Aggregate Optimization Chart

Production Gradation Report

PLANT #: P-101 Contractor:

2/7/22 Sample Date: DM Concrete Grade: Dates Test Represents: 2/8/2022 2/14/2022 MDOT No.: 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

- Verify this number is 100%

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

	i otai wt	2910 17.09		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	99.4	0.6	0.6
3/4"	85.5	100.0	100.0	92.5	6.9	7.5
1/2"	42.9	97.5	100.0	70.3	22.2	29.7
3/8"	22.3	86.8	100.0	58.8	11.6	41.2
#4	3.2	16.7	98.5	42.1	16.7	57.9
#8	1.7	4.4	83.3	34.2	7.9	65.8
#16	1.5	2.0	68.3	27.9	6.2	72.1
#30	1.4	1.6	53.3	21.9	6.0	78.1
#50	1.3	1.4	29.2	12.3	9.6	87.7
#100	1.2	1.3	7.3	3.6	8.7	96.4
LBW	1.1	1.2	0.6	0.9	2.7	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	5	Adjusted WF	Initial Product	ion Sample (IPS	3)
Coarseness Factor:	63	Workability Factor:	34	36.7	Coars	seness Factor:	
45					Work	ability Factor:	
45, 44			JMF Zone]	Sieve	Cumulative % Passing	R
40	52, 41	T		- 11	2"	100.0	
% 40 1		57, 39 68, 38	75, 39	- 11	1.5"	100.0	
		00, 30		- 11	1"	100.0	
Factor 35		■ 60, 38 Production Gradation		- 11	3/4"	95.0	
교 35 -		i ips		- 11	1/2"	70.5	
1 / 🕶	52, 34	-!		- 11	3/8"	60.0	
Available 30 Operating Zone Boundary				- 11	#4	44.4	
這 30]		57 , 31 67 ₆ 3 ,1 ₃₁		- 11	#8	35.5	
Operating Zone				- 11	#16	28.5	
Boundary			75, 28	- 11	#30	21.5	
≥ 25					#50	10.2	
40 45	50 5	55 60 65 70	75	80	#100	3.1	
		Coarseness Factor (%)	. 5	55	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

PLANT #: P-102

Sample Date:

Production Gradation

2/7/22 DM Concrete Grade: Dates Test Represents: 2/8/2022 2/14/2022

Contractor:

Adjusted WF Intial Production Sample (IPS)

Coarseness Factor:

37.7

zates restrictions		_, _,	o a.g	_,,		
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 W/A	2055	17 71		100.0

through

MDOT No.:

Verify this number is 100%

SUPE	RIOR

Superior Materials, LLC 30701 W. 10 Mile Rd. Suite 500

Farmington Hills, MI 48336

	i otai vvt	2955 17.71		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"	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	88.1	35.2	5.7	64.8
#16	0.8	2.1	70.9	28.3	7.0	71.7
#30	0.6	1.8	49.5	19.8	8.5	80.2
#50	0.5	1.7	20.4	8.4	11.4	91.6
#100	0.4	1.5	3.0	1.6	6.8	98.4
LBW	0.3	1.4	0.6	0.6	1.0	99.4

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 Factor:	65	Workability Factor:	35	
45 45, 44 45, 44 45, 33 Operating Zone Boundary	52, 34	40 67 40 68, 38 Production G 60,186 67,32, 31		
Boundary 25 40 45 ActionLimits Boundary =	50 55	Coarseness Factor (%)	75, 28 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"	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

PLANT #: P-32 Contractor: 2/7/22 DM Sample Date: Concrete Grade:

Dates Test Represents: 2/8/2022 2/14/2022 through

MDOT No.		

Batto Toot Hopfooditto.		_, 0, _ 0	unougn	2/11/2022			
	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

MDOT No.:

---- Verify this number is 100%

Adjusted WF Intial Production Sample (IPS)

Coarseness Factor:

38.5

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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"	99.0	100.0	100.0	99.5	0.5	0.5
3/4"	81.2	100.0	100.0	90.6	8.9	9.4
1/2"	34.4	97.0	100.0	66.8	23.8	33.2
3/8"	17.9	88.9	100.0	57.7	9.1	42.3
#4	5.2	28.9	96.2	43.7	14.1	56.3
#8	3.8	8.7	83.8	36.0	7.7	64.0
#16	3.1	4.6	68.8	29.3	6.7	70.7
#30	2.6	3.2	48.5	20.8	8.4	79.2
#50	2.2	2.9	23.4	10.7	10.2	89.3
#100	1.9	2.7	6.8	3.9	6.7	96.1
LBW	1.6	2.6	1.4	1.6	2.3	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 Fact	or: 66	Workability Factor:	36	
45 45, 44 40 40, 45, 33 Operating Bounda	52, 34 S Zone	60, 38S Placetition 67, 40	JMF Zone 75, 39 75, 28	
25 40 45 ActionLimits Boundary =		⁵ Coarseness Factor (%) ⁷⁰	75	80

