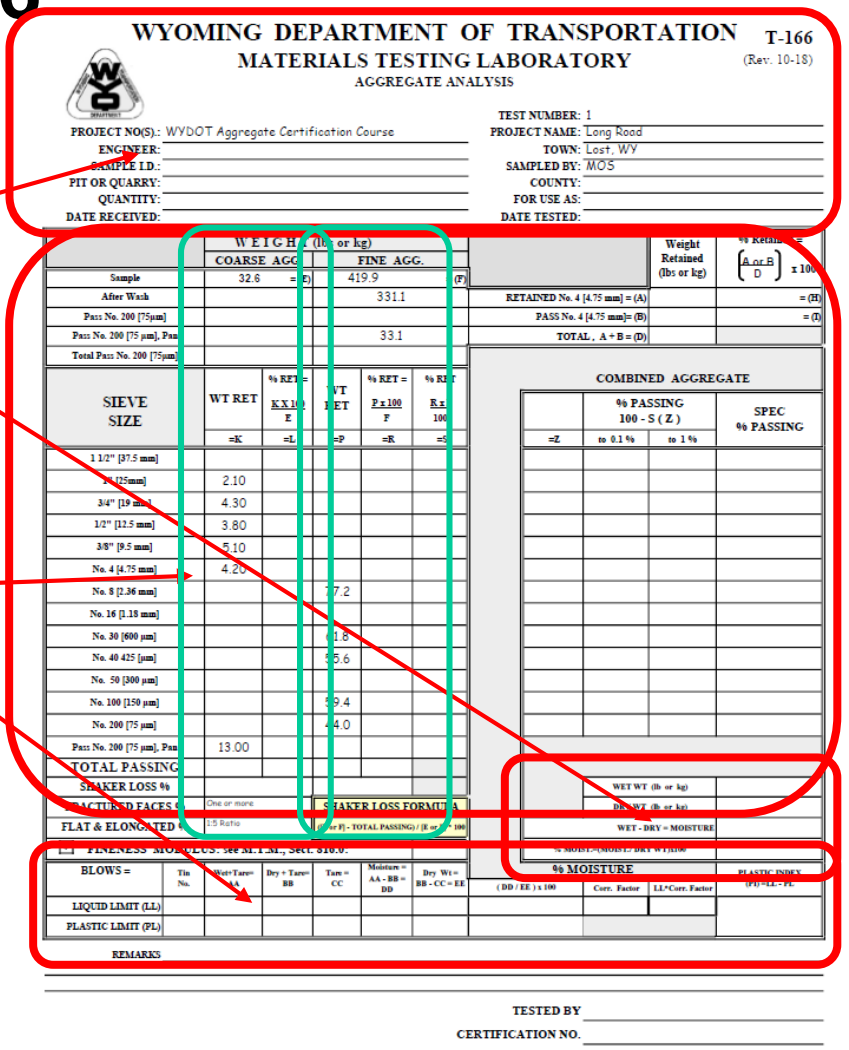
AGGREGATES

Section 8 – Aggregate Gradation Calculations

Aggregate Analysis
T-166

- The T-166 form has several important parts.
  - Project Identification
  - Initial Moisture Content
  - Atterberg Limits
  - Gradation Analysis
- The sheet shows the results of the lab testing.
  - Coarse Aggregate (Gilson) Test
  - Fine Aggregate and Wash Sieve Tests



WYOMING DEPARTMENT OF TRANSPORTATION — T-166
MATERIALS TESTING LABORATORY (Rev. 10-18)
AGGREGATE ANALYSIS

PROJECT NO(S).: WYDOT Aggregate Certification Course
ENGINEER:
SAMPLE I.D.:
PIT OR QUARRY:
QUANTITY:
DATE RECEIVED:
TEST NUMBER: 1
PROJECT NAME: Long Road
TOWN: Lost, WY
SAMPLED BY: MOS
COUNTY:
FOR USE AS:
DATE TESTED:

WEIGHT (lbs or kg)

	COARSE AGG.	FINE AGG.
Sample	32.6 = (E)	419.9 (F)
After Wash		331.1
Pass No. 200 [75µm]		
Pass No. 200 [75 µm], Pan		33.1
Total Pass No. 200 [75µm]		

