

# Aggregate Optimization Chart

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

Sample Date: 1/20/20

Concrete Grade: **DM**

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

Dates Test Represents: 1/21/2020 through 1/27/2020

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

| Agg. Class      | Pit #  | Source       | Weight (SSD) | ft <sup>3</sup> | Specific Gravity | % Contribution |
|-----------------|--------|--------------|--------------|-----------------|------------------|----------------|
| 6AA             | 71-47  | Presque Isle | 1650         | 10.09           | 2.62             | 56.8           |
| 26A             | 71-47  | Presque Isle | 105          | 0.64            | 2.62             | 3.6            |
| 2NS             | 95-013 | Smelter Bay  | 1150         | 6.95            | 2.65             | 39.6           |
| <b>Total Wt</b> |        |              | <b>2905</b>  | <b>17.69</b>    |                  | <b>100.0</b>   |

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



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

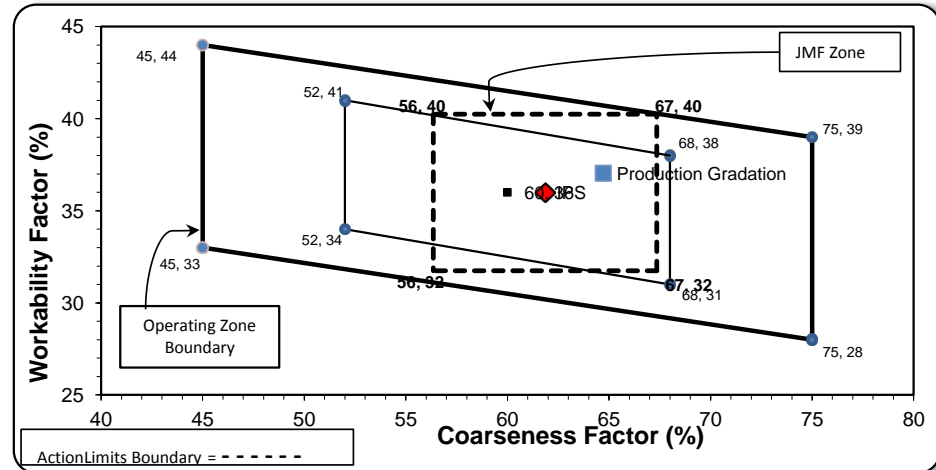
| Sieve | 6AA   | 26A   | 2NS   | Cumulative % Passing | % Retained | Cumulative % Retained |
|-------|-------|-------|-------|----------------------|------------|-----------------------|
| 2"    | 100.0 | 100.0 | 100.0 | 100.0                | 0.0        | 0.0                   |
| 1.5"  | 100.0 | 100.0 | 100.0 | 100.0                | 0.0        | 0.0                   |
| 1"    | 97.0  | 100.0 | 100.0 | 98.3                 | 1.7        | 1.7                   |
| 3/4"  | 83.6  | 100.0 | 100.0 | 90.7                 | 7.6        | 9.3                   |
| 1/2"  | 47.2  | 96.3  | 100.0 | 69.9                 | 20.8       | 30.1                  |
| 3/8"  | 26.8  | 78.2  | 100.0 | 57.6                 | 12.2       | 42.4                  |
| #4    | 4.9   | 20.4  | 96.7  | 41.8                 | 15.8       | 58.2                  |
| #8    | 2.8   | 5.9   | 82.7  | 34.5                 | 7.3        | 65.5                  |
| #16   | 2.4   | 3.2   | 68.4  | 28.6                 | 6.0        | 71.4                  |
| #30   | 2.0   | 2.6   | 49.8  | 20.9                 | 7.6        | 79.1                  |
| #50   | 2.0   | 2.4   | 23.1  | 10.4                 | 10.6       | 89.6                  |
| #100  | 1.9   | 2.1   | 6.6   | 3.8                  | 6.6        | 96.2                  |
| LBW   | 1.3   | 1.4   | 1.4   | 1.3                  | 2.4        | 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.

