

FIELD SAMPLING AND TESTING MANUAL

SECTION 300

BASES

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All test procedures used within and referred to in the section can be found under “Testing Procedures” of this manual. The test procedures are listed in the following order: AASHTO, ASTM, and NDDOT. Any modifications will be listed at the beginning of each test procedure.

Blank copies of the forms referred to in the section will be found numerically at the end of the section. The most current edition of these forms should be used. These forms are found on the NDDOT internet website, or you may duplicate the ones behind each section.

SECTION 302

SALVAGED BASE COURSE, AGGREGATE BASE COURSE, OR AGGREGATE SURFACE COURSE

302 DESCRIPTION

This work consists of furnishing and placing one or more courses of aggregate or salvaged materials and additives on a prepared foundation.

302.1 ACCEPTANCE SAMPLES AND TESTS

Field Laboratory Testing: The Engineer or Representative must obtain these samples and conduct these tests.

Divide the material into lots. A lot is defined as one day's production if production is greater than 1,000 tons per day. If production is less than 1,000 tons per day, then a lot is as many days production as necessary to produce 1,000 tons. If plan quantity is less than 1,000 tons, a lot shall be equal to plan quantity.

Three random samples will be obtained for each lot of material placed. If the base material is placed in a windrow on the roadway, obtain samples from the equalized aggregate windrow. If construction operations do not require the base material to be equalized in a windrow, obtain the sample according to [AASHTO T 2](#), "Sampling of Aggregates," and split the sample according to [AASHTO T 248](#), "Reducing Samples of Aggregate to Testing Size."

Test these samples for compliance with the specified gradation according to [AASHTO T 27](#), "Sieve Analysis of Fine and Coarse Aggregate," and [AASHTO T 11](#), "Materials Finer than No. 200 Sieve in Mineral Aggregates by Washing." Test each sample and accept the material if the average of the three samples meet the specified gradation. If the material from all three samples meets the gradation specified, test only one of the three samples from each subsequent lot. If the sample tested does not meet the gradation requirements, test the remaining two samples. Use the average gradation of these three samples to determine acceptance of the material. If an average of three test results is used to determine the acceptance for a lot, then each subsequent lot shall have all three samples tested. However, the testing can be reduced once again to only one test per subsequent lot after a lot has all three samples within the specified limits.

Compute the sieve analysis results on [SFN 9987](#), "Aggregate Sample Worksheet." Record the results on [SFN 10072](#), "Aggregate Quality Test Summary." Submit [SFN 14388](#), "Price Adjustment Worksheet," if there are failing test results.

Determine the physical properties of the aggregate from each 10,000 ton lot, or fraction thereof. If the fraction is less than 2,500 tons include it in the previous

10,000 ton lot. Physical properties of the aggregate will be conducted according to [NDDOT 4](#), "Percentage of Fractured Particles in Coarse Aggregate"; [AASHTO T 113](#), "Lightweight Pieces in Aggregate"; and [AASHTO T 90](#), "Determining the Plastic Limit and Plasticity Index of Soils." If the material from all three samples is within the specified limits, only one of the three samples will be tested from each subsequent lot. If at any time the sample tested fails to meet the specified limits, the remaining two samples will be tested and the physical properties of each lot will be determined by the average of these three test results. The testing of three samples per lot will continue until all three samples are within the specified limits then only one of the three samples will be tested from each subsequent lot.

Compute the results on [SFN 9987](#), "Aggregate Sample Worksheet." Report results on [SFN 10072](#), "Aggregate Quality Test Summary." Submit [SFN 14388](#), "Price Adjustment Worksheet," if there are failing test results.

Materials and Research Laboratory Testing: One composite aggregate sample will be obtained and tested for L.A. abrasion during the beginning of aggregate stockpiling. The Engineer or Representative must obtain these samples and submit them to the District Materials Coordinator. The District Materials Coordinator or Representative will then submit a composite sample to the Materials and Research Laboratory. The Materials and Research Laboratory will determine L.A. abrasion loss percentage according to [AASHTO T 96](#), "Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine." If the aggregate source has been tested previously by the Department and the material is within allowable limits, the test for L.A. abrasion may be waived at the discretion of the District Materials Coordinator.

302.2 INDEPENDENT ASSURANCE (IA) SAMPLES AND TESTS

District Laboratory Testing: The District Materials Coordinator or Representative must obtain these samples and conduct these tests.

Samples are obtained and split according to [AASHTO T 2](#), "Sampling of Aggregate," and [AASHTO T 248](#), "Reducing Samples of Aggregate to Testing Size," respectively.

Take one sample for every 30,000 tons of aggregate produced for sieve analysis and determining physical properties. The sieve analysis is conducted according to [AASHTO T 27](#), "Sieve Analysis of Fine and Coarse Aggregates," and [AASHTO T 11](#), "Materials Finer than No. 200 Sieve in Mineral Aggregates by Washing." Physical properties are determined according to [NDDOT 4](#), "Percentage of Fractured Particles in Coarse Aggregate"; [AASHTO T 113](#), "Lightweight Pieces in Aggregate"; and [AASHTO T 90](#), "Determining the Plastic Limit and Plasticity Index of Soils." Compute the results on [SFN 9987](#),

“Aggregate Sample Worksheet.” Record the results on [SFN 10072](#), “Aggregate Quality Test Summary.”

For aggregate base or surface course, perform one width and depth check for every two miles and record on [SFN 13889](#), “Project Records Samples/Tests Report.”

If an NHS system project, submit a copy of [SFN 13889](#), “Project Records Samples/Test Reports,” to the FHWA at the completion of the project for compliance purposes.

Materials and Research Laboratory Testing: The District Materials Coordinator or Representative must obtain these samples according to [AASHTO T 2](#), “Sampling of Aggregate,” and submit the samples to the Materials and Research Laboratory.

Submit one sample for the first six miles in length and one sample for every additional six miles, or fraction thereof. If the project is less than six miles in length, submit only one sample.

Sieve analysis is conducted on the samples according to [AASHTO T 27](#), “Sieve Analysis of Fine and Coarse Aggregates,” and [AASHTO T 11](#), “Materials Finer than No. 200 Sieve in Mineral Aggregates by Washing.” The physical properties are determined according to [NDDOT 4](#), “Percentage of Fractured Particles in Coarse Aggregate”; [AASHTO T 113](#), “Lightweight Pieces in Aggregate”; and [AASHTO T 90](#), “Determining the Plastic Limit and Plasticity Index of Soils.” Compute the results on [SFN 9987](#), “Aggregate Sample Worksheet.”

Contractor Supplied Salvage Base Course: The Engineer or Representative must obtain these samples and submit them to the Materials and Research Laboratory.

The bitumen content will be conducted on Contractor supplied salvaged base only. Three separate samples will be submitted for each 10,000 ton lot, or fraction thereof. Bitumen content is tested according to [AASHTO T 164](#), “Quantitative Extraction of Bitumen from Bituminous Paving Mixtures.”

SECTION 304

PERMEABLE STABILIZED BASE COURSE

304 DESCRIPTION

This work consists of constructing a permeable stabilized base course mixed in a central plant and placed on a prepared subbase.

304.1 ACCEPTANCE SAMPLES AND TESTS

Field Laboratory Testing: Each lot of aggregate is sampled by the Contractor, under the observation of and at random locations determined by the Engineer or Representative. A lot is defined as one day's production if production is greater than 4,500 square yards per day. If production is less than 4,500 square yards per day, a lot is as many day's production as necessary to place 4,500 square yards. If plan quantity is less than 4,500 square yards, a lot is equal to plan quantity.

Three random samples for each lot are obtained and split according to [AASHTO T 2](#), "Sampling of Aggregates," and [AASHTO T 248](#), "Reducing Samples of Aggregate to Testing Size," respectively. A sieve analysis is conducted according to [AASHTO T 27](#), "Sieve Analysis of Fine and Coarse Aggregate," and [AASHTO T 11](#), "Materials Finer than No. 200 Sieve in Mineral Aggregates by Washing." Compute the results on [SFN 9987](#), "Aggregate Sample Worksheet."

Test each sample and accept the material if the average of the three samples meet the specified gradation. If the material from all three samples meet the gradation specified, test only one of the three samples from each subsequent lot. If the sample tested does not meet the gradation requirements, test the remaining two samples. Use the average gradation of these three samples to determine acceptance of the material. If an average of three test results is used to determine the acceptance for a lot, then each subsequent lot shall have all three samples tested. However, the testing can be reduced once again to only one test per subsequent lot after a lot has all three samples within the specified limits.

Determine the physical properties of three random samples obtained from the stockpile for each lot of 10,000 ton, or fraction thereof. Physical properties are determined according to [NDDOT 4](#), "Percentage of Fractured Particles in Coarse Aggregate," and [AASHTO T 113](#), "Lightweight Pieces in Aggregate." Compute the results on [SFN 9987](#), "Aggregate Sample Worksheet." If a fraction of a lot is less than 2,500 ton, include it with the previous lot of 10,000 tons. If the material from all three samples is within the specified limits, test only one of the three samples from each subsequent lot. If at any time the sample tested fails to meet the specified limits, test the remaining two samples and determine the physical properties of each lot by the average of these three test results. If an average of

three test results is used to determine the acceptance for a lot, then each subsequent lot shall have all three samples tested. However, the testing can be reduced once again to only one test per subsequent lot after a lot has all three samples within the specified limits.

If it is not possible to obtain a composite aggregate sample for testing, obtain a sample of each component. Test each component and combine the results mathematically in the proportions required for a composite sample.

Report results on [SFN 10072](#), "Aggregate Quality Test Summary." Submit [SFN 14388](#), "Price Adjustment Worksheet," if there are failing test results.

Determine the depth and width of permeable base, at random locations at a frequency of two sets per 4,500 square yards. Take a minimum of two sets of depth and width checks for areas less than 4,500 square yards. Record results on [SFN 13889](#), "Project Records Samples/Tests Report."

A set of depth checks consists of placing three metal plates on top of the primed surface at the random locations. Determine the thickness by inserting a metal measuring device through the permeable base until the device contacts the metal plate. Record the depth of insertion.

If a NHS system project, submit [SFN 13889](#), "Project Records Samples/Test Reports," to the FHWA at the completion of the project for compliance purposes.

Materials and Research Laboratory Testing: One composite aggregate sample will be obtained and tested for L.A. abrasion during the beginning of aggregate stockpiling. The Engineer or Representative must obtain these samples and submit them to the District Materials Coordinator. The District Materials Coordinator or Representative will then submit composite samples to the Materials and Research Laboratory. The Materials and Research Laboratory will determine L.A. abrasion loss percentage according to [AASHTO T 96](#), "Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine." If the aggregate source has been tested previously by the Department and the material is within allowable limits, the test for L.A. abrasion may be waived at the discretion of the District Materials Coordinator.

304.2 INDEPENDENT ASSURANCE (IA) SAMPLES AND TESTS

District Laboratory Testing: The District Materials Coordinator or a Representative must obtain these samples.

Obtain one sample for every 20,000 tons of aggregate produced for sieve analysis and physical properties. The samples are obtained and split according to [AASHTO T 2](#), "Sampling of Aggregates," and [AASHTO T 248](#), "Reducing Samples of Aggregate to Testing Size," respectively. Test samples according to

[AASHTO T 27](#), "Sieve Analysis of Fine and Coarse Aggregates," and [AASHTO T 11](#), "Materials Finer than No. 200 Sieve in Mineral Aggregates by Washing." Physical properties are determined according to [NDDOT 4](#), "Percentage of Fractured Particles in Coarse Aggregate," and [AASHTO T 113](#), "Lightweight Pieces in Aggregate." Compute the results on [SFN 9987](#), "Aggregate Sample Worksheet."

Materials and Research Laboratory Testing: The District Materials Coordinator or Representative must obtain these samples according to [AASHTO T 2](#), "Sampling of Aggregate," and submit them to the Materials and Research Laboratory.

Submit one sample for the first six miles in length and one sample for every additional six miles, or fraction thereof. If the project is less than six miles in length, submit only one sample.

The samples are obtained and split according to [AASHTO T 2](#), "Sampling of Aggregates," and [AASHTO T 248](#), "Reducing Samples of Aggregate to Testing Size," respectively. Test samples according to [AASHTO T 27](#), "Sieve Analysis of Fine and Coarse Aggregates," and [AASHTO T 11](#), "Materials Finer than No. 200 Sieve in Mineral Aggregates by Washing." Physical properties are determined according to [NDDOT 4](#), "Percentage of Fractured Particles in Coarse Aggregate," and [AASHTO T 113](#), "Lightweight Pieces in Aggregate." Compute the results on [SFN 9987](#), "Aggregate Sample Worksheet."

SECTION 306

BLENDED BASE COURSE

306 DESCRIPTION

This work consists of blending and placing the existing aggregate base, existing bituminous surfacing, and possibly one or more courses of aggregate into a uniform base material.

306.1 ACCEPTANCE SAMPLES AND TESTS

Field Laboratory Testing – Un-Blended Aggregate: The Engineer or Representative must obtain these samples and conduct these tests.

Divide the material into lots. A lot is defined as one day's production if production is greater than 1,000 tons per day. If production is less than 1,000 tons per day, then a lot is as many days production as necessary to produce 1,000 tons. If plan quantity is less than 1,000 tons, a lot shall be equal to plan quantity.

Three random samples will be obtained for each lot of material placed. If the base material is placed in a windrow on the roadway, obtain samples from the equalized aggregate windrow. If construction operations do not require the base material to be equalized in a windrow, obtain the sample according to the procedures outlined in [AASHTO T 2](#), "Sampling of Aggregates." Split according to [AASHTO T 248](#), "Reducing Samples of Aggregate to Testing Size."

Test these samples for compliance with the specified gradation according to [AASHTO T 27](#), "Sieve Analysis of Fine and Coarse Aggregate," and [AASHTO T 11](#), "Materials Finer than No. 200 Sieve in Mineral Aggregates by Washing." Test each sample and accept the material if the average of the three samples meet the specified gradation. If the material from all three samples meets the gradation specified, test only one of the three samples from each subsequent lot. If the sample tested does not meet the gradation requirements, test the remaining two samples. Use the average gradation of these three samples to determine acceptance of the material. If an average of three test results is used to determine the acceptance for a lot, then each subsequent lot shall have all three samples tested. However, the testing can be reduced once again to only one test per subsequent lot after a lot has all three samples within the specified limits.

Compute the sieve analysis results on [SFN 9987](#), "Aggregate Sample Worksheet." Record the results on [SFN 10072](#), "Aggregate Quality Test Summary." Submit [SFN 14388](#), "Price Adjustment Worksheet," if there are failing test results.

Field Laboratory Testing – Blended Material: The Engineer or Representative must obtain these samples and conduct these tests.

When the blending process begins, the blended material shall be sampled and tested a minimum of two times per day to assure 97 to 100% of the material passes a 2" sieve and 90 to 100% passes a 1½" sieve. When the Engineer is satisfied the Contractor is producing blended material within the specified limits, random tests will be obtained as determined by the Engineer to assure compliance.

Determine the physical properties of the aggregate from each 10,000 ton lot or fraction thereof. If the fraction is less than 2,500 tons, include it in the previous 10,000 ton lot. Physical properties of the aggregate will be conducted according to [NDDOT 4](#), "Percentage of Fractured Particles in Coarse Aggregate"; [AASHTO T 113](#), "Lightweight Pieces in Aggregate"; and [AASHTO T 90](#), "Determining the Plastic Limit and Plasticity Index of Soils." If the material from all three samples is within the specified limits, only one of the three samples will be tested from each subsequent lot. If at any time the sample tested fails to meet the specified limits, the remaining two samples will be tested and the physical properties of each lot will be determined by the average of these three test results. The testing of three samples per lot will continue until all three samples are within the specified limits then only one of the three samples will be tested from each subsequent lot.

Compute the results on [SFN 9987](#), "Aggregate Sample Worksheet." Report results on [SFN 10072](#), "Aggregate Quality Test Summary." Submit [SFN 14388](#), "Price Adjustment Worksheet," if there are failing test results.

Materials and Research Laboratory Testing: One composite aggregate sample will be obtained and tested for L.A. abrasion during the beginning of aggregate stockpiling. The Engineer or Representative must obtain these samples and submit them to the District Materials Coordinator. The District Materials Coordinator or Representative will then submit a composite sample to the Materials and Research Laboratory. The Materials and Research Laboratory will determine L.A. abrasion loss percentage according to [AASHTO T 96](#), "Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine." If the aggregate source has been tested previously by the Department and the material is within allowable limits, the test for L.A. abrasion may be waived at the discretion of the District Materials Coordinator.

306.2 INDEPENDENT ASSURANCE (IA) SAMPLES AND TESTS

District Laboratory Testing: The District Materials Coordinator or Representative must obtain these samples and conduct these tests.

Samples are obtained according to [AASHTO T 2](#), "Sampling of Aggregate," and split according to [AASHTO T 248](#), "Reducing Samples of Aggregate to Testing Size."

Take one sample for every 30,000 tons of aggregate produced for sieve analysis and physical properties. The sieve analysis is conducted according to [AASHTO T 27](#), "Sieve Analysis of Fine and Coarse Aggregates," and [AASHTO T 11](#), "Materials Finer than No. 200 Sieve in Mineral Aggregates by Washing." Physical properties are determined according to [NDDOT 4](#), "Percentage of Fractured Particles in Coarse Aggregate"; [AASHTO T 113](#), "Lightweight Pieces in Aggregate"; and [AASHTO T 90](#), "Determining the Plastic Limit and Plasticity Index of Soils." Compute the results on [SFN 9987](#), "Aggregate Sample Worksheet." Record the results on [SFN 10072](#), "Aggregate Quality Test Summary."

For aggregate base or surface course, perform one width and depth check for every two miles and record on [SFN 13889](#). If an NHS system project, submit a copy of [SFN 13889](#), "Project Records Samples/Test Reports," to the FHWA at the completion of the project for compliance purposes.

Materials and Research Laboratory Testing: The District Materials Coordinator or Representative must obtain these samples, according to [AASHTO T 2](#), "Sampling of Aggregate," and submit samples to the Materials and Research Laboratory.

Submit one sample for the first six miles in length and one sample for every additional six miles, or fraction thereof. If the project is less than six miles in length, submit only one sample.

Sieve analysis is conducted according to [AASHTO T 27](#), "Sieve Analysis of Fine and Coarse Aggregates," and [AASHTO T 11](#), "Materials Finer than No. 200 Sieve in Mineral Aggregates by Washing." The physical properties are determined according to [NDDOT 4](#), "Percentage of Fractured Particles in Coarse Aggregate"; [AASHTO T 113](#), "Lightweight Pieces in Aggregate"; and [AASHTO T 90](#), "Determining the Plastic Limit and Plasticity Index of Soils." Compute the results on [SFN 9987](#), "Aggregate Sample Worksheet."

SECTION 300 FORMS

AGGREGATE SAMPLE WORKSHEET

North Dakota Department of Transportation, Materials & Research

SFN 9987 (Rev. 07-2007)

PCN
Laboratory No.
Field Sample No.
Pit Location
Owner
Project
County
Material/Specification
Date Received
Date Sampled
Sampled From
Submitted By

(mm)	Ret.	Wt. Ret.		% Ret.	% Pass	ND Spec.
		Non-Cum.	Cum.			
100	4"					
90	3 1/2"					
75	3"					
63	2 1/2"					
50	2"					
37.5	1 1/2"					
25.0	1"					
19.0	3/4"					
16.0	5/8"					
12.5	1/2"					
9.5	3/8"					
4.75	No. 4					
Minus No. 4						
Wt. Check						
Original Wt.						

AASHTO T-27 Tested By:

FRACTURED FACES

FF = Percentage of particles with fractured faces

WF = Weight of fractured particles

WQ = Wt. of questionable fract. particles

WA = Weight of total sample

$FF = [WF + (WQ/2)]/WA \times 100$

FF =

ND Spec

(mm)	Ret.	Wt. Ret.		% Ret.	% Pass	% Pass Tot. Smpl.	ND Spec.
		Non-Cum.	Cum.				
2.36	No. 8						
2.00	No. 10						
1.18	No. 16						
600µm	No. 30						
425µm	No. 40						
300µm	No. 50						
150µm	No. 100						
75µm	No. 200						
Minus No. 200							
Original Wt.							
Wt. After Wash							
Wash Loss							
Wt. Check							

Tested By:

AASHTO T-27 Tested By:

AASHTO T-11 Tested By:

LIGHTWEIGHT PIECES

+ No. 4 Material

- No. 4, + No. 30 Material

(A) % Retained on No.4 Sieve	=	%	(I) Weight of Lt Wt Pieces, -No. 4, + No. 30 Mtrl.	=	g
(B) % Passing No. 30, Total Sample	=	%	(J) Weight of - No. 4, + No. 30 Material	=	g
(C) % Pass No. 4 - % Pass No. 30, [100-(A+B)]	=	%	(K) Lt Wt Pieces, - No. 4, + No. 30 (I/J)x100	=	%
(D) Total Sample A+B+C	=	100.0 %	(L) Lt Wt Pieces, - No. 4, + No. 30 Material		
(E) Weight of Lt Wt Pieces in + No. 4 Mtrl.	=	g	% of Total Sample (KxC)/100	=	%
(F) Weight of + No. 4 Material	=	g			
(G) Lt Wt Pieces, + No. 4 Mtrl (E/F)x100	=	%			
(H) Lt Wt Pieces, + No. 4 Mtrl., % of Total Sample (GxA)/100					%
			(M) Lightweight Pieces in Total Sample (H+L)	=	%

AASHTO T-113 Tested By:

* Attention Advised

Distribution:

District

Central Lab.

Date

Testing Lab Supervisor

Laboratory Number

Liquid Limit, Plastic Limit, and Plasticity Index

Liquid Limit

A. Can no.	tare weight	
B. Can and wet soil		
C. Can and dry soil		
D. Moisture loss (B - C)		
E. Dry soil weight (C - A)		
F. Moisture at blows (D/E) x 100		
	Moisture corrected (F x K)	
G. Liquid Limit		

AASHTO T 89 tested by:

#Blows

Number of blows N	Factor for Liquid Limit K
22	0.985
23	0.990
24	0.995
25	1.000
26	1.005
27	1.009
28	1.014

Plastic Limit

H. Can No.	tare weight	
I. Can and wet soil		
J. Can and dry soil		
L. Moisture loss (I - J)		
M. Dry soil weight (J - H)		
	Moisture content (L/M) x 100	
O. Plastic Limit		
	Plastic Index (G - O)	

AASHTO T 89 tested by:

LA Abrasion

Grading Used:	(indicate by circling)
Weight of original sample	(A) = _____ grams
Weight of sample retained on No. 12	(B) = _____ grams
Loss	(C) = _____ grams
LA Abrasion = C/A x 100	= _____ % Loss

AASHTO T-96 Tested By: _____

Unit Weight

Wt. Loose, lbs	lbs/cf
Wt. Rodded, lbs	lbs/cf

AASHTO T-19 Tested By: _____

AGGREGATE QUALITY TESTS SUMMARY

North Dakota Department of Transportation, Materials & Research Division
 SFN 10072 (Rev. 11-2006)

Specification Section Number	Title		
Project No.			Aggregate Class
County			Los Angeles Wear
Location			Lab. Test No.
Source of Aggregates			

SPECIFICATIONS	SIEVE SIZES AND PERCENTS PASSING													

TEST DATA	DATE/TIME SAMPLED	LOCATION SAMPLED	TEST NO.	PERCENTS PASSING											REMARKS		

If the PI and LL are required, these should also be shown. Sieve size percentages and physical property results shall be reported to the required specification. Include all tests conducted, both passing and failing, and circle all failing percentages. Indicate under "Remarks" the action taken to correct the situation causing failing tests. As each item of the project is completed, submit the original copies of these reports to the district materials coordinator for correction and review. When the district materials coordinator is satisfied that all tests are tabulated, he will sign and forward a copy to FHWA.

Submitted by _____
 Signature of Project Engineer
 Reviewed by _____
 Signature of District Materials Coordinator
 Date _____

Legend - Test Type
 V - Verification
 P - Progress Record
 I - Independent Assurance

PRICE ADJUSTMENT WORKSHEET

North Dakota Department of Transportation, Construction Services
SFN 14388 (Rev. 09-2005)

Price Adjustment Work Sheet for:

- A. Aggregate Gradation - Aggregate Base or Surface Course
- B. Shale Content - Contractor Located Aggregate Sources

Project	Date
Class of Aggregate	Lot No.

A. AGGREGATE GRADATION (Use Applicable Sieves)

Gradation Range Limits

Sieve Size	3"	1 1/2"	1"	3/4"	1/2"	3/8"	4	8	16	30	200
Upper Limit											
Lower Limit											

Test No. Actual Percent Passing of Each Sieve

Test No.	3"	1 1/2"	1"	3/4"	1/2"	3/8"	4	8	16	30	200
1											
2											
3											
Average % passing <small>Round to the nearest whole number, except on the #200 sieve</small>											
Deviation of average from gradation limits											
Sum of deviations = A											A =

Percent deduction = 5 x $\frac{\text{A}}{\text{(A)}} = \frac{\text{B}}{\text{(B)}}\%$

Gradation deduction:

$\frac{\text{A}}{\text{(Tons this lot)}} \times \frac{\text{B}}{\text{(Bid price)}} \times \frac{\text{B}}{\text{(B)}}\% = \$ \frac{\text{Gradation Deduct}}{\text{(Gradation Deduct)}}$

B. SHALE CONTENT

Allowable Shale Content _____ (S₁)

Test No.	1	2	3	
Shale content <small>(round to nearest tenth)</small>	_____	_____	_____	

Average shale content = _____ (S₂)

Deviation = S₂ - S₁ = _____ (D₁)

Percent deduction = $\frac{\text{D}_1}{\text{(D}_1)} \div .2 = \frac{\text{D}_2}{\text{(D}_2)}\%$

Shale deduction:

$\frac{\text{D}_1}{\text{(Tons this lot)}} \times \frac{\text{D}_2}{\text{(Bid price)}} \times \frac{\text{D}_2}{\text{(D}_2)}\% = \$ \frac{\text{Shale Deduct}}{\text{(Shale Deduct)}}$

DISTRIBUTION: Project Engineer (original)
Contractor
District

_____ Engineer - Inspector