	Weight Retained (lbs or kg)	% Retained = (A or B / D) x 100
RETAINED No. 4 [4.75 mm] = (A)		= (H)
PASS No. 4 [4.75 mm]= (B)		= (I)
TOTAL , A + B = (D)		

SIEVE SIZE	WT RET =K	% RET = K X 100 / E =L	WT RET =P	% RET = P x 100 / F =R	% RET = R x 100 =S	COMBINED AGGREGATE % PASSING 100 - S (Z) =Z	to 0.1 %	to 1 %	SPEC % PASSING
1 1/2" [37.5 mm]									
[25mm]	2.10								
3/4" [19 mm]	4.30								
1/2" [12.5 mm]	3.80								
3/8" [9.5 mm]	5.10								
No. 4 [4.75 mm]	4.20								
No. 8 [2.36 mm]			77.2						
No. 16 [1.18 mm]									
No. 30 [600 µm]			41.8						
No. 40 425 [µm]			36.6						
No. 50 [300 µm]									
No. 100 [150 µm]			19.4						
No. 200 [75 µm]			14.0						
Pass No. 200 [75 µm], Pan	13.00								
TOTAL PASSING									
SHAKER LOSS %									
FRACTURED FACES %	One or more		SHAKER LOSS FORMULA						
FLAT & ELONGATED %	1:5 Ratio		(Wet or F] - TOTAL PASSING) / [E or F] x 100						
FINENESS MODULUS: See M.T.M., Sect. 810.0.									

WET WT (lb or kg)
DRY WT (lb or kg)
WET - DRY = MOISTURE
% MOISTURE = (MOIST. DRY WT)/100
% MOISTURE (DD / EE) x 100

BLOWS =	Tin No.	Wet+Tare= AA	Dry + Tare= BB	Tare = CC	Moisture = AA - BB = DD	Dry Wt = BB - CC = EE	Corr. Factor	LL*Corr. Factor	PLASTIC INDEX (PI) = LL - PL
LIQUID LIMIT (LL)									
PLASTIC LIMIT (PL)									

REMARKS

TESTED BY
CERTIFICATION NO.

T-166 Example 1

	WEIGHT (lbs or kg)	
	COARSE AGG.	FINE AGG.
Sample	32.6 = (E)	419.9 = (F)
After Wash		331.1
Pass No. 200 [75µm]		88.8
Pass No. 200 [75 µm], Pan		33.1
Total Pass No. 200 [75µm]		

	Weight Retained (lbs or kg)	% Retained = (A or B / D) x 100
RETAINED No. 4 [4.75 mm] = (A)	19.50	= (H)
PASS No. 4 [4.75 mm]= (B)		40.0 = (I)
TOTAL , A + B = (D)	32.50	

SIEVE SIZE	WT RET	% RET = K X 100 / E	WT RET	% RET = P x 100 / F	% RET R x I / 100
	=K	=L	=P	=R	=S
1 1/2" [37.5 mm]					
1" [25mm]	2.10	6.4			
3/4" [19 mm]	4.30				
1/2" [12.5 mm]	3.80				
3/8" [9.5 mm]	5.10	15.6			
No. 4 [4.75 mm]	4.20	12.9			
No. 8 [2.36 mm]			77.2		7.4
No. 16 [1.18 mm]					
No. 30 [600 µm]			61.8	14.7	
No. 40 425 [µm]			55.6		
No. 50 [300 µm]					
No. 100 [150 µm]			59.4	14.1	5.6
No. 200 [75 µm]			44.0	10.5	4.2
Pass No. 200 [75 µm], Pan	13.00	39.9	121.9	29.0	11.6
TOTAL PASSING			419.9	99.9	
SHAKER LOSS %	0.3 %		0.0 %		
FRACTURED FACES %	One or more		SHAKER LOSS FORMULA		
FLAT & ELONGATED %	1:5 Ratio		([E or F] - TOTAL PASSING) / [E or F] * 100		

COMBINED AGGREGATE			
	% PASSING 100 - S (Z)		SPEC % PASSING
=Z	to 0.1 %	to 1 %	
	100.0		
	93.6		
13.2	80.4		
11.7			
15.6			
		40	
7.4	32.8	33	
5.9	26.9	27	
5.3	21.6	22	
5.6	16.0	16	
4.2	11.8	12	
	WET WT (lb or kg)		
	DRY WT (lb or kg)		
	WET - DRY = MOISTURE		

Aggregate Analysis
T-166

- **This example tests the gradation against the specification for a 3/4” Superpave Mix.**
  - **The sieve specification range is written in the right-hand column.**
  - **After the sieve analysis is completed, the results are compared against the range.**

- **Note: This is a complete sheet with water content, Atterburg Limits and Gradations all calculated.**

WYOMING DEPARTMENT OF TRANSPORTATION T-166
MATERIALS TESTING LABORATORY (Rev. 10-18)
AGGREGATE ANALYSIS

PROJECT NO(S).: TEST NUMBER:
ENGINEER: PROJECT NAME:
SAMPLE I.D.: 3/4" Superpave Mix TOWN:
PIT OR QUARRY: SAMPLED BY:
QUANTITY: COUNTY:
DATE RECEIVED: FOR USE AS:
DATE TESTED:

	WEIGHT (lbs or kg) COARSE AGG.		WEIGHT (lbs or kg) FINE AGG.				Weight Retained (lbs or kg)	% Retained = (A or B / D) x 100
Sample	35.6	= (E)	376.2			= (F)		
After Wash			357.3				RETAINED No. 4 [4.75 mm] = (A)	18.07	50.8 = (H)
Pass No. 200 [75 µm]			18.9				PASS No. 4 [4.75 mm]= (B)	17.53	49.2 = (I)
Pass No. 200 [75 µm], Pan			23.2				TOTAL , A + B = (D)	35.60	
Total Pass No. 200 [75µm]			42.1						

SIEVE SIZE	WT RET =K	% RET = K X 100 / E =L	WT RET =P	% RET = P x 100 / F =R	% RET R x J 100 =S	COMBINED AGGREGATE % PASSING 100 - S (Z) =Z	to 0.1%	to 1%	SPEC % PASSING
1 1/2" [37.5 mm]							100.0	100	
1" [25mm]							100.0	100	100
3/4" [19 mm]	3.25	9.1				9.1	90.9	91	90-100
1/2" [12.5 mm]	5.83	16.4				16.4	74.5	75	55-90
3/8" [9.5 mm]	4.68	13.1				13.1	61.4	61	45-85
No. 4 [4.75 mm]	4.31	12.1				12.1	49.3	49	30-65
No. 8 [2.36 mm]			67.3	17.9	8.8	8.8	40.5	41	20-50
No. 16 [1.18 mm]			59.3	15.8	7.8	7.8	32.7	33	
No. 30 [600 µm]			52.6	14.0	6.9	6.9	25.8	26	5-30
No. 40 425 [µm]			49.5	13.2	6.5	6.5	19.3	19	
No. 50 [300 µm]									
No. 100 [150 µm]			53.3	14.2	7.0	7.0	12.3	12	
No. 200 [75 µm]			52.1	13.8	6.8	6.8	5.5	5.5	2-7
Pass No. 200 [75 µm], Pan	17.53	49.2	42.1	11.2	5.5				
TOTAL PASSING	35.60	99.9	376.2	100.0					
SHAKER LOSS %			0.0%						
FRACTURED FACES %	One or more		SHAKER LOSS FORMULA						
FLAT & ELONGATED %	1:5 Ratio		(F1 - TOTAL PASSING) / (E or F)						
☑ FINENESS MODULUS: see M.T.M., Sect. 816.0:							WET WT (lb or kg)		37.3
							DRY WT (lb or kg)		35.6
							WET - DRY = MOISTURE		1.7
							% MOIST.=(MOIST./ DRY WT)x100		4.8

BLOWS = 18	Tin No.	Wet+Tare= AA	Dry + Tare= BB	Tare = CC	Moisture = AA - BB = DD	Dry Wt = BB - CC = EE	% MOISTURE (DD / EE) x 100	Corr. Factor	L*Corr. Factor	PLASTIC INDEX (PI) =LL - PL
LIQUID LIMIT (LL)	7A	48.5	45.8	21.2	2.7	24.6	11.1	0.961	11.0	3.0
PLASTIC LIMIT (PL)	7B	35.9	34.9	22.3	1.0	12.6	8.0			

REMARKS

TESTED BY
CERTIFICATION NO.

T-166
Example 2

	WEIGHT (lbs or kg)				
	COARSE AGG.		FINE AGG.		
Sample	35.6 = (E)		376.2 = (F)		
After Wash			357.3		
Pass No. 200 [75µm]			18.9		
Pass No. 200 [75 µm], Pan			23.2		
Total Pass No. 200 [75µm]					
SIEVE SIZE	WT RET	% RET = K X 100 / E	WT RET	% RET = P x 100 / F	% RET R x I / 100
	=K	=L	=P	=R	=S
1 1/2" [37.5 mm]					
1" [25mm]					
3/4" [19 mm]	3.25	9.1			
1/2" [12.5 mm]	5.83	16.4			
3/8" [9.5 mm]	4.68				
No. 4 [4.75 mm]	4.31				
No. 8 [2.36 mm]			67.3	17.9	8.8
No. 16 [1.18 mm]			59.3	15.8	7.8
No. 30 [600 µm]			52.6		
No. 40 425 [µm]			49.5		
No. 50 [300 µm]					
No. 100 [150 µm]			53.3		7.0
No. 200 [75 µm]			52.1		
Pass No. 200 [75 µm], Pan	17.53		42.1		5.5
TOTAL PASSING		99.9	376.2	100.0	
SHAKER LOSS %	0.0 %		0.0 %		
FRACTURED FACES %	One or more		SHAKER LOSS FORMULA		
FLAT & ELONGATED %	1:5 Ratio		([E or F] - TOTAL PASSING) / [E or F] * 100		

	Weight Retained (lbs or kg)	% Retained = (A or B / D) x 100
RETAINED No. 4 [4.75 mm] = (A)	18.07	50.8 = (H)
PASS No. 4 [4.75 mm]= (B)	17.53	49.2 = (I)
TOTAL , A + B = (D)	35.60	

COMBINED AGGREGATE

	% PASSING 100 - S (Z)		SPEC % PASSING
=Z	to 0.1 %	to 1 %	
	100.0	100	
			100
9.1	90.9	91	90-100
16.4	74.5	75	55-90
			45-85
			30-65
8.8			20-50
7.8	32.7		
	25.8	26	5-30
		12	
6.8	5.5	5.5	2-7

WET WT (lb or kg)	37.3
DRY WT (lb or kg)	35.6
WET - DRY = MOISTURE	1.7

WYOMING DEPARTMENT OF TRANSPORTATION

MATERIALS TESTING LABORATORY

AGGREGATE ANALYSIS

T-166 (Rev. 10-18)

PROJECT NO(S).:
ENGINEER:
SAMPLE I.D.: 3/4" Superpave Mix
PIT OR QUARRY:
QUANTITY:
DATE RECEIVED:

TEST NUMBER:
PROJECT NAME:
TOWN:
SAMPLED BY:
COUNTY:
FOR USE AS:
DATE TESTED:

	WEIGHT (lbs or kg) COARSE AGG.		WEIGHT (lbs or kg) FINE AGG.	
Sample	35.60	= (E)	376.2	= (F)
After Wash			357.3	
Pass No. 200 [75µm]			18.9	
Pass No. 200 [75 µm], Pan			23.2	
Total Pass No. 200 [75µm]			42.1	

	Weight Retained (lbs or kg)	% Retained = (A or B / D) x 100
RETAINED No. 4 [4.75 mm] = (A)	18.07	50.8 = (H)
PASS No. 4 [4.75 mm]= (B)	17.53	49.2 = (I)
TOTAL , A + B = (D)	35.60	

