

2020 Concrete Plant Monitor Workshop Presentation



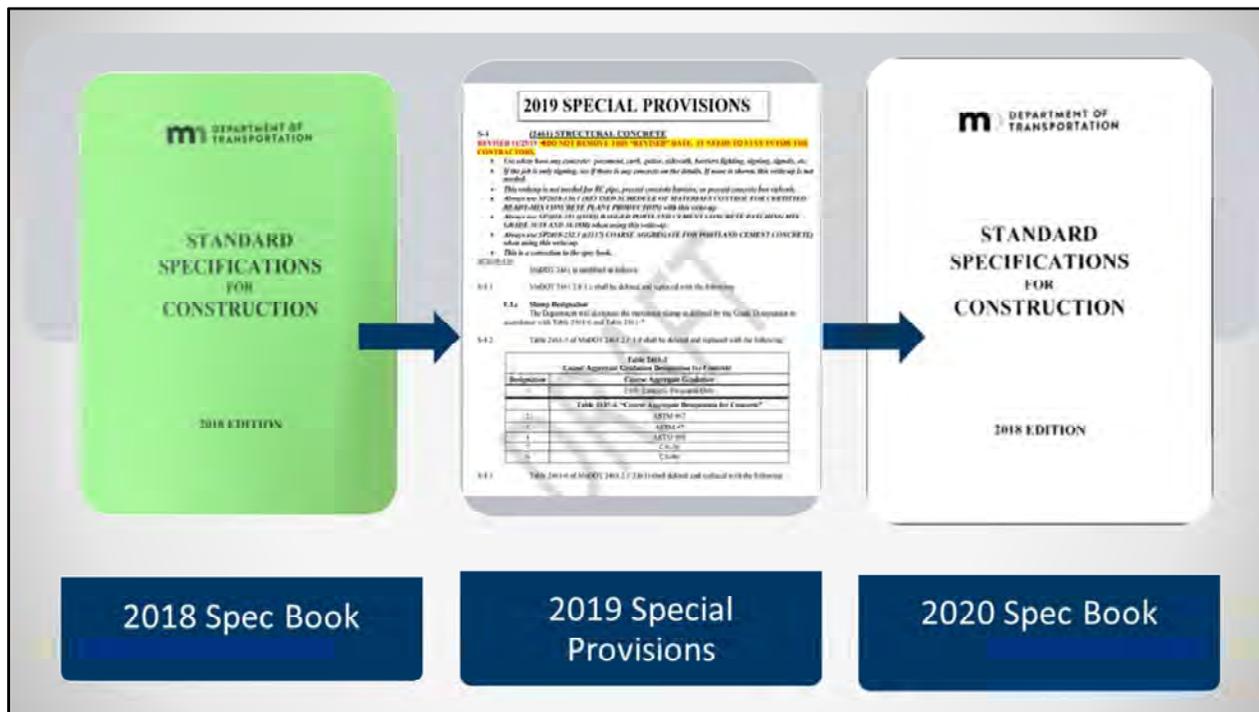
BEFORE YOU GO TO THE PLANT

READ THE CONTRACT!

- * Check which Spec Book applies
- * Become familiar with the Special Provisions
- * Identify which Schedule of Materials apply

DISCLAIMER

The Schedule of Materials Control presented in this workshop is the latest version but may be different on projects according to the letting date. Always check which Schedule of Materials Control is in your Contract.



2018 Spec Book

Special Provisions to the 2016 Spec Book were in contracts let since March 2017 and contain the same information as the 2018 Spec Book

Special Provisions to the 2018 Spec Book

Majority of Additions to the 2020 Spec Book were Special Provisions to 2018 Spec Book

2020 Spec Book

Any future Spec Book changes will be incorporated into our special provisions boilerplate documents for a certain duration prior to incorporation into our spec book. This has many benefits including an increase in quality in our specifications, as well as improvements to customer expectations since they will be able to see the progression of our specifications without being “surprised” at the incorporation of specifications. They will be fully visible within our special provisions prior to spec book incorporation.

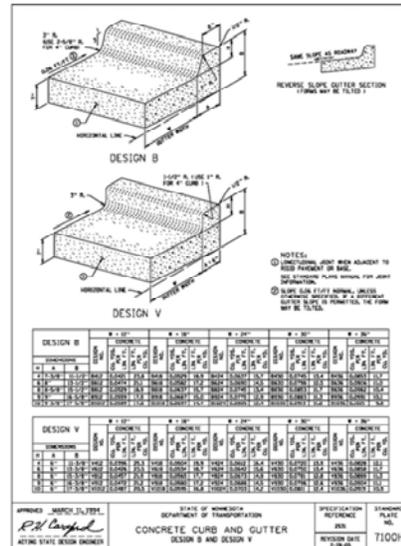
SPECIAL PROVISIONS

- Go to the preconstruction meeting
(Take notes, Ask questions)
- What concrete mix types will be required on the project?
(3F32, 3F52, High Early, JMF mixes, etc.)
- How much concrete will be supplied to the project?
(Evaluate quantities in plan and convert to cubic yards using standard plates.)
- Identify concrete supplier
- Is concrete supplier certified?

Definition in Spec Book:

Additions and revisions to the standard specifications and supplemental specifications that cover conditions specific to a contract.

CURB AND GUTTER STANDARD PLATE



Standard Plate for curb and gutter.

Quantity examples:

(1) 4,378 Lineal Feet of Concrete Curb and Gutter Design B624 would require

IS THE CONCRETE SUPPLIER CERTIFIED?

Certified Ready-Mix Plants and Approved Contractor Mix Designs

Materials Home Concrete Home Contacts

To determine compliance with MnDOT specifications, MnDOT certifies concrete ready-mix plants each year and approves the plant's concrete mix designs.



District Map

Select District: 3 - Brainerd

Select Nearest City: Waite Park

Select RM Plant: RM310 - Cemstone 26-Waite Park

RM310 is Not MnDOT Certified for 2020
RM310 is Not MnDOT Certified for Paving in 2020

Concrete Engineering website:

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

Certified Ready-Mix Plants:

http://dotapp7.dot.state.mn.us/rm_mix/

Certified Ready-Mix Plants and Approved Contractor Mix Designs

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STEPS IN CERTIFYING A READY-MIX PLANT FOR AGENCY

Prior to the beginning of the project or once per calendar year, the Producer completes a *Concrete Plant Contact Report* (Form 2163). A signature block for the Ready-Mix Producer Representative certifying that the Producer will maintain the plant in that condition. An email address is required for each plant.

1. An Agency Representative will meet at the ready-mix plant with the Producer's MnDOT Certified Technician. Together they will review the completed *Contact Report* and do a complete walk-through inspection of the plant.
2. The Producer's MnDOT Certified Concrete Plant Technician will answer all operation and equipment questions.
3. The plant must have its scales calibrated by an approved scale company within the last three months (Specification 1901, 2461.4D, and 2301.3F for concrete paving shall apply).
4. Lab scales and equipment are calibrated annually before the Agency project begins. Equipment and scales meeting the tolerances are dated using tape or other marking methods.
5. The aggregate testing is done by MnDOT Certified Concrete Plant Technicians. Their names, certification numbers, and a cell phone number for the QC Supervisor are posted at the plant site at all times along with the *Contact Report*.
6. The plant must use certified cements, fly ash, slag, and MnDOT approved admixtures. Check the MnDOT Concrete Engineering Unit website for a list of approved materials at <http://www.dot.state.mn.us/products/concrete/index.html> .
7. Observe/discuss materials handling operations with the Producer/Contractor to ensure that stockpiles are not segregated, contaminated, or have non-uniform moisture contents.
8. Assure that the plant is using aggregate sources that are posted on the Concrete Aggregate Properties website <http://dotapp7.dot.state.mn.us/cap/>
9. Obtain a copy of the computerized Certificate of Compliance. Check calculations and required information are correct.
10. Mechanical shakers are required for both fine and coarse aggregate gradations.
11. Continuous on-site access to MnDOT's Concrete Manual is required.
12. A sitemap identifying the contents of all stockpiles, bins, and silos must be visible at the plant site. Stockpiles must be identified with MnDOT pit numbers.
13. Send copy of *Contact Report* and *Certificate of Compliance* to Concrete Office email: conc1off.dot@state.mn.us



2461.3.F.1.a Plant Certification

Prior to the production of Department concrete each construction season, a MnDOT Certified Concrete Plant Technician, representing the Department, shall perform a thorough on-site inspection of the concrete plant with a MnDOT Certified Concrete Plant Technician, representing the Producer.

In order to obtain certification, complete the following:

- (1) The Producer will complete MnDOT Form 2163, *Concrete Plant Contact Report*, prior to the on-site inspection with the Department Representative.
 - (1.1) A MnDOT Certified Concrete Plant Technician, representing the Producer, signs the *Concrete Plant Contact Report* certifying compliance with the Certified Ready Mix requirements and continual maintenance of the plant to assure that the plant can produce concrete meeting MnDOT Specifications.
 - (1.2) A MnDOT Certified Concrete Plant Technician, representing the Department, signs the *Concrete Plant Contact Report* signifying that the plant complies with all requirements prior to concrete production.
- (2) Identify all persons responsible for testing and overseeing plant operations on MnDOT Form 2163, *Concrete Plant Contact Report*. Provide their email, cell phone number, and MnDOT Technical Certification number.
- (3) Include a site map showing stockpile locations identified with the MnDOT pit number.
- (4) Provide cementitious and admixture samples.
- (5) Provide a computerized batching system capable of meeting the requirements of 2461.3.F.2, "Certificate of Compliance."
- (6) Provide continuous access on-site to the Concrete Manual available from MnDOT's website.
- (7) Supply a working email address, including an active internet connection, at the certified ready-mix plant.
- (8) Provide calibrated electronic scales for weighing all materials.
- (9) Provide facilities in accordance with 1604, "Plant Inspection – Commercial Facility," for the use of the plant technician in performing tests.

The Department Representative will submit the completed Contact Report and current Certificate of Compliance to the MnDOT Concrete Engineer for final determination of certification.

MAINTAINING PLANT CERTIFICATION

Display the Contact Report and Site Map in plain sight

All material and equipment changes must be updated on the Contact Report and sent to the Concrete Office

Workbook and Charts must be available at all times

2461.3.F.1.b Maintaining Plant Certification

The Producer will maintain plant certification by:

- (1) Displaying the current Contact Report and site map in plain sight at all times.
- (2) Updating the Contact Report with any material or equipment changes and submitting to the Department.
- (3) Making Producer Plant QC Workbook and QC charts available electronically at all times.
- (4) Performing the responsibilities identified in 2461.3.F.4, "Contractor Quality Control."
- (5) Supplying the following information at the request of the Engineer:
 - (5.1) Approved mix design sheets,
 - (5.2) Agency cementitious and admixture test results,
 - (5.3) Agency verification gradation test results,
 - (5.4) Aggregate quality test results.
- (6) Keeping plant reports, charts, and supporting documentation on file at the plant site for 5 calendar years.

MIX DESIGNS

2461.2.F.2.b Contractor Designed Concrete Mixes

The Contractor will provide concrete mix designs for concrete defined in Table 2461-6 and Table 2461-7 and elsewhere as specified in the Contract.

The Contractor assumes full responsibility for the mix design and performance of the concrete.

MIX DESIGNATIONS

Concrete Mix: 3 F 5 2 A

Type of Concrete
Table 2461-3

Grade of Concrete
Table 2461-6

Maximum Slump
Table 2461-6

Gradation Range
Table 2461-3

Additional Digits at the Contractors Discretion
To the Right of MnDOT Designation Only

MnDOT uses mix designations based on the specification requirements of the structure.

MnDOT's designation is always the first 4 digits to the left. The Producer is allowed to add additional digits to the right of MnDOT's designation.

2461.2.F.1.e Additional Concrete Mix Designation Digits

Specialty concrete mixes require additional concrete digits in accordance with Table 2461-6. Use "EX" for exposed aggregate mixes and "CO" for colored concrete mixes. The Contractor may add additional digits to the right of the required digits in the concrete mix number.

MIX DESIGN TYPES

All concrete mixes are designed by the Producer/Contractor

There are 4 types of mix designs:

1. General concrete
2. Paving concrete
3. Structural concrete
4. Specialty mixes

All concrete mixes are designed by the Producer/Contractor

There are 4 types of mix designs:

- | | |
|------------------------|---|
| 1. General concrete | Preapproved for use at each plant (most common) |
| 2. Paving concrete | Project specific mixes |
| 3. Structural concrete | Project specific mixes |
| 4. Specialty mixes | Cellular and Precast |

After MnDOT approval, each plant retains possession of the mix designs and distributes them electronically upon request.

GENERAL MIX DESIGNS

General concrete mixes are designed in advance and approved by MnDOT. These are the preapproved mixes that the Plant has on hand for use on all Agency Production.

Table 2461-7 lists the requirements for each of the mixes that can be preapproved.

2461-7 TABLE KEY

CONCRETE GRADE - Letter representing broad usage

OLD MIX NUMBER – MnDOT designation previous to 2016

NEW MIX NUMBER – MnDOT Mix Designation

INTENDED USE – List of all transportation structures

MAX W/C RATIO – Varies by part of structure

MAX CEMENTITIOUS CONTENT – Max 750 pounds

MAX % SCM – Max 15% Fly Ash, Max 30% Fly Ash with preliminary test data

SLUMP RANGE – Slump cannot exceed slump range (even with use of admixtures)

MIN 28-DAY COMPRESSIVE STRENGTH – For acceptance

3137 SPECIFICATION – Aggregate quality required

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/yd ³)	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
	3A22 3Y22	3F32	Curb and gutter	0.42	750	30/35/0	½ - 3" #	4500 psi	2.D.1
F Flatwork	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
	1A43	1G52	Footings and pilecap	0.55	750	30/35/40	2 - 5"	4500 psi	2.D.1
G General Concrete	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
	3Y12 3Y32	3M12 3M52	Slipform barrier, Median barrier, non-bridge barrier, Median barrier, non-bridge	0.42 0.45	750 750	30/35/40 30/35/40	½ - 1" # 2 - 5"	4500 psi 4500 psi	2.D.1 2.D.1
P Piling	1A43 1C62	1P42 1P62	MSE and gravity wall leveling pad Piling, spread footing leveling pad	0.63 0.63	750 750	30/35/40 30/35/40	2 - 4" 3 - 6"	3000 psi 3000 psi	2.D.1 2.D.1
	3A32 3B42	3R52	CPR - Full depth concrete repairs, concrete base	0.45	750	30/35/40	2 - 5"	4000 psi	2.D.3
R Pavement Rehabilitation	3Y16	3R12	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 3F57LX 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.

HIGH EARLY MIXES

Table 2461-7
High-Early (HE) Concrete Requirements
(Not applicable to Bridge Superstructure or Mass Concrete)

Mix Number	Concrete Grades Allowed	Minimum Time to Opening	Maximum w/c ratio	Maximum Cementitious Content (lbs/ yd ³) *	Slump Range	Minimum Strength to Opening	Minimum 28-day Compressive Strength, f'c	3137 Spec.
IPHE62	P	-	0.63	750	3 - 6"	-	3000 psi	2.D.1
3HE32	F	48 hrs	0.42	750	1 - 3" †	3000 psi	4500 psi	2.D.1
3HE52	B, F, G	48 hrs	0.42	750	2 - 5"	3000 psi	4500 psi	2.D.1
3YHE52	Y (Repairs Only)	48 hrs	0.42	750	2 - 5"	3000 psi	4000 psi	2.D.2
3RHE52	R (Repairs Only)	48 hrs	0.42	750	2 - 5"	3000 psi	4000 psi	2.D.3

* Supplementary Cementitious Materials allowed.
 || Used only for placing concrete in piles during freezing temperatures, provide 30 percent additional cement to the concrete mix for concrete 10 feet below the ground line or water line in accordance with 2452.3.D.6, "Cast-in-Place Concrete Piles."
 † Adjust slump in accordance with 2461.3.G.7.a, "Concrete Placed by the Slip-form Method."

The High Early mixes designed for General use cannot be opened before 48 hours and the strength has reached 3000 psi. If a quicker opening is required a Project specific mix must be designed and approved.

2461.2.F.2.b(2) High-Early Concrete Mix Design Requirements

The Department defines High-Early (HE) concrete as concrete designed to achieve the minimum strength of 3000 psi for opening at 48 hours. Unless otherwise included in the plans, **all HE concrete requires approval of the Engineer prior to incorporation into the work.**

The Engineer will allow one of the following methods to determine minimum time to opening:

- (A) Field control cylinders in accordance with 2461.3.G.5.c, "Field Control Strength Cylinders."
- (B) Maturity method in accordance with 2461.3.G.6, "Estimating Concrete Strength by the Maturity Method."

LEVEL 1 AND LEVEL 2 MIXES

The General mixes can be designed as a Level 1 or Level 2 mix.

- **LEVEL 1** A mix designed with 15% fly ash or less. These mixes do not require any pretesting.
- **LEVEL 2** A mix with more than 15% fly ash (up to 30%). These mixes require preliminary testing, either a suitable Experience Record or Conventional Trial Mix Data.

	SCM Substitution Limits	Fine Aggregate Limit	Gradation Requirements	Preliminary Test Data Requirements	Submittal Package
Level 1 Mixes *	Fly Ash: 0 – 15% Slag: 0 – 35%	40 – 45% of total aggregate by volume	3126 and 3137	None	General Concrete Mix Design
Level 2 Mixes	Fly Ash: > 15% Ternary: Any	None	Use Either: • 3126 and 3137 • Job Mix Formula (JMF)	2461.2.F.3.a	Use Either: • General Concrete Mix Design • General Concrete Mix Design (JMF)

* High Early concrete in accordance with Table 2461-7 is defined as a Level 1 Mix.
 || Fine aggregate limit does not apply to exposed aggregate concrete mixes.



Minnesota Department of Transportation
Contractor Mix Design - 3137

3/23/2018

PIT #	SOURCE	SIZE	CLASS	SP.G.	ABS.
75999	PRUNE PIT	3/4+		2.65	0.008
77999	PEACH PIT	3/4-	C	2.68	0.012
		5/8-			
		1/2-			
		3/8-			

CHECK WEBSITE FOR F.M.L.
www.dot.state.mn.us/biotech/concepts.htm

Use for:
Level 1 and Level 2 general
concrete not using a F.M.L.

3137 Gradation
67

RMX	777 -001
Plant	Green Plant
Location	Garden, MN
Contact	Fern E. Leaf
Telephone #	999-234-5678

MnDOT Approval **Wendy Garr** Digitally signed by Wendy Garr
DN: cn=Wendy Garr, o=MnDOT, email=w.garr@dot.state.mn.us

MIX	Level	INTENDED USE	Cementitious					W/C Ratio	Sand	% AGGREGATE PROPORTIONS Compos must pass 3137 gradation				
			Water	Cement	Fly Ash	Slag				3/4+	3/4-	5/8-	1/2-	3/8-
3F52	I	Flatwork	225	461	81			1392		1776				
1G52F	II	Footings and pilecap	289	440	110			1410		1750				
1P62	I	Piling, spread footing leveling pad	285	475				1410		1840				
1P62F	II	Piling, spread footing leveling pad	255	340	100			1480		1870				
1X62	I	Cofferdam seals, rock sockets, drilled shafts	295	707				1280		1750				
1X62F	I	Cofferdam seals, rock sockets, drilled shafts	295	601	106			1270		1750				
3F32	I	Slipform curb and gutter	222	535				1370		1800				
3F32F	II	Slipform curb and gutter	220	430	100			1430		1730				
3M12	I	Slipform Median barrier, non-bridge	233	576				1340		1760				
3M12F	I	Slipform Median barrier, non-bridge	233	489	86			1330		1760				
3G52	I	General miscellaneous	250	580				1330		1720				
3G52F	I	General miscellaneous	258	510	90			1300		1700				
3S12	I	Slipform bridge barrier, parapets, end post	233	576				1340		1760				
3S12F	I	Slipform bridge barrier, parapets, end post	233	489	86			1330		1850				
3S52	I	Bridge superstructure, approach panels	250	580				1330		1720				
3S52F	I	Bridge superstructure, approach panels	258	510	90			1300		1700				
3HE32	I	Slipform curb and gutter	274	722				1130		1740				
3HE52	I	Flatwork, General, Bridge Structure	263	658				1250		1700				

GENERAL MIX DESIGN SHEET

- Each mix design equals 1 cubic yard of concrete.
- Mixes can be Level 1 or Level 2
- All mix designs on the sheet must use the aggregates specified in the upper left corner.
- Mix sheets are plant specific. Each plant has its own set of mix designs.
- The RMX number at the top right is a combination of:

777 - 001

Plant ID# Sheet #

- Mix sheets will never be altered or revised.
- To change an existing mix, the whole sheet of mixes will be rescinded and a new sheet will be issued with a new sheet number (777-002).



