Aggregate Optimization Chart

Agg. Class

6AA

26A

2NS

Production Gradation Report

PLANT #: P-101 Contractor:

1/3/22 Sample Date: DM Concrete Grade: Dates Test Represents 1/10/2022 1/4/2022 through

presents.	17-7/2022	tillough	1/10/2022		
Pit#	Source	Weight (SSD)	ft ³	Specific	%
FIL#	Source	weight (SSD)	IL	Gravity	Contribution
71-47	Presque Isle	1560	9.54	2.62	53.6
71-47	Presque Isle	200	1.22	2.62	6.9
75-051	Mid-Michigan	1150	6.93	2.66	39.5

MDOT No.:



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

	i otai vvt	2910	17.09		100.0	< Verify this n	umber is 100%
Sieve	6AA	26	6A	2NS	Cumulative % Passing	% Retained	Cumulative % Retained
2"	100.0	10	0.0	100.0	100.0	0.0	0.0
1.5"	100.0	10	0.0	100.0	100.0	0.0	0.0
1"	98.7	10	0.0	100.0	99.3	0.7	0.7
3/4"	84.2	10	0.0	100.0	91.5	7.8	8.5
1/2"	39.1	96	6.5	100.0	67.1	24.4	32.9
3/8"	23.1	84	1.8	100.0	57.7	9.4	42.3
#4	2.8	14	1.4	98.5	41.4	16.3	58.6
#8	1.8	3	.5	83.3	34.1	7.3	65.9
#16	1.6	1	.7	68.3	28.0	6.2	72.0
#30	1.4	1	.4	53.3	21.9	6.1	78.1
#50	1.3	1	.4	29.2	12.3	9.6	87.7
#100	1.3	1	.3	7.3	3.7	8.7	96.3
LBW	1.1	1	.2	0.6	0.9	2.8	99.1

*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.

Production Gradation	Batch Plant Gra	dations Aggregate Supplier Gradation	IS	Adjusted WF	Initial Product	ion Sample (IPS	3)
Coarseness Factor:	64	Workability Factor:	34	36.6	Coars	eness Factor:	
45					Work	ability Factor:	
45, 44			JMF Zone	7 	Sieve	Cumulative	
1 1 1			JIVII ZOIIC	J	Sieve	% Passing	F
40 1	52, 41			- 11	2"	100.0	
3 40 1		57 , 39 68, 38	75, 39	- 11	1.5"	100.0	
		00, 30		- 11	1"	100.0	
35]		■ 60, 36S	on	- 11	3/4"	95.0	
2 35 -		i IPS		- 11	1/2"	70.5	
	52, 34	-! :		- 11	3/8"	60.0	
Available 30 Operating Zone Boundary				- 11	#4	44.4	
遠 30 		67 ₆ 3 ,1 ₃₁		- 11	#8	35.5	
Operating Zone				- 11	#16	28.5	
Boundary			75, 28	- 11	#30	21.5	
≥ 25 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1					#50	10.2	
40 45	50	55 60 65 70	75	80	#100	3.1	
	,	Coarseness Factor (%)			LBW	1.3	
ActionLimits Boundary =							

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

Batch Plant Gradations

PLANT #: P-102

Sample Date: 1/3/22 DM Concrete Grade: **Dates Test Represents:** 1/4/2022 1/10/2022 through

Contractor:

				.,		
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

MDOT No.:

Coarseness Factor:

	1								
SM	U	Į.	2	₹	3	I	9	R	

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*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.

61

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

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

	Total Wt	2955	17.71		100.0	< Verify this n	umber is 100%
Sieve	6AA	26	SA.	2NS	Cumulative % Passing	% Retained	Cumulative % Retained
2"	100.0	10	0.0	100.0	100.0	0.0	0.0
1.5"	100.0	10	0.0	100.0	100.0	0.0	0.0
1"	100.0	10	0.0	100.0	100.0	0.0	0.0
3/4"	81.4	10	0.0	100.0	91.2	8.8	8.8
1/2"	44.3	98	3.9	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	87.6	35.0	5.9	65.0
#16	0.8	2	.1	69.9	27.9	7.2	72.1
#30	0.6	1	.8	48.1	19.3	8.6	80.7
#50	0.5	1	.7	18.4	7.6	11.6	92.4
#100	0.4	1	.5	2.6	1.4	6.2	98.6
LBW	0.3	1	.4	0.3	0.5	1.0	99.5

Aggregate Supplier Gradations

Production Gradation Adjusted WF Intial Production Sample (IPS) **Coarseness Factor:** 65 **Workability Factor:** 35 37.5 45 JMF Zone 45, 44 Workability Factor (%) Production Gradation ■ 60µβ§ 45, 33 Operating Zone

Coarseness Factor (%)⁷⁰

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"	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

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50

55

Boundary

45

ActionLimits Boundary = - - - -

25

Aggregate Optimization Chart

PLANT #: P-32

Sample Date:

Dates Test Represents:

Production Gradation

1/3/22 DM Concrete Grade: 1/4/2022 1/10/2022 through

Contractor:

MDOT No.:

Adjusted WF Intial Production Sample (IPS)

Coarseness Factor:

37.5

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

- Verify this number is 100%

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	TOtal Wit	2903 17.09		100.0	< verily trils ii	uniber 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"	99.5	100.0	100.0	99.7	0.3	0.3
3/4"	84.1	100.0	100.0	92.0	7.7	8.0
1/2"	40.1	100.0	100.0	70.0	22.0	30.0
3/8"	20.4	92.7	100.0	59.4	10.6	40.6
#4	4.7	26.4	95.7	43.0	16.4	57.0
#8	3.1	6.7	82.8	35.0	7.9	65.0
#16	2.7	2.6	67.2	28.2	6.8	71.8
#30	2.6	2.0	47.5	20.3	7.9	79.7
#50	2.5	1.8	23.1	10.6	9.7	89.4
#100	2.3	1.8	7.0	4.1	6.5	95.9
LBW	1.8	1.6	1.3	1.6	2.5	98.4

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.

62

*% 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:	35	
45 45, 44 45, 44 45, 33 Operating Zone Boundary	52, 34	67, 40 68, 38 Production Gradation 60, 38S	75, 39	
40 45 ActionLimits Boundary =	50 55	Coarseness Factor (%)	75	80

Batch Plant Gradations

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

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PLANT #: P-35

Sample Date:

Dates Test Represents:

1/3/22 DM Concrete Grade: 1/4/2022 1/10/2022 through

Contractor:

MDOT No.:

Coarseness Factor:

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	81-093	Burmeister	1100	6.65	2.65	37.2
		Total Wt	2955	17.70		100.0

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ı	
ı	*Maximum
ı	*Any two a

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

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.

	Total Wt	2955	17.70		100.0	< Verify this n	umber is 100%
Sieve	6AA	26	6 A	2NS	Cumulative % Passing	% Retained	Cumulative % Retained
2"	100.0	10	0.0	100.0	100.0	0.0	0.0
1.5"	100.0	10	0.0	100.0	100.0	0.0	0.0
1"	100.0	10	0.0	100.0	100.0	0.0	0.0
3/4"	81.4	10	0.0	100.0	90.9	9.1	9.1
1/2"	44.3	98	3.9	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	dations	regate Supplier Gr	adations	Adjusted WF	Intial Production	on Sample (IPS)

Coarseness Factor:	65	Workability Factor:	33	35.5
45 45, 44 45, 33 Operating Zone Boundary	52, 41 56, 52, 34 56,	10 87, 40 68, 38	75, 39	
25	50 55	Coarseness Factor (%) ⁷⁰	75	80

Work	ability Factor:	36	
Sieve	Sieve Cumulative % Passing		Cumulative % 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

PREPARED BY: SM, LLC Technical Service

PLANT #: P-39 Contractor: Sample Date:

1/3/22 DM Concrete Grade: Dates Test Represents: 1/4/2022 1/10/2022 through

MDOT No.:

Adjusted WF Intial Production Sample (IPS)

Coarseness Factor:

35.1

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	17.69		100.0

---- Verify this number is 100%

Superior Materials, LLC
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Suite 500
Farmington Hills, MI 48336

	i Otai Wi	2000 17.00		100.0	< verily tills if	umber 13 10070
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"	98.7	100.0	100.0	99.3	0.7	0.7
3/4"	84.2	100.0	100.0	91.3	8.0	8.7
1/2"	39.1	96.5	100.0	66.1	25.2	33.9
3/8"	23.1	84.8	100.0	56.5	9.6	43.5
#4	2.8	14.4	97.0	39.3	17.2	60.7
#8	1.8	3.5	82.8	32.6	6.7	67.4
#16	1.6	1.7	68.3	26.9	5.7	73.1
#30	1.4	1.4	50.3	19.9	6.9	80.1
#50	1.3	1.4	26.9	11.0	8.9	89.0
#100	1.3	1.3	4.2	2.4	8.6	97.6
LBW	1.1	1.2	0.6	0.9	1.5	99.1
Production Gradation	Batch Plant Grada	tions	Gradations	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.

Coarsen	ess Factor:	65	Workability Factor:	33	
45	45, 44			JMF Zone	
Workability Factor (%)		52, 41	58, 40 68, 38 68, 38 Froduction Gradation	75, 39 on	
Morkability	Operating Zone Boundary	50 55	60 Coarseness Factor (%)	75, 28 75	80
ActionLimits I	Boundary =		Coarseness Factor (%)		

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"	100.0	0.0	0.0
3/4"	89.7	10.3	10.3
1/2"	70.3	19.4	29.7
3/8"	59.1	11.2	40.9
#4	42.8	16.3	57.2
#8	35.5	7.3	64.5
#16	29.0	6.5	71.0
#30	21.2	7.7	78.8
#50	9.8	11.5	90.2
#100	3.7	6.1	96.3
LBW	1.2	2.5	98.8

PREPARED BY: SM, LLC Technical Service

Production Gradation

PLANT #: P-02 Contractor:

Sample Date: 1/3/22 DM Concrete Grade: Dates Test Represents: 1/4/2022 1/10/2022 through

Agg. Class	Pit #	Source	Weight (SSD)	ft ³	Specific Gravity	% Contribution
6AA	71-47	Presque Isle	1805	11.04	2.62	62.1
26A	71-47	Presque Isle	0	0.00	2.62	0.0
2NS	63-115	Ray Rd	1100	6.65	2.65	37.9
		Total Wt	2905	17.69		100.0

MDOT No.:

---- Verify this number is 100%

SUPE	

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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"	86.2	100.0	100.0	91.4	8.6	8.6
1/2"	52.3	100.0	100.0	70.4	21.1	29.6
3/8"	34.3	92.7	100.0	59.2	11.2	40.8
#4	4.8	26.4	96.7	39.6	19.6	60.4
#8	2.1	6.7	80.7	31.9	7.7	68.1
#16	1.7	2.6	65.4	25.8	6.0	74.2
#30	1.6	2.0	48.3	19.3	6.5	80.7
#50	1.5	1.8	25.8	10.7	8.6	89.3
#100	1.4	1.8	5.6	3.0	7.7	97.0
LBW	1.0	1.6	1.0	1.0	2.0	99.0
Production Gradation	Batch Plant Gradations	Aggregate SupplierGra	dations	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.

Production Gradation	O Batch Plant Gra	dations Aggregate SupplierGradatio	ns	Adjusted WF	Intial Product	ion Sample (IPS
Coarseness Factor:	60	Workability Factor:	32	34.4	Coars	seness Factor:
45					Worl	kability Factor:
45 45, 44			JMF Zone	7] I	Sieve	Cumulative
1 10,44			31111 20110	-	Sieve	% Passing
-	52, 41			- 11	2"	100.0
[3 ⁴⁰]		58 , 39 68 , 39 68, 38	75, 39	- 11	1.5"	100.0
🖔		68, 38	Ĭ	- 11	1"	100.0
Factor (%)		■ 60, 36		- 11	3/4"	95.1
5 35		IPS I		- 11	1/2"	74.6
\\ \\ \	52, 34	Production Gradation		- 11	3/8"	59.3
45, 33				- 11	#4	42.1
 30		58, 31 6 8 8,331		- 11	#8	35.1
Approximation (A5, 33) Operating Zone Boundary	\Box			- 11	#16	29.2
Boundary	·		75, 28	- 11	#30	21.9
			1 4, 24		#50	9.6
25 +				 	#100	2.4
40 45	50 55	Coarseness Factor (%)	75	80	LBW	0.9
ActionLimits Boundary =						

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

63

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