SIEVE SIZE	WT RET =K	% RET = K X 100 / E =L	WT RET =P	% RET = P x 100 / F =R	% RET R x I / 100 =S
1 1/2" [37.5 mm]					
1" [25mm]					
3/4" [19 mm]	3.25	9.1			
1/2" [12.5 mm]	5.83	16.4			
3/8" [9.5 mm]	4.68	13.1			
No. 4 [4.75 mm]	4.31	12.1			
No. 8 [2.36 mm]			67.3	17.9	8.8
No. 16 [1.18 mm]			59.3	15.8	7.8
No. 30 [600 µm]			52.6	14.0	6.9
No. 40 425 [µm]			49.5	13.2	6.5
No. 50 [300 µm]					
No. 100 [150 µm]			53.3	14.2	7.0
No. 200 [75 µm]			52.1	13.8	6.8
Pass No. 200 [75 µm], Pan	17.53	49.2	42.1	11.2	5.5
TOTAL PASSING	35.60	99.9	376.2	100.1	
SHAKER LOSS %					
FRACTURED FACES %	One or more		SHAKER LOSS FORMULA		
FLAT & ELONGATED %	1:5 Ratio		r F] - TOTAL PASSING) / [E or F]		
☑ FINENESS MODULUS: see M.T.M., Sect. 816.0:					

COMBINED AGGREGATE

	% PASSING 100 - S (Z) =Z	to 0.1%	to 1%	SPEC % PASSING
		100.0	100	
		100.0	100	100
	9.1	90.9	91	90-100
	16.4	74.5	75	55-90
	13.1	61.4	61	45-85
	12.1	49.3	49	30-65
	8.8	40.5	41	20-50
	7.8	32.7	33	
	6.9	25.8	26	5-30
	6.5	19.3	19	
	7.0	12.3	12	
	6.8	5.5	5.5	2-7

WET WT (lb or kg)	37.3
DRY WT (lb or kg)	35.6
WET - DRY = MOISTURE	1.7
% MOIST.=(MOIST./ DRY WT)x100	4.8

BLOWS = 18	Tin No.	Wet+Tare= AA	Dry + Tare= BB	Tare = CC	Moisture = AA - BB - DD	Dry Wt = BB - CC = EE	% MOISTURE (DD / EE) x 100	Corr. Factor	L*Corr. Facto	PLASTIC INDEX (PI) =LL - PL
LIQUID LIMIT (LL)	7A	48.5	45.8	21.2	2.7	24.6	11.0	0.961	11	3
PLASTIC LIMIT (PL)	7B	35.9	34.9	22.3	1.0	12.6	8			

REMARKS

TESTED BY

CERTIFICATION NO.

- **Note: This is a complete sheet with water content, Atterburg Limits and Gradations all calculated.**

Correlation of Testing Technicians for Gradation

The actual calculations of the correlation will not be on the exam but you would need to have an appreciation to the process. In addition, you would need to be able to answer general questions about the process.

Correlation of Testing Technicians for Gradation

(WYDOT MTM 126.0)

- **General**
  - **Compares aggregate gradations obtained by WYDOT field laboratory and Contractor's laboratory.**
  - **The paired t-test is used.**
  - **If difference is significant, then the dispute resolution procedure will start.**
  - **Re-correlate if either tester is changed.**
  - **Can be done during aggregate production.**

Correlation of Testing Technicians for Gradation

- **Procedure**
  - **Obtain 15 aggregate samples**
    - **Groups of 3**
    - **Sample according to WYDOT MTM 804**
    - **5 samples for WYDOT, 5 for contractor, and 5 for referee**
    - **When sampling from a belt, the middle sample should be the referee sample**
  - **Test samples**
    - ***WYDOT MTM 814.0***

Procedural Steps on Form

- **Determine percent passing each sieve size**
- **Perform t-test separately for each sieve size**
- **Calculate the difference between % passing**
- **Determine the mean and the Standard Deviation (s) of the differences**

Procedure (continued)

- **Compare s to the minimum and maximum values in Table 1.**
- **Calculate** $$t = \frac{|\bar{x}|}{\sqrt{\frac{s^2}{n}}}$$
- **If t < 4.604; No significant difference**
- **If t > 4.604; Significant difference**
- **Check for Sign Error – Do the Differences all have the same sign? Indicates Bias.**

Table 1. Allowable Range of Standard Deviation

Percent Retained	Grading			
	Coarse		Fine	
	Maximum	Minimum	Maximum	Minimum
< 3%	3.00	0.39	0.60	0.21
3% - 10%	3.00	1.06	1.60	0.57
10% - 20%	4.70	1.66	2.70	0.95
20% - 30%	5.70	2.01	3.50	1.24
30% - 40%	6.90	2.44	4.00	1.41
>40%	9.00	3.18	5.20	1.41

- **Use the coarse values unless the nominal maximum aggregate size is #4 or less, in which case use the fine values**

Correlation of Testing Technicians for Gradation

Example- #1:

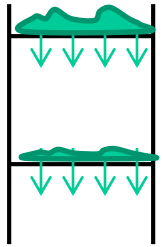
Sampler: _____ Contractor: _____

Project: _____ Location: _____

Test Sieve Size: #4 Date: _____

Average % Passing 1/2" is 57.2%

Grading W - Coarse Gradation



% Retained =

Sample	Percent Passing Test Sieve WYDOT (A)	Contractor (B)	Difference (A) - (B)
A	49.2	49.8	
B	50.6	46.3	
C	49.6	51.2	
D	51.2	48.3	
E	50.9	48.2	
		Mean -x̄:	
Average Passing =	49.53	Std Dev - s:	
		Min SD:	
		Max SD:	
		SD Used:	
		t :	
		t > (t_{crit}=4.604):	

$$t = \frac{|\bar{x}|}{\sqrt{\frac{s^2}{n}}}$$

$s = 2.513$

$s \times s = 2.513 \times 2.513$

$s^2 = 6.315$

$\frac{s^2}{n} = \frac{6.315}{5}$

$\frac{s^2}{n} = 1.263$

$\sqrt{\frac{s^2}{n}} = \sqrt{1.263}$

$\sqrt{\frac{s^2}{n}} = 1.124$

$t = \frac{|\bar{x}|}{\sqrt{\frac{s^2}{n}}} = \frac{1.54}{1.124}$

$t = 1.371$

If $t > t_{crit}$, then the data sets are Significantly Different

If $t \leq t_{crit}$, then the data sets are Not Significantly Different

Is there a sign error? _____

Correlation of Testing Technicians for Gradation

Example - #2:

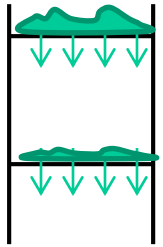
Sampler: _____ Contractor: _____

Project: _____ Location: _____

Test Sieve Size: #4 Date: _____

Average % Passing 1/2" is 57.2%

Grading W - Coarse Gradation



% Retained =

Sample	Percent Passing Test Sieve WYDOT (A)	Contractor (B)	Difference (A) - (B)
A	49.2	46.7	
B	50.6	47.3	
C	49.6	47.3	
D	51.2	48.3	
E	50.9	48.2	
		Mean -x:	
Average Passing =	48.93	Std Dev - s:	
		Min SD:	
		Max SD:	
		SD Used:	
		t :	
		t > (t_{crit}=4.604):	

$$t = \frac{|\bar{x}|}{\sqrt{\frac{s^2}{n}}}$$

s = _____

s x s = _____ x _____

s^2 = _____

$\frac{s^2}{n}$ = _____ = 5

$\frac{s^2}{n}$ = _____

$\sqrt{\frac{s^2}{n}}$ = $\sqrt{\_\_\_\_\_}$ =

$\sqrt{\frac{s^2}{n}}$ = _____

$t = \frac{|\bar{x}|}{\sqrt{\frac{s^2}{n}}}$ = _____ =

t = _____

If $t > t_{crit}$, then the data sets are Significantly Different

If $t \leq t_{crit}$, then the data sets are Not Significantly Different

Is there a sign error? _____

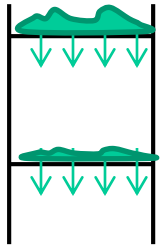
Correlation of Testing Technicians for Gradation

Example - #3:

Sampler: _____ **Contractor:** _____
Project: _____ **Location:** _____
Test Sieve Size: #200 **Date:** _____
Average % Passing #30 is 14.5%
Grading W - Coarse Gradation

$$t = \frac{|\bar{x}|}{\sqrt{\frac{s^2}{n}}}$$

#



#

% Retained =

Sample	Percent Passing Test Sieve WYDOT (A)	Contractor (B)	Difference (A) - (B)
A	2.75	2.64	
B	2.60	2.81	
C	3.12	3.53	
D	3.05	3.69	
E	2.88	3.01	

Mean -$\bar{x}$:	
Std Dev - s:	
Min SD:	
Max SD:	
SD Used:	
t :	
t > (t_{crit}=4.604):	

Average Passing = 3.01

If $t > t_{crit}$, then the data sets are Significantly Different
If $t \leq t_{crit}$, then the data sets are Not Significantly Different
Is there a sign error? _____

Correlation of Aggregate Gradations

WYOMING DEPARTMENT OF TRANSPORTATION

T 165 AG
REV (4-2004)

CORRELATION OF AGGREGATE GRADATIONS

Contractor: ______________________ **Consultant:** ______________________ **Project No(s):** ______________

WYDOT: ______________________ **Resident Engineer:** ______________ **Test is to Correlate (Check One)**

Testing Date: ______________________ **Testers A**______________

QC Supervisor: ______________ **Mechanical Sampler:** ______________ **B** ______________

Control Sieve Sizes & Average %	Tester	Percents Passing					Avg	Std Dev	Max SD	Min SD	t crit=	
		Pair A	Pair B	Pair C	Pair D	Pair E					t=	Pass / Fail
	Contractor											
	WYDOT											
	Difference											
	Contractor											
	WYDOT											
	Difference											
	Contractor											
	WYDOT											
	Difference											
	Contractor											
	WYDOT											
	Difference											
	Contractor											
	WYDOT											
	Difference											
	Contractor											
	WYDOT											
	Difference											

Directional Bias on Any Sieve? ______________________ **Which One(s)?** ______________________

Comments: ____

____

____

Signature of Tester A: ______________________ **Signature of Tester B:** ______________________ **Date:** ______________

Correlation of Aggregate Gradations

WYOMING DEPARTMENT OF TRANSPORTATION

T 165 AG
REV (4-2004)

CORRELATION OF AGGREGATE GRADATIONS

Contractor: Curly Queue **Consultant:** Besttesters **Project No(s):** 12-34-(56)
WYDOT: Moe Thyme **Resident Engineer:** Larry Stuge **Test is to Correlate (Check One)**
Testing Date: 2/29/99 **Testers** A X
QC Supervisor: M. Magoo **Mechanical Sampler:** B

Control Sieve Sizes & Average %	Tester	Percents Passing					Avg	Std Dev	Max SD	Min SD	t crit=	
		Pair A	Pair B	Pair C	Pair D	Pair E					t=	Pass / Fail
1"	Contractor	89.9	88.5	92.5	91.1	86.5	89.8					
	WYDOT	91.0	89.6	88.4	92.0	88.9						
10.2	*Difference*	-1.1	-1.1	4.1	-0.9	-2.4	-0.28	2.52	4.7	1.66	0.248	Pass
3/4"	Contractor	78.6	79.0	77.2	81.2	81.0	79.2					
	WYDOT	79.2	78.9	76.5	79.9	80.5						
10.6	*Difference*	-0.6	0.1	0.7	1.3	0.5	0.4	0.71	4.7	1.66	0.539	Pass
1/2"	Contractor	56.3	55.4	55.0	60.4	59.8	58.6					
	WYDOT	58.9	58.0	59.5	60.2	62.3						
20.6	*Difference*	-2.6	-2.6	-4.5	0.2	-2.5	-2.4	1.68	5.7	2.01	2.67	Pass
#4	Contractor	24.8	24.2	27.2	22.3	24.7	28.2					
	WYDOT	31.3	35.6	31.1	31.6	29.5						
30.4	*Difference*	-6.5	-11.4	-3.9	-9.3	-4.8	-7.18	3.13	6.9	2.44	5.129	Fail
#30	Contractor	11.5	12.6	10.5	14.0	14.6	13.3					
	WYDOT	14.0	12.9	11.6	15.4	15.9						
14.9	*Difference*	-2.5	-0.3	-1.1	-1.4	-1.3	-1.32	0.88	4.7	1.66	1.778	Pass
#200	Contractor	6.5	8.2	6.8	7.3	8.9	7.6					
	WYDOT	7.1	8.4	7.3	7.1	7.9						
5.8	*Difference*	-0.6	-0.2	-0.5	0.2	1.0	-0.02	0.65	3	1.06	0.042	Pass

Directional Bias on Any Sieve? Yes **Which One(s)?** #4, #30

Comments: There appears to be a significant problem on the #4.

Signature of Tester A: Curly Queue

Signature of Tester B: Moe Thyme **Date:** 2/29/99