Aggregate Optimization Chart

Production Gradation Report

PLANT #: P-101 Contractor:

Sample Date: 2/14/22 DM Concrete Grade: Dates Test Represents: 2/15/2022 2/21/2022 through

Agg. Class	Pit#	Source	Weight (SSD)	ft ³	Specific Gravity	% Contribution
6AA	71-47	Presque Isle	1500	9.17	2.62	51.5
26A	71-47	Presque Isle	260	1.59	2.62	8.9
2NS	75-051	Mid-Michigan	1150	6.93	2.66	39.5
		Total Wt	2910	17.69		100.0

MDOT No.:

---- Verify this number is 100%

SUPERIOR MATERIALS

Superior Materials, LLC 30701 W. 10 Mile Rd. Suite 500 Farmington Hills, MI 48336

Sieve	6AA	26A	2NS	Cumulative % Passing	% Retained	Cumulative % Retained
2"	100.0	100.0	100.0	100.0	0.0	0.0
1.5"	100.0	100.0	100.0	100.0	0.0	0.0
1"	98.8	100.0	100.0	99.4	0.6	0.6
3/4"	82.4	100.0	100.0	90.9	8.5	9.1
1/2"	39.0	96.9	100.0	68.3	22.6	31.7
3/8"	19.2	85.3	100.0	57.0	11.2	43.0
#4	3.0	15.4	98.5	41.8	15.2	58.2
#8	1.8	4.0	83.3	34.2	7.6	65.8
#16	1.6	1.9	68.3	28.0	6.2	72.0
#30	1.5	1.5	53.3	22.0	6.0	78.0
#50	1.4	1.4	29.2	12.4	9.6	87.6
#100	1.4	1.3	7.3	3.7	8.7	96.3
LBW	1.3	1.1	0.6	1.0	2.7	99.0
Production 6	Gradation Batch Plant Grad	ations Aggregate Supplier Gra	dations	Adjusted WF	Initial Producti	on Sample (IPS

*Maximum % Retained must be above the 3/8" sieve.

*Any two adjacent sieves must equal 10% except max.,

nom. max., #100 and #200 sieves.

*% Retained must be at least 4% for each sieve except max.,

nom. max., #100 and #200 sieves.

62

*% Retained must be at least 8% for the 1" sieve when

a 2" max. size (nom. Max. 1.5") aggregate is used.

Production Gradation	Batch Plant Grada	ations Aggregate Supplier Grad	ations	Adjusted WF	Initial Product	tion Sample (IPS	3)
Coarseness Factor:	65	Workability Factor:	34	36.7	Coars	seness Factor:	
45 —					Worl	cability Factor:	
45, 44			JMF Zone]	Sieve	Cumulative % Passing	R
	52, 41			- 11	2"	100.0	
3 40 1	5	7, 39 68, 38	75, 39		1.5"	100.0	
					1"	100.0	
Factor		■ 60, 36 _S	Gradation		3/4"	95.0	
꽃 35 -	1	i IPS			1/2"	70.5	
	52, 34	-! :		- 11	3/8"	60.0	
45, 33					#4	44.4	
5 30	57	7, 31 67 ₆ 3 ,1 ₃₁		- 11	#8	35.5	
Operating Zone					#16	28.5	
A5, 33 Operating Zone Boundary			75, 28	- 11	#30	21.5	
≥ 25 L					#50	10.2	
40 45	50 55	60 65 70	75	80	#100	3.1	
ActionLimits Boundary =		Coarseness Factor (%)	, ,		LBW	1.3	

Work	ability Factor:	35	
Sieve	Cumulative % Passing	% Retained	Cumulative % Retained
2"	100.0	0.0	0.0
1.5"	100.0	0.0	0.0
1"	100.0	0.0	0.0
3/4"	95.0	5.0	5.0
1/2"	70.5	24.5	29.5
3/8"	60.0	10.5	40.0
#4	44.4	15.6	55.6
#8	35.5	9.0	64.5
#16	28.5	7.0	71.5
#30	21.5	7.0	78.5
#50	10.2	11.3	89.8
#100	3.1	7.1	96.9
LBW	1.3	1.8	98.7

PREPARED BY: SM, LLC Technical Service

PLANT #: P-102

Sample Date:

Production Gradation

2/14/22 DM Concrete Grade: 2/15/2022 2/21/2022

Contractor:

MDOT No.:

---- Verify this number is 100%

Adjusted WF Intial Production Sample (IPS)

Coarseness Factor:

38.0

Dates Test F	Represents:	2/15/2022	through	2/21/2022		
Agg. Class	Pit#	Source	Weight (SSD)	ft ³	Specific Gravity	% Contribution
6AA	58-003	Stoneco	1400	8.34	2.69	47.4
26A	58-003	Stoneco	405	2.41	2.69	13.7
2NS	63-114	Highland	1150	6.95	2.65	38.9
		Total Wt	2955	17.71		100.0

Source	weight (SSD)	π	Gravity	Contribution
Stoneco	1400	8.34	2.69	47.4
Stoneco	405	2.41	2.69	13.7
Highland	1150	6.95	2.65	38.9
Total Wt	2955	17.71		100.0
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SUPE	RIOR

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Sieve	6AA	26A	2NS	Cumulative % Passing	% Retained	Cumulative % Retained
2"	100.0	100.0	100.0	100.0	0.0	0.0
1.5"	100.0	100.0	100.0	100.0	0.0	0.0
1"	100.0	100.0	100.0	100.0	0.0	0.0
3/4"	81.4	100.0	100.0	91.2	8.8	8.8
1/2"	44.3	98.9	100.0	73.5	17.7	26.5
3/8"	19.2	70.9	100.0	57.7	15.7	42.3
#4	1.8	9.3	99.6	40.9	16.8	59.1
#8	1.0	3.4	88.8	35.5	5.4	64.5
#16	0.8	2.1	72.2	28.8	6.7	71.2
#30	0.6	1.8	50.8	20.3	8.5	79.7
#50	0.5	1.7	21.2	8.7	11.6	91.3
#100	0.4	1.5	3.1	1.6	7.1	98.4
LBW	0.3	1 4	0.5	0.5	11	99.5

Aggregate Supplier Gradations

*Maximum % Retained must be above the 3/8" sieve.

*Any two adjacent sieves must equal 10% except max.,

nom. max., #100 and #200 sieves.

*% Retained must be at least 4% for each sieve except max.,

nom. max., #100 and #200 sieves.

*% Retained must be at least 8% for the 1" sieve when

a 2" max. size (nom. Max. 1.5") aggregate is used.

Coarseness Factor:	66	Workability Factor:	35	
45 45, 44 45, 44 45, 44 45, 33 Operating Zone Boundary	52, 34	67 40 Froduction G 68, 38 G 60µS€	75, 39 75, 28	
25 + 40 45 ActionLimits Boundary =	50 5	5 Coarseness Factor (%)	75	80

Batch Plant Gradations

Work	ability Factor:	36	
Sieve	Cumulative	%	Cumulative
Sieve	% Passing	Retained	% Retained
2"	100.0	0.0	0.0
1.5"	100.0	0.0	0.0
1"	99.3	0.7	0.7
3/4"	89.2	10.1	10.8
1/2"	70.7	18.5	29.3
3/8"	60.7	10.0	39.3
#4	44.4	16.3	55.6
#8	35.9	8.5	64.1
#16	27.3	8.6	72.7
#30	19.1	8.2	80.9
#50	7.4	11.7	92.6
#100	1.9	5.6	98.1
LBW	0.7	1.2	99.3

Aggregate Optimization Chart

PLANT #: P-32

Sample Date:

#100

LBW

Production Gradation

Dates Test Represents:

2/14/22 DM Concrete Grade: 2/15/2022 2/21/2022

Contractor:	

95.4

98.2

Coarseness Factor:

MDOT No.:

6.4

2.8

Adjusted WF Intial Production Sample (IPS)

Agg. Class	Pit #	Source	Weight (SSD)	ft ³	Specific Gravity	% Contribution
6AA	71-47	Presque Isle	1455	8.90	2.62	50.1
26A	71-47	Presque Isle	300	1.83	2.62	10.3
2NS	95-013	Smelter Bay	1150	6.95	2.65	39.6
		Total Wt	2905	17.69		100.0

through

7.9

4.6

1.8

37.9

---- Verify this number is 100%

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30701 W. 10 Mile Rd.
Suite 500
Farmington Hills, MI 48336

Sieve	6AA	26A	2NS	Cumulative % Passing	% Retained	Cumulative % Retained	
2"	100.0	100.0	100.0	100.0	0.0	0.0	
1.5"	100.0	100.0	100.0	100.0	0.0	0.0	
1"	97.6	100.0	100.0	98.8	1.2	1.2	
3/4"	82.6	100.0	100.0	91.3	7.5	8.7	
1/2"	38.4	97.6	100.0	68.9	22.4	31.1	
3/8"	19.6	90.4	100.0	58.7	10.2	41.3	4
#4	4.1	27.2	98.1	43.7	15.0	56.3	1
#8	2.8	9.8	83.2	35.4	8.3	64.6	n
#16	2.6	5.4	67.0	28.4	7.0	71.6	1
#30	2.5	3.6	47.7	20.5	7.9	79.5	n
#50	2.4	3.2	23.9	11.0	9.5	89.0	1

2.8

2.4

Aggregate Supplier Gradations

*Maximum % Retained must be above the 3/8" sieve.

*Any two adjacent sieves must equal 10% except max.,

nom. max., #100 and #200 sieves.

*% Retained must be at least 4% for each sieve except max.,

nom. max., #100 and #200 sieves.

*% Retained must be at least 8% for the 1" sieve when

a 2" max. size (nom. Max. 1.5") aggregate is used.

Coarseness Fac	tor: 64	Workability Factor:	35	
45 45, 44 45, 44 45, 33 Operating Bounds	52, 34	6, 40 67, 40 68, 38 Production Grada 60, 38S 7, 82 68, 31	JMF Zone	
Bounds 25 40 45 ActionLimits Boundary =	50 5	⁵ Coarseness Factor (%)	75, 28 75	80

Work	ability Factor:	36	
Sieve	Cumulative % Passing	% Retained	Cumulative % Retained
2"	100.0	0.0	0.0
1.5"	100.0	0.0	0.0
1"	100.0	0.0	0.0
3/4"	95.0	5.0	5.0
1/2"	72.3	22.8	27.7
3/8"	60.4	11.8	39.6
#4	42.6	17.8	57.4
#8	36.0	6.6	64.0
#16	29.5	6.5	70.5
#30	20.3	9.2	79.7
#50	9.5	10.8	90.5
#100	3.4	6.1	96.6
LBW	1.3	2.1	98.7

PREPARED BY: SM, LLC Technical Service

2.3

Batch Plant Gradations

PLANT #: P-35

Sample Date:

2/14/22 DM Concrete Grade: 2/15/2022 2/21/2022

Contractor:		
•		

Dates Test F	Represents:	2/15/2022	through	2/21/2022		
Agg. Class	Pit#	Source	Weight (SSD)	ft ³	Specific Gravity	% Contribution
6AA	58-003	Stoneco	1450	8.64	2.69	49.1
26A	58-003	Stoneco	405	2.41	2.69	13.7
2NS	81-019	Pleasant Lake	1100	6.65	2.65	37.2
		Total Wt	2955	17.70		100.0

MDOT No.:

-- Verify this number is 100%

Coarseness Factor:

35.5

SUPER	RIOR

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	Total Wt	2900	17.70		100.0	< verify this n	umber is 100%
Sieve	6AA	26	A	2NS	Cumulative % Passing	% Retained	Cumulative % Retained
2"	100.0	100	0.0	100.0	100.0	0.0	0.0
1.5"	100.0	100	0.0	100.0	100.0	0.0	0.0
1"	100.0	100	0.0	100.0	100.0	0.0	0.0
3/4"	81.4	100	0.0	100.0	90.9	9.1	9.1
1/2"	44.3	98	.9	100.0	72.5	18.4	27.5
3/8"	19.2	70	.9	100.0	56.4	16.2	43.6
#4	1.8	9.	3	97.7	38.5	17.8	61.5
#8	1.0	3.	4	86.0	33.0	5.6	67.0
#16	0.8	2.	1	70.7	27.0	6.0	73.0
#30	0.6	1.	8	52.4	20.0	7.0	80.0
#50	0.5	1.	7	22.0	8.7	11.4	91.3
#100	0.4	1.	5	4.5	2.1	6.6	97.9
LBW	0.3	1.	4	1.7	1.0	1.1	99.0
Production Gra	adation O Batch Plant Grad	ations	regate Supplier Gra	adations	Adjusted WF	Intial Production	on Sample (IPS

*Maximum % Retained must be above the 3/8" sieve.

*Any two adjacent sieves must equal 10% except max.,

nom. max., #100 and #200 sieves.

*% Retained must be at least 4% for each sieve except max.,

nom. max., #100 and #200 sieves.

*% Retained must be at least 8% for the 1" sieve when

a 2" max. size (nom. Max. 1.5") aggregate is used.

Coarseness Factor:	65	Workability Factor:	33	
45 45, 44 45, 44 45, 33 Operating Zone Boundary	52, 41 56, 52, 34	68, 38 ■ Production Gr		
25 40 45 ActionLimits Boundary =	50 55	Coarseness Factor (%)	75, 28	80

Work	ability Factor:	36	
Sieve	Cumulative	%	Cumulative
Sieve	% Passing	Retained	% Retained
2"	100.0	0.0	0.0
1.5"	100.0	0.0	0.0
1"	99.3	0.7	0.7
3/4"	89.1	10.2	10.9
1/2"	70.5	18.6	29.5
3/8"	60.5	10.0	39.5
#4	44.1	16.4	55.9
#8	35.6	8.5	64.4
#16	27.7	7.9	72.3
#30	20.6	7.1	79.4
#50	8.7	11.8	91.3
#100	1.6	7.1	98.4
LBW	1.1	0.6	98.9

PLANT #: P-39 Contractor:

Sample Date: 2/14/22 DM Concrete Grade: Dates Test Represents: 2/15/2022 2/21/2022 through

Agg. Class	Pit #	Source	Weight (SSD)	ft ³	Specific Gravity	% Contribution
6AA	71-47	Presque Isle	1605	9.82	2.62	55.2
26A	71-47	Presque Isle	200	1.22	2.62	6.9
2NS	63-92	Grange Hall	1100	6.65	2.65	37.9
		Total Wt	2905	17 60		100.0

MDOT No.:

SUPERIOR

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63

2.5

*Maximum % Retained must be above the 3/8" sieve.

*Any two adjacent sieves must equal 10% except max.,

nom. max., #100 and #200 sieves.

*% Retained must be at least 4% for each sieve except max.,

nom. max., #100 and #200 sieves.

*% Retained must be at least 8% for the 1" sieve when

a 2" max. size (nom. Max. 1.5") aggregate is used.

98.8

	i otai wt	2905	17.69	100.0	< Verify this n	umber is 100%
Sieve	6AA	26A	2NS	Cumulative % Passing	% Retained	Cumulative % Retained
2"	100.0	100.0	100.0	100.0	0.0	0.0
1.5"	100.0	100.0	100.0	100.0	0.0	0.0
1"	98.8	100.0	100.0	99.3	0.7	0.7
3/4"	82.4	100.0	100.0	90.3	9.1	9.7
1/2"	39.0	96.9	100.0	66.1	24.2	33.9
3/8"	19.2	85.3	100.0	54.3	11.7	45.7
#4	3.0	15.4	98.0	39.8	14.5	60.2
#8	1.8	4.0	84.0	33.1	6.7	66.9
#16	1.6	1.9	68.0	26.8	6.3	73.2
#30	1.5	1.5	49.0	19.5	7.3	80.5
#50	1.4	1.4	21.4	9.0	10.5	91.0
#100	1.4	1.3	3.6	2.2	6.7	97.8
LBW	1.3	1.1	0.7	1.1	1.2	98.9

 Batch Plant Gradations Aggregate Supplier Gradations **Production Gradation** Adjusted WF Intial Production Sample (IPS) **Coarseness Factor:** 33 35.6 68 **Workability Factor:** 45 JMF Zone 45, 44 52, 41

36 **Workability Factor:** % Cumulative Cumulative Sieve % Passing Retained % Retained 2" 100.0 0.0 0.0 1.5" 100.0 0.0 0.0 1" 100.0 0.0 0.0 3/4' 89.7 10.3 10.3 1/2" 19.4 29.7 70.3 3/8' 11.2 59.1 40.9 #4 42.8 16.3 57.2 #8 35.5 7.3 64.5 #16 29.0 6.5 71.0 78.8 #30 21.2 7.7 #50 9.8 90.2 11.5 3.7 #100 6.1 96.3

Coarseness Factor:

LBW

Workability Factor (%) ■ 60, 36 IPS Production Gradation 52, 34 Operating Zone Boundary 75, 28 25 Coarseness Factor (%)⁷⁰ 45 50 55 75 80 ActionLimits Boundary = - - -

PLANT #: P-02 Sample Date: 2/14/22

DM Concrete Grade:

MDOT No.:

Adjusted WF Intial Production Sample (IPS)

Coarseness Factor:

35.1

Contractor:

Dates Test Represents:		2/15/2022	through	2/21/2022		
Agg. Cla	ass Pit#	Source	Weight (SSD)	ft ³	Specific Gravity	% Contribution
6AA	71-47	Presque Isle	1555	9.51	2.62	53.5
26A	71-47	Presque Isle	250	1.53	2.62	8.6
2NS	63-115	Ray Rd	1100	6.65	2.65	37.9
		Total Wt	2905	17.69		100.0

%
ntribution
53.5
8.6
37.9



<---- Verify this number is 100%

Superior Materials, LLC 30701 W. 10 Mile Rd. Suite 500 Farmington Hills, MI 48336

						•	
Sieve	6AA	26	A	2NS	Cumulative % Passing	% Retained	Cumulative % Retained
2"	100.0	100	0.0	100.0	100.0	0.0	0.0
1.5"	100.0	100	0.0	100.0	100.0	0.0	0.0
1"	99.1	100	0.0	100.0	99.5	0.5	0.5
3/4"	85.4	100	0.0	100.0	92.2	7.3	7.8
1/2"	41.5	97.	.6	100.0	68.5	23.7	31.5
3/8"	22.7	90.	.4	100.0	57.8	10.7	42.2
#4	4.1	27.	.2	96.0	40.9	16.9	59.1
#8	2.2	9.8	8	80.8	32.6	8.3	67.4
#16	1.9	5.4	4	66.4	26.6	6.0	73.4
#30	1.8	3.0	6	48.9	19.8	6.8	80.2
#50	1.7	3.:	2	26.3	11.1	8.6	88.9
#100	1.6	2.8	8	5.4	3.1	8.0	96.9
LBW	1.2	2.4	4	1.0	1.2	1.9	98.8

Aggregate SupplierGradations

*Maximum % Retained must be above the 3/8" sieve.

*Any two adjacent sieves must equal 10% except max.,

nom. max., #100 and #200 sieves.

*% Retained must be at least 4% for each sieve except max.,

nom. max., #100 and #200 sieves.

*% Retained must be at least 8% for the 1" sieve when

a 2" max. size (nom. Max. 1.5") aggregate is used.

Coarseness Factor:	63	Workability Factor:	33	
45 45, 44 40 45, 44 45, 33 45, 33 Operating Zone Boundary	52, 41	58, 39 68, 39 68, 38 68, 38 FP6duction Gradation	75, 28	
40 45 ActionLimits Boundary =	50 5	Coarseness Factor (%) ⁷⁰	75	80

Batch Plant Gradations

Production Gradation

Work	ability Factor:	35	
Sieve Cumulative % Passing		% Retained	Cumulative % Retained
2"	100.0	0.0	0.0
1.5"	100.0	0.0	0.0
1"	100.0	0.0	0.0
3/4"	95.1	4.9	4.9
1/2"	74.6	20.5	25.4
3/8"	59.3	15.3	40.7
#4	42.1	17.2	57.9
#8	35.1	7.1	64.9
#16	29.2	5.9	70.8
#30	21.9	7.3	78.1
#50	9.6	12.4	90.4
#100	2.4	7.2	97.6
LBW	0.9	1.5	99.1