Contractor Mix Design - 3137

RMX 777 -001

PT#	SOURCE	SIZE	CLASS	SP.G.	ABS.
75999	PRUNE PIT	SAND		2.65	0.006
77999	PEACH PIT	3/4-	C	2.68	0.012
		5/8-			
		1/2-			
		3/8-			

Plant: Green Plant
Location: Garden, MN
Contact: Fern E. Leaf
Telephone #: 999-234-5678

Use for:
Level I and Level 2 general concrete not using a JMF

MnDOT Approval: Wendy Garr
Digitally signed by Wendy Garr
Date: 2018.11.07 15:07:01 -0600

3137 Gradation
67

MIX	Level	INTENDED USE	Water	Concentrations			W/C Ratio	Sand	% AGGREGATE PROPORTIONS					
				Cement	Fly Ash	Slag			3/4+	3/4-	5/8-	1/2-	3/8-	
3F52	I	Flatwork	225	461	81		1392				1776			
1G52F	II	Footings and pilecap	289	440	110		1410				1750			
1P62	I	Piling, spread footing leveling pad	285	475			1410				1840			
1P62F	II	Piling, spread footing leveling pad	255	340	100		1480				1870			
1X62	I	Cofferdam seals, rock sockets, drilled shafts	295	707			1280				1750			
1X62F	I	Cofferdam seals, rock sockets, drilled shafts	295	601	106		1270				1750			
3F32	I	Slipform curb and gutter	222	535			1370				1800			
3F32F	II	Slipform curb and gutter	220	430	100		1430				1730			
3M12	I	Slipform Median barrier, non-bridge	233	576			1340				1760			
3M12F	I	Slipform Median barrier, non-bridge	233	489	86		1330				1760			
3G52	I	General miscellaneous	250	580			1330				1720			
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3S52F	I	Bridge superstructure, approach panels	258	510	90		1300				1700			
3HE32	I	Slipform curb and gutter	274	722			1130				1740			
3HE52	I	Flatwork, General, Bridge Structure	263	658			1250				1700			

HOW DO YOU KNOW IF THE MIX DESIGN HAS BEEN APPROVED?

m DEPARTMENT OF
TRANSPORTATION

Search MnDOT A to Z General Contacts

Concrete Engineering

Materials Home Concrete Home Contacts

What we do
The Concrete Unit provides leadership and assistance to agency consultants on specifications for 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](#)
- [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](#)

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](#)

What's in the News

- The 2016 MnDOT Standard Specifications for Construction requires the Contractor to design all concrete mix designs.

Contractor Mix Design FAQ's
Guidance documents regarding Spec 2461 revisions and implementation of Contractor Mix Designs.

- [Finding Approved Mix Designs](#)
- [Concrete Cylinders - Handling and Curing](#)
- [Gradation Testing and Acceptance](#)
- [Strength Testing and Acceptance](#)

Certified Ready-Mix Plants and Approved Contractor Mix Designs

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To determine compliance with MnDOT specifications, MnDOT certifies concrete ready-mix plants each year and approves the plant's concrete mix designs.



District Map

Select District:

Select Nearest City:

Select RM Plant:

RM310 is Not MnDOT Certified for 2020
RM310 is Not MnDOT Certified for Paving in 2020

Certified Ready-Mix Plants and Approved Contractor Mix Designs

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District Map

Select District:

Select Nearest City:

Select RM Plant:

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Mix Number	Date Approved	Date Rescinded
310-001	6/10/2019	
310-002	6/10/2019	
310-003	7/24/2019	
310-004	7/24/2019	
310-005	7/24/2019	
310-006	8/9/2019	

CAN THE PRODUCER ADJUST THE MIX DESIGN AFTER APPROVAL?

None of the **weights** can be adjusted at the plant once a mix has been approved. The exact weights from the mix design have to be entered into the batching system.

Table 2461-11		
Mix Design Adjustments Requirements		
	Type of Change or Adjustment	Mix Design Resubmittal Requirements
Level 1 Mixes	<ul style="list-style-type: none"> • Cementitious Sources • Admixture Sources • Admixture Dosage Rate 	No resubmittal required
	<ul style="list-style-type: none"> • Aggregate Sources • Aggregate Proportions • Any cementitious proportion ($\leq 15\%$ max fly ash) 	Resubmittal of Mix Design
	<ul style="list-style-type: none"> • Any cementitious proportion ($> 15\%$ max fly ash) 	Resubmittal in accordance with 2461.2.F.3.a
Level 2 Mixes	<ul style="list-style-type: none"> • Cementitious Sources • Admixture Dosage Rate 	No resubmittal required
	<ul style="list-style-type: none"> • Aggregate Source, no change in Aggregate Class • $\leq 5\%$ Total Cementitious • $\leq 10\%$ Aggregate Weights 	Resubmittal of Mix Design
	<ul style="list-style-type: none"> • Aggregate Source and Class of Coarse Aggregate • Supplementary Cementitious Proportion • $> 5\%$ Total Cementitious • $> 10\%$ Aggregate Weights • Admixture Sources 	Resubmittal in accordance with 2461.2.F.3.a
* Only one (1) increase in total cementitious allowed per mix design, next adjustment requires resubmittal in accordance with 2461.2.F.3.a, "Preliminary Test Data Requirements for Level 2 Mixes"		

MnDOT REVIEW FOR ACCEPTANCE

MnDOT will review the following test results:

- (1) Plant and Field Test Results
- (2) **Compressive Strength at 28 days**
- (3) Monthly Aggregate Quality Testing

Provided the concrete met the requirements of the Contract, had satisfactory placement and performance, the Contractor will have that mix design available for use during the next calendar year.

- (1) Plant and Field Test Results:** Gradation, Slump, Air, Temp, Workability, etc.
- (2) Compressive Strength at 28 days:** Each Compressive Strength test is an average of 3 individual cylinders from the same truck.
- (3) Monthly Aggregate Quality** Aggregates remain on the approved list based on the monthly quality tests

NO SUNSET DATE!

2461.2.F.2 Concrete Mix Design Requirements

The Engineer determines final acceptance of the concrete for payment based on test results, satisfactory field placement and performance.

OTHER MIX DESIGN FORMS

Project Specific mixes are also designed by the Contractor.

They can only be used for the Project number in the upper right corner.

They must declare the sources of the cementitious and admixtures. A change would require a new mix design.

**Table 2461-8
Project Specific Contractor Designed Mixes**

Concrete Grade	Intended Use	Specification	3137 Spec.
A	Concrete Pavement	2301	2.D.3
M, V, W, Z	Precast Concrete	2462	Varies
HPC	High Performance Concrete	Special Provision 2401	2.D.2
MC	Mass Concrete	Special Provision 2401	Varies
SCC	Self-consolidating Concrete	Special Provision 2401	Varies
CLSM	Cellular Concrete Grout	2519	None
All concrete grades	Delivery time is > 90 minutes	2461.3.G.3.a	Varies

Minnesota Department of Transportation
Project Specific Paving Mix Design (No JMF) 17/19/18

Use for:
 Paving Projects less than 3,500 CY.
 Minor work and fill-ins

Name/Mill/Plant	MnDOT Abbreviation	Type/Class	SP.G / Dosage
Cement	Holcim - St. Genevieve	STGBLMD I	3.15
Fly Ash	Prairie State - Boral	PSGMAL F	2.40
Slag			
Other CM			

Pit #	Size	Class	SP.G.	ABS.
FAB1	D8058	sand	2.50	0.014
CAB1	93041	3/4"	B	2.73
CAB2				
CAB3				

SP Number	1507-81
Requested By	Kevin L. LeBl
Company	Green Company
Phone	999-234-5678
Email	Lebl@state.mn.gov
Agency Contact	Uhl Joplin
Agency Phone	555-567-8543
Agency Email	Uhl.joplin@state.mn.gov
Plant Name	Green Company, Garden City
Plant #	RM777
Contractor	Trowel Guys
3137 Gradation Specification	#6/

All weights are in lb/cy. Aggregates are considered to be Oven Dry.

Mix #	% Air	Water	Cement	Fly Ash	Slag	Other CM	% Fly Ash	% Slag	% Other CM	Tertiary %	Total CM	W/C Ratio	Total Mix			CR Proportion %			Volume	Unit Wt.	% Paste Volume	Slump Range
													% FA	% CA	CR	CP1	CP2	CP3				
SA415	7.0	252	402	336			33				600	0.42	1288	45	55	100	0	0	1059	140.7	27.4	2-5"

The Concrete Engineer reviews the Contractor's concrete mix design submittal and approves the materials and mix design based on compliance with the contract. Final approval for payment is based on satisfactory field placement and performance.

MnDOT Approval: **Wendy Garr**
Digitally signed by Wendy Garr
 Date: 2018.12.06 13:43:10
 +0800

Comments: DRIVEWAY USE ONLY NOT TO BE USED ON MAINLINE

Submit to: concloff.dot@state.mn.us Page 1

This is a Project Specific Paving mix design without a JMF (Job Mix Formula).

It can only be used for the job printed in the upper right corner.

It is designed for a mix using a standard ASTM gradation found in Specification 3137.

Minnesota Department of Transportation
Project Specific Paving Mix Design (JMF) (1/2/16)

Use for:
 Paving Projects 3,500 CY or greater

Name/Mill/Plant	MnDOT Abbreviation	Type/Class	SP.G / Dosage
Cement	Lehigh - Mason City	LEHMCIA	I 3.15
Fly Ash	Coal Creek - Boral	COCCUNDO	I 2.50
Slag			
Other CM			

Mix #	Size	Class	SP.G	ABS
Admix1	Darvaair 1400	CGRDARI400	ALA	varm
Admix2	WRDA 82	AGRWWRD82	A	3-5/8"WT
Admix3				
Admix4				
Admix5				

SP Number	1567-80
Requested By	Fern L. Lual
Company	Green Company
Phone	999-234-5678
Email	loah@greencompany.com
Agency Contact	Jim Juppiter
Agency Phone	555-987-6543
Agency Email	Jim.Juppiter@state.mn.us
Plant Name	Green Company, Garden City
Plant #	IMA777
Contractor	Tronned Guys
JMF Number	19-027

Mix #	% Air	Water	Cement	Fly Ash	Slag	Other CM	% Fly Ash	% Slag	% Other CM	Tertiary	Total CM	W/C Ratio	% Aggregate Proportion by Volume					Volume	Unit Wt.	% Paste Volume	Slump Range
													FA#1	FA#2	CA#1	CA#2	CA#3				
3A21-1	7.0	324	413	177			30				590	0.38	1182	623	1246		27.0	143.1	25.1	1-2.5"	
3A41-1	7.0	228	402	198			33				600	0.38	1173	618	1236		27.0	142.8	25.8	2-5"	

All weights are in lb/cy. Aggregates are considered to be Oven Dry.

The Concrete Engineer reviews the Contractor's concrete mix design submittal and approves the materials and mix design based on compliance with the contract. Final approval for payment is based on satisfactory field placement and performance.

MnDOT Approval: Wendy Garr
 Digitally signed by Wendy Garr
 Date: 2019.12.08 13:47:36 -0500

Comments:

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This is a paving mix design utilizing a JMF gradation.

It is always 2-page. The second page has the JMF gradation requirement.

If the gradation runs out of the working range the JMF proportions can be changed and resubmitted for approval.

Minnesota Department of Transportation
Contractor Mix Design - Specialty Concrete (JMF) (1/2/17)

JMF: **18-202**
 SP: 1567-80

Agg. Size	FA #1	FA #2	CA #1	CA #2	CA #3	TOTAL % PASSING	WORKING RANGE LIMITS	JMF WORKING RANGE	TOTAL % RETAINED
Sand			3/4	3/4+		100%			0
Prop. %	42		44	14					
2"	100.0		100.0	100.0		100	+5	95	5
1 1/2"	100.0		100.0	80.0		97	±5	92	3
1"	100.0		98.0	7.0		88	±5	81	11
3/4"	100.0		79.0	2.0		77	±5	72	9
1/2"	100.0		44.0	1.0		62	±5	57	15
3/8"	100.0		26.0	1.0		54	±5	49	8
#4	84.0		2.0	1.0		36	±5	31	18
#8	56.0					24	±4	20	12
#16	31.0					13	±4	9	11
#30	13.0					5	±4	1	8
#60	7.0					3	±3	0	2
#100	6.0					3	±2	1	0
#200	1.8					0.8	≤ 1.6	0.0	1.6

Well-Graded Aggregate Optional Incentive - % Retained Gradation Band

Coarse Sand
 % Retained (#8 through #30)
31
 Greater than 15%, generally enhances cohesion of the mix.

Fine Sand
 % Retained (#30 through #200)
12
 Between 24-34%, generally enhances workability of the mix.

Page 2

Minnesota Department of Transportation
Project Specific Structural Concrete Mix Design (JMF) (12/6/19)

Cement	Name/Mill/Plant	MnDOT Abbreviation	Type/C	SP G / Dosage
	Lehigh, Mason City	LQA/DAIA	I/II	1.15
Fly Ash	Labadie, Labadie, MO	LABLAMO	C	
Slag				
Other CM				
Adms#1	Euclid	LUALA92	AEA	1.10
Adms#2	Euclid	LUAWK91	A	1.10
Adms#3				
Adms#4				
Adms#5				
Fiber				

Use for:
 High Performance Bridge
 Mass Concrete
 Self Consolidating Concrete (SCC)
 Specialty Concrete

SP Number	1567-80
Requested By	Fern L. Lofel
Company	Green Company
Phone	999 234 5678
Email	1111111111@state.mn.us
Agency Contact	Uri Jupiter
Agency Phone	505-987-6543
Agency Email	UrLofel@state.mn.us
Plant Name	Green Company, Garden City
Plant #	RM177
Contractor	Trowel Guys
JMF Number	18-202

All weights are in lb/cy. Aggregates are considered to be Oven Dry.

Mix #	% Air	Water	Cement	Fly Ash	Slag	Other CM	% Fly Ash	% Slag	% Other CM	Total CM	W/C Ratio	% Aggregate Proportion by Volume					Volume	Unit WL	Waste % Volume
												FA#1	FA#2	CA#1	CA#2	CA#3			
3652	6.5	258	523	92			15			615	0.42	42	42	14	14	14	27.0	146.0	25.2

Slump Range, in	Spread Range if using SCC, in	Anticipated Strength, psi
2-5		4500

The Concrete Engineer reviews the Contractor's concrete mix design submittal and approves the materials and mix design based on compliance with the contract. Final approval for payment is based on satisfactory field placement and performance.

MnDOT Approval: Wendy Garr
 Digitally signed by Wendy Garr
 Date: 2019.12.06 10:50:20 -06'00'

Comments:

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This is a Structural Concrete mix design.
 Structural Concrete could be both JMF and non-JMF

Minnesota Department of Transportation
Contractor Mix Design - Job Mix Formula (JMF) (12/6/19)

	FA #1	FA #2	CA #1	CA #2	CA #3	TOTAL % PASSING	WORKING RANGE LIMITS	JMF WORKING RANGE	TOTAL % RETAINED
Agg. Size	Sand		3/4-	3/4+		100%			
Prop. %	42		44	14					
2"	100.0		100.0	100.0		100	± 5	95-100	0
1 1/2"	100.0		100.0	80.0		97	± 5	92-100	3
1"	100.0		98.0	7.0		86	± 5	81-91	11
3/4"	100.0		79.0	2.0		77	± 5	72-82	9
1/2"	100.0		44.0	1.0		62	± 5	57-67	15
3/8"	100.0		26.0	1.0		54	± 5	49-59	8
#4	84.0		2.0	1.0		36	± 5	31-41	18
#8	56.0					24	± 4	20-28	12
#16	31.0					13	± 4	9-17	11
#30	13.0					5	± 4	1-9	8
#50	7.0					3	± 3	0-6	2
#100	6.0					3	± 2	1-5	0
#200	1.8					0.8	≤ 1.6	0.0-1.6	2

JMF: **18-202**
 SP: 1567-80

Mix #	3652
-------	------

% Retained Gradation Band

Coarse Sand % Retained (#8 through #30)	31
Greater than 15%, generally enhances cohesion of the mix.	
Fine Sand % Retained (#30 through #200)	12
Between 24-34%, generally enhances workability of the mix.	

Page 2



Minnesota Department of Transportation
DOT

(1/14/20)

Project Specific Structural Concrete Mix Design (JMF) - Non-MnDOT Specified

Name/Mfr/Plant	MnDOT Abbreviation	Type/Class	SP.G./ Dosage	Use for:
Cement	Cortec/Davenport	CONDMA	I/B 3.13	Specialty Concrete for non-MnDOT specified mix designs
Fly Ash	Bural/Coral Creek	DDCUNND	F 2.50	
Slag				
Other CM	BASF/MasterLife 200	Silica Fume	2.20	
Adm#1	BASF	MAIRSD	AEA 0.1-0.15	

Pa #	Size	Class	SP.G.	ABS.	Agency Contact
FAB1	1 1/2"	Sand	2.62	0.010	Mark Jones
FAB2					789-436-1234
CAB1	3/4"	C	2.72	0.004	Agency Email: mname@concrete.com
CAB2					Plant Name: Concrete Products Company
CAB3					Plant # 816350
CAB4					Contractor: Bridge Construction Company
CAB5					JMF Number: 55-000

All weights are in lb/cy. Aggregates are considered to be Oven Dry.

Mix #	% Air	Water	Cement	Fly Ash	Slag	Other CM	% Fly Ash	% Slag	% Other CM	Tertiary	Total CM	W/C Ratio	% Aggregate Proportion by Volume					Volume	Unit Wt.	% Finer		
													FAB1	FAB2	CAB1	CAB2	CAB3					
319PC	6.5	250	546	19		30	3		5	B	595	0.42	1392		1630					27.0	143.2	28.4

Temp. Range, in	Spread Range if using SCC, in	Anticipated Strength, psi
4-7		4500

MnDOT reviewed the materials for compliance with MnDOT aggregate quality requirements and APL/QPL.

MnDOT assigned a JMF for testing purposes.

1/9/20 Date received Engineer of record acceptance of mix design documentation.

MnDOT Reviewer: _____

Engineer of Record: **Mark Jones, PE**

Comments: This mix will contain 1.5 pints of Cortec MCI-2005 NS corrosion inhibiting admixture, and it may contain FMG7500 admixture. It will be used for the deck.

Submit to: conloff.dot@state.mn.us Page 1

This is a Structural concrete mix design that is non-MnDOT specified. These are projects that are not using MnDOT specifications but are submitting samples to MnDOT Labs for testing.

BECOME FAMILIAR WITH THE QC REQUIREMENTS

All Producer QC responsibilities are documented in **Specification 2461.3.F.4**

PRODUCER RESPONSIBILITIES

- Check equipment
- Spot check batching
- Check the bins and piles for segregation and contamination
- Verify scale calibrations
- Inspect mix trucks
- Take cementitious and admixtures samples per Schedule of Materials Control and document in the appropriate Sample Log.

2461.3.F.4 Contractor Quality Control (QC)

The Producer's daily responsibilities include the following:

- (1) Provide qualified personnel.
- (2) Maintain laboratory equipment within allowable tolerances.
- (3) Randomly spot check concrete batching to verify batch weights and tolerances.
- (4) Check the bins and piles for segregation, contamination, or interblending of the aggregates.
- (5) Check that mix trucks are clean, blades are not worn, and revolution counters are working properly.

PRODUCER CERTIFIED TECHNICIANS

MnDOT Provisionalized Plant Personnel	MnDOT Concrete Plant Certified Technician	Quality Control Supervisor	Quality Control Manager
<ul style="list-style-type: none">• Perform Testing• Enter Data in workbooks and charts	<ul style="list-style-type: none">• Perform Testing• Enter Data in workbooks and charts• Sign Certificate of Compliance	<ul style="list-style-type: none">• MnDOT Concrete Plant Certified Technician• Responsible for QC testing and daily plant operations	<ul style="list-style-type: none">• Responsible for Quality Control Supervisor and certified ready-mix plant program

2461.3.F.4.a Personnel

The Producer will provide the following personnel:

- (1) QC Plant Technician(s) to perform all testing and quality control requirements of 2461. The QC Plant Technician shall hold a current MnDOT Concrete Plant Certification.
- (2) Quality Control Supervisor responsible for oversight of all QC testing and daily plant operations. The Quality Control Supervisor shall hold a current MnDOT Concrete Plant Certification and is required to remain on-site during concrete production or have cellular phone availability.
- (3) Quality Control Manager responsible for oversight of the Quality Control Supervisor and the certified ready-mix plant program.

SAMPLING AND TESTING

MaDOT SD-15 June, 2017 (Rev. Nov., 2017) Schedule of Materials Control for 2018 Standard Specifications
 IV. Concrete Construction Items (cont.) (www.dot.state.ma.us/materials/concrete.html) Page 77

Pay Item No.	Material	Spec. No.	Sample Size	Minimum Required Sampling Rate for Laboratory Testing	Form No.
Concrete Plant Batching Materials					
Remarks: (1) All materials must come from certified or qualified sources. All certified sources must state so on the delivery invoice. (2) The most current list of certified approved sources can be found at www.dot.state.ma.us/materials/caplist.htm . (3) The Sample Log sheets are found in the Aggregate Gradation Control Charts Workbook.					
2301 2302 2401 2404 2409 2409 2411 2412 2423 2423 2461 2462 2504 2511 2514 2518 2523 2531 2545 2550 2554 2557 2564 2565	Portland Cement Slag Cement Blended Cement Fly Ash	5101 5102 5103 5112	5 B.	For certified ready-mix and concrete producer and licensed PCC supplier use production: 1 sample when the plant is certified. Take an additional sample: 1) At 6 months during Agency production. 2) If the plant changes sources, or 3) At the Contract requires. For ready-mix concrete: 1 sample every 1 month during Agency production. The Producer obtains and stores the sample in a sealed container provided by the Agency, and includes the supplier's delivery invoice from which the sample is obtained. Take additional samples as directed by the Concrete Engineer.	24300 ID Card Concrete Samples 24306 ID Card Fly Ash Samples
2523 2531 2545 2550 2554 2557 2564 2565	Admixtures (Accelerating Retarding, Water- Reducing, Air- Entraining, etc.)	5113	1/2 pt.	For all concrete including portable concrete: 1 sample of an instrumented and Type A water-reducer when the plant is certified. Take an additional number of any admixtures used: 1) At 3 month intervals during Agency production. 2) If the plant changes sources, or 3) At the Contract requires. The Producer obtains samples from dispensing tubes and stores the sample in a sealed plastic container provided by the Agency. Take additional samples as directed by the Concrete Engineer.	2410 Sample ID Card Sample Log
	Water (Non-Potable or Certified)	3906	1 gal.	Non-Potable Water: 1 sample from any questionable source. Certified Water: 1 sample every month during Agency production. Store sample in a clean glass or plastic container.	2410 Sample ID Card

2461.3.F.4.b Sampling and Testing

Take aggregate, cementitious, and admixtures samples in accordance with ASTM D 3665, Section 5, at a rate defined in the Schedule of Materials Control. Perform sampling and testing in accordance with the Concrete Manual. The Engineer may oversee the QC sampling and testing process.

Perform gradation and moisture testing at the certified ready-mix plant site. Use mechanical shakers for sieve analysis.

