

# Aggregate Optimization Chart

MIX ID'S: DDP154E7, DDP154E8, DDP154ER, DDP164E7 and DDP164E8

## Production Gradation Report

**PLANT #:** **P-101**

Sample Date: 11/5/18

Concrete Grade: **P1M**

Contractor: \_\_\_\_\_

Dates Test Represents: 11/6/2018 through 11/12/2018

MDOT No.: \_\_\_\_\_

Agg. Class	Pit #	Source	Weight (SSD)	ft <sup>3</sup>	Specific Gravity	% Contribution
CA	71-47	Presque Isle	950	5.81	2.62	30.9
IA	71-47	Presque Isle	875	5.35	2.62	28.5
2NS	75-051	Mid-Michigan	1250	7.53	2.66	40.7
<b>Total Wt</b>			<b>3075</b>	<b>18.69</b>		<b>100.0</b>

<----- 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"	49.9	100.0	100.0	84.5	15.5	15.5
3/4"	15.4	98.3	100.0	73.4	11.1	26.6
1/2"	4.3	80.2	100.0	64.8	8.6	35.2
3/8"	2.9	54.2	100.0	57.0	7.8	43.0
#4	2.1	10.3	98.5	43.6	13.3	56.4
#8	1.7	3.7	81.1	34.5	9.1	65.5
#16	1.6	2.7	62.8	26.8	7.8	73.2
#30	1.5	2.4	43.8	19.0	7.8	81.0
#50	1.5	2.3	19.3	9.0	10.0	91.0
#100	1.4	2.1	4.2	2.7	6.2	97.3
LBW	1.3	1.9	0.7	1.2	1.5	98.8



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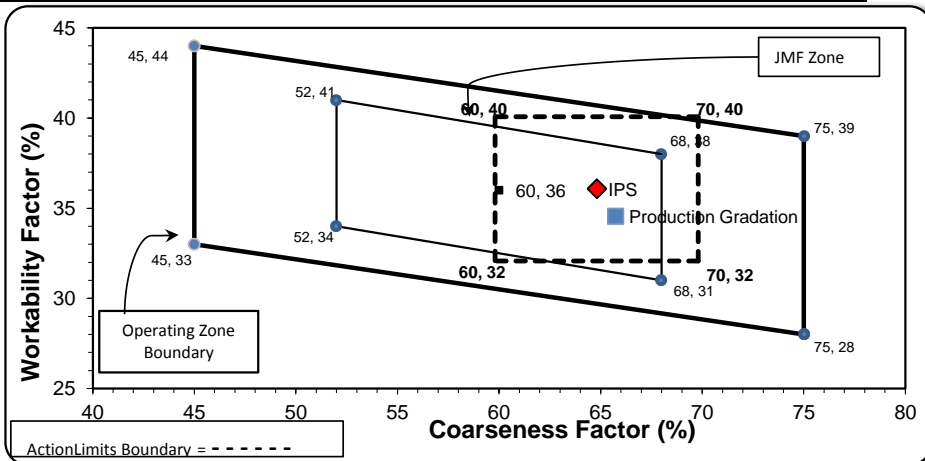
\*Maximum % Retained must be above the 3/8" sieve.  
 \*Any two adjacent sieves must equal 10% except max., nom. max., #100 and #200 sieves.  
 \*% Retained must be at least 4% for each sieve except max., nom. max., #100 and #200 sieves.  
 \*% Retained must be at least 8% for the 1" sieve when a 2"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

Production Gradation  Batch Plant Gradations  Aggregate Supplier Gradations

<b>Coarseness Factor:</b>	<b>66</b>	<b>Workability Factor:</b>	<b>35</b>
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Initial Production Sample (IPS)

<b>Coarseness Factor:</b>	<b>65</b>		
<b>Workability Factor:</b>	<b>36</b>		
Sieve	Cumulative % Passing	% Retained	Cumulative % Retained
2"	100.0	0.0	0.0
1.5"	99.3	0.7	0.7
1"	83.6	15.7	16.4
3/4"	73.0	10.6	27.0
1/2"	65.1	7.9	34.9
3/8"	58.6	6.5	41.4
#4	45.8	12.8	54.2
#8	36.1	9.7	63.9
#16	28.8	7.3	71.2
#30	21.7	7.1	78.3
#50	10.3	11.4	89.7
#100	3.1	7.2	96.9
LBW	1.3	1.8	98.7



PREPARED BY:  
 SM, LLC Technical Service

Approved By:

# Aggregate Optimization Chart

MIX ID'S: DDP154E7, DDP154E8, DDP154ER, DDP164E7 and DDP164E8

## Production Gradation Report

**PLANT #:** **P-102**

Sample Date: 11/5/18

Concrete Grade: **P1M**

Contractor: \_\_\_\_\_

Dates Test Represents: 11/6/2018 through 11/12/2018

MDOT No.: \_\_\_\_\_

Agg. Class	Pit #	Source	Weight (SSD)	ft <sup>3</sup>	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	7.26	2.65	38.5
<b>Total Wt</b>			<b>3120</b>	<b>18.70</b>		<b>100.0</b>

<----- 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"	65.5	100.0	100.0	84.9	15.1	15.1
3/4"	39.1	100.0	100.0	73.3	11.6	26.7
1/2"	15.7	93.8	100.0	61.9	11.4	38.1
3/8"	6.7	83.2	100.0	56.1	5.8	43.9
#4	2.5	25.0	100.0	44.0	12.1	56.0
#8	1.7	6.7	88.0	35.8	8.2	64.2
#16	1.5	2.8	63.0	25.4	10.4	74.6
#30	1.4	2.1	42.0	17.1	8.2	82.9
#50	1.3	1.8	22.0	9.3	7.8	90.7
#100	1.2	1.7	5.0	2.7	6.6	97.3
LBW	1.1	1.5	0.9	1.1	1.7	98.9

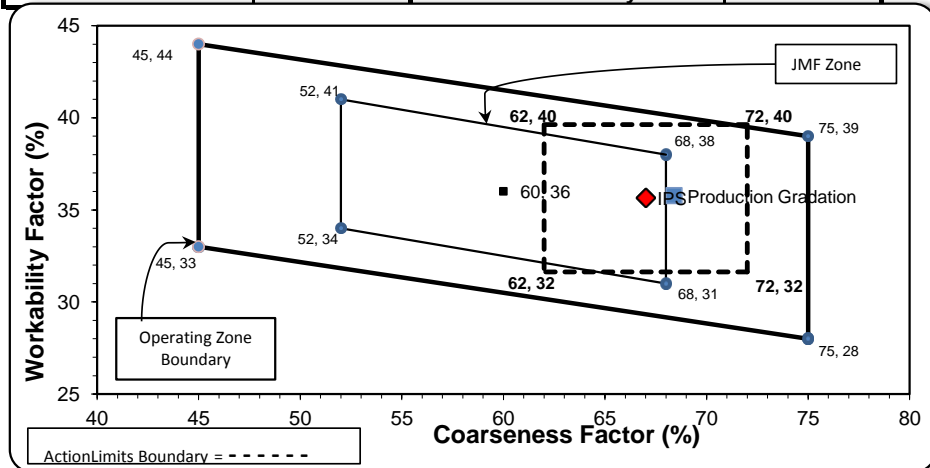


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\*Maximum % Retained must be above the 3/8" sieve.  
 \*Any two adjacent sieves must equal 10% except max., nom. max., #100 and #200 sieves.  
 \*% Retained must be at least 4% for each sieve except max., nom. max., #100 and #200 sieves.  
 \*% Retained 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: **36**



Initial Production Sample (IPS)

Sieve	Cumulative % Passing	% Retained	Cumulative % Retained
2"	100.0	0.0	0.0
1.5"	100.0	0.0	0.0
1"	87.2	12.8	12.8
3/4"	76.6	10.6	23.4
1/2"	64.4	12.2	35.6
3/8"	56.9	7.6	43.1
#4	44.1	12.7	55.9
#8	35.6	8.5	64.4
#16	27.7	8.0	72.3
#30	19.5	8.2	80.5
#50	7.8	11.6	92.2
#100	2.3	5.6	97.7
LBW	0.6	1.6	99.4

PREPARED BY:  
 SM, LLC Technical Service

Approved By:

# Aggregate Optimization Chart

MIX ID'S: DDP154E7, DDP154E8, DDP154ER, DDP164E7 and DDP164E8

## Production Gradation Report

**PLANT #:** **P-12**

Sample Date: 11/5/18

Concrete Grade: **P1M**

Contractor: \_\_\_\_\_

Dates Test Represents: 11/6/2018 through 11/12/2018

MDOT No.: \_\_\_\_\_

Agg. Class	Pit #	Source	Weight (SSD)	ft <sup>3</sup>	Specific Gravity	% Contribution
CA	71-47	Presque Isle	950	5.81	2.62	30.9
IA	71-47	Presque Isle	875	5.35	2.62	28.5
2NS	63-92	AA Grange Hall	1250	7.56	2.65	40.7
<b>Total Wt</b>			<b>3075</b>	<b>18.72</b>		<b>100.0</b>

<----- 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"	49.9	100.0	100.0	84.5	15.5	15.5
3/4"	15.4	98.3	100.0	73.4	11.1	26.6
1/2"	4.3	80.2	100.0	64.8	8.6	35.2
3/8"	2.9	54.2	100.0	57.0	7.8	43.0
#4	2.1	10.3	97.3	43.1	13.8	56.9
#8	1.7	3.7	84.3	35.8	7.3	64.2
#16	1.6	2.7	68.6	29.1	6.7	70.9
#30	1.5	2.4	50.2	21.6	7.6	78.4
#50	1.5	2.3	23.0	10.5	11.1	89.5
#100	1.4	2.1	3.6	2.5	8.0	97.5
LBW	1.3	1.9	0.3	1.1	1.4	98.9

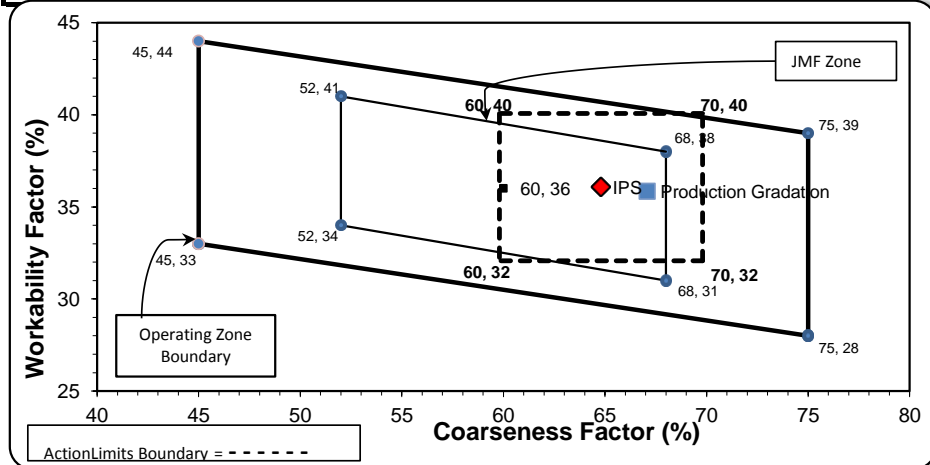


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 \*Any two adjacent sieves must equal 10% except max., nom. max., #100 and #200 sieves.  
 \*% Retained must be at least 4% for each sieve except max., nom. max., #100 and #200 sieves.  
 \*% Retained must be at least 8% for the 1" sieve when a 2" 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: <b>65</b>		Workability Factor: <b>36</b>	
Sieve	Cumulative % Passing	% Retained	Cumulative % Retained
2"	100.0	0.0	0.0
1.5"	99.3	0.7	0.7
1"	83.6	15.7	16.4
3/4"	73.0	10.6	27.0
1/2"	65.1	7.9	34.9
3/8"	58.6	6.5	41.4
#4	45.8	12.8	54.2
#8	36.1	9.7	63.9
#16	28.8	7.3	71.2
#30	21.7	7.1	78.3
#50	10.3	11.4	89.7
#100	3.1	7.2	96.9
LBW	1.3	1.8	98.7

PREPARED BY:  
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Approved By:

# Aggregate Optimization Chart

MIX ID'S: DDP154E7, DDP154E8, DDP154ER, DDP164E7 and DDP164E8

## Production Gradation Report

**PLANT #:** **P-32**

Sample Date: 11/5/18

Concrete Grade: **P1M**

Contractor: \_\_\_\_\_

Dates Test Represents: 11/6/2018 through 11/12/2018

MDOT No.: \_\_\_\_\_

Agg. Class	Pit #	Source	Weight (SSD)	ft <sup>3</sup>	Specific Gravity	% Contribution
CA	71-47	Presque Isle	770	4.71	2.62	25.1
IA	71-47	Presque Isle	1050	6.42	2.62	34.2
2NS	95-13	Smelter Bay	1250	7.56	2.65	40.7
<b>Total Wt</b>			<b>3070</b>	<b>18.69</b>		<b>100.0</b>

<----- 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"	96.8	100.0	100.0	99.2	0.8	0.8
1"	38.6	100.0	100.0	84.6	14.6	15.4
3/4"	9.7	99.2	100.0	77.1	7.5	22.9
1/2"	3.9	73.7	100.0	66.9	10.2	33.1
3/8"	2.9	43.5	100.0	56.3	10.6	43.7
#4	1.9	7.0	97.2	42.4	13.9	57.6
#8	1.6	2.8	85.3	36.1	6.4	63.9
#16	1.4	2.1	69.1	29.2	6.9	70.8
#30	1.4	1.9	48.7	20.8	8.4	79.2
#50	1.3	1.8	20.8	9.4	11.4	90.6
#100	1.1	1.6	3.5	2.2	7.2	97.8
LBW	0.8	1.0	0.4	0.7	1.5	99.3

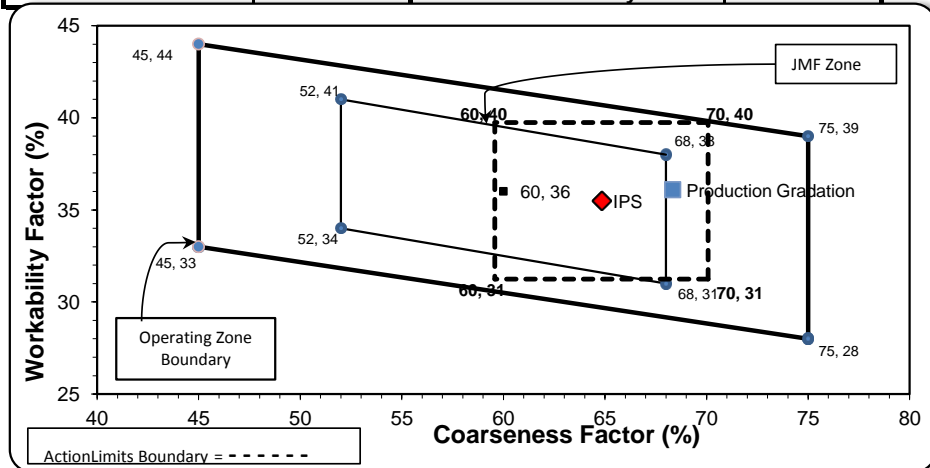


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\*Maximum % Retained must be above the 3/8" sieve.  
 \*Any two adjacent sieves must equal 10% except max., nom. max., #100 and #200 sieves.  
 \*% Retained must be at least 4% for each sieve except max., nom. max., #100 and #200 sieves.  
 \*% Retained 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: **36**



Initial Production Sample (IPS)

Coarseness Factor: <b>65</b>		Workability Factor: <b>35</b>	
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

PREPARED BY:  
 SM, LLC Technical Service

Approved By:

# Aggregate Optimization Chart

MIX ID'S: DDP154E7, DDP154E8, DDP154ER, DDP164E7 and DDP164E8

## Production Gradation Report

**PLANT #:** **P-36**

Sample Date: 11/5/18

Concrete Grade: **P1M**

Contractor: \_\_\_\_\_

Dates Test Represents: 11/6/2018 through 11/12/2018

MDOT No.: \_\_\_\_\_

Agg. Class	Pit #	Source	Weight (SSD)	ft <sup>3</sup>	Specific Gravity	% Contribution
CA	71-47	Presque Isle	770	4.71	2.62	25.1
IA	71-47	Presque Isle	1050	6.42	2.62	34.2
2NS	63-92	AA Grange Hall	1250	7.56	2.65	40.7
<b>Total Wt</b>			<b>3070</b>	<b>18.69</b>		<b>100.0</b>

<----- 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"	96.8	100.0	100.0	99.2	0.8	0.8
1"	38.6	100.0	100.0	84.6	14.6	15.4
3/4"	9.7	99.2	100.0	77.1	7.5	22.9
1/2"	3.9	73.7	100.0	66.9	10.2	33.1
3/8"	2.9	43.5	100.0	56.3	10.6	43.7
#4	1.9	7.0	97.3	42.5	13.8	57.5
#8	1.6	2.8	84.3	35.7	6.8	64.3
#16	1.4	2.1	68.6	29.0	6.7	71.0
#30	1.4	1.9	50.2	21.4	7.6	78.6
#50	1.3	1.8	23.0	10.3	11.1	89.7
#100	1.1	1.6	3.6	2.3	8.0	97.7
LBW	0.8	1.0	0.3	0.7	1.6	99.3

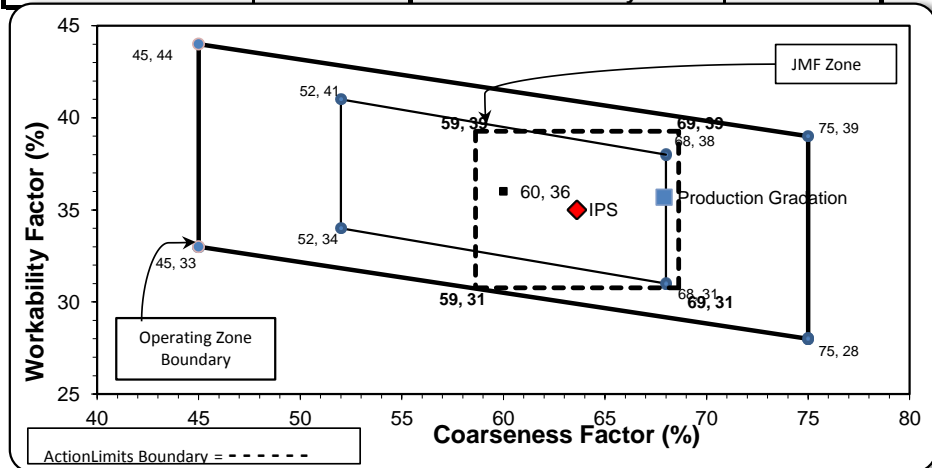


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\*Maximum % Retained must be above the 3/8" sieve.  
 \*Any two adjacent sieves must equal 10% except max., nom. max., #100 and #200 sieves.  
 \*% Retained must be at least 4% for each sieve except max., nom. max., #100 and #200 sieves.  
 \*% Retained 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: **36**



Initial Production Sample (IPS)

Coarseness Factor: <b>64</b>		Workability Factor: <b>35</b>	
Sieve	Cumulative % Passing	% Retained	Cumulative % Retained
2"	100.0	0.0	0.0
1.5"	99.4	0.6	0.6
1"	84.6	14.7	15.4
3/4"	74.4	10.3	25.6
1/2"	66.0	8.4	34.0
3/8"	58.7	7.4	41.3
#4	44.6	14.0	55.4
#8	35.0	9.6	65.0
#16	27.6	7.4	72.4
#30	19.5	8.1	80.5
#50	8.6	11.0	91.4
#100	2.0	6.6	98.0
LBW	0.9	1.1	99.1

PREPARED BY:  
 SM, LLC Technical Service

Approved By:

# Aggregate Optimization Chart

MIX ID'S: DDP154E7, DDP154E8, DDP154ER, DDP164E7 and DDP164E8

## Production Gradation Report

**PLANT #:** **P-39**

Sample Date: 11/5/18

Concrete Grade: **P1M**

Contractor: \_\_\_\_\_

Dates Test Represents: 11/6/2018 through 11/12/2018

MDOT No.: \_\_\_\_\_

Agg. Class	Pit #	Source	Weight (SSD)	ft <sup>3</sup>	Specific Gravity	% Contribution
CA	71-47	Presque Isle	1000	6.12	2.62	32.6
IA	71-47	Presque Isle	750	4.59	2.62	24.4
2NS	63-115	Ray Road	1320	7.98	2.65	43.0
<b>Total Wt</b>			<b>3070</b>	<b>18.69</b>		<b>100.0</b>

<----- 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"	49.9	100.0	100.0	83.7	16.3	16.3
3/4"	15.4	98.3	100.0	72.0	11.7	28.0
1/2"	4.3	80.2	100.0	64.0	8.0	36.0
3/8"	2.9	54.2	100.0	57.2	6.8	42.8
#4	2.1	10.3	96.8	44.8	12.4	55.2
#8	1.7	3.7	80.3	36.0	8.8	64.0
#16	1.6	2.7	63.6	28.5	7.5	71.5
#30	1.5	2.4	47.0	21.3	7.2	78.7
#50	1.5	2.3	23.7	11.2	10.0	88.8
#100	1.4	2.1	5.1	3.2	8.1	96.8
LBW	1.3	1.9	0.5	1.1	2.1	98.9

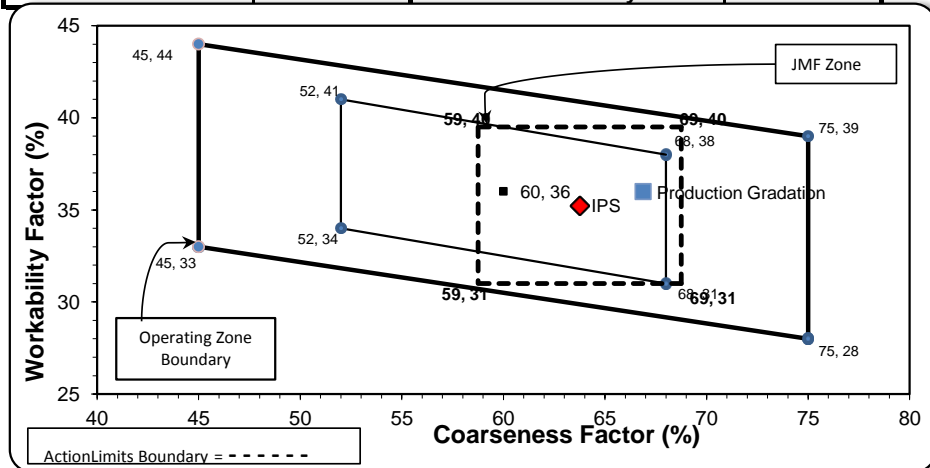


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\*Maximum % Retained must be above the 3/8" sieve.  
 \*Any two adjacent sieves must equal 10% except max., nom. max., #100 and #200 sieves.  
 \*% Retained must be at least 4% for each sieve except max., nom. max., #100 and #200 sieves.  
 \*% Retained 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: **67**      Workability Factor: **36**



Initial Production Sample (IPS)

Coarseness Factor: <b>64</b>		Workability Factor: <b>35</b>	
Sieve	Cumulative % Passing	% Retained	Cumulative % Retained
2"	100.0	0.0	0.0
1.5"	99.4	0.6	0.6
1"	84.3	15.1	15.7
3/4"	73.9	10.4	26.1
1/2"	65.7	8.2	34.3
3/8"	58.7	7.0	41.3
#4	45.1	13.6	54.9
#8	35.3	9.8	64.7
#16	28.1	7.2	71.9
#30	21.2	6.9	78.8
#50	10.1	11.1	89.9
#100	3.1	7.0	96.9
LBW	1.4	1.7	98.6

PREPARED BY:  
 SM, LLC Technical Service

Approved By:

# Aggregate Optimization Chart

MIX ID'S: DDP154E7, DDP154E8, DDP154ER, DDP164E7 and DDP164E8

## Production Gradation Report

**PLANT #:** **P-02**

Sample Date: 11/5/18

Concrete Grade: **P1M**

Contractor: \_\_\_\_\_

Dates Test Represents: 11/6/2018 through 11/12/2018

MDOT No.: \_\_\_\_\_

Agg. Class	Pit #	Source	Weight (SSD)	ft <sup>3</sup>	Specific Gravity	% Contribution
CA	71-47	Presque Isle	770	4.71	2.62	25.1
IA	71-47	Presque Isle	1050	6.42	2.62	34.2
2NS	63-92	AA Grange Hall	1250	7.56	2.65	40.7
<b>Total Wt</b>			<b>3070</b>	<b>18.69</b>		<b>100.0</b>

<----- 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"	96.8	100.0	100.0	99.2	0.8	0.8
1"	38.6	100.0	100.0	84.6	14.6	15.4
3/4"	9.7	99.2	100.0	77.1	7.5	22.9
1/2"	3.9	73.7	100.0	66.9	10.2	33.1
3/8"	2.9	43.5	100.0	56.3	10.6	43.7
#4	1.9	7.0	97.3	42.5	13.8	57.5
#8	1.6	2.8	84.3	35.7	6.8	64.3
#16	1.4	2.1	68.6	29.0	6.7	71.0
#30	1.4	1.9	50.2	21.4	7.6	78.6
#50	1.3	1.8	23.0	10.3	11.1	89.7
#100	1.1	1.6	3.6	2.3	8.0	97.7
LBW	0.8	1.0	0.3	0.7	1.6	99.3

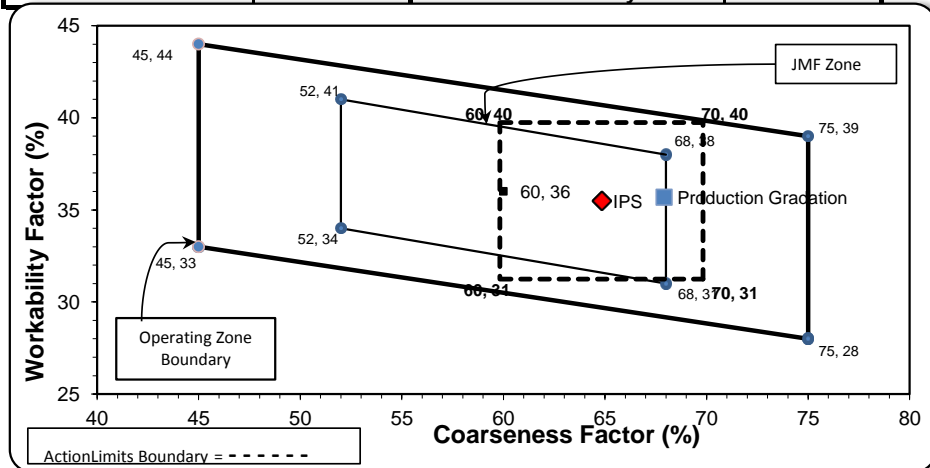


**Superior Materials, LLC**  
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\*Maximum % Retained must be above the 3/8" sieve.  
 \*Any two adjacent sieves must equal 10% except max., nom. max., #100 and #200 sieves.  
 \*% Retained must be at least 4% for each sieve except max., nom. max., #100 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: **36**



Initial Production Sample (IPS)

Coarseness Factor: <b>65</b>		Workability Factor: <b>35</b>	
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

PREPARED BY:  
 SM, LLC Technical Service

Approved By: