

Aggregate Optimization Chart

PLANT #: **P-101**

Sample Date: 7/8/19

Concrete Grade: **P1M**

Contractor: _____

Dates Test Represents: 7/9/2019 through 7/15/2019

MDOT No.: _____

Agg. Class	Pit #	Source	Weight (SSD)	ft ³	Specific Gravity	% Contribution
CA	71-47	Presque Isle	1120	6.85	2.62	36.5
IA	71-47	Presque Isle	750	4.59	2.62	24.4
2NS	75-051	Mid-Michigan	1200	7.23	2.66	39.1
Total Wt			3070	18.67		100.0

<----- Verify this number is 100%



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 Suite 500
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Sieve	CA	IA	2NS	Cumulative % Passing	% Retained	Cumulative % Retained
2"	100.0	100.0	100.0	100.0	0.0	0.0
1.5"	98.1	100.0	100.0	99.3	0.7	0.7
1"	39.8	100.0	100.0	78.0	21.3	22.0
3/4"	10.7	99.4	100.0	67.3	10.8	32.7
1/2"	3.8	83.9	100.0	61.0	6.3	39.0
3/8"	2.4	63.3	100.0	55.4	5.5	44.6
#4	1.6	18.8	98.5	43.7	11.7	56.3
#8	1.4	5.5	82.8	34.2	9.5	65.8
#16	1.3	2.6	67.7	27.6	6.6	72.4
#30	1.2	2.3	51.0	20.9	6.6	79.1
#50	1.1	2.1	23.4	10.1	10.9	89.9
#100	1.1	2.0	6.5	3.4	6.6	96.6
LBW	0.9	1.8	0.8	1.1	2.3	98.9

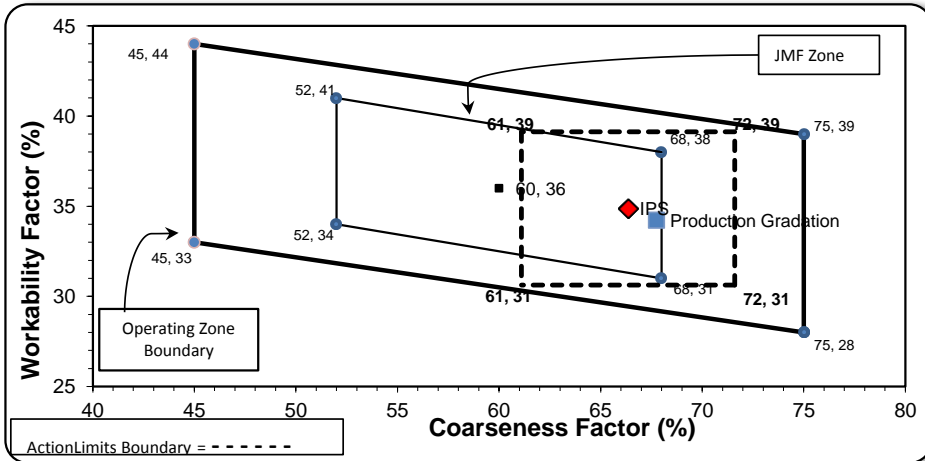
*Maximum % Retained must be above the 3/8" sieve.
 *Any two adjacent sieves must equal 10% except max., nom. max., #100 and #200 sieves.
 *% Retained must be at least 4% for each sieve except max., nom. max., #100 and #200 sieves.
 *% Retained must be at least 8% for the 1" sieve when a 2" max. size (nom. Max. 1.5") aggregate is used.