Provide equipment and perform calibrations meeting the requirements of the following:

- (1) AASHTO T 27, "Sieve Analysis of Fine and Coarse Aggregates,"
- (2) AASHTO T 255, "Total Moisture Content of Aggregate by Drying,"
- (3) AASHTO M 92, "Wire-cloth Sieves for Testing Purpose," and
- (4) AASHTO M 231, "Weighing Devices Used in the Testing of Materials."

Concrete Plant Batching Materials**Remarks:**

- (1) All materials must come from certified or qualified sources. All certified sources must state so on the delivery invoice.
 (2) The most current list of certified/approved sources can be found at www.dot.state.mn.us/products.
 (3) The Sample Log sheets are found in the Aggregate Gradation Control Charts Workbook.

Pay Item No.	Material	Spec. No.	Sample Size	Minimum Required Sampling Rate for Laboratory Testing	Form No.
2301	Portland Cement Slag Cement Blended Cement	3101	5 lb.	For certified ready-mix and concrete paving and bagged PCC patching mix production: 1 sample when the plant is certified. Take an additional sample: 1) At 6 months during Agency production, 2) If the plant changes sources, or 3) As the Contract requires. For precast concrete: 1 sample every 3 months during Agency production. The Producer obtains and stores the sample in a sealed container provided by the Agency, and includes the supplier's delivery invoice from which the sample is obtained. Take additional samples as directed by the Concrete Engineer.	24300 ID Card Cement Samples Sample Log
2302		3102			
2401		3103			
2404	Fly Ash	3115	5 lb.		24308 ID Card Fly Ash Samples Sample Log
2405					
2406	Admixtures (Accelerating, Retarding, Water- Reducing, Air- Entraining, etc.)	3113	1/2 pt	For all concrete including mobile mixers: 1 sample of air entrainment and Type A water reducer when the plant is certified. Take an additional samples of any admixtures used: 1) At 3 month intervals during Agency production, 2) If the plant changes sources, or 3) As the Contract requires. The Producer obtains samples from dispensing tubes and stores the sample in a sealed plastic container provided by the Agency. Take additional samples as directed by the Concrete Engineer.	2410 Sample ID Card Sample Log
2411					
2412					
2422					
2452					
2461					
2462					
2506					
2511					
2514					
2519					
2521	Water (Non-Potable or Clarified)	3906	1 gal	Non-Potable Water: 1 sample from any questionable source. Clarified Water: 1 sample every month during Agency production. Store sample in a clean glass or plastic container	2410 Sample ID Card
2531					
2533					
2545					
2550					
2554					
2557					
2564					
2565					

QC GRADATIONS

IV. Concrete Construction Items (cont.) (www.dot.state.mn.us/materials/concrete.html)

Certified Ready-Mix - Concrete Plant Production

Remarks:
 (1) All gradation and quality tests require companion samples. Samples taken at location identified on Contact Report located.
 (2) Perform Aggregate Quality testing as directed by the Concrete Engineer.
 (3) When **<20 yd³** of concrete is produced in a **week**, plant monitoring is not required with the exception of monthly aggregate quality testing.

Minimum Sample Sizes:

Gradation: 3/4" Plus, #4: 30 lb. 3/4" Minus, #67: 10 lb. #7, CA-70: 6 lb. C/A, F/A: 1000 g CS, FS: 500 g #89, CA-80: 500 g Fine Aggregate: 500 g	Moisture: Fine Aggregate: 500 g Intermediate Aggregate: 500 g Course Aggregate: 2000 g	Aggregate Quality: 3/4" Plus, #4: 50 lb. 3/4" Minus, #67: 30 lb. #7, CA-70: 30 lb. #89, CA-80: 30 lb. Intermediate Agg: 30 lb. Fine Aggregate: 30 lb.
--	--	--

Companion Required, Double Sample Sizes

Pay Item No.	Test Type	Spec. No.	Producer/Contractor Testing	Agency Testing	Form No.	
2301**	Gradation (QC/QA)	2461	All JMFs and Bridge Deck mix designs	All other mix designs	QC Workbook Aggregate Gradation Control Charts Workbook	
2302		3126	Daily Concrete Quantity: 20 – 400 yd³: 1 per fraction per source >400 yd³: 2 per fraction per source Take second gradation after <u>daily</u> total exceeds 400 yd ³ . Passing aggregate gradations are required prior to the start of bridge deck pours. Notes: Washing the fine aggregate gradation (QC) sample is not required when the result on the #200 sieve of the unwashed sample is less than 1.0%. Hold QA (QC companion) samples until they are picked up by the Agency monitor. Discard after 14 calendar days. Performing testing on representative material at the end of the most recent day of production is allowed.	Weekly Concrete Quantity: 20 – 400 yd³: 1 per fraction per source >400 yd³: 2 per fraction per source Take second gradation after <u>weekly</u> total exceeds 400 yd ³ .		All mix designs Weekly Concrete Quantity ≥ 20 yd³: 1 QA (QC Companion) sample per fraction per source per week. Include QC Companion results on Sample ID Card
2401		3131				
2406		3137				
2411						
2432						
2461						
2462						
2506						
2511						
2514						
2519						
2521						
2531						
2533						
2545						
2550						
2554						
2557						
2564						
2565						

2461.3.F.4.c Aggregate Gradations

Complete the *Concrete Aggregate Worksheet* for each aggregate size and source:

- (1.1) QC Gradations: If a QC gradation fails, retest immediately documenting both results. If an additional QC test is required for that week, the Engineer will not allow a retest gradation as a substitute for a QC gradation.
- (1.2) Verification Companion Gradations: The Engineer will not allow a verification companion gradation as a substitute for a QC gradation.

Identify QC companion samples with the following information:

- (2.1) Date,
- (2.2) Test number,
- (2.3) Time,
- (2.4) Type of material,
- (2.5) Plant, and
- (2.6) Sampling location.

IV. Concrete Construction Items (cont.) (www.dot.state.mn.us/materials/concrete.html)

Certified Ready-Mix - Concrete Plant Production

Remarks:

- (1) All gradation and quality tests require companion samples. Samples taken at location identified on Contact Report located.
- (2) Perform Aggregate Quality testing as directed by the Concrete Engineer.
- (3) When <u>20 yd³</u> of concrete is produced in a week, plant monitoring is not required with the exception of monthly aggregate quality testing.

Minimum Sample Sizes:

Gradation:
 3/4" Plus, #4: 30 lb.
 3/4" Minus, #67: 10 lb.
 #7, CA-70: 6 lb.
 CIA, FIA: 1000 g
 CS, FS: 500 g
 #89, CA-80: 500 g
 Fine Aggregate: 500 g

Moisture:
 Fine Aggregate: 500 g
 Intermediate Aggregate: 500 g
 Coarse Aggregate: 2000 g

Aggregate Quality:
 3/4" Plus, #4: 50 lb.
 3/4" Minus, #67: 30 lb.
 #7, CA-70: 30 lb.
 #89, CA-80: 30 lb.
 Intermediate Agg: 30 lb.
 Fine Aggregate: 30 lb.

Companion Required, Double Sample Sizes

Companion Required, Double Sample Sizes

Pay Item No.	Test Type	Spec. No.	Producer/Contractor Testing		Agency Testing	Form No.
			All JMFs and Bridge Deck mix designs	All other mix designs		
2301**	Gradation (QC/QA)	2461	Daily Concrete Quantity: 20 – 400 yd ³ : 1 per fraction per source >400 yd ³ : 2 per fraction per source Take second gradation after <u>daily</u> total exceeds 400 yd ³ . Passing aggregate gradations are required prior to the start of bridge deck pours.	Weekly Concrete Quantity: 20 – 400 yd ³ : 1 per fraction per source >400 yd ³ : 2 per fraction per source Take second gradation after <u>weekly</u> total exceeds 400 yd ³ .	<u>All mix designs</u> Weekly Concrete Quantity ≥ 20 yd ³ : 1 QA (QC Companion) sample per fraction per source per week Include QC Companion results on Sample ID Card.	QC Workbook Aggregate Gradation Control Charts Workbook
2302		3126				
2401		3131				
2406		3137				
2411						
2452						
2461						
2462						
2506						
2511						
2514						
2519						
2521						
2531						
2533						
2545						
2550						
2554						
2557						
2564						
2565						

MOISTURE CONTENT

IV. Concrete Construction Items (cont.) (www.dot.state.mn.us/materials/concrete.html)

Certified Ready-Mix - Concrete Plant Production (cont.)					
Pay Item No.	Test Type	Spec. No.	Producer/Contractor Testing	Agency Testing	Form No.
2301**	Gradation (Verification/Verification Companion)	2461	Test the Verification Companion sample.	Weekly Concrete Quantity \geq 100 yd³: 1 per fraction per source Include Verification Companion results on Sample ID Card.	QC Workbook 24143 Weekly Certified Ready-Mix Plant Report or QA Workbook
2302		3126	Complete on the day the sample was taken.		
2401		3131			
2406		3137	Wash all fine aggregate Verification Companion samples.		
2411					
2452	Aggregate Quality including Coarse Aggregate Percent Passing - #200	3126	Test at Contractor's Discretion	1 per fraction per source per month. Bridge Deck Concrete: 1 per fraction per source per month tested for 3137.2.D.2 Identify quality samples with a "Q" on the Sample ID Card and the Quality companion sample.	2410 Sample ID Card
2461		3131			
2506		3137			
2511					
2514					
2519	Aggregate Moisture (QC)	2461	Daily Concrete Quantity \geq 20 yd³: 1 per fraction per source completed every 4 hours.	None	QC Workbook
2521			Complete the initial moisture content and adjust the batch water prior to the start of concrete production each day.		
2531			If weather conditions allow, performing moisture testing on representative material at the end of production the prior evening is allowed. In this event, the four-hour rate will commence with the first pour of the day, regardless if it is placed in Agency or private work.		
2533					
2545					
2550					
2554					
2557					
2564					
2565					

2461.3.F.4.d Moisture Content

Determine the moisture content using the oven-dry method in the Concrete Manual. Moisture probes to determine moisture content in the aggregates are not allowed without the approval of the Concrete Engineer.

Complete the *Batching Report* for each aggregate size and source.

Observe the batch person enter moisture contents into the batching system. Verify the moisture contents were entered correctly on the Certificate of Compliance.

IV. Concrete Construction Items (cont.) (www.dot.state.mn.us/materials/concrete.html)

Certified Ready-Mix - Concrete Plant Production		
Remarks: (1) All gradation and quality tests require companion samples. Samples taken at location identified on Contact Report located. (2) Perform Aggregate Quality testing as directed by the Concrete Engineer. (3) When <20 yd³ of concrete is produced in a week , plant monitoring is not required with the exception of monthly aggregate quality testing.		
Minimum Sample Sizes:		
Gradation: 3/4" Plus, #4: 30 lb. 3/4" Minus, #67: 10 lb. #7, CA-70: 6 lb. CIA, FIA: 1000 g CS, FS: 500 g #89, CA-80: 500 g Fine Aggregate: 500 g	Moisture: Fine Aggregate: 500 g Intermediate Aggregate: 500 g Coarse Aggregate: 2000 g	Aggregate Quality: 3/4" Plus, #4: 50 lb. 3/4" Minus, #67: 30 lb. #7, CA-70: 30 lb. #89, CA-80: 30 lb. Intermediate Agg: 30 lb. Fine Aggregate: 30 lb.
Companion Required, Double Sample Sizes		

IV. Concrete Construction Items (cont.) (www.dot.state.mn.us/materials/concrete.html)

Certified Ready-Mix - Concrete Plant Production (cont.)					
Pay Item No.	Test Type	Spec. No.	Producer/Contractor Testing	Agency Testing	Form No.
2301** 2302 2401 2406 2411 2452 2461	Gradation (Verification/Verification Companion)	2461 3126 3131 3137	Test the Verification Companion sample. Complete on the day the sample was taken. Wash all fine aggregate Verification Companion samples.	Weekly Concrete Quantity \geq 100 yd³: 1 per fraction per source Include Verification Companion results on Sample ID Card.	QC Workbook 24143 Weekly Certified Ready-Mix Plant Report or QA Workbook
2462 2506 2511 2514 2519 2521 2531	Aggregate Quality including Coarse Aggregate Percent Passing - #200	3126 3131 3137	Test at Contractor's Discretion	1 per fraction per source per month. Bridge Deck Concrete: 1 per fraction per source per month tested for 3137.2.D.2 Identify quality samples with a "Q" on the Sample ID Card and the Quality companion sample.	2410 Sample ID Card
2533 2545 2550 2554 2557 2564 2565	Aggregate Moisture (QC)	2461	Daily Concrete Quantity \geq 20 yd³: 1 per fraction per source completed every 4 hours. Complete the initial moisture content and adjust the batch water prior to the start of concrete production each day. If weather conditions allow, performing moisture testing on representative material at the end of production the prior evening is allowed. In this event, the four-hour rate will commence with the first pour of the day, regardless if it is placed in Agency or private work.	None	QC Workbook

Certified Ready-Mix

Materials Home Concrete Home Contacts

Certified ready-mix program

References

- [Approved certificates of compliance programs](#)
- [Authorized Scale Calibration Companies](#)
- [Concrete aggregates](#)
- [Concrete aggregate properties](#)
- [New source concrete aggregate testing requirements](#)
- [2020 Ready-mix plant monitor manual](#)

Forms

Concrete mix designs

- [Mix designs](#)

Field

- [Weekly concrete report \(2448\)](#) (No longer required for projects using the 2018 specifications)
- [Cylinder Strength Moving Average Workbook](#) (revised 1/8/19)

Plant

- [Aggregate gradation control charts and sample log](#) (revised 1/30/20)
- [Certificate of compliance \(0042\)](#)
- [Concrete ready-mix plant QC workbook](#) (revised 3/30/20)

Submit to us

Contact Reports
(conc1off.dot@state.mn.us)

Concrete Ready Mix Plant QC and
QA Workbooks
(weeklyrmpplantreport.dot@state.mn.us)



Go to Concrete Engineering Website:

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

Select 'READY-MIX'

Select 'Concrete ready-mix plant QC workbook'

PLANT QC WORKBOOK

- **Plant Workbooks are Excel Workbooks**
- **Downloaded from the website**
- Weekly workbooks ending on Saturday
- Complete Workbooks in “REAL TIME”
- Must be submitted electronically by the Tuesday following the week of production

2461.3.F.4.e Concrete Ready-Mix Plant QC Workbook

Complete the *Concrete Ready-Mix Plant QC Workbook* which includes all of the following documents:

- (1) Diary
- (2) Batching Report
- (3) Concrete Aggregate Worksheet
- (4) Weekly Concrete Aggregate Report
- (5) JMF Concrete Aggregate Worksheet
- (6) JMF Weekly Concrete Aggregate Report

The Producer will maintain the *Concrete Ready-Mix Plant QC Workbook* in real time using their full name for the diary and each test performed.

The Producer’s designated Quality Control Supervisor will review and submit to the Engineer and the Concrete Engineering Unit by the Tuesday immediately following the previous week’s production.

AGGREGATE GRADATION CONTROL CHARTS

- (1) Complete the *Aggregate Gradation Control Charts* in real time for each aggregate size and aggregate source:
 - (1.1) Record Producer QC gradation and Verification Companion gradation results. These results are included in the moving average calculation.
 - (1.2) Record Verification Gradation results. These results are not included in the moving average calculation.

2461.3.F.4.f Aggregate Gradation Control Charts and Sample Log

- (1) Complete the *Aggregate Gradation Control Charts* in real time for each aggregate size and aggregate source:
 - (1.1) Record Producer QC gradation and Verification Companion gradation results. These results are included in the moving average calculation.
 - (1.2) Record Verification Gradation results. These results are not included in the moving average calculation.
- (2) Complete *Sample Log* in real time for all samples taken:
 - (2.1) Record all aggregate samples taken by the Agency.
 - (2.2) Record cementitious and admixture samples taken by the Producer and picked up by the Agency.

SIGNING THE CERTIFICATE OF COMPLIANCE

By signing the first ticket of each mix type, each day, the technician is verifying the accuracy of the information and indicating to the field inspector that Quality Control has been performed.

MATERIAL DETAILS:		WATER: City	
CEMENT: Lehigh Mason City, Iowa Type I LEHMCIA	AIR ENTRAINMENT: GRTYPOSASO	AGRTPX90	_____
CEMENT: CEPSCMO SUGAR CREEK PLANT TYPE HI	LOWRANGE: AGRT400NC		
FLASH: BUCOCMN GRT BOGWELL UNIT 3 GCHSSET CL C	REDUCER: AGRTK1200		
FINE AGG: 18139 BORDWELL	REDUCER 2: GRTTP3000		
FINE AGG 2: NA	RETARDER: GRTTFLVR		
COARSE AGG: 1 CA-50 18134. BARTEL	VMA: GORTPLVMA		
COARSE AGG: 2 CA-50A 73000 MARTIN MARRIETA	NCA: GORTPLVSS		
COARSE AGG: 3 3/8 18139 BORDWELL	RENU: GORTTPLREN		

FIELD TEST & COMMENTS

Location: _____ Cylinder# _____

Concrete Temp: _____ Air Temp: _____ Air Content: _____

Slump: _____ Time Discharged: _____

Water Added @ Plant: _____ gal Water Added @ Jobsite: _____ gal Total Actual Water: _____ gal

Producers Signature: _____ Life River NCR

Inspectors Signature: _____

Load Total: 39070 lb Num Batches: 1 CD Training

Slump: 3.06 in Design W/C: 0.425

Water in Truck: 0.0 gal Adjust Water: 0.0 gal / Load Trim Water: -2.0 gal / yd

Design Water: 3480.0 lb Total Water: 2294.9 lb Tot Add: 22 gal

Ingredient	Slack	MCFac	AdjFac	TOT	ABS	SSD	Free Wet	yd TARG	Target	Actual	Actual Resid						
SAND	18134	BARTEL GARRISO	0.018	M	0.010	1699	lb	17	1710	12.74	1729	17267	lb	17361	127	lb	
SAND	18139	BORDWELL	0.030	M	0.008	1330	lb	11	1340	28.18	1375	12740	lb	13903	+	260	lb
CEMENT	DACORSD	SUGO DAKOTA				920	lb		962		962	1020	lb				
FLASH	BUCOCMN	BOGWELL UNIT				80	lb		80		80	380	lb				
REDUCERS	AGRTK1200	KR1200				38.60	gal		38.60		29.60	296.00	gal				
AIR	GRTYPOSASO	GRT POLYCH				7.00	oz		7.00		7.00	70.00	oz				
WATER	CITY					248.0	lb		248.0		187.1	1870.8	lb				

2461.3.F.4.g Signing the Certificate of Compliance

The Producer's MnDOT Certified Concrete Plant Technician will:

- (1) Review the first Certificate of Compliance for each mix type, each day, for accuracy; and
- (2) Legibly hand sign the Certificate of Compliance at a location designated for Producer signature signifying agreement to the terms of this program and to certify that the materials comply with the requirements of the Contract; and
- (3) Print their name and write their MnDOT Technical Certification Number next to their signature.

COMMUNICATION

- Contact with the field inspectors
- Verify mix/mixes daily with the batchman
- Call plant to confirm mix
 - Especially if you do not expect to be there at the beginning of the pour

1510 AUTHORITY AND DUTIES OF THE INSPECTOR

Inspectors have the authority to do the following:

- (1) *Inspect the Work and the preparation, fabrication, or manufacture of materials;*
- (2) *Notify the Contractor of non-conforming Work;*
- (3) *Reject non-conforming materials; and*
- (4) *Suspend portions of the Work for the following reasons that require a decision by the Engineer.*
 - (4.1) *Interpretation of requirements in the Contract,*
 - (4.2) *Performance of unacceptable or unauthorized Work in accordance with 1512, or,*
 - (4.3) *Safety.*

Inspectors do not have authorization to alter or waive requirements of the Contract or to issue instructions contrary to the Contract.

Inspectors do not have an obligation or have authorization to provide direction, superintendence, or guidance to the Contractor, its crews, its Subcontractors, or suppliers to accomplish the Work.

Any action or inaction of the Inspector does not waive the Department's right to pursue any and all legal remedies for defective Work or Work performed by the Contractor in an unworkmanlike manner.

AT THE PLANT

QA Requirements

- Checking QC documentation
- Certificate of Compliance
- QA Sampling
- QA Documentation
- Batch Water Verification

2461.3.F.6 Acceptance of Concrete Materials

Only place concrete meeting the materials requirements in the work. If the Contractor places concrete not meeting the materials requirements into the work, the Engineer will not accept non-conforming concrete at the contract unit price.

QUALITY ASSURANCE RESPONSIBILITIES

2461.3.F.5.a Personnel

The Department will provide MnDOT Certified Concrete Plant Technicians to perform all of the duties of 2461.3.F.5, "Agency Quality Assurance."

2461.3.F.5 Agency Quality Assurance (QA)

The Engineer's responsibilities each time the plant is visited include the following:

- (1) Confirm the *Concrete Ready-Mix Plant QC Workbook* and *Aggregate Gradation Control Charts* are accurate and up-to-date.
- (2) Check Certificate of Compliance for completeness and accuracy.
- (3) Spot check concrete batching to verify batch weights and tolerances.
- (4) Check the bins and stockpiles for segregation, contamination, and interblending of the aggregates.
- (5) Obtain aggregate samples per Schedule of Materials Control.
- (6) Observe Producer's Certified Technician obtain aggregate samples and run gradation and moisture tests when possible.
- (7) Verify cementitious and admixtures are certified and approved. Collect cementitious and admixtures samples per the Schedule of Material Control.
- (8) Provide the following Agency test results to the Producer in a timely manner:
 - (8.1) Cementitious Materials
 - (8.2) Admixtures
 - (8.3) Gradations
 - (8.4) Coarse Aggregate Quality
- (9) If any equipment malfunctions, testing procedures or test results are questionable, or unusual activity is occurring during the plant visit perform the following:
 - (9.1) Continue monitoring at the plant and document observations in the diary.
 - (9.2) Investigate to determine the origin of the concern and document the resolution.
 - (9.3) Contact Independent Assurance Inspector, Project Engineer or Concrete Engineering Unit when necessary.