Batch Plant Gradations

Production Gradation

Work	Workability Factor:		
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

PLANT #: P-35

Sample Date:

Dates Test Represents:

Production Gradation

2/7/22 Concrete Grade: 2/8/2022 2/14/2022

Contractor:

MDOT No.:

Adjusted WF Intial Production Sample (IPS)

Coarseness Factor:

DM

35.5

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

through

	SUPERIOR
ify this number is 100%	MATERIALS

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

	i otai vvt	2955 17.70		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"	100.0	100.0	100.0	100.0	0.0	0.0
3/4"	81.4	100.0	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

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:	65	Workability Factor:	33	
45 45, 44			JMF Zone	
(%) J	52, 41	68, 38	75, 39	
5 35 1 45, 33	52, 34	■ 60 ₁₁ βੇ€ ■ Production Gradati	on	
Morkability Factor (%) 35 45, 33 Operating Zone Boundary	50	6, 31 67, 89 , 31	75, 28	
25 40 45	50 5	55 Coarseness Factor (%)	75	80
ActionLimits Boundary =		Odai seriess Factor (78)		

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"	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

61

PLANT #: P-39 Contractor: _______
Sample Date: 2/7/22 Concrete Grade: DM

Dates Test F	Represents:	2/8/2022	through	2/14/2022		
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

2905

Total Wt

Batch Plant Gradations

Production Gradation

MDOT No.:

<---- Verify this number is 100%

Adjusted WF Intial Production Sample (IPS)

Coarseness Factor:

100.0

35.5

SUPERIOR

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	99.3	0.7	0.7
3/4"	85.5	100.0	100.0	92.0	7.3	8.0
1/2"	42.9	97.5	100.0	68.3	23.7	31.7
3/8"	22.3	86.8	100.0	56.2	12.1	43.8
#4	3.2	16.7	97.7	39.9	16.2	60.1
#8	1.7	4.4	83.8	33.0	6.9	67.0
#16	1.5	2.0	68.2	26.8	6.2	73.2
#30	1.4	1.6	49.8	19.7	7.1	80.3
#50	1.3	1.4	22.0	9.1	10.6	90.9
#100	1.2	1.3	3.7	2.2	7.0	97.8
LBW	1.1	1.2	0.6	0.9	1.2	99.1

Aggregate Supplier Gradations

17.69

*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	Workabi	lity Factor:	33	
45 45, 44 45, 44 45, 44 45, 44 45, 44 45, 44 45, 44 45, 44 45		41	= 60, 36 IPS	68,38 Production Grada	JMF Zone 75, 39	
No Per	rating Zone Boundary		,		75, 28	
40 ActionLimits Bound	45 50	55	Coarseness Fa	ctor (%) ⁷⁰	75	80

Work	ability Factor:	36	
Sieve Cumulati		% 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"	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

63

PREPARED BY: SM, LLC Technical Service Approved By

PLANT #: P-O2

Sample Date:

Production Gradation

Contractor:

MDOT No.:

Adjusted WF Intial Production Sample (IPS)

Coarseness Factor:

Dates Test Represents:		2/8/2022	through	2/14/2022		
Agg. Class	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

% ibution 3.5 .6

DM

34.9



---- 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"	98.1	100	0.0	100.0	99.0	1.0	1.0
3/4"	75.9	100	0.0	100.0	87.1	11.9	12.9
1/2"	35.9	97	.0	100.0	65.4	21.7	34.6
3/8"	17.9	88	.9	100.0	55.1	10.3	44.9
#4	4.2	28	.9	96.4	41.2	13.9	58.8
#8	2.2	8.	7	80.5	32.4	8.8	67.6
#16	1.9	4.	6	64.8	25.9	6.5	74.1
#30	1.8	3.	2	47.1	19.1	6.9	80.9
#50	1.6	2.	9	23.5	10.0	9.1	90.0
#100	1.5	2.	7	4.5	2.7	7.3	97.3
LBW	1.4	2.	6	0.8	1.3	1.5	98.7

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:	66	Workability Factor:	32	
45 45, 44	52, 41	58, 39 68, 39 68, 38	JMF Zone 75, 39	
No. 45, 33 Operating Zone Boundary	52, 34	58, 31 689,391	75, 28	
40 45 ActionLimits Boundary =	50	Coarseness Factor (%)	75	80

Batch Plant Gradations

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

PREPARED BY: SM, LLC Technical Service Approved By