

# Aggregate Optimization Chart

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

## Production Gradation Report

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

Sample Date: 9/24/18

Concrete Grade: **P1M**

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

Dates Test Represents: 9/25/2018 through 10/1/2018

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"	97.2	100.0	100.0	99.1	0.9	0.9
1"	42.4	100.0	100.0	82.2	16.9	17.8
3/4"	9.7	98.8	100.0	71.8	10.4	28.2
1/2"	2.2	78.3	100.0	63.6	8.2	36.4
3/8"	1.8	51.2	100.0	55.8	7.8	44.2
#4	1.6	7.6	98.9	42.9	12.9	57.1
#8	1.4	2.9	80.3	33.9	9.0	66.1
#16	1.4	2.0	63.0	26.6	7.3	73.4
#30	1.4	1.8	47.6	20.3	6.3	79.7
#50	1.3	1.7	24.8	11.0	9.3	89.0
#100	1.2	1.6	6.8	3.6	7.4	96.4
LBW	1.1	1.4	0.9	1.1	2.5	98.9

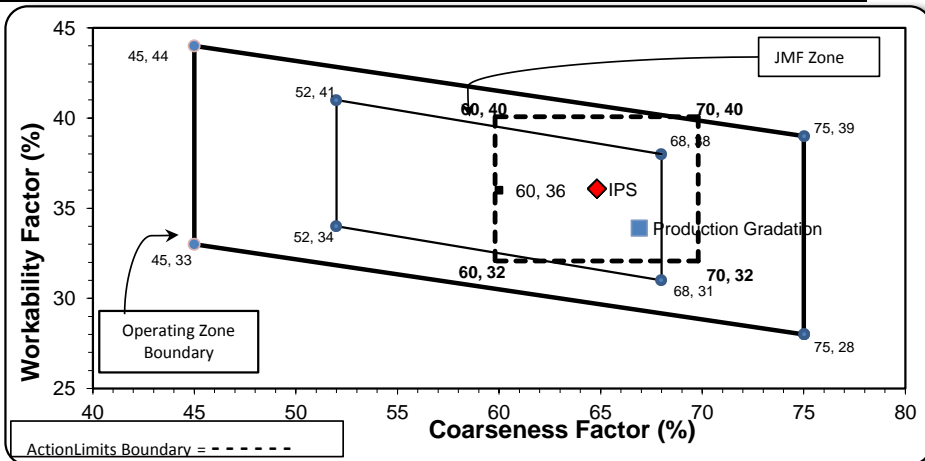


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 Suite 500  
 Farmington Hills, MI 48336

\*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:** **34**



Initial Production Sample (IPS)

Coarseness Factor:		65	
Workability Factor:		36	
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: 9/24/18

Concrete Grade: **P1M**

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

Dates Test Represents: 9/25/2018 through 10/1/2018

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"	64.6	100.0	100.0	84.5	15.5	15.5
3/4"	44.0	100.0	100.0	75.4	9.0	24.6
1/2"	18.0	93.8	100.0	62.9	12.5	37.1
3/8"	8.3	84.4	100.0	57.0	5.9	43.0
#4	3.1	24.3	100.0	44.1	12.9	55.9
#8	2.4	6.8	88.0	36.1	8.0	63.9
#16	1.8	3.2	65.0	26.4	9.7	73.6
#30	1.7	2.4	46.0	18.9	7.5	81.1
#50	1.6	2.2	25.0	10.7	8.2	89.3
#100	1.5	2.1	6.0	3.3	7.4	96.7
LBW	1.4	1.8	1.0	1.3	2.0	98.7

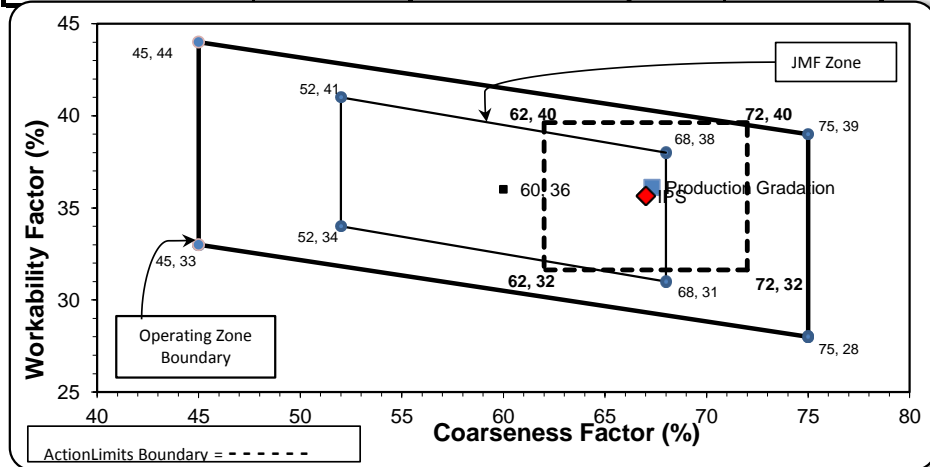
\*Maximum % Retained must be above the 3/8" sieve.  
 \*Any two adjacent sieves must equal 10% except max., nom. max., #100 and #200 sieves.  
 \*% Retained must be at least 4% for each sieve except max., nom. max., #100 and #200 sieves.  
 \*% Retained must be at least 8% for the 1" sieve when a 2"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



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Production Gradation  Batch Plant Gradations  Aggregate Supplier Gradations

**Coarseness Factor: 67**      **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-32**

Sample Date: 9/24/18

Concrete Grade: **P1M**

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

Dates Test Represents: 9/25/2018 through 10/1/2018

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

Agg. Class	Pit #	Source	Weight (SSD)	ft <sup>3</sup>	Specific Gravity	% Contribution
CA	71-47	Presque Isle	820	5.02	2.62	26.7
IA	71-47	Presque Isle	1000	6.12	2.62	32.6
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"	95.3	100.0	100.0	98.7	1.3	1.3
1"	31.6	100.0	100.0	81.7	17.0	18.3
3/4"	7.0	100.0	100.0	75.2	6.6	24.8
1/2"	2.3	84.3	100.0	68.8	6.4	31.2
3/8"	2.0	56.3	100.0	59.6	9.2	40.4
#4	1.9	10.8	97.7	43.8	15.8	56.2
#8	1.9	4.2	86.1	36.9	6.9	63.1
#16	1.9	2.8	68.8	29.4	7.5	70.6
#30	1.9	2.4	46.6	20.3	9.2	79.7
#50	1.9	2.3	19.4	9.2	11.1	90.8
#100	1.8	2.1	4.2	2.9	6.3	97.1
LBW	1.6	1.6	1.0	1.4	1.5	98.6

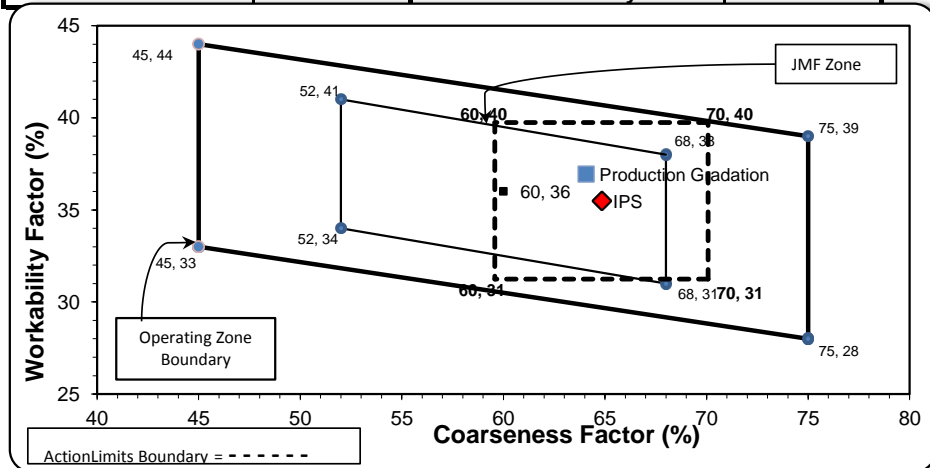


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\*Maximum % Retained must be above the 3/8" sieve.  
 \*Any two adjacent sieves must equal 10% except max., nom. max., #100 and #200 sieves.  
 \*% Retained must be at least 4% for each sieve except max., nom. max., #100 and #200 sieves.  
 \*% Retained 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: **64**      Workability Factor: **37**



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

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Approved By:

# Aggregate Optimization Chart

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

## Production Gradation Report

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

Sample Date: 9/24/18

Concrete Grade: **P1M**

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

Dates Test Represents: 9/25/2018 through 10/1/2018

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

Agg. Class	Pit #	Source	Weight (SSD)	ft <sup>3</sup>	Specific Gravity	% Contribution
CA	71-47	Presque Isle	820	5.02	2.62	26.7
IA	71-47	Presque Isle	1000	6.12	2.62	32.6
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"	95.3	100.0	100.0	98.7	1.3	1.3
1"	31.6	100.0	100.0	81.7	17.0	18.3
3/4"	7.0	100.0	100.0	75.2	6.6	24.8
1/2"	2.3	84.3	100.0	68.8	6.4	31.2
3/8"	2.0	56.3	100.0	59.6	9.2	40.4
#4	1.9	10.8	97.4	43.7	15.9	56.3
#8	1.9	4.2	83.7	36.0	7.7	64.0
#16	1.9	2.8	68.0	29.1	6.8	70.9
#30	1.9	2.4	50.8	22.0	7.1	78.0
#50	1.9	2.3	24.1	11.1	10.9	88.9
#100	1.8	2.1	4.1	2.8	8.2	97.2
LBW	1.6	1.6	0.3	1.1	1.8	98.9

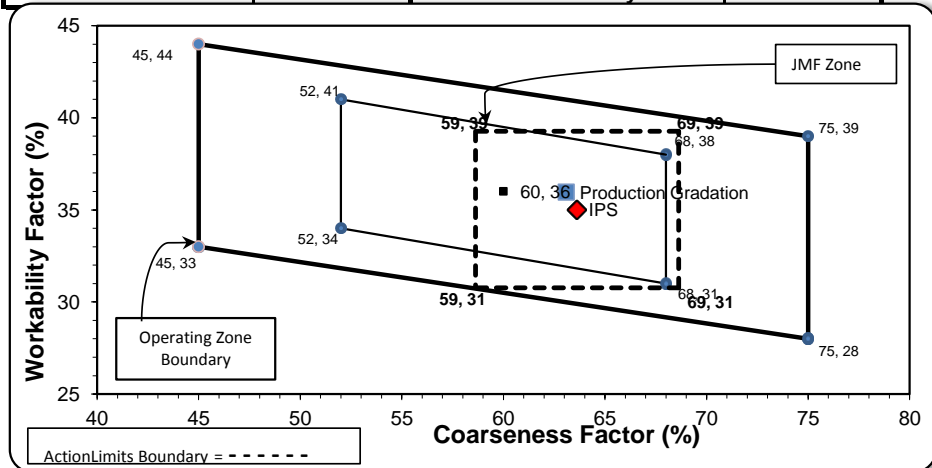


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\*Maximum % Retained must be above the 3/8" sieve.  
 \*Any two adjacent sieves must equal 10% except max., nom. max., #100 and #200 sieves.  
 \*% Retained must be at least 4% for each sieve except max., nom. max., #100 and #200 sieves.  
 \*% Retained 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: **63**      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:  
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# Aggregate Optimization Chart

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

## Production Gradation Report

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

Sample Date: 9/24/18

Concrete Grade: **P1M**

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

Dates Test Represents: 9/25/2018 through 10/1/2018

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"	97.2	100.0	100.0	99.1	0.9	0.9
1"	42.4	100.0	100.0	81.2	17.9	18.8
3/4"	9.7	98.8	100.0	70.3	10.9	29.7
1/2"	2.2	78.3	100.0	62.8	7.5	37.2
3/8"	1.8	51.2	100.0	56.1	6.8	43.9
#4	1.6	7.6	96.1	43.7	12.4	56.3
#8	1.4	2.9	78.7	35.0	8.7	65.0
#16	1.4	2.0	62.4	27.8	7.2	72.2
#30	1.4	1.8	48.1	21.6	6.2	78.4
#50	1.3	1.7	25.8	11.9	9.6	88.1
#100	1.2	1.6	4.1	2.5	9.4	97.5
LBW	1.1	1.4	0.4	0.9	1.7	99.1

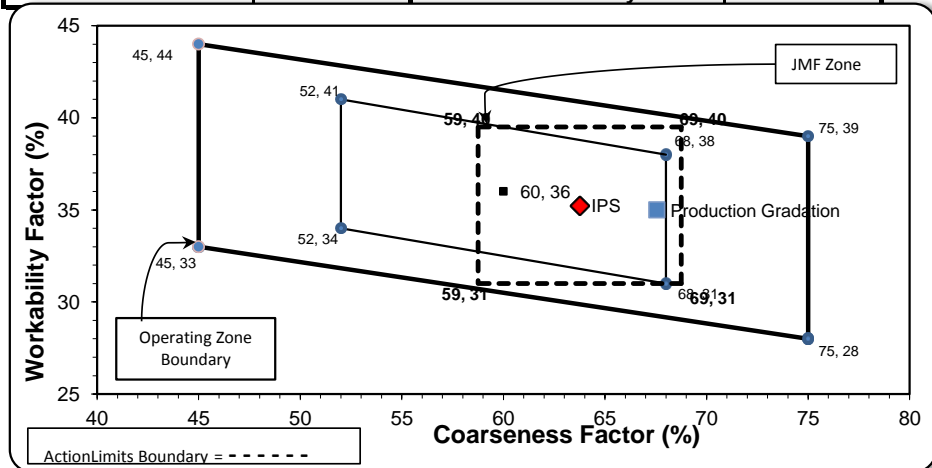


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\*Maximum % Retained must be above the 3/8" sieve.  
 \*Any two adjacent sieves must equal 10% except max., nom. max., #100 and #200 sieves.  
 \*% Retained must be at least 4% for each sieve except max., nom. max., #100 and #200 sieves.  
 \*% Retained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

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: 9/24/18

Concrete Grade: **P1M**

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

Dates Test Represents: 9/25/2018 through 10/1/2018

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

Agg. Class	Pit #	Source	Weight (SSD)	ft <sup>3</sup>	Specific Gravity	% Contribution
CA	71-47	Presque Isle	820	5.02	2.62	26.7
IA	71-47	Presque Isle	1000	6.12	2.62	32.6
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%



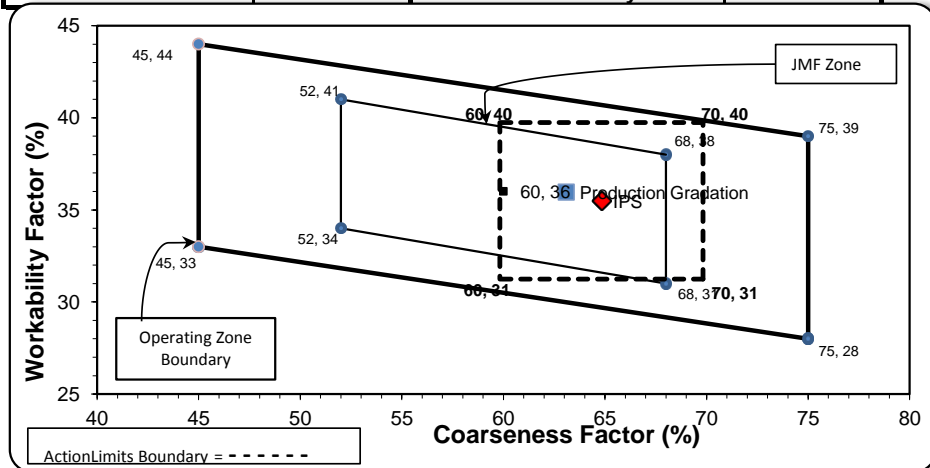
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Sieve	CA	IA	2NS	Cumulative % Passing	% Retained	Cumulative % Retained
2"	100.0	100.0	100.0	100.0	0.0	0.0
1.5"	95.3	100.0	100.0	98.7	1.3	1.3
1"	31.6	100.0	100.0	81.7	17.0	18.3
3/4"	7.0	100.0	100.0	75.2	6.6	24.8
1/2"	2.3	84.3	100.0	68.8	6.4	31.2
3/8"	2.0	56.3	100.0	59.6	9.2	40.4
#4	1.9	10.8	97.4	43.7	15.9	56.3
#8	1.9	4.2	83.7	36.0	7.7	64.0
#16	1.9	2.8	68.0	29.1	6.8	70.9
#30	1.9	2.4	50.8	22.0	7.1	78.0
#50	1.9	2.3	24.1	11.1	10.9	88.9
#100	1.8	2.1	4.1	2.8	8.2	97.2
LBW	1.6	1.6	0.3	1.1	1.8	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

<b>Coarseness Factor:</b>	<b>63</b>	<b>Workability Factor:</b>	<b>36</b>
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Initial Production Sample (IPS)

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