Production Gradation  Batch Plant Gradations  Aggregate Supplier Gradations  Adjusted WF Initial Production Sample (IPS)

|                           |           |                            |           |                    |             |
|---------------------------|-----------|----------------------------|-----------|--------------------|-------------|
| <b>Coarseness Factor:</b> | <b>65</b> | <b>Workability Factor:</b> | <b>35</b> | <b>Adjusted WF</b> | <b>37.0</b> |
|---------------------------|-----------|----------------------------|-----------|--------------------|-------------|

|                            |           |
|----------------------------|-----------|
| <b>Coarseness Factor:</b>  | <b>62</b> |
| <b>Workability Factor:</b> | <b>36</b> |



| 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                  |

PREPARED BY:  
 SM, LLC Technical Service

Approved By:

# Aggregate Optimization Chart

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

Sample Date: 1/20/20

Concrete Grade: **DM**

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

Dates Test Represents: 1/21/2020 through 1/27/2020

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

| Agg. Class      | Pit # | Source       | Weight (SSD) | ft <sup>3</sup> | Specific Gravity | % Contribution |
|-----------------|-------|--------------|--------------|-----------------|------------------|----------------|
| 6AA             | 71-47 | Presque Isle | 1455         | 8.90            | 2.62             | 50.1           |
| 26A             | 71-47 | Presque Isle | 350          | 2.14            | 2.62             | 12.0           |
| 2NS             | 63-92 | Grange Hall  | 1100         | 6.65            | 2.65             | 37.9           |
| <b>Total Wt</b> |       |              | <b>2905</b>  | <b>17.69</b>    |                  | <b>100.0</b>   |

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



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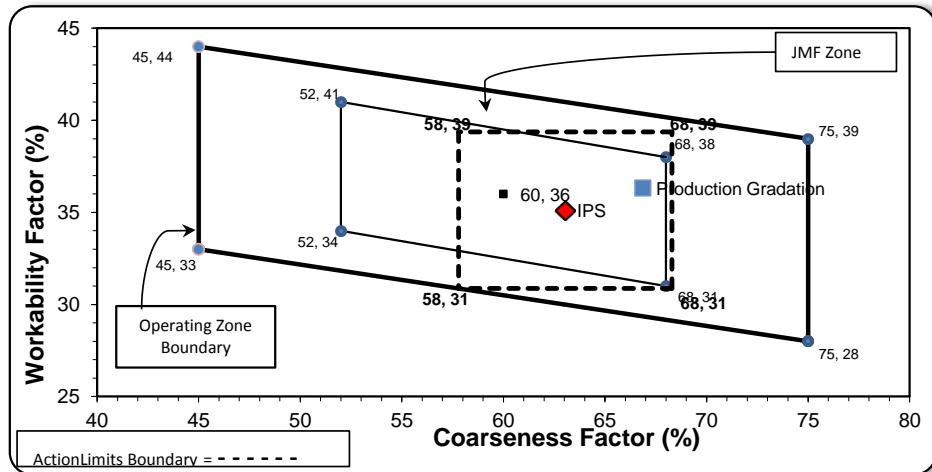
| Sieve | 6AA   | 26A   | 2NS   | Cumulative % Passing | % Retained | Cumulative % Retained |
|-------|-------|-------|-------|----------------------|------------|-----------------------|
| 2"    | 100.0 | 100.0 | 100.0 | 100.0                | 0.0        | 0.0                   |
| 1.5"  | 100.0 | 100.0 | 100.0 | 100.0                | 0.0        | 0.0                   |
| 1"    | 98.9  | 100.0 | 100.0 | 99.4                 | 0.6        | 0.6                   |
| 3/4"  | 78.4  | 100.0 | 100.0 | 89.2                 | 10.3       | 10.8                  |
| 1/2"  | 35.7  | 96.3  | 100.0 | 67.3                 | 21.8       | 32.7                  |
| 3/8"  | 16.9  | 78.2  | 100.0 | 55.8                 | 11.6       | 44.2                  |
| #4    | 2.5   | 20.4  | 97.5  | 40.6                 | 15.1       | 59.4                  |
| #8    | 2.0   | 5.9   | 84.8  | 33.8                 | 6.8        | 66.2                  |
| #16   | 1.6   | 3.2   | 69.9  | 27.7                 | 6.2        | 72.3                  |
| #30   | 1.5   | 2.6   | 51.7  | 20.6                 | 7.0        | 79.4                  |
| #50   | 1.5   | 2.4   | 23.2  | 9.8                  | 10.8       | 90.2                  |
| #100  | 1.4   | 2.1   | 4.3   | 2.6                  | 7.2        | 97.4                  |
| LBW   | 0.8   | 1.4   | 0.3   | 0.7                  | 1.9        | 99.3                  |

\*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  Adjusted WF Initial Production Sample (IPS)

|                           |           |                            |           |                    |             |
|---------------------------|-----------|----------------------------|-----------|--------------------|-------------|
| <b>Coarseness Factor:</b> | <b>67</b> | <b>Workability Factor:</b> | <b>34</b> | <b>Adjusted WF</b> | <b>36.3</b> |
|---------------------------|-----------|----------------------------|-----------|--------------------|-------------|

|                            |           |
|----------------------------|-----------|
| <b>Coarseness Factor:</b>  | <b>63</b> |
| <b>Workability Factor:</b> | <b>35</b> |



| Sieve | Cumulative % Passing | % Retained | Cumulative % Retained |
|-------|----------------------|------------|-----------------------|
| 2"    | 100.0                | 0.0        | 0.0                   |
| 1.5"  | 100.0                | 0.0        | 0.0                   |
| 1"    | 99.1                 | 0.9        | 0.9                   |
| 3/4"  | 90.3                 | 8.8        | 9.7                   |
| 1/2"  | 69.2                 | 21.1       | 30.8                  |
| 3/8"  | 59.1                 | 10.1       | 40.9                  |
| #4    | 41.8                 | 17.3       | 58.2                  |
| #8    | 35.1                 | 6.6        | 64.9                  |
| #16   | 28.5                 | 6.6        | 71.5                  |
| #30   | 21.2                 | 7.3        | 78.8                  |
| #50   | 8.7                  | 12.5       | 91.3                  |
| #100  | 1.8                  | 7.0        | 98.2                  |
| LBW   | 0.7                  | 1.0        | 99.3                  |

PREPARED BY:  
 SM, LLC Technical Service

Approved By:

# Aggregate Optimization Chart

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

Sample Date: 1/20/20

Concrete Grade: **DM**

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

Dates Test Represents: 1/21/2020 through 1/27/2020

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

| Agg. Class      | Pit # | Source       | Weight (SSD) | ft <sup>3</sup> | Specific Gravity | % Contribution |
|-----------------|-------|--------------|--------------|-----------------|------------------|----------------|
| 6AA             | 71-47 | Presque Isle | 1655         | 10.12           | 2.62             | 57.0           |
| 26A             | 71-47 | Presque Isle | 150          | 0.92            | 2.62             | 5.2            |
| 2NS             | 63-92 | Grange Hall  | 1100         | 6.65            | 2.65             | 37.9           |
| <b>Total Wt</b> |       |              | <b>2905</b>  | <b>17.69</b>    |                  | <b>100.0</b>   |

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



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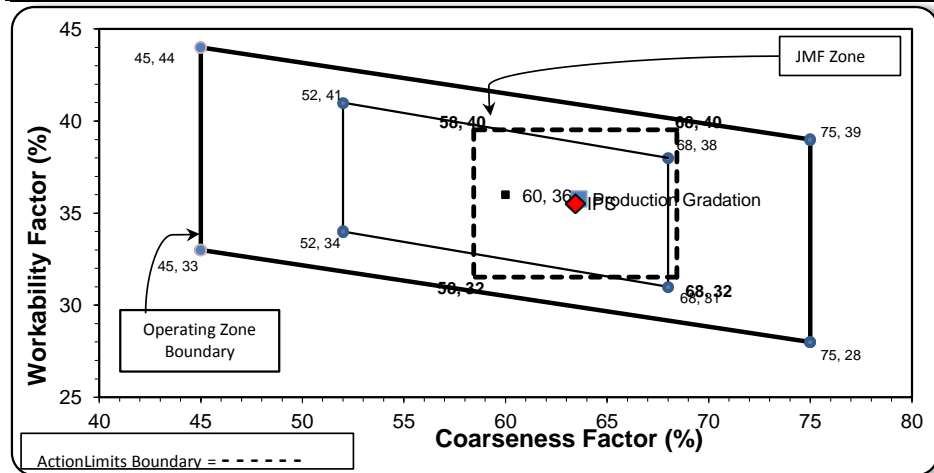
| Sieve | 6AA   | 26A   | 2NS   | Cumulative % Passing | % Retained | Cumulative % Retained |
|-------|-------|-------|-------|----------------------|------------|-----------------------|
| 2"    | 100.0 | 100.0 | 100.0 | 100.0                | 0.0        | 0.0                   |
| 1.5"  | 100.0 | 100.0 | 100.0 | 100.0                | 0.0        | 0.0                   |
| 1"    | 100.0 | 100.0 | 100.0 | 100.0                | 0.0        | 0.0                   |
| 3/4"  | 89.4  | 100.0 | 100.0 | 94.0                 | 6.0        | 6.0                   |
| 1/2"  | 46.5  | 96.7  | 100.0 | 69.4                 | 24.6       | 30.6                  |
| 3/8"  | 26.6  | 87.8  | 100.0 | 57.6                 | 11.8       | 42.4                  |
| #4    | 2.9   | 18.8  | 97.5  | 39.5                 | 18.0       | 60.5                  |
| #8    | 1.5   | 6.0   | 84.8  | 33.3                 | 6.3        | 66.7                  |
| #16   | 1.3   | 3.0   | 69.9  | 27.4                 | 5.9        | 72.6                  |
| #30   | 1.3   | 2.3   | 51.7  | 20.4                 | 6.9        | 79.6                  |
| #50   | 1.2   | 2.1   | 23.2  | 9.6                  | 10.9       | 90.4                  |
| #100  | 1.2   | 2.0   | 4.3   | 2.4                  | 7.2        | 97.6                  |
| LBW   | 1.1   | 1.8   | 0.3   | 0.8                  | 1.6        | 99.2                  |

\*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  Adjusted WF Initial Production Sample (IPS)

|                           |           |                            |           |                    |             |
|---------------------------|-----------|----------------------------|-----------|--------------------|-------------|
| <b>Coarseness Factor:</b> | <b>64</b> | <b>Workability Factor:</b> | <b>33</b> | <b>Adjusted WF</b> | <b>35.8</b> |
|---------------------------|-----------|----------------------------|-----------|--------------------|-------------|

|                            |           |
|----------------------------|-----------|
| <b>Coarseness Factor:</b>  | <b>63</b> |
| <b>Workability Factor:</b> | <b>36</b> |



| 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"  | 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

Approved By:

# Aggregate Optimization Chart

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

Sample Date: 1/20/20

Concrete Grade: **DM**

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

Dates Test Represents: 1/21/2020 through 1/27/2020

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

| Agg. Class      | Pit #  | Source       | Weight (SSD) | ft <sup>3</sup> | Specific Gravity | % Contribution |
|-----------------|--------|--------------|--------------|-----------------|------------------|----------------|
| 6AA             | 71-47  | Presque Isle | 1500         | 9.17            | 2.62             | 51.6           |
| 26A             | 71-47  | Presque Isle | 275          | 1.68            | 2.62             | 9.5            |
| 2NS             | 63-115 | Ray Rd       | 1130         | 6.83            | 2.65             | 38.9           |
| <b>Total Wt</b> |        |              | <b>2905</b>  | <b>17.69</b>    |                  | <b>100.0</b>   |

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



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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"    | 98.9  | 100.0 | 100.0 | 99.4                 | 0.6        | 0.6                   |
| 3/4"  | 78.4  | 100.0 | 100.0 | 88.8                 | 10.6       | 11.2                  |
| 1/2"  | 35.7  | 96.3  | 100.0 | 66.4                 | 22.4       | 33.6                  |
| 3/8"  | 16.9  | 78.2  | 100.0 | 55.0                 | 11.4       | 45.0                  |
| #4    | 2.5   | 20.4  | 96.2  | 40.6                 | 14.4       | 59.4                  |
| #8    | 2.0   | 5.9   | 78.4  | 32.1                 | 8.6        | 67.9                  |
| #16   | 1.6   | 3.2   | 62.1  | 25.3                 | 6.8        | 74.7                  |
| #30   | 1.5   | 2.6   | 47.3  | 19.4                 | 5.9        | 80.6                  |
| #50   | 1.5   | 2.4   | 25.4  | 10.9                 | 8.5        | 89.1                  |
| #100  | 1.4   | 2.1   | 5.8   | 3.2                  | 7.7        | 96.8                  |
| LBW   | 0.8   | 1.4   | 1.1   | 1.0                  | 2.2        | 99.0                  |

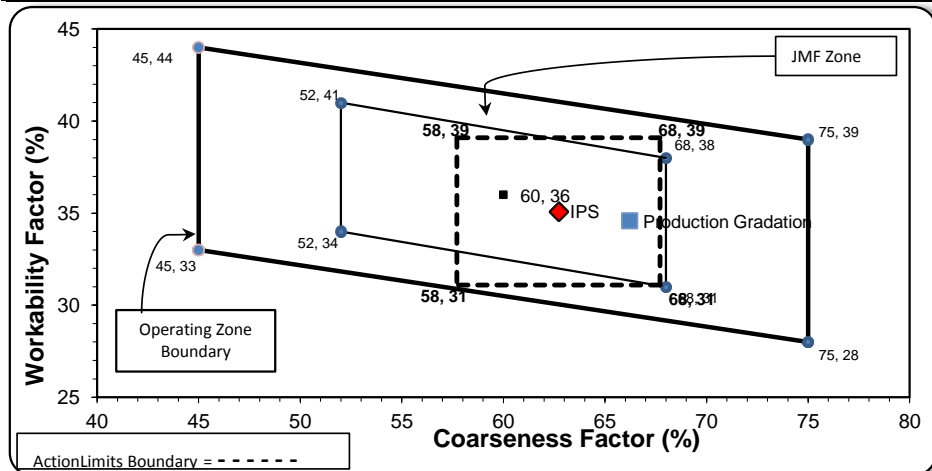
\*Maximum % Retained must be above the 3/8" sieve.  
 \*Any two adjacent sieves must equal 10% except max., nom. max., #100 and #200 sieves.  
 \*% Retained must be at least 4% for each sieve except max., nom. max., #100 and #200 sieves.  
 \*% Retained must be at least 8% for the 1" sieve when a 2"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

Production Gradation  Batch Plant Gradations  Aggregate Supplier Gradations

Adjusted WF Initial Production Sample (IPS)

|                           |           |                            |           |
|---------------------------|-----------|----------------------------|-----------|
| <b>Coarseness Factor:</b> | <b>66</b> | <b>Workability Factor:</b> | <b>32</b> |
|---------------------------|-----------|----------------------------|-----------|

|                            |           |
|----------------------------|-----------|
| <b>Coarseness Factor:</b>  | <b>63</b> |
| <b>Workability Factor:</b> | <b>35</b> |



| 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: