

AGGREGATE TECHNICIAN HANDOUTS



AGGREGATE GRADATION **SPECIFICATIONS - 2018**

Coarse Aggregate	Agg Manual Pg. 1 – 23 Spec Book Pg. 800, Table 703.4 C. Agg. } MP 601.03.51 Minus No. 200 in Conc. Agg. Spec Book Pg. 799, 703.4
Fine Aggregate	Agg Manual Pg. 1 – 25 Spec Book Pg. 795, 702.6 F. Agg. } MP 601.03.51 Minus No. 200 in Conc. Agg. Spec Book Pg. 794, 702.1.2
Combination	Agg Manual Pg. 1 – 24 Spec Book Pg. 802, Table 704.6.2

Aggregate in the 2017 Spec Book

207	Excavation and Embankment (pg. 112)	412	Winter Grade Asphalt Patching Material (pg. 213)
211	Borrow Excavation (pg. 128)	501	Portland Cement Concrete Pavement (pg. 219)
212	Structure, Rock, and Wet Excavation (Select Materials) pg. 133		
217	Special Rock Fill (pg. 140)	507	Crack and Pothole Repair (pg. 263)
218	Slope and Foundation Protection (pg. 141)	601	Structural Concrete (pg. 297)
307	Crushed Aggregate Base Course (p. 153)	603	Prestressed Concrete Members (pg. 340)
311	Open Graded Free Draining Base Course (pg. 159)	604	Pipe Culverts (pg. 365)
		606	Underdrains (pg. 383)
401	Hot Mix, Asphalt Wearing and Patching, and Leveling (pg. 163)	626	Retaining Wall Systems (pg. 511)
402	Asphalt Skid-Resistant Pavement (pg. 181)	636	Maintaining Traffic (pg. 540)
405	Surface Treatments (pg. 283)	702	Fine Aggregate (pg. 794)
		703	Coarse Aggregate (pg. 796)
		704	Stone and Crushed Aggregate (pg. 801)

Sampling from a Conveyor Belt

- Suppose the random number chosen to locate the Sampling Unit was .886
 $.886 \times 240 \text{ minutes} = 212.6 = 213 \text{ minutes}$
- Next convert 213 minutes to hours ($213 / 60 = 3 \text{ hours } 33 \text{ minutes}$)

Sampling From a Conveyor Belt Using a Calculator

- $213 / 60 = 3.55 \text{ hours}$
NOT 3 HOURS 55 MINUTES!
- .55 hour must then be multiplied by 60 minutes in one hour to obtain the number of minutes in excess of 3 hours
- $.55 \text{ hour} \times 60 \text{ minutes in one hour} = 33 \text{ minutes}$
- This gives you the correct answer of 3 hours and 33 minutes added to the starting time of production.

EXAMPLE:

8:00 AM + 3 hour and 33 minutes = 11:33 AM

Moisture Problem

10,000 TONS Class 1

6% Moisture

$$W_A = (1 + 0.06) = 10,000 \text{ TN}$$

$$W_A = 10,000 / 1.06$$

$$W_A = 9,434 \text{ TN}$$

$$W_w = 10,000 - 9434 = 566 \text{ TN}$$

$$\text{Class 1} = \$30.00 / \text{TN}$$

$$566 \text{ TN} \times \$30.00 =$$

\$16,980.00 For Water

(W_A is the weight of aggregate)

(W_w is the weight of water)

WEST VIRGINIA DIVISION OF HIGHWAYS

SIEVE ANALYSIS OF FINE AND COARSE AGGREGATE (AASHTO T-27)

MATERIALS FINER THAN No. 200 SIEVE BY WASHING (AASHTO T-11)

Site Manager I.D.#: _____ Lab Reference Number: _____ Technician: _____ Producer / Supplier Code: _____ Producer / Supplier Name: _____ Site Manager Material Code: _____ Date Sampled: _____ Date Tested: _____	Aggregate Size: Manufactured Sand Sieve Type Coarse: _____ Sieve Type Fine: _____ Material Type: _____ Contract #: _____ Project #: _____ Auth #: _____ Item #: _____ Tons / CY: _____	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Spec Sieve Sizes</th> <th>% Pass</th> <th>Pass / Fail</th> </tr> </thead> <tbody> <tr> <td>3/8 in.(9.5mm)</td> <td>100</td> <td>Pass</td> </tr> <tr> <td>No. 4 (4.75mm)</td> <td>100</td> <td>Pass</td> </tr> <tr> <td>No. 16 (1.18mm)</td> <td>83</td> <td>Fail</td> </tr> <tr> <td>No. 50 (300µm)</td> <td>53</td> <td>Fail</td> </tr> <tr> <td>No. 100 (150µm)</td> <td>23</td> <td>Fail</td> </tr> <tr> <td>No. 200 (75µm)</td> <td>2.6</td> <td>Pass</td> </tr> <tr> <td></td> <td style="text-align: center;">19</td> <td style="text-align: center;">20</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Spec Sieve Sizes	% Pass	Pass / Fail	3/8 in.(9.5mm)	100	Pass	No. 4 (4.75mm)	100	Pass	No. 16 (1.18mm)	83	Fail	No. 50 (300µm)	53	Fail	No. 100 (150µm)	23	Fail	No. 200 (75µm)	2.6	Pass		19	20						
Spec Sieve Sizes	% Pass	Pass / Fail																														
3/8 in.(9.5mm)	100	Pass																														
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No. 100 (150µm)	23	Fail																														
No. 200 (75µm)	2.6	Pass																														
	19	20																														

- | | | |
|--|-----|---------|
| (A) Initial Oven Dry Mass of Total Sample..... | (A) | |
| (B) Oven Dry mass of Total Sample After T-11..... | (B) | |
| (C) Oven Dry Mass of Plus No. 4 Material..... | (C) | |
| (D) Oven Dry Mass of Plus No. 4 Material After T-11..... | (D) | |
| (E) Oven Dry Mass of Minus No. 4 Material Used in Split..... | (E) | |
| (F) Combination Gradation Coarse Fraction Pan Material After Dry Sieving (K)..... | (F) | |
| (G) Total Oven Dry Mass of Minus No. 4 Material (E+F)..... | (G) | |
| (H) Initial Oven Dry Mass of Total Fine Sample or Mass of Minus No. 4 Material..... | (H) | 2 340.8 |
| (I) Oven Dry Mass of Total Fine Sample or Mass of Minus No. 4 Material After T-11..... | (I) | 3 335.5 |

Sieve Analysis of Coarse Aggregate

Sieve Size	Mass Retained M_R		Over Loading	% Retained $(M_R/A) \times 100$	Percent Passing	Reported Percent Passing	Material Specifications	
	Regular	Combination					Low	High

- | | | | | |
|----------------------------------|--|--|--|-------------------|
| (J) Pan | | | | C. F. = (G) ÷ (P) |
| (K) Combination Grad. Pan | | | | C. F. = ÷ |
| (L) Loss By T-11..... | | | | C. F. = |
| (M) Final Total (ΣM_R) | | | | |

Sieve Analysis of Fine Aggregate

Sieve Size	Mass Retained M_R		Over Loading	% Retained $(M_R/(H+R)) \times 100$	Percent Passing	Reported Percent Passing	Material Specifications	
	Regular	Combination					Low	High
1 3/8 in.(9.5mm)	4 0.0		8 ok	13 0.0	99.95	17 100	100	18 100
No. 4 (4.75mm)	0.0		ok	0.0	99.95	100	95	100
No. 8 (2.36mm)	10.7		ok	3.1	96.85	97		
No. 16 (1.18mm)	47.7		ok	14.0	82.85	83	45	80
No. 30 (600µm)	47.5		ok	13.9	68.95	69		
No. 50 (300µm)	55.1		ok	16.2	52.75	53	10	30
No. 100 (150µm)	102.8		ok	30.2	22.55	23	2	10
No. 200 (75µm)	68.0		ok	20.0	2.55	2.6	0	5

- | | | | | | | | |
|--|---------------------|-----|----|--|--|--------------------|-------------------------------|
| (N) Pan..... | 3.4 | 5 | | | Coarse - No. 200 Dry | Fine - No. 200 Dry | 6 3.4 |
| (O) Loss By T-11..... (H - | 5.3 | 7 | | | Coarse - No. 200 Wet | Fine - No. 200 Wet | 9 5.3 |
| (P) Final Total Fine Sample (ΣM_R)..... | 10 340.5 | | | | Total - No. 200 | 14 8.7 | ÷ Init. Mass (A) or (H) 340.8 |
| (Q) Final Total - No. 4 (ΣM_R)..... | | | | | x 100 = | 2.55281 | 15 % |
| (R) Combined Total (M+Q)..... | | | | | DO NOT ROUND!!! | | |
| (S) Sample Loss or Gain | (A-M) or (M-A)..... | | | | <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> Name: _____

 Signature: _____

 Date: _____ </div> | | |
| | (H-P) or (P-H)..... | 0.3 | 11 | | | | |
| | (A-R) or (R-A)..... | | | | | | |
| (T) Percentage of Initial OD Mass ((S/A)x100) or ((S/H)x100) | | 0.1 | 12 | | | | |

Remarks:	Lab Info Only: ☐

WEST VIRGINIA DIVISION OF HIGHWAYS

SIEVE ANALYSIS OF FINE AND COARSE AGGREGATE (AASHTO T-27)

MATERIALS FINER THAN No. 200 SIEVE BY WASHING (AASHTO T-11)

Site Manager I.D.#: _____ Lab Reference Number: _____ Technician: _____ Producer / Supplier Code: _____ Producer / Supplier Name: _____ Site Manager Material Code: _____ Date Sampled: _____ Date Tested: _____	Aggregate Size: _____ Sieve Type Coarse: _____ Sieve Type Fine: _____ Material Type: _____ Contract #: _____ Project #: _____ Auth #: _____ Item #: _____ Tons / CY: _____	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Spec Sieve Sizes</th> <th>% Pass</th> <th>Pass / Fail</th> </tr> </thead> <tbody> <tr> <td>1 1/2 in. (37.5mm)</td> <td>100</td> <td>Pass</td> </tr> <tr> <td>1 in. (25.0mm)</td> <td>99</td> <td>Pass</td> </tr> <tr> <td>1/2 in. (12.5mm)</td> <td>40</td> <td>Pass</td> </tr> <tr> <td>No. 4 (4.75mm)</td> <td>3</td> <td>Pass</td> </tr> <tr> <td>No. 8 (2.36mm)</td> <td>2</td> <td>Pass</td> </tr> <tr> <td>No. 200 (75µm)</td> <td>1.5</td> <td>Pass</td> </tr> <tr> <td></td> <td>20</td> <td>21</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Spec Sieve Sizes	% Pass	Pass / Fail	1 1/2 in. (37.5mm)	100	Pass	1 in. (25.0mm)	99	Pass	1/2 in. (12.5mm)	40	Pass	No. 4 (4.75mm)	3	Pass	No. 8 (2.36mm)	2	Pass	No. 200 (75µm)	1.5	Pass		20	21						
Spec Sieve Sizes	% Pass	Pass / Fail																														
1 1/2 in. (37.5mm)	100	Pass																														
1 in. (25.0mm)	99	Pass																														
1/2 in. (12.5mm)	40	Pass																														
No. 4 (4.75mm)	3	Pass																														
No. 8 (2.36mm)	2	Pass																														
No. 200 (75µm)	1.5	Pass																														
	20	21																														

- (A) Initial Oven Dry Mass of Total Sample (A) **2** 10336.2
- (B) Oven Dry mass of Total Sample After T-11 (B) **3** 10219.5
- (C) Oven Dry Mass of Plus No. 4 Material (C) _____
- (D) Oven Dry Mass of Plus No. 4 Material After T-11 (D) _____
- (E) Oven Dry Mass of Minus No. 4 Material Used in Split (E) _____
- (F) Combination Gradation Coarse Fraction Pan Material After Dry Sieving (K) (F) _____
- (G) Total Oven Dry Mass of Minus No. 4 Material (E+F) (G) _____
- (H) Initial Oven Dry Mass of Total Fine Sample or Mass of Minus No. 4 Material (H) _____
- (I) Oven Dry Mass of Total Fine Sample or Mass of Minus No. 4 Material After T-11 (I) _____

Sieve Analysis of Coarse Aggregate

Sieve Size	Mass Retained M_R		Over Loading	% Retained $(M_R/A) \times 100$	Percent Passing	Reported Percent Passing	Material Specifications	
	Regular	Combination					Low	High
1 1 1/2 in. (37.5mm)	6 0.0		ok	14 0.0	99.99	18 100	100	19 100
1 in. (25.0mm)	61.4		ok	0.6	99.39	99	95	100
3/4 in. (19.0 mm)	2104.7		ok	20.4	78.99	79		
1/2 in. (12.5mm)	4013.2		ok	38.8	40.19	40	25	60
3/8 in. (9.5mm)	2270.6		ok	22.0	18.19	18		
No. 4 (4.75mm)	1564.4		ok	15.1	3.09	3	0	10
No. 8 (2.36mm)	64.5		ok	0.6	2.49	2	0	5
No. 200 (75µm)	7 101.9		ok	ad 1.0	1.49	1.5	0	1.5
(J) Pan	8 37.4		ok					
(K) Combination Grad. Pan								
(L) Loss By T-11	4 116.7							
(M) Final Total (ΣM_R)	11 10,334.8							

C. F. = **17** Truncate to 2 Places
 C. F. =
 C. F. =

Sieve Analysis of Fine Aggregate

Sieve Size	Mass Retained M_R		Over Loading	% Retained $(M_R/(H+R)) \times 100$	Percent Passing	Reported Percent Passing	Material Specifications	
	Regular	Combination					Low	High
(N) Pan								
(O) Loss By T-11				Coarse - No. 200 Dry 10 37.4	Fine - No. 200 Dry			
(P) Final Total Fine Sample (ΣM_R)				Coarse - No. 200 Wet 5 116.7	Fine - No. 200 Wet			
(Q) Final Total - No. 4 (ΣM_R)				Total - No. 200 15 154.1	÷ Init. Mass (A) or (H)		10336.2	
(R) Combined Total (M+Q)				x 100 = 16 1.49087	%			
(S) Sample Loss or Gain	(A-M) or (M-A)	1.4 12						
	(H-P) or (P-H)							
	(A-R) or (R-A)							
(T) Percentage of Initial OD Mass ((S/A)x100) or ((S/H)x100)		0.0 13						

DO NOT ROUND!!!

Name:	
Signature:	
Date:	

Remarks:	Lab Info Only: ☐

WEST VIRGINIA DIVISION OF HIGHWAYS

SIEVE ANALYSIS OF FINE AND COARSE AGGREGATE (AASHTO T-27)

MATERIALS FINER THAN No. 200 SIEVE BY WASHING (AASHTO T-11)

Site Manager I.D.#: _____ Lab Reference Number: _____ Technician: _____ Producer / Supplier Code: _____ Producer / Supplier Name: _____ Site Manager Material Code: _____ Date Sampled: _____ Date Tested: _____	Aggregate Size: Class 1 Sieve Type Coarse: 12 Inch Sieve Type Fine: 12 Inch Material Type: Lime Stone	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>Spec Sieve Sizes</th> <th>% Pass</th> <th>Pass /Fail</th> </tr> <tr> <td>1 1/2 in. (37.5mm)</td> <td>100</td> <td>Pass</td> </tr> <tr> <td>3/4 in. (19.0mm)</td> <td>80</td> <td>Pass</td> </tr> <tr> <td>No. 4 (4.75mm)</td> <td>34</td> <td>Pass</td> </tr> <tr> <td>No. 40 (425µm)</td> <td>11</td> <td>Pass</td> </tr> <tr> <td>No. 200 (75µm)</td> <td>7.2</td> <td>Fail</td> </tr> <tr> <td></td> <td>(37)</td> <td>(38)</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </table>	Spec Sieve Sizes	% Pass	Pass /Fail	1 1/2 in. (37.5mm)	100	Pass	3/4 in. (19.0mm)	80	Pass	No. 4 (4.75mm)	34	Pass	No. 40 (425µm)	11	Pass	No. 200 (75µm)	7.2	Fail		(37)	(38)						
Spec Sieve Sizes	% Pass	Pass /Fail																											
1 1/2 in. (37.5mm)	100	Pass																											
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No. 40 (425µm)	11	Pass																											
No. 200 (75µm)	7.2	Fail																											
	(37)	(38)																											
	Contract #: _____ Project #: _____ Auth #: _____ Item #: _____ Tons / CY _____																												

- | | | |
|--|-----|-------------|
| (A) Initial Oven Dry Mass of Total Sample..... | (A) | (3) 10804.0 |
| (B) Oven Dry mass of Total Sample After T-11..... | (B) | |
| (C) Oven Dry Mass of Plus No. 4 Material..... | (C) | (4) 7330.0 |
| (D) Oven Dry Mass of Plus No. 4 Material After T-11..... | (D) | (7) 7272.0 |
| (E) Oven Dry Mass of Minus No. 4 Material Used in Split..... | (E) | (5) 3483.0 |
| (F) Combination Gradation Coarse Fraction Pan Material After Dry Sieving (K)..... | (F) | (14) 77.0 |
| (G) Total Oven Dry Mass of Minus No. 4 Material (E+F)..... | (G) | (15) 3560.0 |
| (H) Initial Oven Dry Mass of Total Fine Sample or Mass of Minus No. 4 Material..... | (H) | (6) 320.6 |
| (I) Oven Dry Mass of Total Fine Sample or Mass of Minus No. 4 Material After T-11..... | (I) | (9) 259.3 |

Sieve Analysis of Coarse Aggregate

Sieve Size	Mass Retained M _R		Over Loading	% Retained (M _R /A)x100	Percent Passing	Reported Percent Passing	Material Specifications	
	Regular	Combination					Low	High
1 1/2 in. (37.5mm)		(11) 0.0	(12) ok	(27) 0.0	100.10	(35) 100	(36) 100	
1 in. (25.0mm)		559.0	ok	5.2	94.90	95		
3/4 in. (19.0mm)		1,602.0	ok	14.8	80.10	80	50	90
1/2 in. (12.5mm)		2,488.0	ok	23.0	57.10	57		
3/8 in. (9.5mm)		1,059.0	ok	9.8	47.30	47		
No. 4 (4.75mm)		1,486.0	ok	13.8	33.50	34	20	50
(J) Pan								
(K) Combination Grad. Pan		(13) 77.0						
(L) Loss By T-11.....		(8) 58						
(M) Final Total (Σ M _R)		7,252.0						

C. F. = (G) ÷ (P)

C. F. = (19) 3,560.0 ÷ (20) 320.4

C. F. = (23) 11.1111 (Rounded @ 4 Places)

Sieve Analysis of Fine Aggregate

Sieve Size	Mass Retained M _R		Over Loading	% Retained (M _R /H _{or} A)x100	Percent Passing	Reported Percent Passing	Material Specifications	
	Regular	Combination					Low	High
No. 8 (2.36mm)	(16) 101.7	(17) 1130.0	ok	10.5	23.00	23		
No. 16 (1.18mm)	75.6	840.0	ok	7.8	15.20	15		
No. 40 (425µm)	37.2	413.3	ok	3.8	11.40	11	5	20
No. 50 (300µm)	9.9	110.0	ok	1.0	10.40	10		
No. 100 (150µm)	17.0	188.9	ok	1.7	8.70	9		
No. 200 (75µm)	14.2	157.8	ok	1.5	7.20	(34) 7.2	0	7
(N) Pan.....	3.5	38.9						
(O) Loss By T-11.....	(10) 61.3	681.1	Coarse - No. 200 Dry		Fine - No. 200 Dry	(29) 38.9		
(P) Final Total Fine Sample (Σ M _R).....	(18) 320.4		Coarse - No. 200 Wet	(28) 58.0	Fine - No. 200 Wet	(30) 681.1		
(Q) Final Total - No. 4 (Σ M _R).....		(23) 3560.0	Total - No. 200	(31) 778.0	÷ Init. Mass (A) or (H)	(32) 10804.0		
(R) Combined Total (M+Q).....		(24) 10812.0			x 100 =	(33) 7.20103	%	
(S) Sample Loss or Gain	(A-M) or (M-A).....							
	(H-P) or (P-H).....							
	(A-R) or (R-A).....	(25) 8.0						
(T) Percentage of Initial OD Mass ((S/A)x100) or ((S/H)x100)		(26) 0.1						

(Truncate @ 5 Places)

Name: _____

 Signature: _____

 Date: _____

Remarks:	Fail	Lab Info Only: ☐	

WEST VIRGINIA DIVISION OF HIGHWAYS
SIEVE ANALYSIS OF FINE AND COARSE AGGREGATE (AASHTO T-27)
MATERIALS FINER THAN No. 200 SIEVE BY WASHING (AASHTO T-11)

Site Manager I.D.#: _____ Lab Reference Number: _____ Technician: _____ Producer / Supplier Code: _____ Producer / Supplier Name: _____ Site Manager Material Code: _____ Date Sampled: _____ Date Tested: _____	Aggregate Size: Manufactured Sand Sieve Type Coarse: _____ Sieve Type Fine: _____ Material Type: _____ Contract #: _____ Project #: _____ Auth #: _____ Item #: _____ Tons / CY: _____	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">Spec Sieve Sizes</th> <th style="text-align: center;">% Pass</th> <th style="text-align: center;">Pass /Fail</th> </tr> <tr> <td>3/8 in.(9.5mm)</td> <td style="text-align: center;">100</td> <td style="text-align: center;">Pass</td> </tr> <tr> <td>No. 4 (4.75mm)</td> <td style="text-align: center;">100</td> <td style="text-align: center;">Pass</td> </tr> <tr> <td>No. 16 (1.18mm)</td> <td style="text-align: center;">83</td> <td style="text-align: center;">Fail</td> </tr> <tr> <td>No. 50 (300µm)</td> <td style="text-align: center;">53</td> <td style="text-align: center;">Fail</td> </tr> <tr> <td>No. 100 (150µm)</td> <td style="text-align: center;">23</td> <td style="text-align: center;">Fail</td> </tr> <tr> <td>No. 200 (75µm)</td> <td style="text-align: center;">2.6</td> <td style="text-align: center;">Pass</td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </table>	Spec Sieve Sizes	% Pass	Pass /Fail	3/8 in.(9.5mm)	100	Pass	No. 4 (4.75mm)	100	Pass	No. 16 (1.18mm)	83	Fail	No. 50 (300µm)	53	Fail	No. 100 (150µm)	23	Fail	No. 200 (75µm)	2.6	Pass						
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- | | | |
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| (A) Initial Oven Dry Mass of Total Sample..... | (A) | |
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| (F) Combination Gradation Coarse Fraction Pan Material After Dry Sieving (K)..... | (F) | |
| (G) Total Oven Dry Mass of Minus No. 4 Material (E+F)..... | (G) | |
| (H) Initial Oven Dry Mass of Total Fine Sample or Mass of Minus No. 4 Material..... | (H) | 340.8 |
| (I) Oven Dry Mass of Total Fine Sample or Mass of Minus No. 4 Material After T-11..... | (I) | 335.5 |

Sieve Analysis of Coarse Aggregate

Sieve Size	Mass Retained M _R		Over Loading	% Retained (M _R /A)x100	Percent Passing	Reported Percent Passing	Material Specifications	
	Regular	Combination					Low	High

(J) Pan			
(K) Combination Grad. Pan		C. F. = (G) ÷	(P)
(L) Loss By T-11.....		C. F. =	340.5
(M) Final Total (Σ M _R)		C. F. =	

Sieve Analysis of Fine Aggregate

Sieve Size	Mass Retained M _R		Over Loading	% Retained (M _R /(H+R))x100	Percent Passing	Reported Percent Passing	Material Specifications	
	Regular	Combination					Low	High
3/8 in.(9.5mm)	0.0		ok	0.0	99.95	100	100	100
No. 4 (4.75mm)	0.0		ok	0.0	99.95	100	95	100
No. 8 (2.36mm)	10.7		ok	3.1	96.85	97		
No. 16 (1.18mm)	47.7		ok	14.0	82.85	83	45	80
No. 30 (600µm)	47.5		ok	13.9	68.95	69		
No. 50 (300µm)	55.1		ok	16.2	52.75	53	10	30
No. 100 (150µm)	102.8		ok	30.2	22.55	23	2	10
No. 200 (75µm)	68.0		ok	20.0	2.55	2.6	0	5

(N) Pan.....	3.4		
(O) Loss By T-11..... (H -	5.3	Coarse - No. 200 Dry	Fine - No. 200 Dry
(P) Final Total Fine Sample (Σ M _R).....	340.5	Coarse - No. 200 Wet	Fine - No. 200 Wet
(Q) Final Total - No. 4 (Σ M _R).....		Total - No. 200	8.7 ÷ Init. Mass (A) or (H)
(R) Combined Total (M+Q).....		x 100 =	2.55281 %
(S) Sample Loss or Gain	(A-M) or (M-A).....	DO NOT ROUND!!!	
	(H-P) or (P-H).....	Name: _____ Signature: _____ Date: _____	
	(A-R) or (R-A).....		
(T) Percentage of Initial OD Mass ((S/A)x100) or ((S/H)x100)	0.1		

Remarks:	Lab Info Only: ☐

WEST VIRGINIA DIVISION OF HIGHWAYS

SIEVE ANALYSIS OF FINE AND COARSE AGGREGATE (AASHTO T-27)

MATERIALS FINER THAN No. 200 SIEVE BY WASHING (AASHTO T-11)

Site Manager I.D.#: _____ Lab Reference Number: _____ Technician: _____ Producer / Supplier Code: _____ Producer / Supplier Name: _____ Site Manager Material Code: _____ Date Sampled: _____ Date Tested: _____	Aggregate Size: _____ Sieve Type Coarse: _____ Sieve Type Fine: _____ Material Type: _____ Contract #: _____ Project #: _____ Auth #: _____ Item #: _____ Tons / CY: _____	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Spec Sieve Sizes</th> <th style="text-align: center;">% Pass</th> <th style="text-align: center;">Pass / Fail</th> </tr> </thead> <tbody> <tr> <td>1 1/2 in. (37.5mm)</td> <td style="text-align: center;">100</td> <td style="text-align: center;">Pass</td> </tr> <tr> <td>1 in. (25.0mm)</td> <td style="text-align: center;">99</td> <td style="text-align: center;">Pass</td> </tr> <tr> <td>1/2 in. (12.5mm)</td> <td style="text-align: center;">40</td> <td style="text-align: center;">Pass</td> </tr> <tr> <td>No. 4 (4.75mm)</td> <td style="text-align: center;">3</td> <td style="text-align: center;">Pass</td> </tr> <tr> <td>No. 8 (2.36mm)</td> <td style="text-align: center;">2</td> <td style="text-align: center;">Pass</td> </tr> <tr> <td>No. 200 (75µm)</td> <td style="text-align: center;">1.5</td> <td style="text-align: center;">Pass</td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Spec Sieve Sizes	% Pass	Pass / Fail	1 1/2 in. (37.5mm)	100	Pass	1 in. (25.0mm)	99	Pass	1/2 in. (12.5mm)	40	Pass	No. 4 (4.75mm)	3	Pass	No. 8 (2.36mm)	2	Pass	No. 200 (75µm)	1.5	Pass						
Spec Sieve Sizes	% Pass	Pass / Fail																											
1 1/2 in. (37.5mm)	100	Pass																											
1 in. (25.0mm)	99	Pass																											
1/2 in. (12.5mm)	40	Pass																											
No. 4 (4.75mm)	3	Pass																											
No. 8 (2.36mm)	2	Pass																											
No. 200 (75µm)	1.5	Pass																											

- | | | |
|--|-----|---------|
| (A) Initial Oven Dry Mass of Total Sample..... | (A) | 10336.2 |
| (B) Oven Dry mass of Total Sample After T-11..... | (B) | 10219.5 |
| (C) Oven Dry Mass of Plus No. 4 Material..... | (C) | |
| (D) Oven Dry Mass of Plus No. 4 Material After T-11..... | (D) | |
| (E) Oven Dry Mass of Minus No. 4 Material Used in Split..... | (E) | |
| (F) Combination Gradation Coarse Fraction Pan Material After Dry Sieving (K)..... | (F) | |
| (G) Total Oven Dry Mass of Minus No. 4 Material (E+F)..... | (G) | |
| (H) Initial Oven Dry Mass of Total Fine Sample or Mass of Minus No. 4 Material..... | (H) | |
| (I) Oven Dry Mass of Total Fine Sample or Mass of Minus No. 4 Material After T-11..... | (I) | |

Sieve Analysis of Coarse Aggregate

Sieve Size	Mass Retained M _R		Over Loading	% Retained (M _R /A)x100	Percent Passing	Reported Percent Passing	Material Specifications	
	Regular	Combination					Low	High
1 1/2 in. (37.5mm)	0.0		ok	0.0	99.99	100	100	100
1 in. (25.0mm)	61.4		ok	0.6	99.39	99	95	100
3/4 in. (19.0 mm)	2104.7		ok	20.4	78.99	79		
1/2 in. (12.5mm)	4013.2		ok	38.8	40.19	40	25	60
3/8 in. (9.5mm)	2270.6		ok	22.0	18.19	18		
No. 4 (4.75mm)	1564.4		ok	15.1	3.09	3	0	10
No. 8 (2.36mm)	64.5		ok	0.6	2.49	2	0	5
No. 200 (75µm)	101.9		ok	1.0	1.49	1.5	0	1.5
(J) Pan	37.4		ok					
(K) Combination Grad. Pan								
(L) Loss By T-11.....	116.7							
(M) Final Total (Σ M _R)	10,334.8							

C. F. = (G) ÷ (P)
 C. F. = ÷
 C. F. = ÷

Sieve Analysis of Fine Aggregate

Sieve Size	Mass Retained M _R		Over Loading	% Retained (M _R /(H+R)) x100	Percent Passing	Reported Percent Passing	Material Specifications	
	Regular	Combination					Low	High
(N) Pan.....								
(O) Loss By T-11..... (H -				Coarse - No. 200 Dry	37.4	Fine - No. 200 Dry		
(P) Final Total Fine Sample (Σ M _R).....				Coarse - No. 200 Wet	116.7	Fine - No. 200 Wet		
(Q) Final Total - No. 4 (Σ M _R).....				Total - No. 200	154.1	÷ Init. Mass (A) or (H)	10336.2	
(R) Combined Total (M+Q).....				x 100 =	1.49087	%		
(S) Sample Loss or Gain	(A-M) or (M-A).....	1.4				DO NOT ROUND!!!		
	(H-P) or (P-H).....							
	(A-R) or (R-A).....							
(T) Percentage of Initial OD Mass ((S/A)x100) or ((S/H)x100)		0.0						

Name:	
Signature:	
Date:	

Remarks:	Lab Info Only: ☐

WEST VIRGINIA DIVISION OF HIGHWAYS

SIEVE ANALYSIS OF FINE AND COARSE AGGREGATE (AASHTO T-27)

MATERIALS FINER THAN No. 200 SIEVE BY WASHING (AASHTO T-11)

Site Manager I.D.#: _____ Lab Reference Number: _____ Technician: _____ Producer / Supplier Code: _____ Producer / Supplier Name: _____ Site Manager Material Code: _____ Date Sampled: _____ Date Tested: _____	Aggregate Size: _____ Sieve Type Coarse: _____ Sieve Type Fine: _____ Material Type: _____ Contract #: _____ Project #: _____ Auth #: _____ Item #: _____ Tons / CY: _____	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">Spec Sieve Sizes</th> <th style="text-align: center;">% Pass</th> <th style="text-align: center;">Pass / Fail</th> </tr> <tr> <td>1 1/2 in. (37.5mm)</td> <td style="text-align: center;">100</td> <td style="text-align: center;">Pass</td> </tr> <tr> <td>3/4 in. (19.0 mm)</td> <td style="text-align: center;">76</td> <td style="text-align: center;">Pass</td> </tr> <tr> <td>No. 4 (4.75mm)</td> <td style="text-align: center;">28</td> <td style="text-align: center;">Pass</td> </tr> <tr> <td>No. 40 (425µm)</td> <td style="text-align: center;">13</td> <td style="text-align: center;">Pass</td> </tr> <tr> <td>No. 200 (75µm)</td> <td style="text-align: center;">4.4</td> <td style="text-align: center;">Pass</td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </table>	Spec Sieve Sizes	% Pass	Pass / Fail	1 1/2 in. (37.5mm)	100	Pass	3/4 in. (19.0 mm)	76	Pass	No. 4 (4.75mm)	28	Pass	No. 40 (425µm)	13	Pass	No. 200 (75µm)	4.4	Pass									
Spec Sieve Sizes	% Pass	Pass / Fail																											
1 1/2 in. (37.5mm)	100	Pass																											
3/4 in. (19.0 mm)	76	Pass																											
No. 4 (4.75mm)	28	Pass																											
No. 40 (425µm)	13	Pass																											
No. 200 (75µm)	4.4	Pass																											

(A) Initial Oven Dry Mass of Total Sample.....	(A)	12870.1
(B) Oven Dry mass of Total Sample After T-11.....	(B)	
(C) Oven Dry Mass of Plus No. 4 Material.....	(C)	9350.4
(D) Oven Dry Mass of Plus No. 4 Material After T-11.....	(D)	9299.6
(E) Oven Dry Mass of Minus No. 4 Material Used in Split.....	(E)	3510.7
(F) Combination Gradation Coarse Fraction Pan Material After Dry Sieving (K).....	(F)	80.2
(G) Total Oven Dry Mass of Minus No. 4 Material (E+F).....	(G)	3590.9
(H) Initial Oven Dry Mass of Total Fine Sample or Mass of Minus No. 4 Material.....	(H)	333.5
(I) Oven Dry Mass of Total Fine Sample or Mass of Minus No. 4 Material After T-11.....	(I)	258.9

Sieve Analysis of Coarse Aggregate

Sieve Size	Mass Retained M _R		Over Loading	% Retained (M _R /A)x100	Percent Passing	Reported Percent Passing	Material Specifications	
	Regular	Combination					Low	High
1 1/2 in. (37.5mm)		0.0	ok	0.0	100.12	100	100	100
1 in. (25.0mm)		929.2	ok	7.2	92.92	93		
3/4 in. (19.0 mm)		2,130.1	ok	16.6	76.32	76	50	90
1/2 in. (12.5mm)		2,670.0	ok	20.7	55.62	56		
3/8 in. (9.5mm)		1,551.7	ok	12.1	43.52	44		
No. 4 (4.75mm)		1,941.2	ok	15.1	28.42	28	20	50

(J) Pan			
(K) Combination Grad. Pan	80.2		
(L) Loss By T-11.....	50.8		
(M) Final Total (Σ M _R)	9,273.0		

C. F. = (G) ÷ (P)

C. F. = 3,590.9 ÷ 333.4

C. F. = 10.7705 (Round this Number to 4 Places)

Sieve Analysis of Fine Aggregate

Sieve Size	Mass Retained M _R		Over Loading	% Retained (M _R /(H+R))x100	Percent Passing	Reported Percent Passing	Material Specifications	
	Regular	Combination (Regular x C.F.)					Low	High
No. 8 (2.36mm)	104.6	1126.6	ok	8.8	19.62	20		
No. 16 (1.18mm)	48.5	522.4	ok	4.1	15.52	16		
No. 40 (425µm)	28.3	304.8	ok	2.4	13.12	13	5	20
No. 50 (300µm)	7.8	84.0	ok	0.7	12.42	12		
No. 100 (150µm)	38.1	410.4	ok	3.2	9.22	9		
No. 200 (75µm)	57.9	623.6	ok	4.8	4.42	4.4	0	7

(N) Pan.....	0.6	6.5				
(O) Loss By T-11..... (H -	47.6	512.7	Coarse - No. 200 Dry		Fine - No. 200 Dry	6.5
(P) Final Total Fine Sample (Σ M _R).....	333.4		Coarse - No. 200 Wet	50.8	Fine - No. 200 Wet	512.7
(Q) Final Total - No. 4 (Σ M _R).....		3591.0	Total - No. 200	570.0	÷ Init. Mass (A) or (H)	12870.1
(R) Combined Total (M+Q).....		12864.0		x 100 =	4.42887	%
(S) Sample Loss or Gain	(A-M) or (M-A).....				DO NOT ROUND!!!	
	(H-P) or (P-H).....					
	(A-R) or (R-A).....	6.1				
(T) Percentage of Initial OD Mass ((S/A)x100) or ((S/H)x100)		0.0				

Name:	
Signature:	
Date:	

Remarks:	Lab Info Only: ☐

WEST VIRGINIA DIVISION OF HIGHWAYS
SIEVE ANALYSIS OF FINE AND COARSE AGGREGATE (AASHTO T-27)
MATERIALS FINER THAN No. 200 SIEVE BY WASHING (AASHTO T-11)

Site Manager I.D.#: _____ Lab Reference Number: _____ Technician: _____ Producer / Supplier Code: _____ Producer / Supplier Name: _____ Site Manager Material Code: _____ Date Sampled: _____ Date Tested: _____	Aggregate Size: Class 1 Sieve Type Coarse: 12 inch Sieve Type Fine: 12 inch Material Type: Lime Stone Contract #: _____ Project #: _____ Auth #: _____ Item #: _____ Tons / CY: _____	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">Spec Sieve Sizes</th> <th style="text-align: center;">% Pass</th> <th style="text-align: center;">Pass / Fail</th> </tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> </table>	Spec Sieve Sizes	% Pass	Pass / Fail																											
Spec Sieve Sizes	% Pass	Pass / Fail																														

- | | | |
|--|-----|-------|
| (A) Initial Oven Dry Mass of Total Sample..... | (A) | |
| (B) Oven Dry mass of Total Sample After T-11..... | (B) | |
| (C) Oven Dry Mass of Plus No. 4 Material..... | (C) | |
| (D) Oven Dry Mass of Plus No. 4 Material After T-11..... | (D) | |
| (E) Oven Dry Mass of Minus No. 4 Material Used in Split..... | (E) | |
| (F) Combination Gradation Coarse Fraction Pan Material After Dry Sieving (K)..... | (F) | |
| (G) Total Oven Dry Mass of Minus No. 4 Material (E+F)..... | (G) | |
| (H) Initial Oven Dry Mass of Total Fine Sample or Mass of Minus No. 4 Material..... | (H) | 380.4 |
| (I) Oven Dry Mass of Total Fine Sample or Mass of Minus No. 4 Material After T-11..... | (I) | 368.8 |

Sieve Analysis of Coarse Aggregate

Sieve Size	Mass Retained M_R		Over Loading	% Retained $(M_R/A) \times 100$	Percent Passing	Reported Percent Passing	Material Specifications	
	Regular	Combination					Low	High
(J) Pan								
(K) Combination Grad. Pan								
(L) Loss By T-11.....								
(M) Final Total (ΣM_R)								

C. F. = _____

C. F. = _____

÷

÷

k

k

Sieve Analysis of Fine Aggregate

Sieve Size	Mass Retained M_R		Over Loading	% Retained $(M_R/(H+R)) \times 100$	Percent Passing	Reported Percent Passing	Material Specifications	
	Regular	Combination					Low	High
(N) Pan.....								
(O) Loss By T-11.....	11.6			Coarse - No. 200 Dry		Fine - No. 200 Dry		
(P) Final Total Fine Sample (ΣM_R)				Coarse - No. 200 Wet		Fine - No. 200 Wet	11.6	
(Q) Final Total - No. 4 (ΣM_R)				Total - No. 200	11.6	÷ Init. Mass (A) or (H)	380.4	
(R) Combined Total (M+Q).....				x 100 =	3.04942	%		
(S) Sample Loss or Gain	(A-M) or (M-A).....							
	(H-P) or (P-H).....							
	(A-R) or (R-A).....							
(T) Percentage of Initial OD Mass $((S/A) \times 100)$ or $((S/H) \times 100)$								

Name: _____
 Signature: _____
 Date: _____

Remarks:	Pass/Fail	Lab Info Only: ☐	

T301E
Rev. 4-03WEST VIRGINIA DIVISION OF HIGHWAYS
MATERIALS CONTROL, SOIL AND TESTING
A CALCULATION WORKSHEETF. S. #
Tech.
Date**Combo A-Bar Color**
ColorGradations.xlsm
5/29/2018

Lab Number	Project and Contract					Date Sampled		Transmit Date	
Test Sequence	C					Item Number	Plant Source Code	Aggregate Source Code	
Sieves:	1st	2nd	3rd	4th	5th	6th	7th	8th	No. 200
Design Number				Unit Weight	Face Fracture % One	% Two	LL	PL	PI
AASHTO Size	Smallest Sieve 100%		Target A-bar	Actual A-bar	FA A-bar	CA No. 200	FA No. 200	Total No. 200	P/F/N
			4.88	4.72	6.36	1.0	2.5	1.6	P

Plant Name _____ Source Coarse Agg. _____
 Technician _____ Date _____ Source Fine Agg. _____
 Class of Concrete _____ Cmnt Fact _____ Field Sample # _____

Sieves	CA #57 Lmst	FA Silca Sand	Cement
1 1/2" % pass	100	100	100
3/4" % pass	76	100	100
3/8" % pass	12	100	100
No. 4 % pass	3	98	100
No. 8 % pass	2	83	100
No. 16 % pass	0	67	100
No. 30 % pass	0	55	100
No. 50 % pass	0	25	100
No. 100 % pass	0	5	100
No. 200 % pass	1.0	2.5	100
Total	194.0	635.5	1000.0
Solid A's	1.94	6.36	10.00

Total Mass of Each Solid at SSD in One yd³ of Concrete From Mix Design

M _{ca}	1808	lb
M _{fa}	1366	lb
M _{ca} + M _{fa}	3174	lb
*M _c	536	lb
M _t	3710	lb

Fractional Part of Each Solid (0.001)

M _{ca}	=	1808	=	0.487
M _t	=	3710		
M _{fa}	=	1366	=	0.368
M _t	=	3710		
*M _c	=	536	=	0.144
M _t	=	3710		

* Include Mass of Fly Ash When Used.

Solid Fraction x Each Solid A

Coarse Agg	0.487	x	1.94	=	0.94	A _{ca}
Fine Agg	0.368	x	6.36	=	2.34	A _{fa}
Cement	0.144	x	10.00	=	1.44	A _c

Fractional Part of Coarse and Fine Agg. (0.001)

F _{ca}	=	M _{ca}	=	1808	=	0.570
		M _{ca} + M _{fa}		3174		
F _{fa}	=	M _{fa}	=	1366	=	0.430
		M _{ca} + M _{fa}		3174		

Adjusted and Maximum Minus No. 200 Based on Fractional Part of Total Aggregate (0.01)

A Total Solids	A _{ca} + A _{fa} + A _c	4.72
Target A		4.88
A Tolerance ±		0.25
Total A P/F		P

- No. 200 % pass x F _{ca} or F _{fa} =					Adjusted Total - 200 CA + FA
CA	1.0	x	0.570	=	0.57
FA	2.5	x	0.430	=	1.08
- No. 200 Spec Limit x F _{ca} or F _{fa} =					Max. Allowed Total - 200 CA + FA
CA	1.5	x	0.570	=	0.86
FA	3.0	x	0.430	=	1.29