APPENDIX D
ANSWERS TO STUDY QUESTIONS/PROBLEMS

Chapter 2
Quality Assurance Program
Questions

1. What determines the lot size for a specified material accepted under the Statistical QA Program?

   B. production tonnage

2. A normal lot is represented by how many test samples?

   D. 4

3. The Producer's Technician is responsible for making batch adjustments.

   A. True

4. The job-mix formula is approved by the:

   C. District Materials Engineer

5. The Project Inspector is responsible for the submission of the job-mix formula.

   B. False

6. One of the duties of the District Materials Engineer's CMA staff technician is to provide technical guidance to the Producer's Technician.

   A. True

7. The inspection, sampling, and testing of the aggregates for conformance with the VDOT Specifications are the responsibilities of the:

   C. Producer's Technician

8. Actuating of dials, gauges, scales, meters, or other plant control or weighing devices is the responsibility of the Producer.

   A. True

9. The District CMA Monitor Technician is the field representative of the Resident Engineer.

   B. False

10. Must the Producer's Technician in plants producing Aggregate Base, Subbase and Select Material, Type I be certified CMA Technicians?

    A. Yes

11. When should the job mix formula be submitted by the producer?

    Before production begins.

12. What is the length of time that the Department has to evaluate a job mix formula change?

    Up to one week.

13. A system to allow resampling and retesting where there is doubt that the original test results are valid is the:

    A. Referee System

14. A chart that is set up to alert the Producer when to investigate his process is a Control Chart.

    A. True

15. The Job-Mix Formula for Aggregate Bases, Subbases, and Select Material, Type I is chosen from the:

    B. Design Range

16. In the production of Cement Stabilized Aggregate, no one sample shall have a cement content more than 1.3 percent below that stated on the Job-Mix Formula.

    B. False

17. Is it permissible to accept Central-Mix Aggregate by visual inspection?

    B. No

18. Who approves the source and quality of materials for use in central-mix aggregates?

    The Materials Division.

19. Who conducts the inspection of central-mix aggregate plants?

    The Materials Division.

20. Who is required to furnish a plant laboratory?

    The Producer.

21. The job acceptance sample for central-mix aggregate bases, subbases and select material is taken from:

    D. Truck

22. What is the difference in taking a sample of stabilized and non-stabilized material?

    Non-stabilized material is sampled when the ton and truck quadrant come up for test. Stabilized material is tested for cement content when the ton and truck quadrant come up then the cement is cut off and the sample is pulled form the next truck that has no cement in the mixture for gradation.

23. Does the Plant Quality Control Technician run job acceptance samples when the producer is stockpiling?

    B. No

Chapter 3
Sampling and Testing Aggregates
Questions

1. The fine gradation is washed over the:

   D. No. 200 (75 μm) sieve

2. The sieve size that separates the coarse material from the fine material is the:

   B. No. 10 (2.00 mm) sieve

3. The fine gradation sample should weigh between:

   C. 125 and 200 grams

4. A process in which an aggregate is separated into its various sizes by passing it through screens of various openings for the purpose of determining the distribution of the quantities separated is:

   B. Sieve analysis

5. The minimum dry weight of a sample of central mix aggregate that contains +19.0 mm material should be:

   C. 5000 grams

6. Two acceptable ways of splitting a sample are by a sample splitter and by the quartering method.

   A. True

7. What is the temperature range at which the fine gradation is dried?

   230 $\pm$ 9° F (110 $\pm$ 5°) C

8. The fine material is shaken for how many minutes?

   7 to 10

9. The total sample is computed to the nearest_____percent?

   tenth

10. The numerical difference between the liquid limit and plastic limit is the plasticity index.

    A. True

11. The liquid limit and plastic limit tests are run on material passing the:

    B. No. 40 sieve (425 μm)

12. The moisture content at which a soil changes from a semi-solid to a plastic state is the liquid limit.

    B. False

13. In determining the liquid limit and plastic limit, the portion of the wet sample used must be dried at a temperature not to exceed 140°F (60°C) .

    A. True

14. What size material is used for determining the liquid limit and plastic limit?

    Passing the No. 40 sieve (425 μm) sieve

15. Which tests are performed on Dense Graded Aggregates?

    Gradation, Liquid Limit and Plastic Limit.

16. What are the requirements for water used in the liquid limit and plastic limit test?

    Distilled and demineralized.

17. How many blows per second is the cup on the liquid limit device dropped?

    two per second

18. To determine the moisture content in the liquid limit test a slice of soil approximately the width of the spatula extending from edge to edge of the soil cake at right angles to the groove, and including that portion that flowed together must be taken.

    True

19. When determining the plastic limit, the soil is rolled to a thread of 1/8 inch (3.1 mm).

20. VDOT Specifications require that Central Mixed Aggregate be shipped at optimum moisture

    ± 2

Chapter 3
PROBLEMS

1. Complete the following moisture determination problem and give the moisture content in percent.

Dish & Wet Material	700 grams
Dish & Dry Material	680 grams
Dish	200 grams

700	680	$\frac{500 - 480}{480} \times 100 = 4.2\%$
-200	-200	
500	480	

2. In an effort to determine the moisture content of a material, a sample of the material was taken and found to weigh 1346 grams. The sample was then dried to a constant weight and reweighed. The dried sample was found to have a weight of 1240 grams. Using this information, calculate the percent of moisture.

$$\frac{1346 - 1240}{1240} \times 100 = 8.5\ \%$$

Chapter 3
Problem No. 3

Mechanical Analysis of total sample				Mechanical Analysis of soil mortar			
Sieve Sizes	Grams Retained	Percent Retained	Percent Passing	Sieve Sizes	Grams Retained	Percent Retained	Percent Passing
63.0 mm (2 ½)				63.0 mm (2 ½)			
50.0 mm (2)				50.0 mm (2)			
37.5 mm (1 ½)				37.5 mm (1 ½)			
25.0 mm (1)			**100.0**	25.0 mm (1)			
19.0 mm (3/4)	**252**	**2.7**%	**97.3**	19.0 mm (3/4)			
9.50 mm (3/8)	**2352**	**25.2**%	**72.1**	9.50 mm (3/8)			
4.75 mm (4)	**1241**	**13.3**%	**58.8**	4.75 mm (4)			
2.0 mm (10)	**1017**	**10.9**%	**47.9**	2.0 mm (10)			**100.0**
.850 mm (20)		**10.9**%	**37.0**	.850 mm (20)	**39.7**	**22.8**%	**77.2**
425 mm (40		**6.4**%	**30.6**	425 mm (40	**23.2**	**13.3**%	**63.9**
.250 mm (60)		**3.7**%	**26.9**	.250 mm (60)	**13.4**	**7.7**%	**56.2**
.180 mm (80)		**2.5**%	**24.4**	.180 mm (80)	**9.2**	**5.3**%	**50.9**
.150 mm (100)		**1.8**%	**22.6**	.150 mm (100)	**6.4**	**3.7**%	**47.2**
. 075 mm (200)		**5.2**%	**17.4**	.075 mm (200)	**18.8**	**10.8**%	**36.4**
Total	**9334**	**17.5**%		Total	**174.2**	**36.5**%	

Liquid Limit		Plastic Limit		Physical Characteristics of Soil
Dish No. **14**	No. of Blows **26**	Dish No. **19**		Liquid Limit **26.6**%
Dish & Wet Soil **87.1**	Dish & Dry Soil **84.1**	Dish & Wet Soil **80.1**	Dish & Dry Soil **78.0**	Plastic Limit **24.4**%
Dish & Dry Soil **84.1**	Dish **72.8**	Dish & Dry Soil **78.0**	Dish **69.4**	Plasticity Index **2.2**%
Mass of Water **3.0**	Dry Soil **11.3**	Mass of Water **2.1**	Dry Soil **8.6**	
% Moisture = Mass of Water x 100 = **26.5** Dry Soil		P.L. = Mass of Water x 100 = **24.4** Dry Soil		Optimum Moisture Content Total Soil **6.6** % -4.75 mm (-4)Portion **10.3 %** Maximum Density Total Soil kg/m³(lbs/ft³) -4 75 mm (-4)Portion **6.0**kg/m³(lbs/ft³)
L.L. = **26.6**				

Wet Weight = **9847** grams % Moisture **5.5** Moisture Range **4.6% - 8.6%** Absorption 0.3

Percent Moisture	**Percent Optimum Moisure**	
9847 wet wt. - 9334 dry wt. 513 513 / 9334 = 0.0549 x 100 = **5.49** **5.5% moisture**	-4.75(-No. 4) optimum moisture 0.588 x 10.3 6.0564 **6.1%**	+4.75(+No. 4) optimum moisture 0.412 x 1.3 (0.3 + 1) 0.5356 = 0.5%
Percent +4.75 (+No. 4)	**Total Optimum Moisture**	**Moisture Range**
100.0 - 58.8 -4.75 (-No. 4) **41.2** +4.75 (+No. 4)	6.1% + 0.5% **6.6%**	6.6% 6.6% - 2.0% + 2.0% **4.6% to 8.6%**

Chapter 3
Problem No. 4

Mechanical Analysis of total sample				Mechanical Analysis of soil mortar			
Sieve Sizes	Grams Retained	Percent Retained	Percent Passing	Sieve Sizes	Grams Retained	Percent Retained	Percent Passing
63.0 mm (2 ½)				63.0 mm (2 ½)			
50.0 mm (2)				50.0 mm (2)			
37.5 mm (1 ½)				37.5 mm (1 ½)			
25.0 mm (1)			**100.0**	25.0 mm (1)			
19.0 mm (3/4)	**357**	**5.8**%	**94.2**	19.0 mm (3/4)			
9.50 mm (3/8)	**1448**	**23.6**%	**70.6**	9.50 mm (3/8)			
4.75 mm (4)	**913**	**14.9**%	**55.7**	4.75 mm (4)			
2.0 mm (10)	**1011**	**16.5**%	**39.2**	2.0 mm (10)			**100.0**
.850 mm (20)		**11.9**%	**27.3**	.850 mm (20)	**57.8**	**30.4**%	**69.6**
425 mm (40		**5.1**%	**22.2**	425 mm (40	**24.8**	**13.1**%	**56.5**
.250 mm (60)		**3.3**%	**18.9**	.250 mm (60)	**16.0**	**8.4**%	**48.1**
.180 mm (80)		**1.8**%	**17.1**	.180 mm (80)	**8.7**	**4.6**%	**43.5**
.150 mm (100)		**1.3**%	**15.8**	.150 mm (100)	**6.3**	**3.3**%	**40.2**
. 075 mm (200)		**4.0**%	**11.8**	.075 mm (200)	**19.5**	**10.3**%	**29.9**
Total	**6136**	**11.7**%		Total	**190.0**	**29.9**%	

Liquid Limit		Plastic Limit		Physical Characteristics of Soil	
Dish No. **21**	No. of Blows **28**	Dish No. **10**		Liquid Limit	**21.4** %
Dish & Wet Soil **52.1**	Dish & Dry Soil **48.9**	Dish & Wet Soil **79.9**	Dish & Dry Soil **77.8**	Plastic Limit	**20.2** %
Dish & Dry Soil **48.9**	Dish **33.7**	Dish & Dry Soil **77.8**	Dish **67.4**	Plasticity Index	**1.2** %
Mass of Water **3.2**	Dry Soil **15.2**	Mass of Water **2.1**	Dry Soil **10.4**		
% Moisture = Mass of Water x 100 = **2**1.1 Dry Soil		P.L. = Mass of Water x 100 = **20.2** Dry Soil		Optimum Moisture Content Total Soil **6.5** % -4.75 mm (-4) Portion **10.5** % Maximum Density Total Soil kg/m³(lbs/ft³) -4.75 mm (-4) Portion kg/m³(lbs/ft³)	
L.L. = **21.4**					

Wet Weight = **6449** grams % Moisture **5.1** Moisture Range **4.2 – 8.2** Absorption **0.6**

Percent Moisture	**Percent Optimum Moisure**	
6449 wet wt. - 6136 dry wt. 313 313 = 0.051 x 100 = **5.1% moisture** 6136	-4.75(-No. 4) optimum moisture	+4.75(+No. 4) optimum moisture
	0.557 x10.5 5.8485 = **5.8%**	0.443 x 1.6 (0.6 +1) 0.7088 = **0.7%**
Percent +4.75 (+No. 4)	**Total Optimum Moisture**	**Moisture Range**
100.0 - 55.7 -4.75 (-No. 4) **44.3** +4.75 (+No. 4)	5.8% + 0.7% **6.5%**	6.5% 6.5% - 2.0% + 2.0% **4.5% to 8.5%**

Chapter 3
Problem No 5

Mechanical Analysis of total sample				Mechanical Analysis of soil mortar			
Sieve Sizes	Grams Retained	Percent Retained	Percent Passing	Sieve Sizes	Grams Retained	Percent Retained	Percent Passing
63.0 mm (2 ½)		%		63.0 mm (2 ½)		%	
50.0 mm (2)		%		50.0 mm (2)		%	
37.5 mm (1 ½)		%		37.5 mm (1 ½)		%	
25.0 mm (1)		%	**100.0**	25.0 mm (1)		%	
19.0 mm (3/4)	**267**	**3.0**%	**97.0**	19.0 mm (3/4)		%	
9.50 mm (3/8)	**2650**	**29.8**%	**67.2**	9.50 mm (3/8)		%	
4.75 mm (4)	**1343**	**15.1**%	**52.1**	4.75 mm (4)		%	
2.0 mm (10)	**1103**	**12.4**%	**39.7**	2.0 mm (10)		%	**100.0**
.850 mm (20)		**8.9**%	**30.8**	.850 mm (20)	**44.6**	**22.3**%	**77.7**
425 mm (40		**5.6**%	**25.2**	425 mm (40	**28.4**	**14.2**%	**63.5**
.250 mm (60)		**3.1**%	**22.1**	.250 mm (60)	**15.8**	**7.9**%	**55.6**
.180 mm (80)		**2.0**%	**20.1**	.180 mm (80)	**10.2**	**5.1**%	**50.5**
.150 mm (100)		**1.5**%	**18.6**	.150 mm (100)	**7.6**	**3.8**%	**46.7**
. 075 mm (200)		**4.2**%	**14.4**	.075 mm (200)	**21.2**	**10.6**%	**36.1**
Total	**8893**	**14.3**%		Total	**200.0**	**36.1**%	

Liquid Limit		Plastic Limit		Physical Characteristics of Soil		
Dish No. **3**	No. of Blows **22**	Dish No. **5**		Liquid Limit	**20.6**	%
Dish & Wet Soil **88.2**	Dish & Dry Soil **85.4**	Dish & Wet Soil **80.2**	Dish & Dry Soil **78.2**	Plastic Limit	**19.8**	%
Dish & Dry Soil **85.4**	Dish **72.0**	Dish & Dry Soil **78.2**	Dish **68.1**	Plasticity Index	**0.8**	%
Mass of Water **2.8**	Dry Soil **13.4**	Mass of Water **2.0**	Dry Soil **10.1**			
% Moisture = Mass of Water x 100 = **2**0.9 / Dry Soil		P.L. = Mass of Water x 100 = **19.8** / Dry Soil		Optimum Moisture Content Total Soil **6.4** % -4.75 mm (-4) Portion **10.8** % Maximum Density Total Soil kg/m³(lbs/ft³) -4.75 mm (-4)Portion kg/m³(lbs/ft³)		
L.L. = **20.6**						

Wet Weight = **9418** grams % Moisture **5.9** Moisture Range **4.4 – 8.4** Absorption **0.7**

Percent Moisture	**Percent Optimum Moisure**	
	-4.75(-No. 4) optimum moisture	+4.75(+No. 4) optimum moisture
9418 wet wt. - 8893 dry wt. 525 525 / 8893 = 0.059 x 100 = **5.9% moisture**	0.521 x 10.8 5.62 = **5.6%**	0.479 x 1.7 (0.7 + 1) 0.8143 = **0.8%**
Percent +4.75 (+No. 4)	**Total Optimum Moisture**	**Moisture Range**
100.0 - 52.1 -4.75 (-No. 4) **47.9** +4.75 (+No. 4)	5.6% + 0.8% **6.4%**	6.4% 6.4% - 2.0% + 2.0% **4.4% to 8.4%**

Chapter 4
Acceptance of Material

1. What types of Portland Cement are allowed in stabilized Central-Mix aggregates?

   C. Types I, I-P and II

2. What are the specification requirements for water used in cement treated aggregates?

   pH 4.5 to 8.5

3. In the production of cement stabilized aggregate, no one sample shall have a cement content below design by more than ___ percent.

   C. 1.6%

4. If the total adjustment (excluding range adjustment) for the lot is greater than 25 points the failing material has to be removed from the road.

   A. True

5. The maximum time interval between manufacture of cement treated aggregate and final shaping and compaction is 4 hours.

6. Is it permissible to accept central-mix aggregate by visual inspection?

   No

7. It is the Departments policy to require the producer to plot his own Control Charts.

   A. True

8. If the job-mix formula on the 9.5 mm (3/8 in.) sieve is 68% passing, what is the acceptance range?

   58.5 to 77.5

9. Can the acceptance range on a sieve fall outside of the Design Range for that particular sieve?

   yes

10. The contractor must accept the price adjustment.

    B. False

11. The pH requirement for water used in cement stabilized aggregate 4.5 to 8.5.

12. The ambient air temperature must be at least before production can start.

    C. 40°F

13. A lot is usually an average of:

    D. 4 samples

14. Standard Deviation and variability are the same thing.

    A. True

15. The Referee System can only be implemented by the contractor.

    B. False

Chapter 4
Acceptance of Material
Problem No. 1

Complete the following test report and calculate the percent of unit price adjustment.

Type Mix - Stabilized Aggregate Base Type I, No. 21A

Sample No. Sieve Size	1	2	3	4	Aver.	Lower	Upper	Job-Mix	P/F
50 mm (2 in.)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	P
25 mm (1 in.)	96.0	100.0	98.5	100.0	98.6	92.0	100.0	97.0	P
9.5 mm (3/8 in.)	70.9	67.3	74.9	62.8	69.0	57.5	76.5	67.0	P
2.00 mm (No. 10)	40.7	39.4	45.0	34.5	39.9	32.0	46.0	39.0	P
425 μm (No. 40)	22.5	21.5	25.4	19.7	22.3	20.0	28.0	24.0	P
75 μm (No.200)	11.2	13.1	10.4	10.8	11.4	8.0	12.0	10.0	P
L.L.	21.6	18.8	20.6	19.7	20.2		23.0	23.0	P
P.I.	1.5	0.0	0.5	0.0	0.5		2.0	2.0	P
Cement	3.9	3.2	2.5	2.7	3.1	3.2		4.0	F

Price Adjustment:

3.2 Lower Acceptance Range
-3.1 Average Cement Content
0.1% Outside Process Tolerance

10 Adjustment for each 1%
x 0.1% Outside process tolerance
1.0% Price adjustment for cement content

Chapter 4
Acceptance of Material
Problem No. 2

Complete the following test report and calculate the percent of unit price adjustment.

Type Mix - Stabilized Aggregate Base Type I, No. 21A

Sample No.	1	2	3	4	Aver.	Lower	Upper	Job-Mix	P/F
Sieve Size									
50 mm (2 in.)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	P
25 mm (1 in.)	100.0	98.0	96.0	97.4	97.9	90.0	100.0	95.0	P
9.5 mm (3/8 in.)	70.8	67.1	62.8	66.7	66.9	57.5	76.5	67.0	P
2.00 mm (No. 10)	45.0	34.5	39.4	38.2	39.3	32.0	46.0	39.0	P
425 μm (No. 40)	21.3	25.4	20.8	24.1	22.9	20.0	28.0	24.0	P
75 μm (No.200)	14.1	9.8	11.1	10.2	11.3	8.0	12.0	10.0	P
L.L.	25.0	19.7	20.6	19.8	21.3		23.2	23.0	P
P.I.	5.8	0.0	0.5	0.0	1.6		2.0	2.0	P
Cement	3.3	2.5	2.9	2.9	2.9	3.2		4.0	F

Price Adjustment:

3.2 Lower Acceptance Range
-2.9 Average Cement Content
0.2% Outside Process Tolerance

10 Adjustment for each 1%
x 0.2% Outside process tolerance
2.0% Price adjustment for cement content

Chapter 4
Acceptance of Material
Problem No.3

Complete the following test report and calculate the percent of unit price adjustment.

Type Mix - Stabilized Aggregate Base Type I, No. 21A

Sample No.	1	2	3	4	Aver.	Lower	Upper	Job-Mix	P/F
Sieve Size									
50 mm (2 in.)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	P
25 mm (1 in.)	94.2	91.6	94.4	97.1	94.3	89.0	99.0	94.0	P
9.5 mm (3/8 in.)	68.5	67.4	70.6	61.3	67.0	57.5	76.5	67.0	P
2.00 mm (No. 10)	34.2	32.4	34.8	40.9	35.6	27.0	41.0	34.0	P
425 μm (No. 40)	15.8	14.4	14.5	21.6	16.6	12.0	20.0	16.0	P
75 μm (No.200)	8.8	8.7	8.0	9.9	8.9	9.0	13.0	11.0	F
L.L.	20.5	19.1	20.0	28.6	22.1		23.0	23.0	P
P.I.	0.0	0.0	0.0	4.2	1.1		2.0	2.0	P
Cement	3.3	2.7	2.5	3.5	3.0	3.2		4.0	F

Price Adjustment:

No. 200 (75 μm)

9.0	5
-8.9	x 0.1%
0.1%	0.5

Cement:

3.2	10
-3.0	x 0.2%
0.2%	2.0

Total Price Adjustment:

0.5% adjustment on the No. 200 (75 μm) sieve
+2.0% adjustment for cement content
2.5% Total adjustment

Chapter 5
Modified Acceptance Production
Questions

1. What is the rate of sampling under the Modified Acceptance Plan for Open Graded Aggregates?

   B. one per 1000 tons

2. The sample taken for open graded aggregates accepted under the Modified Acceptance Plan is taken from:

   D. All of the above

3. Does the Quality Control Technician have to be certified?

   B. No

4. Sieve Analysis on Open Graded Aggregates are accumulated.

   A. True

5. All Open-Graded Aggregates must have a job mix submitted before production can start.

   B. False

Chapter 5
Modified Acceptance Production
Open Graded Aggregates Sieve Analysis
Problem No.1

Check the following sieve analysis of a sample of natural sand for use in concrete not subject to abrasion and determine if it meets Virginia Department of Transportation requirements for Grading "A" Sand. Circle the sieve(s) not passing, if any.

Sieve Size	Cumulative Grams Retained	Cumulative % Retained	% Passing	VDOT Specs. (% Passing)
9.5 mm (3/8 in.)	0.0	0.0	100	100
4.75 mm (No. 4)	16.6	2.9	97	95-100
2.36 mm (No. 8)	64.5	11.3	89	80-100
1.18 mm (No. 16)	214.1	37.4	63	50-85
600 μm (No. 30)	389.2	67.9	32	25-60
300 μm (No. 50)	483.0	84.3	16	5-30
150 μm (No. 100)	543.4	94.8	5	0-10
75 μm (No. 200)	565.0	98.6	1.4	0-5
Total Wt.	573.0			

Does this sample pass? Yes_x_ No___

Chapter 5
Modified Acceptance Production
Open Graded Aggregates Sieve Analysis
Problem No.2

Check the following sieve analysis of a sample of 57s and determine if it meets Virginia Department of Transportation requirements. Circle the sieve(s) not passing, if any.

Sieve Size	Grams Retained	% Retained	% Passing	VDOT Specs. (% Passing)
37.5 mm (1 1/2 in.)	0.0	0.0	100.0	100
25.0 mm (1 in.)	0.0	0.0	100.0	95 - 100
19.0 mm (3/4 in.)	703.2	6.9	93	
12.5 mm (1/2 in.)	4544.7	44.9	48	25 - 60
9.5 mm (3/8 in.)	2247.8	22.2	26	
4.75 mm (No. 4)	2250.6	22.2	4	0 – 10
2.36 mm (No. 8)	116.1	1.1	3	0 – 5
Total Wt.	10120.7			

Does this sample pass? Yes_x_ No___

Appendix B
Pay Quantities
Problem No. 1

A plant produced 406 tons of material at a moisture content of 9.6%. If the optimum moisture was 6.0%, give the weight in tons of stone and moisture that may be paid for.

Step 1. Determine the Total Allowable Moisture

Optimum Moisture + 2% = Total Allowable Moisture
6% + 2% = Total Allowable Moisture
8% = Total Allowable Moisture

Step 2. Determine the Dry Weight of the Aggregate

Tons Shipped / (1 + % Avg. Moist.) = Dry Weight of Aggregate
406 / (1 + 9.6%) = Dry Weight of Aggregate
406 / (1 + .096) = Dry Weight of Aggregate
406 / (1.096) = Dry Weight of Aggregate
370.44 = Dry Weight of Aggregate

Step 3. Determine the Pay Quantity

Dry Weight of Aggregate x (1 + % Allowable Moisture) = Pay Quantity
370.44 x (1 + 8.0%) = Pay Quantity
370.44 x (1 + .08) = Pay Quantity
370.44 x (1.08) = Pay Quantity
400.08 = Pay Quantity

Appendix B
Pay Quantities
Problem No. 2

A plant produced 333 tons of mix at a moisture of 10.6%. If the optimum moisture was 7.0%, give the weight in tons of stone and moisture that may be paid for.

Step 1. Determine the Total Allowable Moisture

Optimum Moisture + 2% = Total Allowable Moisture
7% + 2% = Total Allowable Moisture
9% = Total Allowable Moisture

Step 2. Determine the Dry Weight of the Aggregate

Tons Shipped / (1 + % Avg. Moist.) = Dry Weight of Aggregate
333 / (1 + 10.6%) = Dry Weight of Aggregate
333 / (1 + .106) = Dry Weight of Aggregate
333 / (1.106) = Dry Weight of Aggregate
301.08 = Dry Weight of Aggregate

Step 3. Determine the Pay Quantity

Dry Weight of Aggregate x (1 + % Allowable Moisture) = Pay Quantity
301.08 x (1 + 9.0%) = Pay Quantity
301.08 x (1 + .09) = Pay Quantity
301.08 x (1.09) = Pay Quantity
301.08 x (1.09) = Pay Quantity
328.18 = Pay Quantity

Appendix B
Pay Quantities
Problem No. 3

A plant shipped 396.0 tons of mix. The moisture sample taken weighed 500 grams wet and 454.9 grams dry. If the optimum moisture content was 7.2%, determine the allowable pay quantities of stone and moisture.

Wet Wt. - Dry Wt. / Dry Wt. x 100 = % Moisture
500 - 454.9 / 454.9 x 100 = 9.9% Moisture

Step 1. Determine the Total Allowable Moisture

Optimum Moisture + 2% = Total Allowable Moisture
7.2% + 2% = Total Allowable Moisture
9.2% = Total Allowable Moisture

Step 2. Determine the Dry Weight of the Aggregate

Tons Shipped / (1 + % Avg. Moist.) = Dry Weight of Aggregate
396 / (1 + 9.9%) = Dry Weight of Aggregate
396 / (1 + .099) = Dry Weight of Aggregate
396 / (1.099) = Dry Weight of Aggregate
360.33 = Dry Weight of Aggregate

Step 3. Determine the Pay Quantity

Dry Weight of Aggregate x (1 + % Allowable Moisture) = Pay Quantity
360.33 x (1 + 9.2%) = Pay Quantity
360.33 x (1 + .092) = Pay Quantity
360.33 x (1.092) = Pay Quantity
393.48 = Pay Quantity

Appendix C
VTM-40,Titration
Questions

1. The Contractor shall furnish a motorized screen shaker for:

   C. Coarse and fine aggregate gradation analysis.

2. To determine the cement content of cement aggregate mixtures by the Titration Method, samples shall be taken at the:

   B. Completion of mixing.

3. When dealing with sodium hydroxide solution, you should always pour the solution into distilled or demineralized water to prevent a spontaneous reaction.

   A. True.

4. The method used to determine the cement content of cement aggregate mixtures is:

   C. Titration Method.

5. In determining the cement content by the Titration Method, the sample for testing should weigh 600 grams.

   A. True.