Production Gradation Batch Plant Gradations Aggregate Supplier Gradations

Coarseness Factor:	68	Workability Factor:	34
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Initial Production Sample (IPS)

Coarseness Factor:	66		
Workability Factor:	35		
Sieve	Cumulative % Passing	% Retained	Cumulative % Retained
2"	100.0	0.0	0.0
1.5"	99.6	0.4	0.4
1"	84.3	15.3	15.7
3/4"	74.8	9.6	25.2
1/2"	64.3	10.4	35.7
3/8"	56.8	7.5	43.2
#4	43.0	13.8	57.0
#8	34.9	8.1	65.1
#16	26.4	8.5	73.6
#30	19.9	6.5	80.1
#50	10.4	9.5	89.6
#100	3.4	7.0	96.6
LBW	1.2	2.2	98.8



PREPARED BY:
 SM, LLC Technical Service

Approved By:

Aggregate Optimization Chart

PLANT #: **P-102**

Sample Date: 7/8/19

Concrete Grade: **P1M**

Contractor: _____

Dates Test Represents: 7/9/2019 through 7/15/2019

MDOT No.: _____

Agg. Class	Pit #	Source	Weight (SSD)	ft ³	Specific Gravity	% Contribution
CA	58-003	Stoneco	1370	8.16	2.69	43.9
IA	58-003	Stoneco	550	3.28	2.69	17.6
2NS	38-046	Chelsea	1200	7.28	2.64	38.5
Total Wt			3120	18.72		100.0

<----- Verify this number is 100%

Sieve	CA	IA	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"	67.2	100.0	100.0	85.6	14.4	14.4
3/4"	48.6	100.0	100.0	77.4	8.2	22.6
1/2"	18.3	90.6	100.0	62.5	15.0	37.5
3/8"	13.8	76.1	100.0	57.9	4.5	42.1
#4	3.7	24.4	100.0	44.4	13.5	55.6
#8	2.2	6.5	87.6	35.8	8.6	64.2
#16	1.8	2.7	65.2	26.3	9.5	73.7
#30	1.7	1.9	42.8	17.5	8.8	82.5
#50	1.6	1.6	20.8	9.0	8.6	91.0
#100	1.6	1.5	4.2	2.6	6.4	97.4
LBW	1.5	1.4	1.0	1.3	1.3	98.7

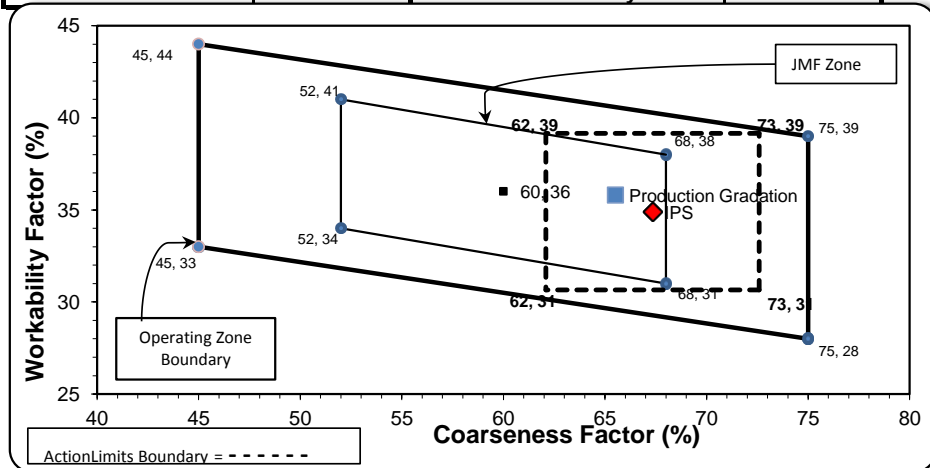


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*Maximum % Retained must be above the 3/8" sieve.
 *Any two adjacent sieves must equal 10% except max., nom. max., #100 and #200 sieves.
 *% Retained must be at least 4% for each sieve except max., nom. max., #100 and #200 sieves.
 *% Retained must be at least 8% for the 1" sieve when a 2" max. size (nom. Max. 1.5") aggregate is used.

Production Gradation Batch Plant Gradations Aggregate Supplier Gradations

Coarseness Factor:	66	Workability Factor:	36
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Initial Production Sample (IPS)

Coarseness Factor:	67		
Workability Factor:	35		
Sieve	Cumulative % Passing	% Retained	Cumulative % Retained
2"	100.0	0.0	0.0
1.5"	100.0	0.0	0.0
1"	85.5	14.5	14.5
3/4"	73.4	12.1	26.6
1/2"	61.0	12.4	39.0
3/8"	56.2	4.8	43.8
#4	43.1	13.1	56.9
#8	34.9	8.2	65.1
#16	29.4	5.5	70.6
#30	21.6	7.8	78.4
#50	8.1	13.4	91.9
#100	2.2	5.9	97.8
LBW	1.4	0.8	98.6

PREPARED BY:
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Aggregate Optimization Chart

PLANT #: **P-32**

Sample Date: 7/8/19

Concrete Grade: **P1M**

Contractor: _____

Dates Test Represents: 7/9/2019 through 7/15/2019

MDOT No.: _____

Agg. Class	Pit #	Source	Weight (SSD)	ft ³	Specific Gravity	% Contribution
CA	71-47	Presque Isle	900	5.50	2.62	29.3
IA	71-47	Presque Isle	1000	6.12	2.62	32.6
2NS	47-16	Buno Rd	1170	7.08	2.65	38.1
Total Wt			3070	18.70		100.0

<----- Verify this number is 100%

Sieve	CA	IA	2NS	Cumulative % Passing	% Retained	Cumulative % Retained
2"	100.0	100.0	100.0	100.0	0.0	0.0
1.5"	95.4	100.0	100.0	98.7	1.3	1.3
1"	40.8	100.0	100.0	82.6	16.0	17.4
3/4"	17.4	97.2	100.0	74.9	7.8	25.1
1/2"	8.8	72.0	100.0	64.1	10.7	35.9
3/8"	6.8	47.0	100.0	55.4	8.7	44.6
#4	3.6	11.5	96.3	41.5	13.9	58.5
#8	2.6	4.2	85.7	34.8	6.7	65.2
#16	2.4	2.6	72.3	29.1	5.7	70.9
#30	2.2	2.3	53.2	21.7	7.4	78.3
#50	2.2	2.2	17.7	8.1	13.6	91.9
#100	2.0	2.0	1.9	2.0	6.1	98.0
LBW	1.6	1.4	0.3	1.0	0.9	99.0

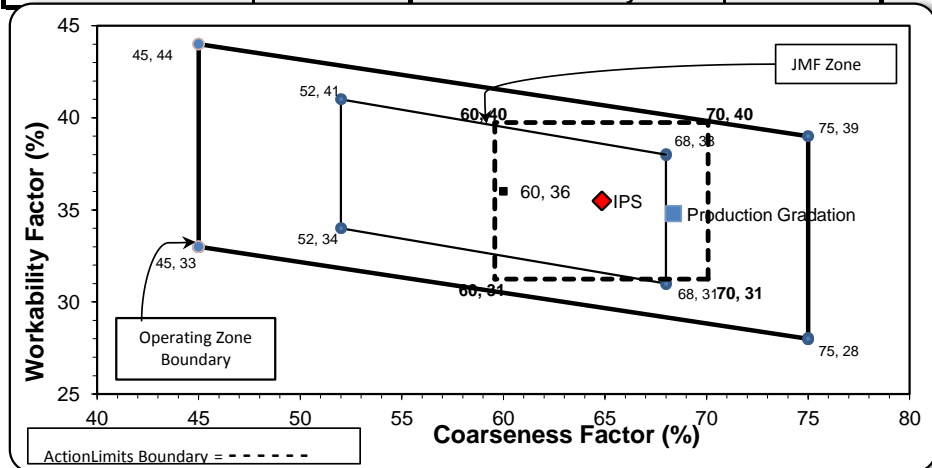


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*Maximum % Retained must be above the 3/8" sieve.
 *Any two adjacent sieves must equal 10% except max., nom. max., #100 and #200 sieves.
 *% Retained must be at least 4% for each sieve except max., nom. max., #100 and #200 sieves.
 *% Retained must be at least 8% for the 1" sieve when a 2" max. size (nom. Max. 1.5") aggregate is used.