CHECK IN WITH THE BATCHMAN

- Become familiar with the plant
- Tell the batchman to remind the truck drivers to empty their trucks
- Observe the batching of concrete to verify batch weights and tolerances

1511 INSPECTION OF WORK

The Engineer may inspect Materials and the Work. The Contractor shall provide the Engineer or the Engineer's representative access to the Work, information, and assistance necessary to conduct a complete inspection. The Contractor shall notify the Engineer at least 24 h before required inspections.

The Department will determine the level of inspection for any item of Work. The Contractor is responsible for the quality of Work and compliance with the Contract requirements regardless of the Department's level of inspection.

BATCH MATERIAL REQUIREMENTS

- Cementitious materials and admixtures from the list of “approved/qualified products” list on the website
- Only use aggregates listed on the mix design
- Do not change sources without a new mix design

2461.3.C Handling and Storing Materials

2461.3.C.1 Batch Material Requirements

Do not change the source, kind or gradation of batch materials after the start of concrete production for the work unless otherwise approved by the Engineer. If the Engineer approves use of different material, completely exhaust the supply on hand before changing to the different material.

If delivering freshly washed aggregates to the batching plant, drain the aggregates for at least 12 h before using in the batching operation. If draining freshly washed aggregates at the site of the batching plant, completely separate the drained material from the undrained materials, and provide for the disposal of water that accumulates from the drainage of materials.

Provide smooth, firm, and well-drained stockpile sites cleared of vegetation and extraneous matter. Where the natural foundation is unsatisfactory, as determined by the Engineer, construct the stockpiles on suitable platforms. Construct suitable bulkheads or partitions to separate different kinds of aggregate, gradation, or water content.

BATCH MATERIAL REQUIREMENTS

- Drain the aggregates for at least 12 h before using in the batching operation
- Do not use aggregates that were used as runways
- Do not use aggregates from the bottom 1 foot of a stockpile

Construct stockpiles by methods that hold segregation and degradation to a minimum. If the Engineer sees segregation or degradation, the Engineer may designate that pile as unacceptable for use.

Do not use aggregates used to construct runways for loading or hauling equipment in concrete batches.

Use of aggregates from the bottom 1 ft of a stockpile placed on an unprepared surface in concrete batches is allowed only under the Engineer's direct supervision and if the material meets all requirements of 3126, "Fine Aggregate for Portland Cement Concrete," and 3137, "Coarse Aggregate for Portland Cement Concrete."

Provide aggregates in accordance with the specified gradation requirements.

The Engineer will consider aggregates unacceptable if the variation in moisture content carried by any of the aggregates causes a marked variation in the consistency of successive batches of the mixed concrete, and will suspend operations until corrected.

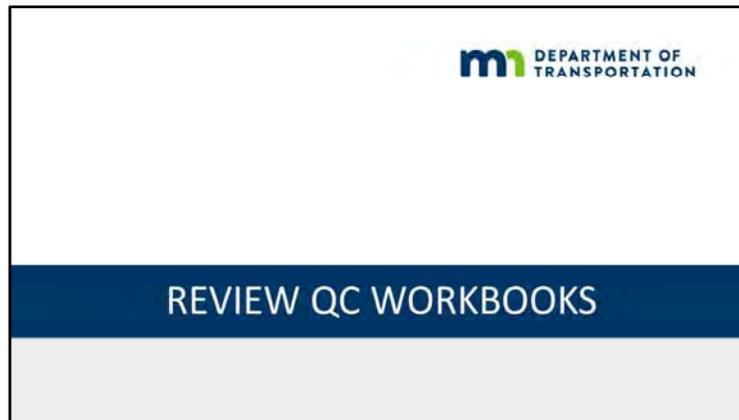
READY-MIX TRUCKS

If the concrete is mixed solely in the truck (dry batch), hold trucks in the plant yard for 5 minutes or 50 revolutions.

2461.3.E.1 Mixing In Truck Mixer

Charge the materials into the truck mixer drum by introducing sufficient water before adding solid materials. Perform charging operations without losing materials.

Leave the truck mixer at the plant site for a minimum of 5 min or 50 revolutions during the mixing period. Transport the concrete at agitating speed to the point of placement.



1. The QC Workbook is an electronic workbook on the Producer's laptop or computer that documents the Concrete Plant's quantities, ingredients, and test results for all Agency concrete. It includes the Producer's observations and comments of issues at the Plant for that week.
2. The QC Workbook is available to the Agency at the plant at all times.
3. The duration of the workbook is one week ending on Saturday. A workbook is required for each week Agency concrete is produced.
4. The Producer is required to submit the QC Workbook by the following Tuesday to the Project Engineer and the Concrete Engineering Unit.

Checklist for reviewing QC Workbook each time you go to the plant:

1. Review all entries since the last Agency inspection.
2. Check plant diary is accurate and up to date.
3. Check that the Producer has run the required amount of gradation and moisture tests.
4. Check samples are correct size according to the Schedule of Materials Control.
5. Review gradation results with respect to project specifications.
Compare QC results to verification and companion sample results.
6. Determine reasonableness of all entries.
(duplication of sample sizes, duplication of test results, weather conditions, etc.)

Concrete Ready Mix Plant QC Workbook	
<p>This weekly workbook contains the Diary, Batching Report, Concrete Aggregate Worksheet, Weekly Concrete Aggregate Report, Concrete Aggregate Worksheet for JMF and Weekly Concrete Aggregate Report for JMF.</p>	
Submit	<p>Submit this Workbook by Tuesday of the following week to:</p> <ul style="list-style-type: none"> - The Project Engineer, and - The Concrete Office (weeklyrplantreport.dot@state.mn.us).
Note	<ul style="list-style-type: none"> - This workbook can contain more than one combination of materials. - Complete all required fields. - Chart all gradation results and Department verification gradation results using the electronic charting worksheets (Aggregate Gradation Control Charts) found on the MnDOT Concrete website.
Diary	<p>The plant location, week ending date and pit numbers must be entered in the Diary before the remaining workbook can be used. Select the plant location by clicking on the dropdown tab. The plant location will then populate throughout the entire workbook and the week ending date will populate into the Weekly Concrete Aggregate Reports.</p> <ul style="list-style-type: none"> - Enter all the products (cement, fly ash, admixtures, etc.) used for the week. - Enter the project number, mix design and quantity of concrete.
Batching Report - Moistures	<p>Enter information in all Blue cells. Highlighted results on Line F "Total Moisture 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.</p>
Concrete Aggregate Worksheet	<p>Enter information in all Blue cells for each test taken.</p> <p>If the mix design contains one coarse aggregate fraction:</p> <ul style="list-style-type: none"> - Select the coarse aggregate (CA) material size (#67, #7, CA-70), under Agg. Source(s). - Select the fine and coarse pit numbers. - Enter mix proportion of 100% into the first column. - Use only the first column on the worksheet for entering the individual sieve analysis (one page per gradation). <p>If the mix design uses multiple coarse aggregate fractions:</p> <ul style="list-style-type: none"> - Select the CA material size (#67, #7, CA-70, 3/4-), under Agg. Source(s). - Select the second CA material size (CA, 3/8-, 1/2-, 5/8-, CA-70, #7, 3/4-, #67), under Agg. Source(s). - Select the third CA material size (CA, 3/8-, 1/2-, 5/8-, CA-70, #7, 3/4-, #67), under Agg. Source(s). - Select the appropriate fine and coarse pit numbers. - Enter the mix proportion % of each fraction. - Enter the appropriate composite CA gradation number in the Blue box below the sieve analysis.
Weekly Concrete Aggregate Report	<p>The plant location, week ending date and SP numbers will populate from the Diary. The pit numbers and QC gradation results will populate from the Concrete Aggregate Worksheet.</p>
Concrete Aggregate Worksheet - JMF	<p>Enter information in all Blue cells for each test taken.</p> <ul style="list-style-type: none"> - Select the fine and coarse pit numbers. - Enter the JMF # and Mix Design #. - Enter sample weight, CA type and mix proportion for each aggregate fraction. - Enter the combined gradation JMF (total % passing) from the mix design.
Weekly Concrete Aggregate Report - JMF	<p>The plant location, week ending date and SP numbers will populate from the Diary. The JMF numbers, total % passing and working ranges will populate from the Concrete Aggregate Worksheet - JMF.</p>
<p>Procedures Diary Moistures ConcAggWrk WklyConcAggRpt ConcAggWrk-JMF WklyConcAggRpt-JMF</p>	

PROCEDURES TAB

- Instructions and notes for each form are located on the procedures page.
- The producer is required to enter data in each of the applicable forms.

		Fine	Fine	Coarse	Coarse	Coarse	Coarse	Fine	Fine	Coarse	Coarse	Coarse	Coarse	Fine	Fine	Coarse	Coarse	Coarse	Coarse
Aggregate Size		FA		#67				FA		#67				FA		3/4-	3/4+	5/8-	
Pit #		75999		76999				75999		76999				75999		77999	77999	78999	
Date		9/9/19						9/9/19						9/13/19					
Tester		Jimmy John						Jimmy John						Mike Boulder					
A. Wt. Sample + Pan	Wet	755		2375				773		2426				776		2403	2380	2506	
B. Wt. Sample + Pan	Dry	735		2341				749		2373				755		2365	2354	2476	
C. Moisture Loss	A-B	20		34				24		53				21		38	26	30	
D. Tare Wt. Pan	-	226		224				226		224				226		224	226	224	
E. Dry Wt. Sample	B-D	509		2117				523		2149				529		2141	2128	2252	
F. Total Moisture Factor	C/E	0.039		0.016				0.046		0.025				0.040		0.018	0.012	0.013	
G. Absorb. Factor	-	0.006		0.012				0.006		0.012				0.006		0.012	0.011	0.010	
H. Free Moisture Factor	F-G	0.033		0.004				0.040		0.013				0.034		0.006	0.001	0.003	
I. Time Scales Set		5:47 AM						9:32 AM						5:35 AM					
<p>Highlighted results on Line F "Total Moisture 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.</p>																			

MOISTURE TAB

- Ensure the header is filled out completely and accurately
- The moisture test sample sizes on line E must meet minimum sample sizes:
 Fine Aggregate: 500 g
 Coarse Aggregate: 2,000 g
- Confirm the Absorption Factors match the Abs factors on the mix design
- Verify the MCFac on the Certificate of Compliances matches line F for the timeframe specified on Line I
- Review the moisture test results for accuracy and reasonableness

QC WORKBOOK AGGREGATE WORKSHEET

Minimum Sample Sizes:

#67: 10 lb.
Fine Aggregate: 500 g

Sieve	Maximum Allowable Quantity Retained on a 14 X 14 in Sieve
3/4	13.2
5/8	11.2
1/2	8.7
3/8	6.6
#3	4.4
#4	3.3

The Maximum amount of material on an 8" sieve is 200 g

CONCRETE AGGREGATE WORKSHEET TAB

- Ensure the header is filled out completely and accurately
- Confirm Coarse and Fine Aggregate minimum sample sizes have been met
- Determine if any of the coarse or fine sieves were overloaded
- Ensure a test number is assigned to the gradation
- Compare results to the Gradation Requirements

A gradation is only valid and compliant if:

1. It meets Gradation Requirements.
2. Minimum sample sizes were used.
3. Individual sieves were not been overloaded.
4. The Check Total is within tolerance of the Sample Weight.

FINENESS MODULUS

- Check the website for the Fine Aggregate Fineness Modulus (FM).
- Verify that the FM is within tolerance (+/- 0.20).
- Advise the Producer to contact the Concrete Engineering Unit if problems persists.



Concrete Aggregate Worksheet

S.P.:	Plant: Garden - Green Plant	Date: 9/9/19	Agg. Source(s):	Fine Pit #: 75999
Engineer:	Tester: Jimmy John	Time: 7:30 AM	CA: #67	Coarse Pit #: 76999
			CA:	Coarse Pit #:
			CA:	Coarse Pit #:

Sieve Analysis of Coarse Aggregate

Agg. Fractions	CA: #67	Mix Prop.: 100 %	CA:	Mix Prop. %	CA:	Mix Prop. %
Sieve Sizes	Weights (lb)		Weights (lb)		Weights (lb)	
	Ind.	Cum.	Ind.	Cum.	Ind.	Cum.
Test No.: CA-8	Sample Wt. (lb): 11.8		2nd Fraction of Composite Gradation Only		Sample Wt. (lb):	
Sample Wt. (lb): 11.8	11.8		Sample Wt. (lb):		3rd Fraction of Composite Gradation Only	
Sample Wt. (lb):	11.8		Sample Wt. (lb):		Sample Wt. (lb):	
% Pass	Req.	% Pass	Req.	% Pass	Req.	% Pass
1 1/4" - 1"	0.0	11.8	100	100		
1" - 3/4"	0.2	11.8	100	100		
3/4" - 5/8"	1.5	11.6	98	90-100		
5/8" - 1/2"	3.4	9.7	-	-		
1/2" - 3/8"	3.2	6.3	53	-		
3/8" - 1/4"	0.0	3.1	26	20-55		
1/4" - #4	2.8	3.1	-	**		
#4 - Btm	0.3	0.3	3	0-10		
Check Total	11.8	± 0.2 lb of Sample Wt	11.8	12.0	± 0.2 lb of Sample Wt	± 0.2 lb of Sample Wt

Page 1

Coarse Aggregate Percent Passing the #200 Sieve Test

Agg. Fractions	#67			
(A) Dry weight of original sample				
(B) Dry weight of washed sample				
(C) Loss by washing (A - B)				
(D) % Passing #200 (C ÷ A) × 100				

Sieve Analysis of Fine Aggregate

Sieve Sizes	Test No.: FA-8	Sample Wt. (g): 525.3		
Pass - Ret.	Weights (g)		% Pass	Req.
	Ind.	Cum.		
3/8" - #4	0.0	524.9	100	100
#4 - #6	15.5	524.9	100	95 - 100
*#6 - #8	43.6	509.4	-	**
#8 - #16	89.5	465.8	89	80 - 100
#16 - #30	136.8	376.3	72	55 - 85
#30 - #50	127.6	239.5	46	30 - 60
#50 - #100	66.3	111.9	21	5 - 30
#100 - #200	19.0	25.6	5	0 - 10
*#200 - Btm	0.7	7.6	1.4	0 - 2.5
Loss by Washing	6.9			
Check Total	524.9	± 0.3 % of Sample Wt	###	###
Fineness Modulus	Within ± 0.20	2.67	2.70	

Composite Gradation for:

Agg. Fractions	Composite			Grad. Req.
Proportions	%	%	%	100%
1 1/4"				
1"				
3/4"				
3/8"				
#4				

Washing Data for Sieve Analysis of Fine Aggregate

(A) Dry Sample and Record Weight	525.3
(B) Wash and Dry Sample, Record Weight	518.4
(C) Loss by Washing (A - B)	6.9

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

Comments: PRODUCTION GRADATION

MAXIMUM ALLOWABLE QUANTITY OF MATERIAL RETAINED ON A SIEVE

References from ASSHFO T 27 - 97' and/or Mn/DOT Standards

(+ #4 Sieve Quantities interpolated by this formula = $\{(2.5) \times (\text{Sieve opening, mm}) \times (\text{Sieving Area, M}^2)\}$)

Nominal Dimensions of Sieve	Sieving Area m ²	203mm	8"	305mm	12"	305mm	12"x12"	360mm	14"x14"	400mm	16"x16"	368mm	14.5
		kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs
		.02850	*	.06701		.09290		.12645		.16516		.21043	
In.													
Mm													
4		-	-	-	-	23.23	-	-	-	-	-	-	-
3 1/2		-	-	15.08	33.2	20.90	-	-	-	-	-	-	-
3		-	-	12.56	27.7	17.42	-	-	-	-	-	39.47	87.0
2 1/2		-	-	10.55	23.3	14.63	-	-	-	-	-	31.15	69.4
2		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 1/2		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 1/4		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		1.78	3.9	4.19	9.2	5.81	12.8	7.89	17.4	10.30	22.7	13.15	29.0
3/4		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		1.14	2.5	2.68	5.9	3.72	8.2	5.06	11.2	6.61	14.6	8.42	18.6
1/2		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		0.67	1.5	1.59	3.5	2.21	4.9	2.99	6.6	3.90	8.6	5.00	11.0
3		0.45	1.0	1.06	2.3	1.46	3.2	1.99	4.4	2.60	5.7	3.32	7.3
4		0.33	0.7	0.80	1.8	1.10	2.4	1.50	3.3	1.95	4.3	2.50	5.5

MAXIMUM ALLOWED ON A ROUND SIEVE

SIEVE WEIGHT LIMITS AASHTO T-27 TABLE 1

Sieve Size	Large Gilson TS-1 Trays	8" Diameter	12" Diameter
2" (50mm)	27000g	-	-
1-1/2" (37.5mm)	20200g	-	-
1" (25mm)	13500g	1800g	4200g
3/4" (19mm)	10200g	1400g	3200g
5/8" (16mm)	8600g	1100g	2600g
1/2" (12.5mm)	6700g	890g	2100g
3/8" (9.5mm)	5100g	670g	1600g
#4 (4.75mm)	2600g	330g	800g
#8 (2.36mm) thru #200 (75µm)	1500g	200g	460g

NOTE: If the weight retained on any sieve exceeds the weight shown for that sieve in the table above the sample must be discarded, a new sample prepared and split to a smaller beginning weight so that it will not happen again.

The new sample size must conform to the minimum sample size in AASHTO T 27. If it is necessary that the new sample be so large that there is a possibility weight(s) might be exceeded the new sample can be split into two or more portions (sieving each individually and combining the weights on each sieve size before calculating the percentages) or additional breaker sieves can be added.

Use this chart for determining the maximum weights allowed on the round brass sieves used for fine aggregate gradations.

WEEKLY CONCRETE AGGREGATE REPORT

m Minnesota Department of Transportation									
Weekly Concrete Aggregate Report									
Plan		Station		Contract		Week Ending		BBS	
S.P. No.		Start/End		No./Part		Date		No.	
2005-12		10/21-22							
First Aggregate									
Class	90	90	90						
Time	7:30 AM	2:00 PM	2:30 PM						
Prod No	FAA	FAA/C	FAA/B						
Chalk	7500	7500	7500						
1-1/2" B	80	80	80						80
1-1/4" B	80	80	80						80
1-1/8" B	80	80	80						80
3/8" B	80	80	80						80
3/4" B	80	80	80						80
1/2" B	80	80	80						80
3/8" B	80	80	80						80
1/4" B	80	80	80						80
1/8" B	80	80	80						80
3/16" B	80	80	80						80
1/16" B	80	80	80						80
1/32" B	80	80	80						80
1/64" B	80	80	80						80
1/128" B	80	80	80						80
1/256" B	80	80	80						80
1/512" B	80	80	80						80
1/1024" B	80	80	80						80
1/2048" B	80	80	80						80
1/4096" B	80	80	80						80
1/8192" B	80	80	80						80
1/16384" B	80	80	80						80
1/32768" B	80	80	80						80
1/65536" B	80	80	80						80
1/131072" B	80	80	80						80
1/262144" B	80	80	80						80
1/524288" B	80	80	80						80
1/1048576" B	80	80	80						80
1/2097152" B	80	80	80						80
1/4194304" B	80	80	80						80
1/8388608" B	80	80	80						80
1/16777216" B	80	80	80						80
1/33554432" B	80	80	80						80
1/67108864" B	80	80	80						80
1/134217728" B	80	80	80						80
1/268435456" B	80	80	80						80
1/536870912" B	80	80	80						80
1/1073741824" B	80	80	80						80
1/2147483648" B	80	80	80						80
1/4294967296" B	80	80	80						80
1/8589934592" B	80	80	80						80
1/17179869184" B	80	80	80						80
1/34359738368" B	80	80	80						80
1/68719476736" B	80	80	80						80
1/137438953472" B	80	80	80						80
1/274877906944" B	80	80	80						80
1/549755813888" B	80	80	80						80
1/1099511627776" B	80	80	80						80
1/2199023255552" B	80	80	80						80
1/4398046511104" B	80	80	80						80
1/8796093022208" B	80	80	80						80
1/17592186444416" B	80	80	80						80
1/35184372888832" B	80	80	80						80
1/70368745777664" B	80	80	80						80
1/14073749155328" B	80	80	80						80
1/28147498310656" B	80	80	80						80
1/56294996621312" B	80	80	80						80
1/112589993226624" B	80	80	80						80
1/225179986453248" B	80	80	80						80
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1/90071994581312" B	80	80	80						80
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1/360287978053248" B	80	80	80						80
1/720575956106496" B	80	80	80						80
1/1441151912212928" B	80	80	80						80
1/2882303824425856" B	80	80	80						80
1/5764607648851712" B	80	80	80						80
1/11529215297703424" B	80	80	80						80
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1/184467444723254784" B	80	80	80						80
1/368934889446509568" B	80	80	80						80
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1/147573955778603872" B	80	80	80						80
1/295147911557207744" B	80	80	80						80
1/590295823114415488" B	80	80	80						80
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1/236118329245766272" B	80	80	80						80
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1/944473316983065088" B	80	80	80						80
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1/7555786535864520704" B	80	80	80						80
1/15111573071729041408" B	80	80	80						80
1/30223146143458082816" B	80	80	80						80
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1/519229706898065768915555333334336" B	80	80	80						80
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1/8307675311681052302264893333333333" B	80	80	80						80
1/1661535062336210464529788666666666" B	80	80	80						80
1/3323070124672420929059577333333333" B	80	80	80						80
1/6646140249344841858119146666666666" B	80	80	80						80
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1/2658456099377777743276765866666666" B	80	80	80						80
1/5316912198755555486553531733333333" B	80	80	80						80
1/1063382439511111197110670666666666" B	80	80	80						80



Weekly Concrete Aggregate Report

Plant: Garden - Green Plant

Week Ending: 9/14/19

S. P. No(s)	5555-12	1507-33							
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Fine Aggregate

Date	9/9	9/9	9/13						
Time	7:30 AM	2:30 PM	8:30 AM						
Test No.	FA-8	FA-9VC	FA-10						
Pit #	75999	75999	75999						
#30"	100	100	100						100
#4	100	100	100						95 - 100
#6	-	-	-						-
#8	89	89	88						80 - 100
#16	72	71	70						55 - 85
#30	46	45	45						30 - 60
#50	21	21	22						5 - 30
#100	5	5	5						0 - 10
#200	14	14	13						0 - 2.5
FM	2.67	2.69	2.70						
Tester	Jimmy John	Mike Boulder	Mike Boulder						

Page 1

Coarse Aggregate

Date	9/9	9/9	9/13						
Time	7:30 AM	2:30 PM	8:30 AM						
Test No.	CA-8	CA-9VC	CA-10						
CA-Size	#57	#57	#57						
1 - Pit #	76999	75999	77999 34-						
2 - Pit #			78999 58-						
3 - Pit #									
1 1/4"	100	100	100						
1"	100	100	100						
3/4"	98	99	100						
5/8"	-	-	72						
1/2"	53	55	45						
3/8"	26	29	49						
1/4"	-	-	-						
#4	3	6	6						
Tester	Jimmy John	Mike Boulder	Mike Boulder						

JMF CONCRETE AGGREGATE WORKSHEET

The image shows a detailed spreadsheet-style form for concrete aggregate analysis. It is divided into several main sections:

- Header:** Minnesota Department of Transportation, JMF Concrete Aggregate Worksheet. Includes fields for Job No., Plan, Station, Date, and Job No.
- Coarse Analysis of Coarse Aggregates:** A table with columns for Sieve Size, Weight, and Percent. It includes rows for 3/4", No. 4, No. 10, No. 20, No. 40, No. 60, No. 80, and 100.
- Fine Analysis of Fine Aggregates:** A similar table for finer aggregates, with sieve sizes ranging from No. 20 to No. 200.
- Combined Gradation for All the Coarse:** A summary table that combines the data from the coarse and fine analyses.
- Additional Remarks or Comments:** A text area for notes.

CONCRETE AGGREGATE WORKSHEET – JMF TAB

- Ensure the header is filled out completely and accurately
- Verify the proper aggregates were selected from the drop down boxes
- Obtain mix proportions from the JMF mix design and enter for all aggregates
- Ensure the Combined Gradation JMF percentages match the JMF mix design
- Check the individual weights for both the coarse and fine aggregates for overloading on sieves
- Verify the Total % Passing is within the JMF Working Range. **A PASSING AGGREGATE GRADATION IS REQUIRED PRIOR TO THE START OF A BRIDGE DECK POUR.**



JMF Concrete Aggregate Worksheet

S/P	1617-00	Plant	Golden Green Plant	Date	9/27/19	Mix #	9000	CA #1	77999 3/4
Engineer	J.SMITH	Tester	Mike Boulder	Time	5:30PM			CA #2	77999 3/4
Test No.	JMF1			Job #	19-202			CA #3	

Sieve Analysis of Coarse Aggreg.

Sieve Size	Sample Wt.		Sample Wt.		Sample Wt.	
	CA #1	CA #2	CA #1	CA #2	CA #1	CA #2
2" - 1 1/2"	0.0	14.1	0.0	12.2	0.0	100
1 1/2" - 1 1/4"	0.0	14.1	5.0	9.7	80	
1 1/4" - 1"	0.5	14.1	4.3	4.7	39	
1" - 3/4"	0.7	13.6	0.2	0.4	3	
3/4" - 3/8"	3.5	9.3	0.1	0.2	2	
3/8" - 1/2"	3.5	5.8	0.0	0.0	0	
1/2" - 3/8"	0.0	2.3	0.0	0.0	0	
3/8" - 1/4"	1.5	2.3	0.0	0.0	0	
1/4" - 1/8"	0.8	0.8	0.0	0.0	0	
1/8" - 1/16"	0.0	0.0	0.0	0.0	0	
1/16" - 1/32"	0.0	0.0	0.0	0.0	0	
Check Total	14.1	± 0.1 lb. of Sample Wt.	13.2	± 0.2 lb. of Sample Wt.		

* Recommended Filler Sieve

Sieve Analysis of Fine Aggregate

Sieve Fraction	Sample Wt.		Sample Wt.	
	FA #1	FA #2	FA #1	FA #2
Pass - Ret	42	42	42	42
1/2" - 3/8"	0.0	526.4	100	100
3/8" - 1/4"	75.5	492.9	86	86
1/4" - 1/8"	105.4	386.6	63	63
1/8" - 1/16"	95.4	82.3	36	36
1/16" - 1/32"	49.5	36.9	9	9
1/32" - 1/64"	23.8	47.4	4	4
1/64" - 1/128"	17.8	33.6	4	4
1/128" - 1/256"	0.00	8.8	1	1
Loss by Washing	5.0			
Check Total	523.4	± 0.1% of Sample Wt.		

Percent Passing #200 Sieve Test

Aggregate	CA #1	CA #2	CA #3
(A) Wt. of original sample			
(B) Wt. of washed sample			
(C) Loss by washing (A-B)			
(D) % Passing #200 (C/A) * 100			

Additional Remarks or Comments

Composite Gradation for Job, Mixture Formula

Aggregate Fraction	CA #1	CA #2	CA #3	FA #1 (#2500)	FA #2	Total % Passing	Gradation JMF	Working Range	JMF Working Range
2"	44	14	0	42	42	100	97	± 5	95 - 100
1 1/2"	44	11	0	42	42	85	86	± 5	81 - 91
1"	42	0	0	42	42	82	77	± 5	72 - 82
3/4"	16	0	0	42	42	61	62	± 5	57 - 67
3/8"	7	0	0	42	42	49	54	± 5	49 - 59
1/2"	2	0	0	38	38	32	38	± 5	31 - 41
3/8"	8	0	0	22	22	18	24	± 4	20 - 28
1/2"	16	0	0	15	15	13	13	± 4	9 - 17
3/8"	8	0	0	8	8	6	5	± 4	1 - 9
1/2"	4	0	0	4	4	4	3	± 3	0 - 6
3/8"	2	0	0	2	2	2	2	± 2	0 - 4
1/2"	1	0	0	1	1	1	1	± 1	0 - 2
3/8"	0.9	0	0	0.9	0.9	0.9	0.9	± 0.8	0 - 1.7

WEEKLY CONCRETE AGG REPORT-JMF

mi DOT Minnesota Department of Transportation
Weekly Concrete Aggregate Report - JMF

Plant: [Blank] (Samples - Gross Plant) Week Ending: 9/14/19

S. P. [Blank]
 Ref(s) [Blank]

Year: 2019
 Day: 5/31
 Location: [Blank]
 Job No: [Blank]
 Job Name: [Blank]
 Job Description: [Blank]
 Job Address: [Blank]
 Job City: [Blank]
 Job State: [Blank]
 Job Zip: [Blank]
 Job Phone: [Blank]
 Job Email: [Blank]
 Job Website: [Blank]
 Job Notes: [Blank]

Gravimetric	100	75	60	42.5	25	15
100	100	85	100	100	85	100
97.5	97.5	82	100	97.5	82	100
85	85	81	81	85	81	85
82	82	72	82	82	72	82
60	60	57	57	59	57	60
49	49	49	50	49	49	50
39	39	33	41	39	33	43
22	22	20	28	22	20	28
15	15	0	17	15	9	17
8	8	7	8	8	7	8
4	4	0	0	0	0	0
2	2	2	2	2	2	2
0.5	0.5	0.0	1.0	0.0	0.0	1.0

WEEKLY CONCRETE AGGREGATE REPORT – JMF TAB

The QC Weekly Concrete Aggregate Report JMF is a summary of all JMF gradations performed by the producer for the week’s production and is auto populated from the QC Concrete Aggregate JMF Worksheets.



Minnesota Department of Transportation

Weekly Concrete Aggregate Report - JMF

TP 2443 JMF

(10/2020)

Plant: Garden - Green Plant Week Ending: 9/14/19

S. P. No(s):	1567-80
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Date	Time	Test No.	JMF #	19-202	75999	77999 3/4+	77999 3/4	9/12		9/13		Working Range	Working Range	Working Range
								100	95	100	100			
2"								95	100	95	100			
12"								92	100	92	100			
7"								81	91	81	91			
34"								72	82	72	82			
12"								57	67	57	67			
36"								49	59	49	59			
84"								31	41	31	41			
88"								20	28	20	28			
116"								9	17	9	17			
800"								1	9	1	9			
850"								0	6	0	6			
800"								1	5	1	5			
820"								0.0	1.6	0.0	1.6			
Tester								Mile	Buffer	Mile	Buffer			

Page 1

COMMON QC/QA WORKBOOK ERRORS

Incomplete and/or inaccurate headers throughout the workbook.

- tester names,
- dates,
- times,
- test numbers.
- products and aggregate sources

- Completely fill out all headers throughout the entire workbook
- Verify minimum sample sizes and testing rates are being met according to the Schedule of Materials Control specified for the project
- Verify values on Line F from the QC aggregate moisture tests are being used in the MCFac column on the Certificate of Compliances for the timeframe specified
- Check individual sieve weights for overloading of material
- Review **BOTH** the QC and QA workbooks for data entry errors and reasonable results

COMMON QC/QA WORKBOOK ERRORS

Incorrect sample sizes (Refer to Schedule of Materials Control for proper sample sizes). Keep in mind there are minimum sample sizes, but a sample can also be too big causing inaccurate results due to sieve overloading.

MINIMUM SAMPLE SIZES

Gradation:

3/4" Plus, #4:	30 lb.
3/4" Minus, #67:	10 lb.
#7, CA-70:	6 lb.
CIA, FIA:	1000 g
CS, FS:	500 g
#89, CA-80:	500 g
Fine Aggregate:	500 g

Aggregate Quality:

3/4" Plus, #4:	50 lb.
3/4" Minus, #67:	30 lb.
#7, CA-70:	30 lb.
#89, CA-80:	30 lb.
Intermediate Agg:	30 lb.
Fine Aggregate:	30 lb.

Moisture:

Fine Aggregate:	500 g
Intermediate Aggregate:	500 g
Coarse Aggregate:	2000 g

COMMON QC/QA WORKBOOK ERRORS

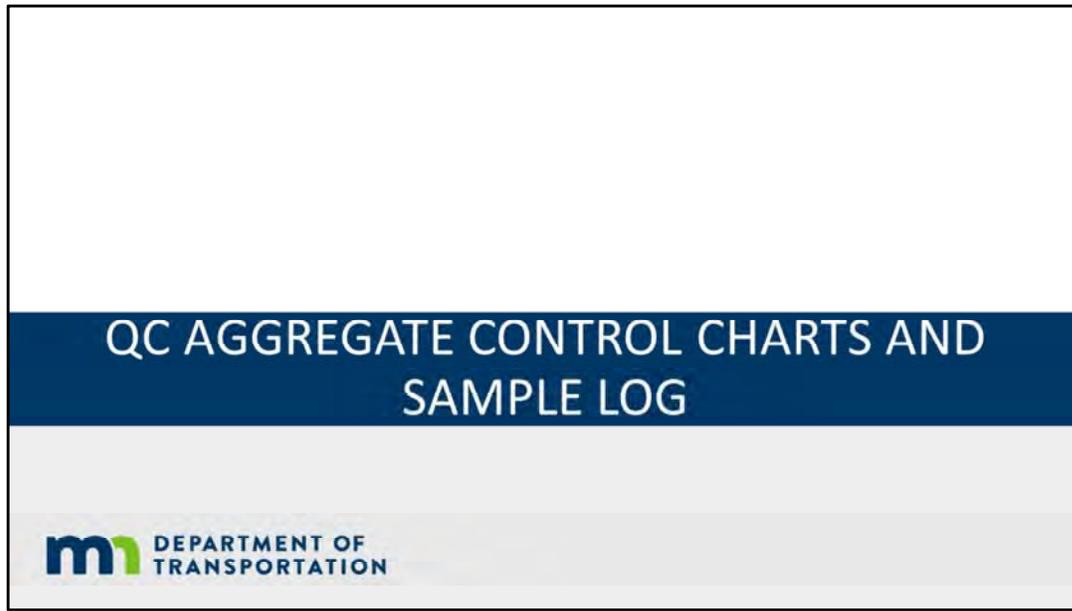
Failing to enter remarks or comments in the sections located on each page of the workbook. (Air Test results, QA Plant Monitor names, Plant Issues and resolutions, etc.)

Failing to enter remarks or comments in the sections located on each page of the workbook. (Air Test results, QA Plant Monitor names, Plant Issues and resolutions, etc.)

Not using consecutive pages in the Diary. If the plant produces agency concrete on Tuesday and Friday, use page 1 and 2 in the Diary, not page 2 and page 5. The same is true for gradations and moisture tests.

Not reviewing the entire workbook for data entry errors and reasonable results before submitting to Agency.

Line F from the Moisture Test in QC Workbook is not the same as the MCFac on the Cert of Compliance for the timeframe specified.



The sample log is in an Excel workbook.

The Producer enters all samples taken or picked up from the plant by Agency personnel.

Concrete components documented in the QC Aggregate Gradation Control Charts and Sample Log include:

- Aggregate- Agency Verification and Quality samples
- Aggregate- Agency QA (QC Companion) samples
- Admixture samples
- Cementitious samples
- Chart- Producer's fine and coarse aggregate QC (Production) and Verification Companion gradation results (If the producer performs a gradation at the plant it is required to be charted)
- Chart- Producer's Combined Gradation JMF results.



The Agency is required to check the logs and take aggregate and product samples in accordance with the Schedule of Materials Control.

Quantities are for total Agency production. Agencies are encouraged to share results if multiple projects are being produced at a plant.

Checklist for reviewing QC Sample logs each time you go to the plant:

1. Check sample logs for compliance with Schedule of Materials Control.
2. If sample has been pulled by the producer, complete the card and submit with sample to the appropriate lab.
3. If the sample has not been pulled by the Producer, request a sample be pulled by the Producer within an appropriate time frame, pick up sample at stated interval.
4. Document all discrepancies in the Diary in the QA Workbook.

QC AGGREGATE GRADATION SAMPLE LOG (VERIFICATION, QUALITY AND QA SAMPLES)

m DOT Agency Verification and Quality Samples							
							Last revised (1/3/19)
							Plant: GARDEN CITY - GREEN PLANT
Date Sampled	Size (3/4, #67, etc.)	P/I Number	Sample ID	Agency Representative	Agency (MnDOT, County, City, Consultant?)	Agency Rep. Phone	Lab Name (Testing Location?)
9/9/19	FINES	75999	FA9919V	TOMMY SANDS	MNDOT	320-555-1212	ST. CLOUD
9/9/19	#67	76999	CA9919V	TOMMY SANDS	MNDOT	320-555-1212	ST. CLOUD
9/13/19	3/4-	77999	JMF1Q	TOMMY SANDS	MNDOT	320-555-1212	ST. CLOUD
9/13/19	3/4+	77999	JMF1Q	TOMMY SANDS	MNDOT	320-555-1212	ST. CLOUD
9/13/19	FINES	75999	JMF1Q	TOMMY SANDS	MNDOT	320-555-1212	ST. CLOUD

m DOT QA (QC Companion) Samples							
							Last revised (1/3/19)
							Plant: GARDEN CITY - GREEN PLANT
Date Sampled	Size (3/4, #67, etc.)	P/I Number	Sample ID	Agency Representative	Agency (MnDOT, County, City, Consultant?)	Agency Rep. Phone	Lab Name (Testing Location?)
9/9/19	#67	77999	CA9919C	TOMMY SANDS	MNDOT	651-867-5309	MAPLEWOOD
9/9/19	FINES	76999	FA9919C	TOMMY SANDS	MNDOT	651-867-5309	MAPLEWOOD

Verification and Quality Samples:

- Sample is taken randomly determined by the Agency
- Sample location is determined by the Agency
- Sample is taken by the Agency
- Sample is tested by the Agency

QA (QC Companion) Samples:

- Sample location is determined by the Producer
- Sample is taken by the Producer
- Sample is tested by the Agency

ADMIXTURE AND CEMENTITIOUS SAMPLE LOGS

m DOT Agency Admixture Samples						
Date Sampled	Product Name	Type	Sample ID	Agency Representative	Agency (MNDOT County, City, Consultant?)	Agency Rep. Phone
6/3/19	MAIR90	AEA	AIR6319	TOMMY SANDS	MNDOT	320-555-1212
6/3/19	AMPOL1020	A	WR6319	TOMMY SANDS	MNDOT	320-555-1212
9/6/19	MAIR90	AEA	AIR9619	TOMMY SANDS	MNDOT	320-555-1212
9/6/19	AMPOL1020	A	WR9619	TOMMY SANDS	MNDOT	320-555-1212
9/6/19	SMMAT306	S	VMA9619	TOMMY SANDS	MNDOT	320-555-1212

m DOT Agency Cement, Fly Ash and Silica						
Date Sampled	Product Name (Cement)	Sample ID	Agency Representative	Agency (MNDOT County, City, Consultant?)	Agency Rep. Phone	
6/3/19	CONDASK	CEM6319	TOMMY SANDS	MNDOT	320-555-1212	
9/6/19	LAFALM	CEM9619	TOMMY SANDS	MNDOT	320-555-1212	

Date Sampled	Product Name (Fly Ash)	Sample ID	Sampled By	Agency Name (MNDOT County, City, Consultant?)	Agency Phone
6/3/19	BOLZMAN	FLY6319	TOMMY SANDS	MNDOT	320-555-1212
9/6/19	LALABAO	FLY9619	TOMMY SANDS	MNDOT	320-555-1212

Page 1

Admixture Sample Requirements:

- Admixture samples are taken by the Producer in a container supplied by the Agency
- Agency fills out the sample card and submits to appropriate lab
- 1 sample of air entrainment and Type A water reducer when the plant is certified
- At 3 month intervals
- If the plant changes sources, or
- As the Contract requires

Cement and Fly Ash Sample Requirements:

- Cement and SMCs samples are taken by the Producer in a container supplied by the Agency
- Agency fills out the sample card and submits to appropriate lab
- 1 sample when the plant is certified
- At 6 month intervals
- If the plant changes sources, or
- As the Contract requires



Quality Control Charts are a visual and statistical method of tracking gradations for one calendar year in order to achieve better quality control of concrete aggregates.

The moving average is used to determine acceptance and for basis of payment.

This method is helpful in visualizing the consistency of the material and aiding the Producer in making sound aggregate decisions and adjustments.

These charts are produced and maintained by the Producer's Technician.

They must remain at the plant for 5 years.

Checklist for reviewing QC Aggregate Gradation Control Charts each time you go to the plant:

1. Check that QC and Verification Companion gradation results are entered accurately in the appropriate chart. These results are included in the moving average calculation.
2. Check for material consistency.
- 2 Entries must be in Real Time,
3. Document all discrepancies in the Diary in the QA Workbook.

QC AGGREGATE GRADATION CONTROL CHARTS - SAND



The Sand Quality Control Chart plots the results entered by the producer for the #8, #30, and #50 sieves.

The Producer monitors these charts. When the results are consistently borderline the Producer is expected to investigate and find a resolution.

The Agency must check the charts each time they go to the plant. If the results are borderline, notify the producer and document the problem, the solution, and the name of the Producer who was notified.



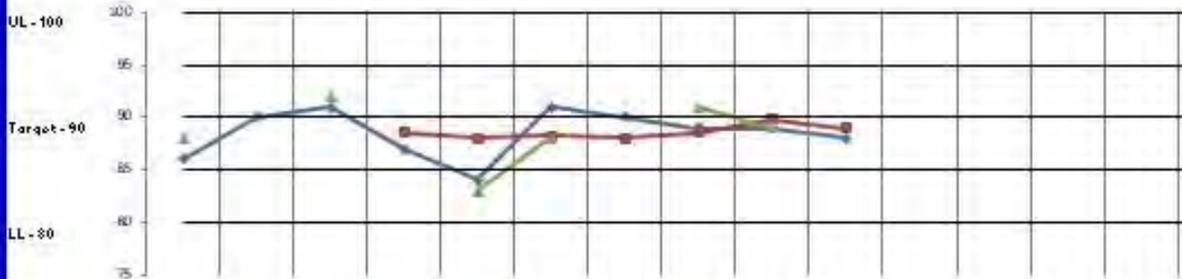
Sand Quality Control Chart

Pit #: 75999

Plant: GARDEN CITY - GREEN PLANT

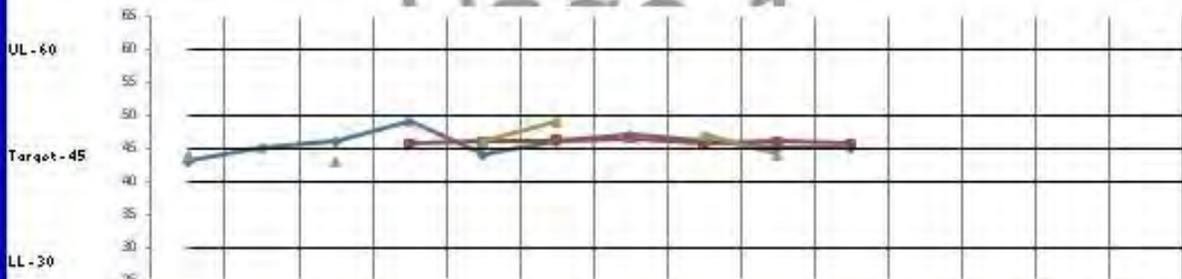
Sample #	FA-1	FA-2	FA-3	FA-4	FA-5	FA-6	FA-7	FA-8	FA-9V	FA-10			
Date	6/11/13	6/13/13	6/17/13	6/19/13	6/21/13	7/15/13	7/18/13	8/9/13	8/9/13	8/13/13			
Time	6a	9a	3p	9a	1p	6a	3p	7a	2p	8a			

Sieve: #8 Range: 80 - 100



Results	86	90	91	87	84	91	90	89	89	88			
Running Ave				89	88	88	88	89	90	89			
State Results	88		92		83	88		91	89				

Sieve: #30 Range: 30 - 60



Results	43	45	46	49	44	46	47	46	45	45			
Running Ave				46	46	46	47	46	46	46			
State Results	44		43		46	49		47	44				

Sieve: #50 Range: 5 - 30



Results	18	21	22	19	17	20	20	21	21	22			
Running Ave				20	20	20	19	20	21	21			
State Results	19		21		19	22		23	21				

QC AGGREGATE GRADATION CONTROL CHARTS - #67 COARSE AGGREGATE



2461.3.F.4.F Aggregate Gradation QC Charts

Complete the Aggregate Gradation Control Charts in real time for each aggregate size and aggregate source by recording Producer QC gradation and Verification Companion gradation results. These results are included in the moving average calculation.



#67 Quality Control Chart

Pit #: 76999

Plant: GARDEN CITY - GREEN PLANT

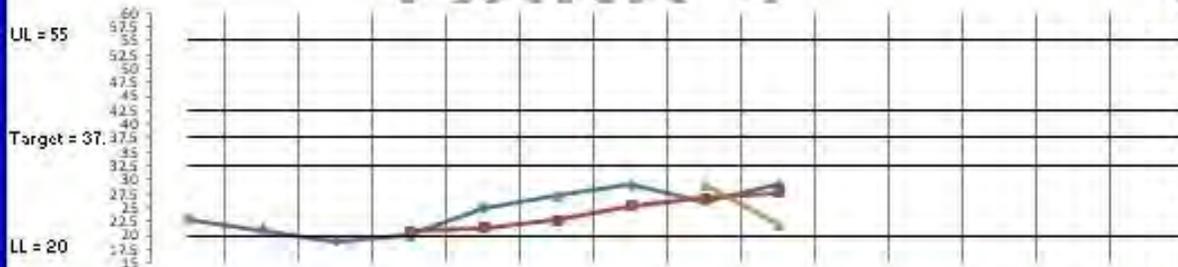
Sample #	CA-1	CA-2	CA-3	CA-4	CA-5	CA-6	CA-7	CA-8	CA-9V				
Date	6/11/13	6/13/13	6/17/13	6/19/13	6/21/13	7/15/13	7/16/13	8/19/13	8/19/13				
Time	6a	9a	3p	9a	1p	6a	3p	7a	8a				

Sieve: 3/4" Range: 90 - 100



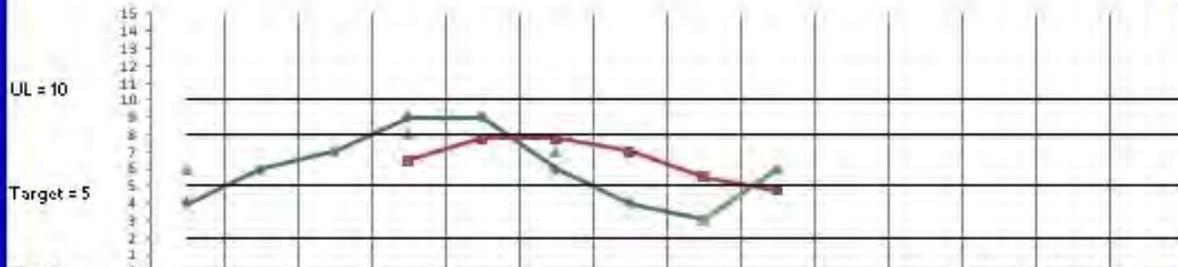
Results	92	94	96	93	94	95	96	98	99				
Running Ave				94	94	95	95	96	97				
State Results	95			92		96		99	96				

Sieve: 3/8" Range: 20 - 55



Results	23	21	19	20	25	27	29	26	29				
Running Ave				21	21	23	25	27	28				
State Results	23			20		27		29	22				

Sieve: #4 Range: 0 - 10



Results	4	6	7	9	9	6	4	3	6				
Running Ave				7	8	8	7	6	5				
State Results	6			8		7		3	6				

**Table 2461-14
Acceptance Criteria for Aggregate Gradations**

	Within Gradation Limits of MnDOT 3126 or 3137	Outside of Gradation Limits in MnDOT 3126 or 3137	Contractor Action
Individual gradation test	1. Continue testing as required	<ol style="list-style-type: none"> (1) Immediately take second gradation (a) If second gradation passes, resume testing as required (b) If second gradation fails, stop production and contact Engineer (2) Resume production when corrective action results in a passing gradation and continue testing as required 	
Moving average of 4 consecutive tests*	Continue testing as required	<ol style="list-style-type: none"> (1) Stop production and contact Engineer (2) Determine the cause of continual borderline or failing material (3) Resume production when corrective action results in a passing gradation (4) Increase gradation testing at a rate of 1 per 100 cubic yards until the moving average is within the gradation limits 	
	<p>* If any aggregate size or source does not establish a moving average of 4 consecutive tests, use the average of all tests taken to determine acceptance. The Engineer may increase the testing rates if gradation issues persist.</p>		



2461.3.F.5 Quality Assurance

The Engineer's responsibilities include the following:

- (2) Check Certificate of Compliance for completeness and accuracy.

2461.3.F.2 Certificate of Compliance

Provide a computerized Certificate of Compliance with each truckload of ready-mixed concrete at the time of delivery. The Department defines computerized to mean a document that records mix design quantities from load cells and meters.

If the computer that generates the Certificate of Compliance malfunctions, the Engineer may allow the Contractor to finish any pours in progress if the Producer issues a handwritten MnDOT Form 0042, *Certificate of Compliance* with each load. The Engineer will not allow the Producer to begin new pours without a working computerized Certificate of Compliance.

CERTIFICATE OF COMPLIANCE

2461.3.F.5 Quality Assurance

The Engineer's responsibilities include the following:

- (2) Check Certificate of Compliance for completeness and accuracy

Provide a computerized Certificate of Compliance that includes all of the following information:

- (1) Name of the ready-mix concrete plant,
- (2) Name of the Contractor,
- (3) Date,
- (4) State Project Number (SP) or (SAP),
- (5) Bridge Number (if applicable),
- (6) Time concrete was batched,
- (7) Truck number,
- (8) Quantity of concrete in this load,
- (9) Running total of each type of concrete, each day for each project,
- (10) Type of concrete (MnDOT Mix Designation Number),
- (11) Cementitious materials using MnDOT Standard Abbreviations,
- (12) Admixtures using MnDOT Standard Abbreviations,
- (13) Aggregate sources using 5 digit State Pit Numbers,
- (14) Admixture quantity in fluid ounces per 100 lb of cementitious materials or ounces per cubic yard,
- (15) Batch weights in columns in accordance with Table 2461-12:
 - (15.1) Print in order a through k.
 - (15.2) Use formula to calculate weights.
 - (15.3) Head columns with Standard Labels.

	Formula Letter	Formula	Standard Label
a	Ingredients (aggregate, cementitious, water, admixture type)	—	Ingredient
b	Product Source (MnDOT Standard Abbreviation)	—	Source
c	Total Moisture Factor (in decimals to 3 places)	—	MCFac
d	Absorption Factor (in decimals to 3 places)	—	AbsFac
e	Mix design oven dry (OD) weights, <i>lb/cu. yd</i>	—	OD
f	Absorbed moisture in the aggregates, <i>lb/cu. yd</i>	$(e \times d)$	Abs
g	Saturated surface dry (SSD) weights for aggregates, <i>lb/cu. yd</i>	$(e + f)$	SSD
h	Free moisture, <i>lb/cu. yd</i>	$(c - d) \times e$	Free Mst
i	Target weights for one cubic yard of concrete, <i>lb/cu. yd</i>	$(g + h)$	CY Targ
j	Target batch weights, <i>lb</i>	$(cu. yd \times i)$ $[cu. m \times i]$	Target
k	Actual batch weights, <i>lb</i>	—	Actual

NOTE: Actual cubic yards batched may vary due to differences in air content, weight tolerances, specific gravities of aggregates, and other variables.

- (16) Total Water (Batch Water + Free Moisture) in pounds,
- (17) Water available to add $[(\text{Mix Design Water} \times \text{Batch Size}) - \text{Total water}]$ in gallons,
- (18) Space to note the water adjustment information, including:
 - (18.1) Water in gallons added to truck at plant (filled in by Producer, enter zero if no water is added),
 - (18.2) Water in gallons added to truck at the jobsite (filled in by Producer or Engineer, enter zero if no water is added), and
 - (18.3) Total actual water in pounds (Total Water from Certificate of Compliance plus any additions).
- (19) The following information printed with enough room beside each item to allow the Engineer to record the test results:
 - (19.1) Air content,
 - (19.2) Air temperature,
 - (19.3) Concrete temperature,
 - (19.4) Slump,
 - (19.5) Cylinder number,
 - (19.6) Location or part of structure,
 - (19.7) Time discharge, and
 - (19.8) Signature of Inspector.
- (20) Location for the Producer signature,
- (21) For colored concrete, final color.

2461.3.F.3 Definitions

The Department defines ready-mix concrete as one of the following:

- (1) Central-mixed concrete proportioned and mixed in a stationary plant and hauled to the point of placement in revolving drum agitator trucks or a truck mixer, or
- (2) Truck-mixed concrete proportioned in a stationary plant and fully mixed in truck mixers.

Table 2461-13 defines commonly used certified ready-mix terms.

Table 2461-13 Certified Ready-Mix Terminology	
Term	Definition
Mix design water	The maximum allowable water content for 1 cu. yd of concrete.
Total moisture factor	Factor used to determine total amount of water carried by a given wet aggregate.
Absorption factor	Factor used to determine the water contained within the pores of the aggregate and is held within the particles by capillary force.
Free moisture	The water that is carried on the surface of the aggregate that becomes part of the total water.
Batch water	Water actually batched into the truck by the batcher. Batch water includes potable water and clarified water.
Total water	Batch water added to free moisture. Total water may also include the water used in diluting admixture solutions.
Temper water	Water added in mixer to adjust slump.
Total actual water	The water in the concrete mixture at the time of placement from any source other than the amount absorbed by the aggregate. It includes all batch water placed in the mixer, free moisture on the aggregate and any water added to the ready mix truck prior to placement.
Ready-Mix Producer or "Producer"	Party that is producing the concrete for the Contract. It is understood that the Ready-Mix Producer is the agent of the Contractor.
Water/Cement (w/c) Ratio	W/C ratio is defined as the ratio of the total water weight to the total cementitious weight, which includes cement and supplementary cementitious materials.
Real time	The actual time during which something takes place.

**Information you must have on hand to review Certificate of Compliance:
Mix Design Sheet and Latest Moisture Results**

3/22/2018

Minnesota Department of Transportation

Contractor Mix Design - 3137

RMX		777 -001	
Plant	Green Plant		
Location	Garden, MN		
Contact	Fern E. Leaf		
Telephone #	999-234-5678		
MinDOT Approval	Wendy Garr <small>Digitally signed by Wendy Garr Date: 2018.11.07 15:07:01 -0600</small>		

CHECK WEBSITE FOR F.M.
www.dot.state.mn.us/materials/concrete.html

Use for:
Level 1 and Level 2 general concrete not using a JMF

3137 Gradation
67

PIT #	SOURCE	SIZE	CLASS	SP.G.	ABS.
75999	PRUNE PIT	SAND		2.65	0.006
		3/4"			
77999	PEACH PIT	3/4"	C	2.68	0.012
		5/8"			
		1/2"			
		3/8"			

% AGGREGATE PROPORTIONS
Combos must pass 3137 gradation

MIX	Level	INTENDED USE	Water	Cementitious			W/C Ratio	Sand	% AGGREGATE PROPORTIONS		
				Cement	Fly Ash	Slag			3/4+	5/8-	1/2-
3F52	I	Flatwork	225	461	81		1392		1776		
1G52F	II	Footings and pilecap	289	440	110		1410		1750		
1P62	I	Piling, spread footing leveling pad	285	475			1410		1840		
1P62F	II	Piling, spread footing leveling pad	255	340	100		1480		1870		
1X62	I	Cofferdam seals, rock sockets, drilled shafts	295	707			1280		1750		
1X62F	I	Cofferdam seals, rock sockets, drilled shafts	295	601	106		1270		1750		
3F32	I	Slipform curb and gutter	222	535			1370		1800		
3F32F	II	Slipform curb and gutter	220	430	100		1430		1730		
3M12	I	Slipform Median barrier, non-bridge	233	576			1340		1760		
3M12F	I	Slipform Median barrier, non-bridge	233	489	86		1330		1760		
3G52	I	General miscellaneous	250	580			1330		1720		
3G52F	I	General miscellaneous	258	510	90		1300		1700		
3S12	I	Slipform bridge barrier, parapets, end post	233	576			1340		1760		
3S12F	I	Slipform bridge barrier, parapets, end post	233	489	86		1330		1850		
3S52	I	Bridge superstructure, approach panels	250	580			1330		1720		
3S52F	I	Bridge superstructure, approach panels	258	510	90		1300		1700		
3HE32	I	Slipform curb and gutter	274	722			1130		1740		
3HE52	I	Flatwork, General, Bridge Structure	263	658			1250		1700		

**Information you must have on hand to review Certificate of Compliance:
Mix Design Sheet and Latest Moisture Results**

TP 2152 (8/3/2015)

Minnesota Department of Transportation



Concrete Batching Report

Batch Plant: Garden - Green Plant

Material	9/10		9/10		9/12		Coarse	Coarse	Coarse
	Fine Sand	3/4-	Fine Sand	3/4-	Fine Sand	3/4-			
Date	9/10		9/10		9/12				
Tester	Jimmy John		Jimmy John		Jimmy John				
A. Wt. Sample + Pan	718	2345	700	2313	676	2400			
B. Wt. Sample + Pan	692	2298	674	2271	657	2379			
C. Moisture Loss	26	47	26	43	19	21			
D. Tare Wt. Pan	145	300	145	300	145	300			
E. Dry Wt. Sample	547	1998	529	1971	512	2079			
F. Total Moisture Factor	0.048	0.024	0.049	0.021	0.037	0.010			
G. Absorb. Factor	0.006	0.012	0.006	0.012	0.006	0.012			
H. Free Moisture Factor	0.042	0.012	0.043	0.009	0.031	-0.002			
I. Time Scales Set	6:00am		10:00am		12:30p				
Mix No.:	3F52	Cement Wt.:	461	Fly Ash Wt.:	81	Design Water:	225		
J. Design Wt.	1392	1776	1392	1776	1392	1776			
K. Total Moisture	67	43	68	37	52	18			
L. Scale Setting	1459	1819	1460	1813	1444	1794			
M. Free Moisture	58	21	60	16	43	-4			
Total Free Moisture	79		440		110		289		
Mix No.:	1G52F	Cement Wt.:	1410	Fly Ash Wt.:	1410	Design Water:	1750		
J. Design Wt.	1410	1750	1410	1750	1410	1750			
K. Total Moisture	68	42	69	37	52	18			
L. Scale Setting	1478	1792	1479	1787	1462	1768			
M. Free Moisture	59	21	60	16	44	-4			
Total Free Moisture	80		77		40				

CERTIFICATE OF COMPLIANCE

Mix: 3F52
Quantity: 5 cy

Ingredient	Source	MCFac	Abs Fac	OD	ABS	SSD	FMst	CYTarg	Target	Actual
Sand	75999	.048	.006	1392	8	1400	58	1458	7290	7225
3/4-	77999	.024	.012	1776	21	1797	21	1818	9090	9075
Cmt	LAFDAIA			461				461	2305	2310
FlyAsh	COCUNND			81				81	405	401
Water	City			27ga				27ga	88ga	86ga
AEA	MBAE90			10oz/cwt				54oz	270oz	280oz

- INGREDIENT** Description of product
- SOURCE** MnDOT 5 digit pit numbers and approved abbreviations
- MCFac** Total Moisture Factor from Line F on the Batching Report
- ABS FAC** Absorption Factor from the MnDOT Mix Design
- OD** Oven Dried Weights from the MnDOT Mix Design
- ABS** Absorbed Moisture in pounds $AbsFac \times OD = ABS$
- SSD** Saturated, Surface Dry $OD + ABS = SSD$
- FMst** Free Moisture in pounds $(MCFac - AbsFac) \times OD = FMst$
- CYTARG** Cubic Yard Target $(SSD + FMst = CYTarg)$
- TARGET** Batch Weight Targets $(CYTarg \times CY \text{ in batch} = Target)$
- ACTUAL** Weights actually batched directly from the scales

WATER CALCULATIONS

Total Free Water lb/yd³ = Free Mst X Yards in Batch

Batch Water lb/yd³ = Actual Batch Water

Total Water lb/yd³ = Total Free Water + Batch Water + Temper Water

Design Water lb/yd³ = Water from OD Column X Yards in Batch

Water Available to Add /yd³ = (Design Water-Total Water) / 8.33

CERTIFICATE OF COMPLIANCE

Mix: 3F52
Quantity: 5 cy

Ingredient	Source	MCFac	Abs Fac	OD	ABS	SSD	FMst	CYTarg	Target	Actual
Sand	75999	.048	.006	1392	8	1400	58	1458	7290	7225
3/4-	77999	.024	.012	1776	21	1797	21	1818	9090	9075
Cmt	LAFDAIA			461				461	2305	2310
FlyAsh	COCUNND			81				81	405	401
Water	City			27ga				27ga	88ga	86ga
AEA	MBAE90			10oz/cwt				54oz	270oz	280oz

FOR THE ENTIRE BATCH

FREE MOISTURE = _____ LBS.

DESIGN WATER _____ LBS.

BATCHED WATER = _____ LBS.

WATER AVAILABLE TO ADD: _____ GA.

(Design Water-Total Water)/8.33

TOTAL WATER = _____ LBS.

EXAMPLE 2

Volume: 6.00 yd3 Mix ID: 3A3268 Mix Desc: 3F32 3/4 FA
 Truck #: 379 Driver:
 Qty Ord: Qty Del: Loads:
 Admix H2O included in Total Water
 Design Agg Referenced to: OvenDry Water in Trucks: 0 gal
 Probe Calibration Reference: OvenDry, 0% = OvenDry

Ingrd	Source	MCFac	AbsFac	OD	Abs	SSD	FMst	CYTarg	Target	Actual
3/4	19108 3/4EMN	0.018	0.013	1161	15	1176	6	1182 Lb	7091	7080
3/8	19108 3/8EMN	0.027	0.013	625	8	633	9	642 Lb	3851	3840
SAND C	19108 SANDEM	0.035	0.009	1193	11	1204	31	1235 Lb	7409	7400
CEMENT	LEHMC1A			512				512 Lb	3072	3070
FLYASH	COGUNND			90				90 Lb	540	535
AEA	MBAE90			8.0				8.0 oz	48	48
COLDWELL				34.7				34.7 Gal	157	156

FOR THE ENTIRE BATCH

FREE MOISTURE = _____ LBS.

DESIGN WATER _____ LBS.

BATCHED WATER = _____ LBS.

WATER AVAILABLE TO ADD: _____ GA.

(Design Water-Total Water)/8.33

TOTAL WATER = _____ LBS.

EXAMPLE 3

Ticket No. 13255 **Mix** 3F52 **Load Size** 10.00 **Truck:** 1515 **Started:** 14:19:35 **Completed:** 14:21:38 04-26—16

INGREDIENT	SOURCE	MCFAC	ABSFAC	OD	ABS	SSD	F MST	CY TARG	TARGET	ACTUAL
3/4-	15007	0.027	0.012	1824	22	1846	27	1873	18730	18550
Sand	04105	0.039	0.006	1227	7	1234	40	1274	12740	12750
CEMENT	HOLMCIA			489				489	4890	4900
FLY ASH	NSPEAMN			86				86	860	860
WATER	CITY			31.1 G					230 G	225 G
AIR 1000	WRGDA1000			10.5 oz/yd				10.5	105 fl.oz	104 fl.oz
DARACEM 65	WRGDARA65			0.0 oz/100				0.0	0 fl.oz	
DARACCEL	WRGDARCEL			0.0 oz/100				0.0	0 fl.oz	

FOR THE ENTIRE BATCH

FREE MOISTURE = _____ LBS.

DESIGN WATER _____ LBS.

BATCHED WATER = _____ LBS.

WATER AVAILABLE TO ADD: _____ GA.

(Design Water-Total Water)/8.33

TOTAL WATER = _____ LBS.

CERTIFICATE OF COMPLIANCE CHECKLIST

- SP# and BR#
- Abs Factors
- Mix Design Weights
- Pit #s
- Do the MCFacs match the last moisture test?
- Are admixtures on the approved product list?
- Do all admixtures have the Engineer's approval?
- Is the Total Water less than the mix design?
- Was water added at the plant recorded?
- Are the weights within tolerance?

2461.2.E Concrete Admixture 3113

Provide admixtures from the Approved/Qualified Products list for all concrete grades shown in Table 2461-6 and Table 2461-7.

Use of any of the following admixtures are at the Contractor's discretion:

- (1.1) Type A, Water Reducing Admixture
- (1.2) Type B, Retarding Admixture
- (1.3) Type D, Water Reducing and Retarding Admixture
- (1.4) Type F, High Range Water Reducing Admixture
- (1.5) Type G, High Range Water Reducing and Retarding Admixture
- (1.6) Type S, Specific Performance Based Admixture

Use of the following accelerating admixtures require approval of the Concrete Engineer, in conjunction with the Engineer, unless otherwise allowed in the Contract:

- (2.1) Type C, Accelerating Admixture
- (2.2) Type E, Water Reducing and Accelerating Admixture

The Engineer will permit the use of Type C or Type E accelerating admixtures when all of the following conditions exist:

- (3.1) The ambient temperature is below 36 °F,
- (3.2) An Engineer approved cold weather protection plan is in-place, and
- (3.3) Cold weather protection materials are on-site and ready for use.

BATCH WEIGHT TOLERANCES

TARGET = 6000

ACTUAL = 6100

CEMENT TOLERANCE = 1%

$$6000 \times .01 = 60$$

$$6000 - 60 = 5940$$

$$6000 + 60 = 6060$$

$$\text{Tolerance Range} = 5940 - 6060$$

D.1.b Weighing Equipment and Tolerances

Weigh or measure concrete mixture ingredients using load cells or meters for ready-mix and paving concrete to within the targeted batch weight in accordance with the following:

- (1) Water – 1 percent,
- (2) Cement – 1 percent,
- (3) Other cementitious materials – 3 percent,
- (4) Aggregates – 2 percent, and
- (5) Admixtures – 3 percent.

FIBER ADDITION MONITORING

When fibers are required, observe the method according to Specification 2401.2.A.5.b (4)

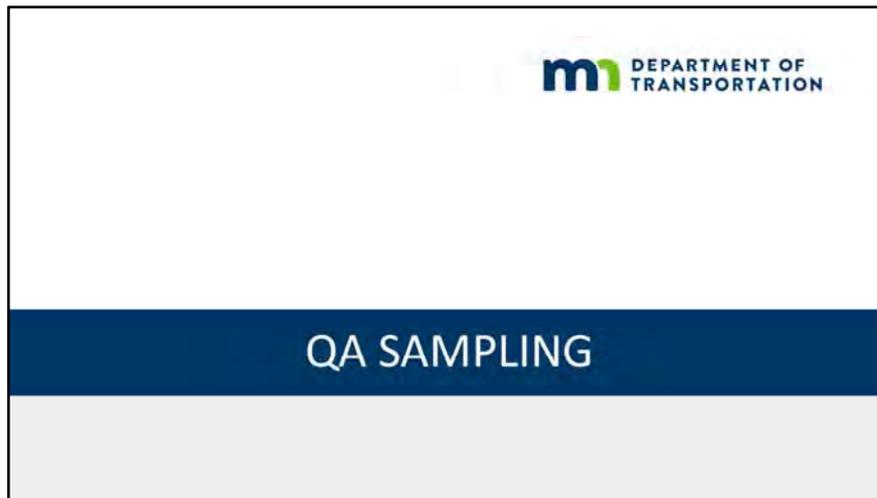
2401.2.A.5.b (4) Application Requirements

Mix non-metallic fiber reinforcement in concrete mixer in accordance with mixing time and speed of ASTM C94, "Standard Specification for Ready-Mixed Concrete" to ensure uniform distribution and random orientation of fibers throughout concrete. Notify the Engineer in writing of the dedicated personnel for this task and the procedures for distributing fibers.

The following fiber addition methods are acceptable on all jobs:

1. Open bag and distribute fibers on aggregate belt at ready-mix concrete plant;
2. Open bag, break apart any fiber clumps, and introduce fibers into ready-mix concrete truck in a well-distributed manner (i.e., "chicken feed")

Any alternate methods to add fibers to the concrete mix must be submitted for acceptance by the Engineer and be demonstrated by a successful trial placement. Allowing bags to dissolve in the ready-mix concrete trucks will not be allowed. Balling of fibers is defined as a 2 inch diameter or greater conglomerate of fibers at the point of placement. Any balling more prevalent than 1 location in 20 CYDs will be considered a failed trial placement. Ensure the manufacturer's technical representative is available by phone or in person to troubleshoot fiber inclusion into the mix during the trial placement and bridge deck placement.



Producer samples:

- Cementitious material – Agency tests
- Admixtures – Agency tests
- QC gradations – Agency tests at their discretion

Agency samples:

- Aggregate Verification samples
- Aggregate Quality samples

Always have the loader operator turn the pile when sampling from a stockpile

All aggregate samples are split samples

Agencies share samples

2461.3.F.5.b Sampling and Testing

The Engineer will:

- (1) Take all samples randomly in accordance with ASTM D 3665, Section 5, at a rate defined in the Schedule of Materials Control.
- (2) Perform all sampling and testing in accordance with the Concrete Manual.
- (3) Use mechanical shakers for sieve analysis.

VERIFICATION TESTING

Samples taken randomly at location identified on the Contact Report

Take additional Verification samples when production problems exist

Verification companion sample CANNOT be used to fulfill the testing requirement for QC

Record Verification results on *Weekly Certified Ready-Mix Plant Report* in the *Concrete Ready-Mix Plant QA Workbook*

Submit to lab within 2 days

Report discrepancies to the District Independent Assurance Inspector

MnDOT SD-15 June, 2017 Schedule of Materials Control for 2018 Standard Specifications
 IV. Concrete Construction Items (cont.) (www.dot.state.mn.us/materials/concrete.html)

Certified Ready-Mix - Concrete Plant Production (cont.)					
Pay Item No.	Test Type	Spec. No.	Producer/Contractor Testing	Agency Testing	Form No.
2301**	Gradation (Verification/Verification Companion)	2461	Test the Verification Companion sample. Complete on the day the sample was taken. Wash all fine aggregate. Verification Companion samples.	When > 25 yd³ of Agency concrete produced per week: 1 or 2 days per week 1 per week. 3 or more days per week 2 per week. For small quantities: When ≤ 25 yd³ of Agency concrete is produced per week: Verification samples are not required. Include Verification Companion results on Sample ID Card.	Concrete Ready-Mix Plant QC Workbook 24143 Weekly Certified Ready-Mix Plant Report or Concrete Ready-Mix Plant QA Workbook. (Verification)
2302		3126			
2401		3131			
2406		3137			
2411					
2452					
2461					
2462					
2506					
2511					
2514	Aggregate Quality including Coarse Aggregate Percent Passing - #200	3126	Test at Contractor's Discretion	When Agency concrete is produced: 1 test each fraction per month. For all bridge deck concrete poured during the month: If the monthly quality was not tested for 3137.2.D.2, take 1 additional quality sample for each coarse aggregate fraction and test for 3137.2.D.2. Identify quality samples with a "●" on the Sample ID Card and the Quality Companion sample. Write 3137.2.D.2 on bridge deck concrete Sample ID Cards.	2410 Sample ID Card
2550		3131			
2554		3137			
2557					
2564					
2565					
	Aggregate Moisture (●C)	2461	When > 20 yd³ of Agency concrete produced per day: 1 completed every 4 hours. Complete the initial moisture content and adjust the batch water prior to the start of concrete production each day. If weather conditions allow, performing moisture testing on representative material at the end of production the prior evening is allowed. In this event, the four-hour rate will commence with the first pour of the day, regardless if it is placed in Agency or private work.	None	Concrete Ready-Mix Plant QC Workbook

QA DOCUMENTATION

2461.3.F.5.e 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.

Concrete Ready Mix Plant QA Workbook

This weekly workbook contains the Diary, Concrete Aggregate Worksheet, Concrete Aggregate Worksheet for JMF, Weekly Certified Ready-Mix Plant Report and Weekly Certified Ready-Mix Plant Report (Blank).

Submit	<p>Submit this Workbook by Thursday of the following week to:</p> <ul style="list-style-type: none"> - The Project Engineer, and - The Concrete Office (weeklyrmplantreport.dot@state.mn.us).
Note	<ul style="list-style-type: none"> - This workbook can contain more than one combination of materials. - Complete all required fields. - Chart all gradation results and Department verification gradation results using the electronic charting worksheets (Aggregate Gradation Control Charts) found on the MnDOT Concrete website.
Diary	<p>The plant location, week ending date and pit numbers must be entered in the Diary before the remaining workbook can be used. Select the plant location by clicking on the dropdown tab. The plant location will then populate throughout the entire workbook and the week ending date will populate into the Weekly Certified Ready-Mix Plant Report.</p> <ul style="list-style-type: none"> - Enter all the products (cement, fly ash, admixtures, etc.) used for the week. - Enter the project number, mix design and quantity of concrete.
Concrete Aggregate Worksheet	<p>Enter information in all Blue cells for each test taken.</p> <p>If the mix design contains one coarse aggregate fraction:</p> <ul style="list-style-type: none"> - Select the coarse aggregate (CA) material size (#67, #7, CA-70), under Agg. Source(s). - Select the fine and coarse pit numbers. - Enter mix proportion of 100% into the first column. - Use only the first column on the worksheet for entering the individual sieve analysis (one page per gradation). <p>If the mix design uses multiple coarse aggregate fractions:</p> <ul style="list-style-type: none"> - Select the CA material size (#67, #7, CA-70, 3/4-), under Agg. Source(s). - Select the second CA material size (CIA, 3/8-, 1/2-, 5/8-, CA-70, #7, 3/4-, #67), under Agg. Source(s). - Select the third CA material size (CIA, 3/8-, 1/2-, 5/8-, CA-70, #7, 3/4-, #67), under Agg. Source(s). - Select the appropriate fine and coarse pit numbers. - Enter the mix proportion % of each fraction.
Concrete Aggregate Worksheet - JMF	<p>Enter information in all Blue cells for each test taken.</p> <ul style="list-style-type: none"> - Select the fine and coarse pit numbers. - Enter the JMF # and Mix Design #. - Enter sample weight, CA and mix proportion for each aggregate fraction. - Enter the combined gradation JMF (total % passing) from the mix design.
Weekly Concrete Aggregate Report	<p>The plant location and week ending date will populate from the Diary.</p> <ul style="list-style-type: none"> - In the upper portion of the report, enter the required information in the blue cells. - In the lower portion of the report, enter the verification companion results in the blue cells next to the verification test results.
Weekly Concrete Aggregate Report (Blank)	<p>For use when the gradation tests are NOT done in the field and are sent in to the lab. Enter the lab test results into the blank Weekly Concrete Aggregate Report.</p>

Procedures	Diary	ConcAggWrk	ConcAggWrk-JMF	WklyCertRMPlantRpt	WklyCertRMPlantRpt (Blank)
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- Instructions and notes for each form are located on the procedures page
- The Agency is required to enter data in each of the applicable forms

DAILY DIARY

Includes:

- Time arrived and departed from plant
- Lab sample type and I.D. number
- Total cubic yards produced (estimate if necessary)
- Materials with appropriate sources
- Any additional comments

1. Fill in the header completely and accurately.
2. List the pit numbers and sample IDs for **the week**.
3. List cementitious and admixture sources and sample IDs used for **the day**.
4. List all mix types and quantities used on your project for **the day**.
5. Thoroughly document all observations and issues important to the day, such as:

Full names of QC Technician and Batchperson

Documentation issues and resolutions

Samples taken

Certificate of Compliance issues and resolutions

Stockpile conditions for contamination and segregation

QC air test results performed at plant

Concrete temps,

Plant difficulties, etc.



Agency Plant Monitor Daily Diary

Date: **9/9/19**
 Plant: **Garden City - Green Plant** Week Ending: **9/14/19**
 Technician: **TOMMY SANDS** Cert#: **5745** Weather: **57, CLOUDY, 94% RELATIVE HUMIDITY, SW17**
 Arrival: **5:30 AM** Departure: **8:15 AM**

Cementitious Sources		Sample ID
Cement:	LAFALMI	CEM9619
Fly Ash:	LABLAMO	FLY9619
Other:		
Admixture Sources		Sample ID
AEA:	MAIR90	AIR9619
1-Admix:	AMPOL1020	WR9619
2-Admix:	SMMAT358	VMA9619
3-Admix:		

Aggregate Sources		Sample ID(s)
1-Fine Pit #:	75999	FA9919C, FA9919V
2-Fine Pit #:		
3-Fine Pit #:		
-Coarse Pit #:	76999	CA9919C, CA9919V
-Coarse Pit #:	77999 3/4-	
-Coarse Pit #:	77999 3/4+	
-Coarse Pit #:	78999	
-Coarse Pit #:		

MnDOT MIXES					JMF MIXES					
Date	RM #	SP	MIX	QTY (cy ³)	Date	RM #	SP	MIX	JMF #	QTY (cy ³)
9/9/19	RM077	555-12	3F32F	75.00	9/9/19	RM077				
9/9/19	RM077	1507-33	3F52	52.00	9/9/19	RM077				
9/9/19	RM077				9/9/19	RM077				
9/9/19	RM077				9/9/19	RM077				
9/9/19	RM077				9/9/19	RM077				
9/9/19	RM077				9/9/19	RM077				
9/9/19	RM077				9/9/19	RM077				
9/9/19	RM077				9/9/19	RM077				
9/9/19	RM077				9/9/19	RM077				
9/9/19	RM077				9/9/19	RM077				
9/9/19	RM077				TOTAL DAILY JMF MIXES (cy ³)					
9/9/19	RM077				Comments:					
9/9/19	RM077				ADMIXTURE AND CEMENTITIOUS SAMPLES TAKEN ON 9/6/19 & SUBMITTED TO MAPLEWOOD. CHECKED STOCKPILES FOR CONTAMINATION AND SEGREGATION. OBSERVED JIMMY JOHN FINISHING MOISTURE TESTS. OBSERVED TRUCKS REVERSE DRUMS. OBSERVED BATCHING OF 1ST LOAD 3F52F AT 7:11 AM AND 3F52 AT 7:43 AM AND VERIFIED INFO ON CERT. OF COMPLIANCE WAS CORRECT. JIMMY J. TESTED 1ST LOAD OF 3F52F AND HAD 7.2% AIR. RED GREENJEANS, MNDOT IA INSPECTOR AT PLANT FOR IA OBSERVATIONS. OBTAINED QC COMPANION FOR GRADATION. CHECKED PRODUCER QC WORKBOOK AND CONTROL CHART FOR INFO AND ACCURACY. BATCHMAN: ROCKY PLANTE					
TOTAL DAILY MnDOT MIXES (cy ³)				127.00						

AGGREGATE WORKSHEET

Minimum Sample Sizes:

#67: 10 lb.

Fine Aggregate: 500 g

The form is titled 'Concrete Aggregate Worksheet' and includes fields for project name, location, date, and test number. It contains two main tables for recording sieve analysis results: one for coarse aggregate (sieves #4 to #60) and one for fine aggregate (sieves #60 to #200). Each table has columns for sieve size, sample weight, and the amount retained on that sieve. There are also sections for recording test conditions, equipment used, and a final check total.

Maximum Allowable Quantity Retained on a 14 X 14 in Sieve

3/4	13.2
5/8	11.2
1/2	8.7
3/8	6.6
#3	4.4
#4	3.3

The Maximum amount of material on an 8" sieve is 200 g

1. FILL out header completely and accurately.
2. Confirm Coarse and Fine Aggregate minimum sample sizes have been met.
3. Determine if any of the coarse or fine sieves were overloaded.
4. Assign a test number to the gradation.
5. Compare results to the Gradation Requirements.

A gradation is only valid and compliant if:

1. It meets Gradation Requirements
2. Minimum sample sizes are used
3. Individual sieves have not been overloaded
4. The Check Total is within tolerance of the Sample Weight



Concrete Aggregate Worksheet

S.P.:	Plant: Garden City - Green Plant	Date: 9/9/19	Agg. Source(s):	Fine Pit #: 75999
Engineer:	Tester: TOMMY SANDS	Time: 3:00 PM	CA: #67	Coarse Pit #: 76999
			CA:	Coarse Pit #:
			CA:	Coarse Pit #:

Sieve Analysis of Coarse Aggregate

Agg. Fractions	CA: #67 Mix Prop.: 100 %				CA: Mix Prop.: %				CA: Mix Prop.: %			
	Test No. CA9919C	Sample Wt. (lb): 12.5			Composite Gradation Only	Sample Wt. (lb):			Composite Gradation Only	Sample Wt. (lb):		
Sieve Sizes	Weights (lb)		% Pass	Req.	Weights (lb)		% Pass	Req.	Weights (lb)		% Pass	Req.
Pass - Ret.	Ind.	Cum.			Ind.	Cum.			Ind.	Cum.		
1 1/4" - 1"	0.0	12.5	100	100								
1" - 3/4"	0.1	12.5	100	100								
3/4" - 5/8"	1.9	12.4	99	90-100								
5/8" - 1/2"	3.5	10.5	-	-								
1/2" - 3/8"	3.4	7.0	56	-								
3/8" - 1/4"	0.0	3.6	29	20-55								
1/4" - #4	3.2	3.6	-	**								
#4 - Btm	0.4	0.4	3	0-10								
Check Total	12.5	± 0.2 lb of Sample Wt		12.5 - 12.7	± 0.2 lb of Sample Wt				± 0.2 lb of Sample Wt			

Coarse Aggregate Percent Passing the #200 Sieve Test

Agg. Fractions	#67			
(A) Dry weight of original sample				
(B) Dry weight of washed sample				
(C) Loss by washing (A - B)				
(D) % Passing #200 (C ÷ A) × 100				

Sieve Analysis of Fine Aggregate

Sieve Sizes	Test No. FA9919C		Sample Wt. (g): 540.2	
	Weights (g)		% Pass	Req.
Pass - Ret.	Ind.	Cum.		
3/8" - #4	0.5	539.6	100	100
#4 - #6	15.9	539.1	100	95 - 100
*#6 - #8	31.6	523.2	-	**
#8 - #16	97.3	491.6	91	80 - 100
#16 - #30	140.4	394.3	73	55 - 85
#30 - #50	129.7	253.9	47	30 - 60
#50 - #100	91.8	124.2	23	5 - 30
#100 - #200	23.4	32.4	6	0 - 10
*#200 - Btm	0.9	9.0	1.7	0 - 2.5
Loss by Washing	8.1			
Check Total	539.6	± 0.3 % of Sample Wt		** **
Fineness Model	Within ± 0.20	2.60	2.70	

Composite Gradation for:

Agg. Fractions				Composite	Grad.
Proportions	%	%	%	100%	Req.
1 1/4"					
1"					
3/4"					
3/8"					
#4					

Washing Data for Sieve Analysis of Fine Aggregate

(A) Dry Sample and Record Weight	540.2
(B) Wash and Dry Sample, Record Weight	532.1
(C) Loss by Washing (A - B)	8.1

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

Comments: QC COMPANION

CONCRETE AGGREGATE WORKSHEET - JMF

The image shows a detailed spreadsheet-style form for concrete aggregate analysis. It is titled 'Minnesota Department of Transportation - JMF Concrete Aggregate Worksheet'. The form is divided into several main sections:

- Header:** Contains project information such as 'Project Name', 'Plan', 'Sheet', 'Date', 'Time', 'Job No.', 'Job Name', 'Job No.', 'Job Name', 'Job No.', 'Job Name'.
- Coarse Analysis of Concrete Aggregate:** A table with columns for 'Sieve Size', 'Weight Retained', 'Weight Passing', 'Percentage Retained', and 'Percentage Passing'. It includes rows for various sieve sizes like 3/8", No. 40, No. 60, No. 100, No. 200, No. 425, and No. 600.
- Fine Analysis of Fine Aggregate:** A similar table for fine aggregate analysis, with sieve sizes ranging from No. 20 to No. 200.
- Proposed Planning RDM Values Table:** A table for determining RDM values based on sieve size and aggregate type.
- Component Evaluation for Job Mix Formula:** A table for evaluating the suitability of aggregates for use in concrete, with columns for 'Sieve Size', 'Weight Retained', 'Weight Passing', 'Percentage Retained', and 'Percentage Passing'.

1. Fill in the header completely and accurately.
2. Enter the proper aggregates from the drop down boxes.
3. Obtain mix proportions from the JMF mix design and enter for all aggregates.
4. Ensure the combined Gradation JMF percentages match the JMF mix design.
5. Check the individual weights for both the coarse and fine aggregates for overloading on sieves.
6. Verify the Total % Passing is within the JMF Working Range.



Minnesota Department of Transportation
JMF Concrete Aggregate Worksheet

S.P. #	562.00	Plant	Garden - Green Plant	Date	3/12/19	Mis. #	3003	Agg. Sources (P, F, H)	CA #1: 77999 344
Engineer	J.Smith	Tester	Mike Boudet	Time	5:30 PM	JMF #	19-202	FA #1: 7599	CA #2: 77999 344
Test Obj.	JMF1							FA #2:	CA #3:

Sieve Analysis of Coarse Aggregate

Aggregate Fraction	Sample Vt. 14.1		Sample Vt. 12.20		Sample Vt. CA #3	
	Mis Prop. %	Weights (lb)	Mis Prop. %	Weights (lb)	Mis Prop. %	Weights (lb)
Passes	0.0	14.1	0.0	12.2	0.0	12.2
1/2" - 3/8"	0.0	14.1	0.0	12.2	0.0	12.2
3/8" - 1/4"	0.5	0.7	0.0	0.0	0.0	0.0
1/4" - #4	0.7	1.0	0.0	0.0	0.0	0.0
#4 - #10	3.5	5.0	0.1	0.1	0.1	0.1
#10 - #20	3.5	5.0	0.0	0.0	0.0	0.0
#20 - #30	0.0	0.0	0.0	0.0	0.0	0.0
#30 - #40	1.5	2.1	0.0	0.0	0.0	0.0
#40 - #60	0.8	1.1	0.0	0.0	0.0	0.0
Check Total	14.1	19.9	0.1	0.1	0.1	0.1

Sieve Analysis of Fine Aggregate

Aggregate Fraction	Sample Vt. 11.33		Sample Vt. 11.33		Sample Vt. 11.33	
	Mis Prop. %	Weights (lb)	Mis Prop. %	Weights (lb)	Mis Prop. %	Weights (lb)
Passes	0.0	11.3	0.0	11.3	0.0	11.3
75 - #4	0.0	11.3	0.0	11.3	0.0	11.3
#4 - #10	66.3	7.5	66.3	7.5	66.3	7.5
#10 - #20	105.4	12.0	105.4	12.0	105.4	12.0
#20 - #30	281.2	3.2	281.2	3.2	281.2	3.2
#30 - #40	392.3	4.4	392.3	4.4	392.3	4.4
#40 - #60	36.9	0.4	36.9	0.4	36.9	0.4
#60 - #100	23.8	0.3	23.8	0.3	23.8	0.3
#100 - #200	17.5	0.2	17.5	0.2	17.5	0.2
#200 - #300	0.80	0.01	0.80	0.01	0.80	0.01
Loos by Washing	5.0	0.06	5.0	0.06	5.0	0.06
Check Total	538.4	6.1	538.4	6.1	538.4	6.1

Composite Gradation for Job Mix Formula

Aggregate Fraction	CA #1	CA #2	CA #3	FA #1	FA #2	Total Gradation	Total Retention	Total Working Range
Passes	34	34	34	75999	42	100	0	100
1/2" - 3/8"	44	14	14	42	42	97	3	97
3/8" - 1/4"	42	0	0	42	42	100	0	100
1/4" - #4	40	0	0	42	42	100	0	100
#4 - #10	18	0	0	42	42	60	40	60
#10 - #20	7	0	0	42	42	48	52	48
#20 - #30	2	0	0	42	42	32	68	32
#30 - #40	1	0	0	42	42	22	78	22
#40 - #60	0	0	0	42	42	14	86	14
#60 - #100	0	0	0	42	42	6	94	6
#100 - #200	0	0	0	42	42	4	96	4
#200 - #300	0	0	0	42	42	2	98	2
Loos by Washing	0	0	0	0.6	0.6	0.6	99.4	0.6

Percent Passing #200 Sieve Test

Location	Aggregate	CA #1	CA #2	CA #3
(A) Weight of original sample				
(B) Weight of washed sample				
(C) Loss by washing (A-B)				
(D) % Passing #200 (C/A) 100				

Location	Aggregate	FA #1	FA #2
(A) Weight of original sample			
(B) Weight of washed sample			
(C) Loss by washing (A-B)			
(D) % Passing #200 (C/A) 100			

Additional Remarks or Comments

Weekly Certified Ready-Mix Plant Report

Plant: Garden City - Green Plant Week Ending: 9/14/19

Date	9/9/19	9/13/19					
Yd ³ Produced	75	105					
Producers # of Gradations	1	2					
S.P.	5555-12	1567-80					
Mix Designation	3F32F	3G52					
Time of Batch	7:11 AM	7:05 AM					
Total Free Water lb/yd ³	51	48					
Batch Water lb/yd ³	152	190					
Temper Water lb/yd ³	8						
Total Water lb/yd ³	211	238					
Design Water lb/yd ³	220	258					
Inspector	OMMY SAND		OMMY SAND				

FA Verification Samples					CA Verification Samples				
Date	9/9	9/9	9/9	9/9	Date	9/9	9/9	9/9	9/9
FA Test #	FA991 9C	FA-8	FA991 9V	FA-9VC	CA Test #	CA991 9C	CA-8	CA991 9V	CA-9VC
Pit #	75999		75999		CA-Size	#67	#67	#67	#67
3/8"	100	100	100	100	1-Pit #	76999		76999	
#4	100	100	100	100	2-Pit #				
#8	91	89	89	89	3-Pit #				
#16	73	72	71	71	1 1/4"	100	100	100	100
#30	47	46	44	45	1"	100	100	100	100
#50	23	21	21	21	3/4"	99	98	100	99
#100	6	5	5	5	5/8"	-		-	
#200	1.7	1.4	1.2	1.4	1/2"	56	53	53	55
FM	2.60	2.67	2.70	2.69	3/8"	29	26	29	29
Tester	TOMMY	JIMMY	TOMMY	MIKE BOUL	#4	3	3	7	6
					Tester	TOMMY	JIMMY JOHN	TOMMY	MIKE BOUL

JMF Verification Samples									
Date	9/13	9/13							
JMF Test #	JMF1Q	JMF-2VC							
JMF #	19-202								
1-FA Pit#	75999								
2-FA Pit#									
1-CA Pit#	7999 3/4+								
2-CA Pit#	7999 3/4-								
3-CA Pit#									
2"	100	100							
1 1/2"	97	97							
1"	85	85							
3/4"	82	82							
1/2"	61	59							
3/8"	52	49							
#4	38	38							
#8	22	22							
#16	14	15							
#30	9	8							
#50	4	3							
#100	2	2							
#200	1	1							
Tester	TOMMY	MIKE BOUL							

LAB/FIELD TOLERANCE

Table 2461-16
Allowable Variations on Percent Passing Sieves

Sieve Size	Allowed Percentage
2 in – ¾ in	± 6
No. 4 – No. 30	± 4
No. 50	± 3
No. 100	± 2
No. 200	± 0.6

2461.3.F.6.a Aggregate Gradation (Does not apply to Job Mix Formulas)

- (1) If the gradation tests on split samples from quality control or verification samples result in a variation between the Producer and the Engineer greater than that set forth in Table 2461-16, the Engineer will substitute QA and/or Verification test results into the moving average calculation to determine acceptance.
- (2) If Producer test results are consistently coarser or finer than Engineer test results, the Engineer will review in accordance with 1503, "Conformity with Contract Documents."
- (3) The Engineer will determine the monetary reduction due to the moving average gradation failure.
 - (3.1) Calculate the quantity of non-complying concrete placed, beginning with the first individual gradation test within the moving average failure and ending with the first passing individual gradation test after the moving average failure.
 - (3.2) Based on the total quantity of non-compliant concrete placed, the Engineer will apply the monetary reduction outlined in Table 2461-15.
 - (3.3) If a moving average failure occurs on multiple sieves, the Engineer will only reduce the price based on a single monetary deduction.

WEEKLY CERTIFIED READY MIX PLANT REPORT (BLANK)

Minnesota Department of Transportation
DOT
Weekly Certified Ready-Mix Plant Report

Plant: Garden City - Green Plant Week Ending: 8/24/15

Date: _____
 HP Produced: _____
 Producers # of Gradations: _____
 S.P.: _____
 Aftic Designation: _____
 Time of Batch: _____
 Total Free Water (lb/yd³): _____
 Batch Water (lb/yd³): _____
 Temp. Water (lb/yd³): _____
 Total Water (lb/yd³): _____
 Design Water (lb/yd³): _____
 Inspector: _____

QA Verification/Verification Companion Results

Date	Test #	Test #	Test #
	1A	1A	1A
	1B	1B	1B
	1C	1C	1C
	1D	1D	1D
	1E	1E	1E
	1F	1F	1F
	1G	1G	1G
	1H	1H	1H
	1I	1I	1I
	1J	1J	1J
	1K	1K	1K
	1L	1L	1L
	1M	1M	1M
	1N	1N	1N
	1O	1O	1O
	1P	1P	1P
	1Q	1Q	1Q
	1R	1R	1R
	1S	1S	1S
	1T	1T	1T
	1U	1U	1U
	1V	1V	1V
	1W	1W	1W
	1X	1X	1X
	1Y	1Y	1Y
	1Z	1Z	1Z
	2A	2A	2A
	2B	2B	2B
	2C	2C	2C
	2D	2D	2D
	2E	2E	2E
	2F	2F	2F
	2G	2G	2G
	2H	2H	2H
	2I	2I	2I
	2J	2J	2J
	2K	2K	2K
	2L	2L	2L
	2M	2M	2M
	2N	2N	2N
	2O	2O	2O
	2P	2P	2P
	2Q	2Q	2Q
	2R	2R	2R
	2S	2S	2S
	2T	2T	2T
	2U	2U	2U
	2V	2V	2V
	2W	2W	2W
	2X	2X	2X
	2Y	2Y	2Y
	2Z	2Z	2Z
	3A	3A	3A
	3B	3B	3B
	3C	3C	3C
	3D	3D	3D
	3E	3E	3E
	3F	3F	3F
	3G	3G	3G
	3H	3H	3H
	3I	3I	3I
	3J	3J	3J
	3K	3K	3K
	3L	3L	3L
	3M	3M	3M
	3N	3N	3N
	3O	3O	3O
	3P	3P	3P
	3Q	3Q	3Q
	3R	3R	3R
	3S	3S	3S
	3T	3T	3T
	3U	3U	3U
	3V	3V	3V
	3W	3W	3W
	3X	3X	3X
	3Y	3Y	3Y
	3Z	3Z	3Z
	4A	4A	4A
	4B	4B	4B
	4C	4C	4C
	4D	4D	4D
	4E	4E	4E
	4F	4F	4F
	4G	4G	4G
	4H	4H	4H
	4I	4I	4I
	4J	4J	4J
	4K	4K	4K
	4L	4L	4L
	4M	4M	4M
	4N	4N	4N
	4O	4O	4O
	4P	4P	4P
	4Q	4Q	4Q
	4R	4R	4R
	4S	4S	4S
	4T	4T	4T
	4U	4U	4U
	4V	4V	4V
	4W	4W	4W
	4X	4X	4X
	4Y	4Y	4Y
	4Z	4Z	4Z
	5A	5A	5A
	5B	5B	5B
	5C	5C	5C
	5D	5D	5D
	5E	5E	5E
	5F	5F	5F
	5G	5G	5G
	5H	5H	5H
	5I	5I	5I
	5J	5J	5J
	5K	5K	5K
	5L	5L	5L
	5M	5M	5M
	5N	5N	5N
	5O	5O	5O
	5P	5P	5P
	5Q	5Q	5Q
	5R	5R	5R
	5S	5S	5S
	5T	5T	5T
	5U	5U	5U
	5V	5V	5V
	5W	5W	5W
	5X	5X	5X
	5Y	5Y	5Y
	5Z	5Z	5Z
	6A	6A	6A
	6B	6B	6B
	6C	6C	6C
	6D	6D	6D
	6E	6E	6E
	6F	6F	6F
	6G	6G	6G
	6H	6H	6H
	6I	6I	6I
	6J	6J	6J
	6K	6K	6K
	6L	6L	6L
	6M	6M	6M
	6N	6N	6N
	6O	6O	6O
	6P	6P	6P
	6Q	6Q	6Q
	6R	6R	6R
	6S	6S	6S
	6T	6T	6T
	6U	6U	6U
	6V	6V	6V
	6W	6W	6W
	6X	6X	6X
	6Y	6Y	6Y
	6Z	6Z	6Z
	7A	7A	7A
	7B	7B	7B
	7C	7C	7C
	7D	7D	7D
	7E	7E	7E
	7F	7F	7F
	7G	7G	7G
	7H	7H	7H
	7I	7I	7I
	7J	7J	7J
	7K	7K	7K
	7L	7L	7L
	7M	7M	7M
	7N	7N	7N
	7O	7O	7O
	7P	7P	7P
	7Q	7Q	7Q
	7R	7R	7R
	7S	7S	7S
	7T	7T	7T
	7U	7U	7U
	7V	7V	7V
	7W	7W	7W
	7X	7X	7X
	7Y	7Y	7Y
	7Z	7Z	7Z
	8A	8A	8A
	8B	8B	8B
	8C	8C	8C
	8D	8D	8D
	8E	8E	8E
	8F	8F	8F
	8G	8G	8G
	8H	8H	8H
	8I	8I	8I
	8J	8J	8J
	8K	8K	8K
	8L	8L	8L
	8M	8M	8M
	8N	8N	8N
	8O	8O	8O
	8P	8P	8P
	8Q	8Q	8Q
	8R	8R	8R
	8S	8S	8S
	8T	8T	8T
	8U	8U	8U
	8V	8V	8V
	8W	8W	8W
	8X	8X	8X
	8Y	8Y	8Y
	8Z	8Z	8Z
	9A	9A	9A
	9B	9B	9B
	9C	9C	9C
	9D	9D	9D
	9E	9E	9E
	9F	9F	9F
	9G	9G	9G
	9H	9H	9H
	9I	9I	9I
	9J	9J	9J
	9K	9K	9K
	9L	9L	9L
	9M	9M	9M
	9N	9N	9N
	9O	9O	9O
	9P	9P	9P
	9Q	9Q	9Q
	9R	9R	9R
	9S	9S	9S
	9T	9T	9T
	9U	9U	9U
	9V	9V	9V
	9W	9W	9W
	9X	9X	9X
	9Y	9Y	9Y
	9Z	9Z	9Z

This worksheet is identical to the Weekly Certified Ready Mix Plant Report but is not auto populated.

Use this sheet when Verification and QA gradation samples are preformed in a Lab and the results have to be entered manually.

BATCH WATER VERIFICATION

2461.3.F.5.d Batch Weight Verification

Each time the Engineer obtains a verification gradation, the Engineer will observe the actual water batched in a single load of concrete in accordance with the following:

- (1) Watching the ready-mix truck reverse the drum after washing,
- (2) Verifying use of the current moisture test,
- (3) Verifying that any additional water added to adjust the slump is recorded, and
- (4) Validating water weights on the load batched and comparing the total water with the design water.

The Engineer will document the actual water batched on MnDOT Form 24143, *Weekly Certified Ready-Mix Plant Report* or *Concrete Ready-Mix Plant QA Workbook*.

BATCH WATER VERIFICATION

Watch the batchperson weigh at least 1 load each time a verification gradation is collected.

This includes observing the removal of wash water from the ready-mix truck by reversing the drum.

Validate all water weights on the load watched and compare the total water with the design water.

Include all water added at the plant.

Results are documented on:

Weekly Certified Ready-Mix Report in the Ready-Mix Concrete Plant QA Workbook



Weekly Certified Ready-Mix Plant Report

Plant: Garden - Green Plant Week Ending: 9/15/18

S. P. No(s):	1507-33	2345-54	141-25-333					
	1567-80	-						

Cement Source:	LAFDAIA	1-Fine Pit #:	75999
Fly Ash Source:	LAB IAM O	2-Fine Pit #:	
Other Source:		3-Fine Pit #:	
AEA Source:	EUAEA92	1-Coarse Pit #:	77999
1-Admix Source:	AEUWR91	2-Coarse Pit #:	77999
2-Admix Source:		3-Coarse Pit #:	
3-Admix Source:		4-Coarse Pit #:	
		5-Coarse Pit #:	

Date	9/10/18	9/11/18	9/12/18			
Yd ³ Produced	185	72	196			
Producers # of Gradations	1		1			
S.P.	1507-33	1507-33	1507-33			
Mix Designation	3F52F	3F52F	3G52F			
Time of Batch	8:55a	10:00a	10:45	A	B	C
Total Free Water lb/yd ³	56	43	39			
Batch Water lb/yd ³	200	202	183			
Temper Water lb/yd ³	0	0	0			
Total Water lb/yd ³	256	245	222			
Design Water lb/yd ³	271	271	245			
Inspector	T.S.	T.S.	T.S.			

FA Verification Samples				CA Verification Samples				JMF Verification Samples			
Date	9/10	9/12		Date	9/10	9/12		Date			
FA Test #	V1	V2		CA Test #	V1	V2		JMF Test #			
Pit #	75999	75999		CA-Size	#67	#67		JMF #			
3/8"	100	100		1-Pit #	77999	77999		1-FA Pit#			
#4	100	100		2-Pit #				2-FA Pit#			
#8	94	91		3-Pit #				1-CA Pit#			
#16	67	76		2"	100	100		2-CA Pit#			
#30	51	40		1 1/2"	100	100		3-CA Pit#			
#50	13	12		1 1/4"	100	100		2"			
#100	3	2		1"	100	100		1 1/2"			
#200	1.5	0.7		3/4"	93	92		1"			
FM	2.72	2.79		5/8"	-			3/4"			
Tester	T.S.	T.S.		1/2"	41	43		1/2"			
				3/8"	37	36		3/8"			
				#4	5	6		#4			
				Tester	T.S.	T.S.		#8			
								#16			
								#30			
								#50			
								#100			
								#200			
								Tester			

OT Weekly Certified Ready-Mix Plant Report

Plant: Garden City - Green Plant Week Ending: 9/14/19

Date	9/9/19	9/13/19			
Yd ³ Produced	75	105			
Producers # of Gradations	1	2			
S.P.	5555-12	1567 80			
Mix Designation	3F32F	3G52			
Time of Batch	7:11 AM	7:05 AM	A	B	C
Total Free Water lb/yd ³	51	48			
Batch Water lb/yd ³	152	190			
Temper Water lb/yd ³	8				
Total Water lb/yd ³	211	238			
Design Water lb/yd ³	220	258			
Inspector	OMMY SAND TOMMY SAND				

WATER CALCULATIONS

Total Free Water lb/yd³ = Add Free Mst column

Batch Water lb/yd³ = $\frac{\text{Actual Batch Water}}{\text{Yards in Batch}}$

Total Water lb/yd³ = Free Water + Batch Water + Temper Water

Design Water lb/yd³ = Water from OD Column

EXAMPLE A

TP 0042-02 (3/2000)							
 Minnesota Department of Transportation							
<h2>Certificate of Compliance</h2>							
Ready-Mix Plant Quickmix - Mill City			Contractor Pebble Brothers		S. P. 1020-30	Date 4/1/2010	
Bridge # 89006	Mix # 3Y43F	Truck # 10	Time Batched 8:55a	Quantity this load 10 yd ³	Cumulative quantity 10 yd ³		
Design Wt. (C.Y.)	Total Moisture	Free Water	Target Batch (C.Y.)	Target Batch Weight	Actual Batch Weight	Manufacturer & Mill or Power Plant/Aggregate Source & Pit #	
Cement	549		549	5490	5480	Holcim - Mason City, IA	
Fly Ash	97		97	970	980	NSP - Eagan, MN	
Sand	1193	57	48	1250	12500	123456 Salinger - Lakeland	
CA 3/4+							
CA 3/4-	1276	20	3	1296	12960	123456 Salinger - Lakeland	
CA- 3/8-	547	13	4	560	5600	134567 Rock Island - Falls City	
Water	271		(55)		2000		
Total Water (Free Plus Batched)				2710	2550		
Total Water Available to Add at Jobsite	19 Gal.	Total Water Added at Jobsite		5 Gal.	Total Water	2592 Lbs.	
<small>(Target - Actual)/8.33</small>						<small>Water Added at Jobsite*8.33 + Total Water (Actual)</small>	

WATER CALCULATIONS

Total Free Water lb/yd³ = Add Free Mst column

Batch Water lb/yd³ = $\frac{\text{Actual Batch Water}}{\text{Yards in Batch}}$

Total Water lb/yd³ = Free Water + Batch Water + Temper Water

Design Water lb/yd³ = Water from OD Column

EXAMPLE B

Volume: 10.00 yd3		Mix ID: 5067P		Mix Desc: 7 BEQ 5000 3/4						
Truck #: 761		Drvr: DUANE GUSE								
Qty Ord: 310.00		Qty Del: 280.00		Loads: 28						
Admix H2O included in Total Water										
Design Agg Referenced to: SSD				Water in Trucks: 0 gal						
Probe Calibration Reference: OvenDry, 0% = OvenDry										
Ingred	Source	MCFac	AbsFac	OD	Abs	SSD FMst	CYTarg	Target	Actual	
SANDNEL	82001	0.051	0.010	1309	13	1322	54	1376 Lb	13757	13750
3/4NEL	82001	0.017	0.013	738	10	748	3	751 Lb	7510	7500
1/2NEL	82001	0.022	0.013	1020	13	1033	9	1042 Lb	10421	10340
FCCEMENT	LAFDAIA			540				540 Lb	5400	5420
FLYASH	COCUNND			120				120 Lb	1200	1200
HRWRA	BSFGL7500			9.9				9.9 oz	99	100
NCACCEL	MBPZNC534			66.0				66.0 oz	660	660
CACL2	UNIVARCC			211.2				211.2 oz	0	0
CWWATER				35.7				35.7 Gal	28	25
HWATER				0.0				0.0 Gal	247	243
Total Admix H2O:				3 Gal	Water allowed by mix design:			357 Gal		
Aggregate Water				79 Gal	Total Water			350 Gal		
Temp Water:				0 Gal	Water allowed at Jobsite			7 Gal		
Total Water				2915 Lb	Water added @ Plant:			Gal		
Total Cement				6620 Lb	Water added @ Jobsite:			Gal		
W/(C+P) Ratio: 0.44				Total Actual Water:			Lb			
Mix Design W/(C+P): 0.45				Water/yd3:			0.0			

WATER CALCULATIONS

Total Free Water lb/yd³ = Add Free Mst column

Batch Water lb/yd³ = $\frac{\text{Actual Batch Water}}{\text{Yards in Batch}}$

Total Water lb/yd³ = Free Water + Batch Water + Temper Water

Design Water lb/yd³ = Water from OD Column

EXAMPLE C

TRUCK	USER LOGIN	DISP	TICKET NUM	TICKET NUM	TICKET ID	TIME	DATE									
0462	USER	1226742	25143	48302	11:14	02/14/2006										
LOAD SIZE	MIX CODE				SEQ	LOAD ID										
11.00 yd	303Y43F				0	46468										
INGREDIENT	SOURCE	MCFAC	ABSFAC	DD	ABS	SSD	FREE	MST	CY	TARG	TARGET	ACTUAL	%FREE WAT	FREE WATER	ABS.WAT	TOT.WAT
3/4ROCK	171047 ST	0.015 M	0.010	1702 lb	10	1000	9	1809	1989	1989	1989 lb	19860	0.500% M	98.01 lb	196.02	294.03
SAND	171041	0.034 M	0.009	1156 lb	10	1166	29	1195	13148 lb	14130 +	14130 lb	14130	2.500% M	317.90 lb	114.44	432.34
WATER	WELL			296.0 lb		296.0		241.5	2656.5 lb	2653.7	2653.7 lb	2653.7		2653.71 lb		2653.71
CEMENT	LEHNCIA			563 lb		563		563	6193 lb	6235	6235					
FLYASH	COCCUNAD			99 lb		99		99	1009 lb	1090	1090					
AIR	GRIPOLYR			11.50 oz		11.50		10.45	115.00 oz	115.00	115.00					
NON-SIMULATED NUM BATCHES: 1 DD																
LOAD TOTAL: 43976 lb DESIGN W/C: 0.447 WATER/CEMENT: 0.419T DESIGN WATER: 3256.0 lb TOTAL WATER: 3069.6 lb TO ADD: 22.3 gl WATE																
R IN TRUCK: 0.0 gl ADJUST WATER: 0.0 gl /load TRIM WATER: -2.0 gl /yd																

CERTIFIED READY-MIX PLANT DECERTIFICATION

- It is important to verbally notify and document any deficiencies in the Producer's work.
- Using the email address on the Contact Report simplifies the notification to the Producer that there is a problem.
- Always include a timeline as to when the problem should be remedied.

2461.3.F.5.f 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.
- (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."