Production Gradation Batch Plant Gradations Aggregate Supplier Gradations

Coarseness Factor: 68 **Workability Factor: 35**



Initial Production Sample (IPS)

Coarseness Factor: 65		Workability Factor: 35	
Sieve	Cumulative % Passing	% Retained	Cumulative % Retained
2"	100.0	0.0	0.0
1.5"	99.4	0.6	0.6
1"	84.0	15.3	16.0
3/4"	73.5	10.5	26.5
1/2"	65.2	8.2	34.8
3/8"	58.2	7.1	41.8
#4	44.1	14.1	55.9
#8	35.5	8.6	64.5
#16	29.1	6.4	70.9
#30	21.9	7.3	78.1
#50	9.6	12.2	90.4
#100	2.6	7.1	97.4
LBW	1.0	1.6	99.0

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Aggregate Optimization Chart

PLANT #: **P-35**

Sample Date: 7/8/19

Concrete Grade: **P1M**

Contractor: _____

Dates Test Represents: 7/9/2019 through 7/15/2019

MDOT No.: _____

Agg. Class	Pit #	Source	Weight (SSD)	ft ³	Specific Gravity	% Contribution
CA	58-003	Stoneco	1430	8.52	2.69	45.8
IA	58-003	Stoneco	440	2.62	2.69	14.1
2NS	81-093	Burmeister	1250	7.56	2.65	40.1
Total Wt			3120	18.70		100.0

<----- Verify this number is 100%



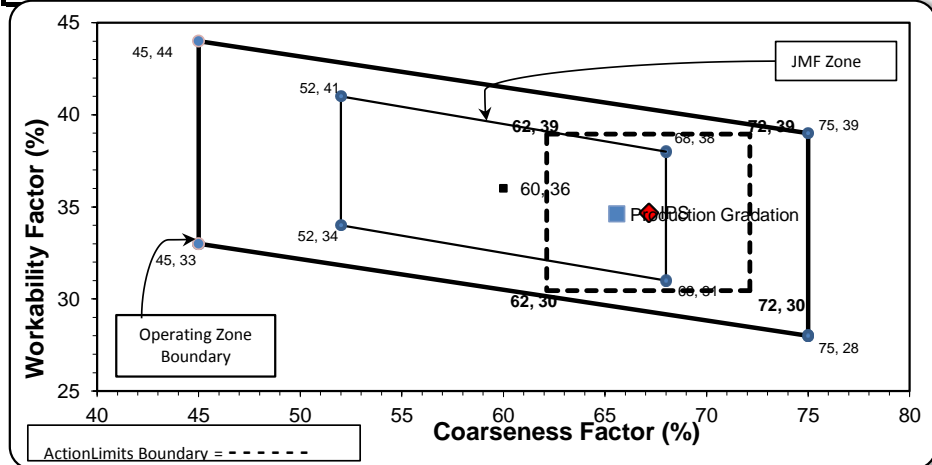
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Sieve	CA	IA	2NS	Cumulative % Passing	% Retained	Cumulative % Retained
2"	100.0	100.0	100.0	100.0	0.0	0.0
1.5"	100.0	100.0	100.0	100.0	0.0	0.0
1"	67.2	100.0	100.0	85.0	15.0	15.0
3/4"	48.6	100.0	100.0	76.4	8.5	23.6
1/2"	18.3	90.6	100.0	61.2	15.2	38.8
3/8"	13.8	76.1	100.0	57.1	4.1	42.9
#4	3.7	24.4	96.0	43.6	13.5	56.4
#8	2.2	6.5	81.6	34.6	9.0	65.4
#16	1.8	2.7	60.5	25.4	9.2	74.6
#30	1.7	1.9	40.8	17.4	8.1	82.6
#50	1.6	1.6	15.6	7.2	10.2	92.8
#100	1.6	1.5	3.2	2.2	5.0	97.8
LBW	1.5	1.4	0.8	1.2	1.0	98.8

*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 Gradations Aggregate Supplier Gradations

Coarseness Factor: 66 **Workability Factor: 35**



Initial Production Sample (IPS)

Coarseness Factor: 67
Workability Factor: 35

Sieve	Cumulative % Passing	% Retained	Cumulative % Retained
2"	100.0	0.0	0.0
1.5"	100.0	0.0	0.0
1"	86.9	13.1	13.1
3/4"	76.1	10.8	23.9
1/2"	63.7	12.4	36.3
3/8"	56.2	7.5	43.8
#4	43.2	13.0	56.8
#8	34.7	8.5	65.3
#16	27.5	7.2	72.5
#30	20.6	7.0	79.4
#50	9.0	11.6	91.0
#100	2.1	6.9	97.9
LBW	1.0	1.1	99.0

PREPARED BY:
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Aggregate Optimization Chart

PLANT #: **P-36**

Sample Date: 7/8/19

Concrete Grade: **P1M**

Contractor: _____

Dates Test Represents: 7/9/2019 through 7/15/2019

MDOT No.: _____

Agg. Class	Pit #	Source	Weight (SSD)	ft ³	Specific Gravity	% Contribution
CA	71-47	Presque Isle	820	5.02	2.62	26.7
IA	71-47	Presque Isle	1050	6.42	2.62	34.2
2NS	63-92	Grange Hall	1200	7.26	2.65	39.1
Total Wt			3070	18.70		100.0

<----- Verify this number is 100%



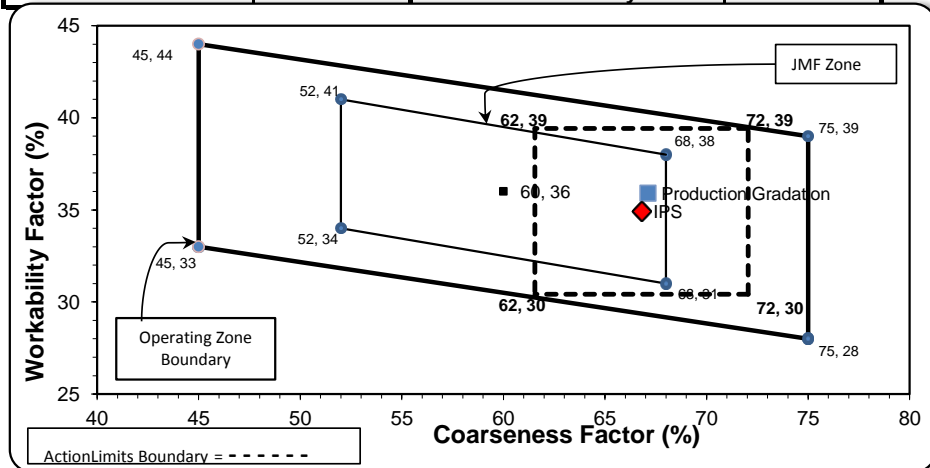
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Sieve	CA	IA	2NS	Cumulative % Passing	% Retained	Cumulative % Retained
2"	100.0	100.0	100.0	100.0	0.0	0.0
1.5"	95.4	100.0	100.0	98.8	1.2	1.2
1"	40.8	100.0	100.0	84.2	14.6	15.8
3/4"	7.0	97.2	100.0	74.2	10.0	25.8
1/2"	8.8	72.0	100.0	66.1	8.1	33.9
3/8"	6.8	47.0	100.0	57.0	9.1	43.0
#4	3.6	11.5	97.8	43.1	13.9	56.9
#8	2.6	4.2	86.4	35.9	7.2	64.1
#16	2.4	2.6	71.6	29.5	6.4	70.5
#30	2.2	2.3	52.4	21.9	7.7	78.1
#50	2.2	2.2	21.2	9.6	12.2	90.4
#100	2.0	2.0	2.2	2.1	7.5	97.9
LBW	1.6	1.4	0.3	1.0	1.1	99.0

*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 Gradations Aggregate Supplier Gradations

Coarseness Factor: 67 **Workability Factor: 36**



Initial Production Sample (IPS)

Coarseness Factor: 67		Workability Factor: 35	
Sieve	Cumulative % Passing	% Retained	Cumulative % Retained
2"	100.0	0.0	0.0
1.5"	100.0	0.0	0.0
1"	85.0	15.0	15.0
3/4"	72.1	12.9	27.9
1/2"	64.5	7.6	35.5
3/8"	56.5	8.0	43.5
#4	42.7	13.8	57.3
#8	34.9	7.8	65.1
#16	29.0	5.9	71.0
#30	21.0	8.0	79.0
#50	8.2	12.8	91.8
#100	1.6	6.5	98.4
LBW	0.7	0.9	99.3

PREPARED BY:
 SM, LLC Technical Service

Approved By:

Aggregate Optimization Chart

PLANT #: **P-39**

Sample Date: 7/8/19

Concrete Grade: **P1M**

Contractor: _____

Dates Test Represents: 7/9/2019 through 7/15/2019

MDOT No.: _____

Agg. Class	Pit #	Source	Weight (SSD)	ft ³	Specific Gravity	% Contribution
CA	71-47	Presque Isle	950	5.81	2.62	30.9
IA	71-47	Presque Isle	850	5.20	2.62	27.7
2NS	44-051	Krake Willis Rd	1270	7.68	2.65	41.4
Total Wt			3070	18.69		100.0

<----- Verify this number is 100%



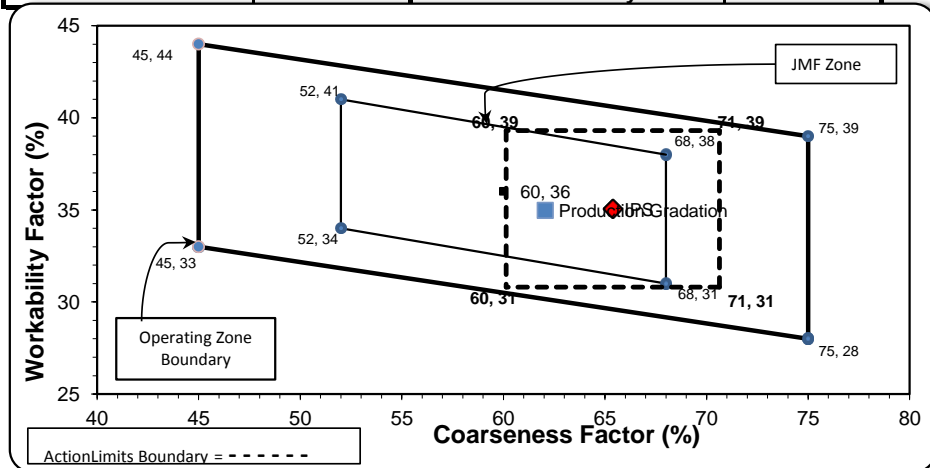
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 Suite 500
 Farmington Hills, MI 48336

Sieve	CA	IA	2NS	Cumulative % Passing	% Retained	Cumulative % Retained
2"	100.0	100.0	100.0	100.0	0.0	0.0
1.5"	98.1	100.0	100.0	99.4	0.6	0.6
1"	39.8	100.0	100.0	81.4	18.0	18.6
3/4"	10.7	99.4	100.0	72.2	9.2	27.8
1/2"	3.8	83.9	100.0	65.8	6.4	34.2
3/8"	2.4	63.3	100.0	59.6	6.1	40.4
#4	1.6	18.8	95.4	45.2	14.5	54.8
#8	1.4	5.5	79.8	35.0	10.2	65.0
#16	1.3	2.6	63.8	27.5	7.5	72.5
#30	1.2	2.3	50.0	21.7	5.8	78.3
#50	1.1	2.1	30.0	13.3	8.4	86.7
#100	1.1	2.0	9.0	4.6	8.7	95.4
LBW	0.9	1.8	1.5	1.4	3.2	98.6

*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 Gradations Aggregate Supplier Gradations

Coarseness Factor:	62	Workability Factor:	35
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Initial Production Sample (IPS)

Coarseness Factor:		65	
Workability Factor:		35	
Sieve	Cumulative % Passing	% Retained	Cumulative % Retained
2"	100.0	0.0	0.0
1.5"	99.6	0.4	0.4
1"	83.9	15.7	16.1
3/4"	74.1	9.8	25.9
1/2"	64.3	9.7	35.7
3/8"	57.5	6.8	42.5
#4	44.5	13.1	55.5
#8	35.1	9.4	64.9
#16	27.9	7.2	72.1
#30	21.7	6.2	78.3
#50	12.6	9.1	87.4
#100	3.5	9.1	96.5
LBW	1.2	2.4	98.8

PREPARED BY:
 SM, LLC Technical Service

Approved By:

Aggregate Optimization Chart

PLANT #: **P-02**

Sample Date: 7/8/19

Concrete Grade: **P1M**

Contractor: _____

Dates Test Represents: 7/9/2019 through 7/15/2019

MDOT No.: _____

Agg. Class	Pit #	Source	Weight (SSD)	ft ³	Specific Gravity	% Contribution
CA	71-47	Presque Isle	900	5.50	2.62	29.3
IA	71-47	Presque Isle	1000	6.12	2.62	32.6
2NS	47-16	Buno Rd	1170	7.08	2.65	38.1
Total Wt			3070	18.70		100.0

<----- Verify this number is 100%



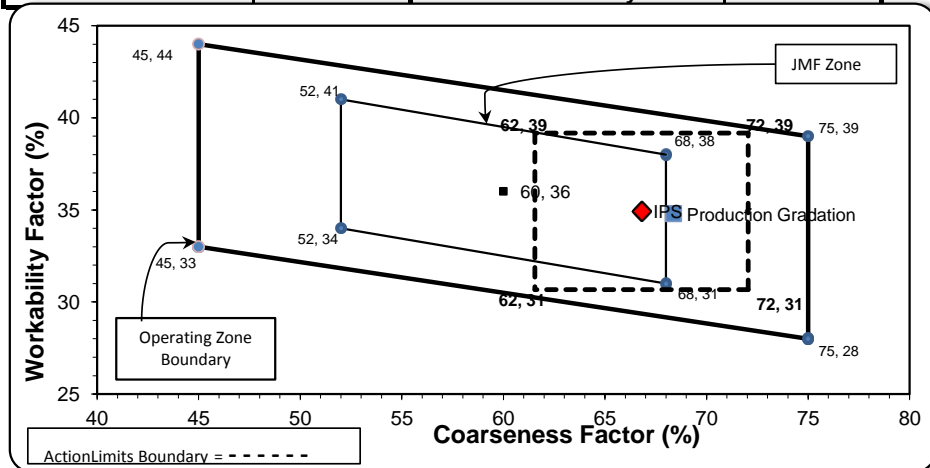
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 Suite 500
 Farmington Hills, MI 48336

Sieve	CA	IA	2NS	Cumulative % Passing	% Retained	Cumulative % Retained
2"	100.0	100.0	100.0	100.0	0.0	0.0
1.5"	95.4	100.0	100.0	98.7	1.3	1.3
1"	40.8	100.0	100.0	82.6	16.0	17.4
3/4"	17.4	97.2	100.0	74.9	7.8	25.1
1/2"	8.8	72.0	100.0	64.1	10.7	35.9
3/8"	6.8	47.0	100.0	55.4	8.7	44.6
#4	3.6	11.5	96.3	41.5	13.9	58.5
#8	2.6	4.2	85.7	34.8	6.7	65.2
#16	2.4	2.6	72.3	29.1	5.7	70.9
#30	2.2	2.3	53.2	21.7	7.4	78.3
#50	2.2	2.2	17.7	8.1	13.6	91.9
#100	2.0	2.0	1.9	2.0	6.1	98.0
LBW	1.6	1.4	0.3	1.0	0.9	99.0

*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 Gradations Aggregate Supplier Gradations

Coarseness Factor:	68	Workability Factor:	35
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Initial Production Sample (IPS)

Coarseness Factor:		67	
Workability Factor:		35	
Sieve	Cumulative % Passing	% Retained	Cumulative % Retained
2"	100.0	0.0	0.0
1.5"	100.0	0.0	0.0
1"	85.0	15.0	15.0
3/4"	72.3	12.7	27.7
1/2"	64.5	7.8	35.5
3/8"	56.5	8.0	43.5
#4	42.7	13.8	57.3
#8	34.9	7.8	65.1
#16	29.0	5.9	71.0
#30	21.0	8.0	79.0
#50	8.2	12.8	91.8
#100	1.6	6.5	98.4
LBW	0.7	0.9	99.3

PREPARED BY:
 SM, LLC Technical Service

Approved By: