8 Duties of the Technicians

Contractors and VDOT must work together to ensure that the product produced and delivered meets specifications for each project or job. Our mutual goal is to ensure that we can safely and efficiently produce the critical outcomes for each job and achieve the goals of each job.

VDOT employs a Quality Assurance (QA) program to ensure that quality asphalt concrete mixtures (HMA) are produced and placed throughout the Commonwealth. These include:

- Superpave asphalt mixtures
- Stone matrix asphalt (SMA)
- Porous Friction Course (PFC)
- Thin hot mix asphalt concrete (THMACO)

This QA program consists of a materials acceptance and Quality Assurance (QA) program—quality control (QC) and acceptance testing by the contractor, as well as verification sampling and testing (VST) and independent assurance (IA) testing and observation by the VDOT.

In this chapter, we examine the primary duties, certification requirements and responsibilities of the Contractor Technicians that flow from these programs, and the responsibilities of VDOT to monitor and maintain quality.

Learning Objectives:

Upon completion of this chapter, you should be able to:

- ☑ Discuss the primary duties of each party in the QA and QC Programs
- ☑ Demonstrate how to conduct split sampling
- ☑ Define stratified random sampling and list the major tasks it requires
- ☑ Explain how to create and use control charts
- ☑ Describe the primary duties, certifications and bonds required of the Weighperson
- ☑ Identify major VDOT responsibilities
- ☑ Describe how the referee system works

An Overview of Roles and Responsibilities

The certified roles and responsibilities that are introduced in this chapter are summarized in the two tables that follow.

Contractor Role	Responsibility
Asphalt Plant Mix Design Technician	• Responsible for the design and control of asphalt mixtures produced for the VDOT
Asphalt Plant Technician Level I I	• Perform all tests necessary to put the plant into operation, and sample all mixes and components of mixtures produced at the plant • Assist the AMDT in mix design and monitoring of all components of asphalt mixtures produced at the plant
Asphalt Plant Technician Level I	• Perform sampling and splitting of mixes and components of mixtures produced at the plant • Perform test
Weighperson	• Responsible for certifying the load of each truck shipping asphalt mixtures to a VDOT project • Tracks accumulated asphalt tonnages shipped to VDOT projects on a per JMF/Project/Day basis

VDOT Role	Responsibility
District Materials Engineer	• Responsible for the execution of the VDOT's QA Program on all materials supplied to VDOT projects • Approves asphalt Job Mix Formulas for all mixes produced for the VDOT in the district
QA Monitor	• Responsible for the day-to-day operation of the QA Program at the asphalt plant

Contractor's Responsibility

	DEFINITIONS. The following terms will be used throughout this section:
Lot	Quantity of material to be checked for compliance with specifications.
Stratified random sample	Samplings from equal portions of a lot at locations that have been selected solely by chance.
Control chart	Graphical record of data taken from a repetitive process.
Statistical control	When repeated measurements from a process are normally distributed around a target value.
Normal Distribution	A pattern for the distribution of a set of data which follows a bell shaped curve.

In this section of the chapter we will explore the roles for which the Contractor is responsible.

The Asphalt Plant Mix Design and Plant Technicians

The Contractor shall have a VDOT-certified Asphalt Plant Mix Design Technician to see that all component materials have been approved for use, are being stored and handled properly, and are combined into a mixture that meets all specification requirements.

The Asphalt Plant Mix Design Technician or the Asphalt Plant Level II Technician must be capable of conducting any tests necessary to put the plant into operation and produce a mixture that meets all specification requirements. This job role requires the Asphalt Plant Mix Design Certification.

Duties for which the Asphalt Plant Mix Design Technician is responsible are illustrated in Figure 8-1 and detailed in the text that follows.

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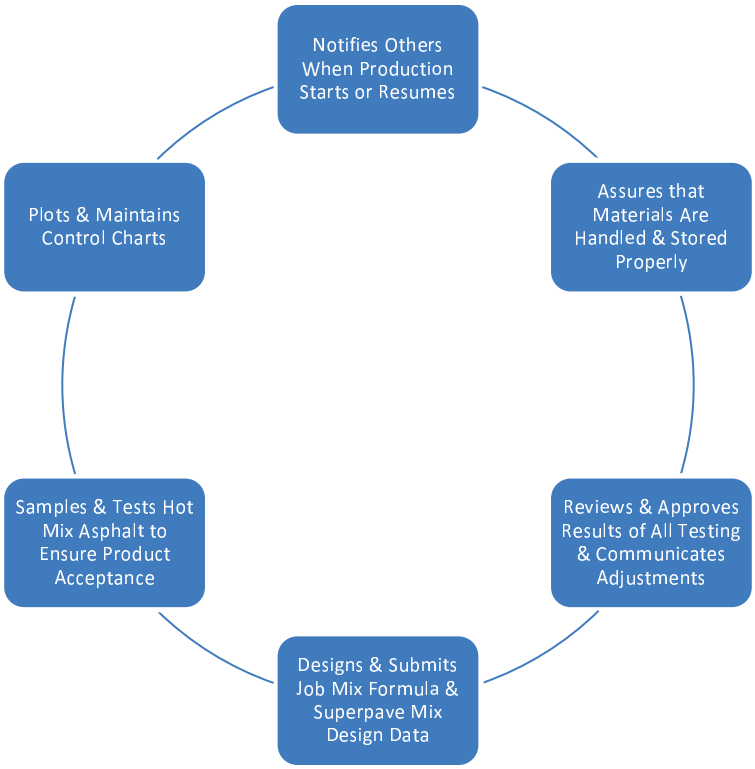

Figure 8-1: Primary Responsibilities of the Asphalt Mix Design Technician

Notifies Others When Production Starts or Resumes

The Contractor/Technician must notify the District Materials Engineer when production is to start or resume after a delay.

Assures that Materials Are Handled & Stored Properly

The Contractor/Technician must assure that all materials are properly handled and stored to prevent them from becoming unsuitable for use. Aggregates for asphalt concrete should be handled and stored to minimize segregation and to prevent contamination with deleterious substances.

The Contractor/Technician also must ensure that the proper kind of asphalt cement, as shown on the job mix formula, is used. He/she is also responsible for seeing that the asphalt cement is handled and stored properly.

AWARENESS/IMPORTANT

Asphalt cement used for State work must come from suppliers listed on the VDOT's Approved List for PG Binder Suppliers.

Highlights a step in the procedure which is either unusual or very particular to this procedure.
May also indicate awareness (additional information) or a cautionary concern in the procedure.

Designs & Submits Job Mix Formula & Superpave Mix Design Data

Before any asphalt concrete is produced, the AMDT shall submit, for the District Materials Engineer's approval, a job mix formula for each mixture to be supplied, along with Superpave mix design data. A sample job mix formula (Form TL-127) is provided in Chapter 7 (page 7-4).

Reviews & Approves Results of Testing & Communicates Adjustments

The Asphalt Plant Mix Design Technician will review and approve the results of all testing. He/she shall be available and in direct communication with the plant to enable him/her to make necessary adjustments in the asphalt concrete mixes at the mixing plant.

Samples & Tests Hot Mix Asphalt to Ensure Product Acceptance

The Asphalt Plant Mix Design Technician must perform the following sampling and testing tasks:

- Sampling hot mix asphalt (HMA), utilizing an approved random method
- Testing in accordance with the specifications
- Recording test results and furnishing copies to VDOT
- Maintaining current quality control charts at the plant for review by VDOT
- Maintaining all records and test results associated with asphalt concrete materials production.

Test Specifications

Test specifications that must be followed when completing these tasks include:

1. A rate of 8 samples per 4000 ton lot is to be used. An 8000 ton lot may be used when normal production exceeds 4000 tons per day, with approval by the Engineer.
2. Samples are to be obtained from the approximate center of truckloads of material.
3. A statistically acceptable method of randomization is to be used to determine the time the stratified random sample is to be taken.

The Asphalt Plant Mix Design Technician and Plant Technician must be able to conduct three specific types of sampling functions:

- Sampling from the truck
- Split sampling
- Statistical sampling.

Sampling from the Truck. Samples used for Acceptance and Quality Assurance must be sampled from the truck. To sample from a truck:

1. Take the sample from the approximate center of the truckload.
2. Strike off the top six inches of material.
3. Take the sample horizontally, 8-12 inches below the surface of the load.

Splitting Samples for Quality Assurance Testing. The Technician also must be able to conduct split sampling, at the request of VDOT. In split sampling, the Technician analyzes half of the sample and VDOT analyzes the other half as part of the VDOT Quality Assurance program. This split sample shall be quartered or processed through a sample splitter in accordance with standard procedures, the quartering method is summarized in Figure 8-2.

1.

Divide the sample.

2.

Quarter the sample.

3.

Remove the two opposing quarters.

Figure 8-2: Summary of the Quartering Method for Sampling

The contractor's portion of the split sample will be used as the next production acceptance sample. Properties to be determined include, but are not limited to:

- Gradation
- Asphalt content
- Temperature (at time of sampling).

Statistical Sampling. VDOT uses a statistical (i.e., a mathematical analysis of accumulated data) method for product acceptance. This allows the Contractor/Technician to exercise product *control*, while VDOT exercises product *acceptance*. VDOT accepts or rejects material based on the average of test results, instead of accepting or rejecting material on an individual sample results. An important phase of any acceptance or rejection plan is the process of "sampling."

Statistical sampling is performed because individuals cannot consistently select, by eye, a sample that truly typifies the entire quantity of material to be checked for compliance with specifications. Statistical

systems require that "samples be taken in such a manner that every part of the quantity of material to be checked for compliance has an equal chance of being sampled." This means that samples must be taken randomly.

Another important part of any acceptance or rejection plan is the *quantity* of material to be checked for compliance with specifications. In statistical quality control, the term "lot" is used to denote the quantity of material to be checked for compliance with specifications, then accepted, rejected or subjected to adjustment. In Virginia, lot sizes are typically 4000 tons; 8000 ton lots may be used when the normal daily production of the source from which the material is obtained is in excess of 4000 tons.

In order for the Asphalt Plant Technician to use statistical quality control properly, he/she must know the following information:

- When to take a sample
- Where to take a sample
- How to take a sample
- How to test the sample
- What to do with the test results

Statistical quality control of asphalt concrete utilizes random sampling within a lot. Virginia's Statistical Quality Control Program, however, goes one step further than just random sampling. VDOT uses the *stratified random sampling* method. Stratified random sampling is sampling from equal portions of a lot at locations that have been selected solely by chance. Any statistically acceptable method of randomization may be used to determine the time and location of the stratified random sample to be taken. However, VDOT shall be advised of the method to be used prior to beginning production.

How to Conduct Stratified Random Sampling. The following is a description and discussion of the step-by-step procedures used in the stratified random sampling method.

1. Determine the lot size (4000 or 8000 ton lots), based on the normal daily production of the plant from which the material is being obtained. The ton is selected each day before beginning production.

2. Stratify the lot: 500 tons per sample for 4000 ton lots or 1000 tons per sample for 8000 ton lots, with 4 samples per lot regardless of lot size. One sample shall be on or between each group of tons, shown in the table that follows:

4000 ton lot	8000 ton lot
1 - 500	1 - 1000
501 - 1000	1001 - 2000
1001 - 1500	2001 - 3000
1501 - 2000	3001 - 4000
2001 - 2500	4001 - 5000
2501 - 3000	5000 - 6000
3001 - 3500	6001 - 7000
3501 - 4000	7001 - 8000

3. Secure four sets of numbers from a Random Number Table. The first number of each set will represent which ton is to be sampled.

4. Record these numbers. The Technician should notify the Weighperson of the ton number selected so that he/she can notify the Technician as to which truck contains the ton to be tested. The Weighperson and the Technician should be the only ones who know which ton is to be sampled. Below is an example for a 4000 ton lot, using Random Numbers Table 1 (page 8-10):

Note: The Random Number Tables presented here are just one of many acceptable methods available for selecting random numbers. The method the Technician uses must be approved by the Engineer prior to production.

Ton	Ton to be Sampled			
.192	1st sample	0 +	(.192 x 1000) =	192 ton
.432	2nd sample	500 +	(.432 x 1000) =	932 ton
.143	3rd sample	1000 +	(.143 x 1000) =	1143 ton
.214	4th sample	1500 +	(.214 x 1000) =	1714 ton
.353	5th sample	2000 +	(.353 x 1000) =	2353 ton
.038	6th sample	2500 +	(.038 x 1000) =	2538 ton
.021	7th sample	3000 +	(.021 x 1000) =	3021 ton
.405	8th sample	3500 +	(.405 x 1000) =	3905 ton

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Below is an example for an 8000 ton lot, using Random Numbers Table 2 (page 8-11):

Ton	Ton to be Sampled			
.822	1st sample	0 +	(.822 x 1000) =	822 ton
.826	2nd sample	1000 +	(.826 x 1000) =	1826 ton
.495	3rd sample	2000 +	(.495 x 1000) =	2495 ton
.160	4th sample	3000 +	(.160 x 1000) =	3160 ton
.379	5th sample	4000 +	(.379 x 1000) =	4379 ton
.558	6th sample	5000 +	(.558 x 1000) =	5558 ton
.452	7th sample	6000 +	(.452 x 1000) =	6452 ton
.278	8th sample	7000 +	(.278 x 1000) =	7278 ton

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Random Numbers Table 1
(Range 0 - 0.500)

0.192	0.051	0.299	0.450	0.442	0.479	0.008	0.204
0.432	0.070	0.123	0.024	0.017	0.083	0.111	0.010
0.143	0.172	0.277	0.179	0.187	0.178	0.455	0.234
0.214	0.153	0.488	0.404	0.946	0.129	0.476	0.028
0.353	0.408	0.486	0.234	0.151	0.375	0.176	0.388
0.038	0.100	0.033	0.180	0.244	0.256	0.187	0.493
0.021	0.116	0.003	0.463	0.051	0.129	0.388	0.340
0.405	0.362	0.043	0.067	0.378	0.314	0.088	0.203
0.277	0.356	0.278	0.091	0.485	0.344	0.265	0.399
0.403	0.132	0.090	0.434	0.058	0.031	0.381	0.369
0.493	0.463	0.452	0.273	0.251	0.338	0.245	0.074
0.020	0.398	0.336	0.366	0.293	0.077	0.446	0.190
0.101	0.104	0.168	0.163	0.151	0.401	0.348	0.136
0.452	0.021	0.355	0.227	0.259	0.129	0.146	0.401
0.395	0.338	0.378	0.474	0.310	0.361	0.484	0.185
0.425	0.279	0.437	0.221	0.110	0.430	0.141	0.352
0.354	0.189	0.166	0.044	0.488	0.143	0.268	0.204
0.499	0.447	0.406	0.454	0.288	0.353	0.201	0.056
0.449	0.194	0.049	0.389	0.392	0.333	0.329	0.130
0.383	0.350	0.430	0.002	0.340	0.464	0.022	0.260
0.456	0.477	0.298	0.279	0.484	0.242	0.129	0.409
0.249	0.425	0.334	0.464	0.226	0.085	0.032	0.004
0.271	0.309	0.247	0.290	0.301	0.465	0.267	0.067
0.042	0.288	0.415	0.034	0.136	0.350	0.208	0.183
0.218	0.166	0.106	0.370	0.262	0.448	0.302	0.262
0.295	0.293	0.249	0.056	0.297	0.280	0.387	0.116
0.366	0.294	0.273	0.404	0.482	0.049	0.055	0.356
0.442	0.096	0.009	0.093	0.290	0.333	0.082	0.098
0.339	0.275	0.148	0.271	0.087	0.093	0.426	0.474
0.126	0.216	0.273	0.484	0.362	0.476	0.286	0.470
0.131	0.084	0.442	0.411	0.022	0.449	0.211	0.065
0.016	0.103	0.341	0.410	0.237	0.240	0.293	0.182
0.412	0.156	0.495	0.386	0.365	0.082	0.404	0.463
0.117	0.191	0.046	0.456	0.426	0.287	0.008	0.347
0.351	0.444	0.085	0.443	0.144	0.117	0.022	0.458
0.084	0.470	0.062	0.171	0.049	0.472	0.256	0.315
0.418	0.487	0.238	0.077	0.143	0.401	0.404	0.348
0.035	0.042	0.222	0.133	0.132	0.405	0.101	0.228
0.205	0.468	0.048	0.088	0.217	0.073	0.039	0.009
0.360	0.184	0.330	0.011	0.439	0.014	0.152	0.083
0.231	0.277	0.479	0.154	0.107	0.115	0.361	0.450
0.039	0.417	0.472	0.127	0.267	0.103	0.379	0.298
0.260	0.077	0.192	0.383	0.249	0.421	0.078	0.388
0.447	0.061	0.327	0.020	0.266	0.422	0.425	0.271
0.112	0.360	0.340	0.384	0.086	0.363	0.473	0.297
0.176	0.300	0.483	0.005	0.254	0.226	0.420	0.446
0.475	0.018	0.395	0.322	0.386	0.343	0.224	0.476
0.338	0.244	0.246	0.240	0.024	0.336	0.289	0.371
0.217	0.398	0.454	0.486	0.048	0.366	0.208	0.115

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Random Numbers Table 2
(Range 0 - 1.00)

0.822	0.640	0.703	0.511	0.152	0.282	0.617	0.298	0.012	0.136
0.826	0.995	0.295	0.654	0.388	0.495	0.610	0.406	0.397	0.648
0.495	0.449	0.278	0.666	0.734	0.372	0.076	0.508	0.001	0.046
0.160	0.450	0.782	0.748	0.075	0.187	0.035	0.206	0.094	0.753
0.379	0.192	0.370	0.558	0.088	0.330	0.321	0.166	0.610	0.084
0.558	0.255	0.178	0.936	0.521	0.941	0.597	0.906	0.868	0.483
0.452	0.627	0.190	0.301	0.172	0.979	0.363	0.297	0.943	0.968
0.278	0.402	0.386	0.562	0.319	0.940	0.314	0.621	0.406	0.014
0.003	0.738	0.048	0.629	0.806	0.721	0.858	0.509	0.999	0.168
0.429	0.828	0.597	0.642	0.873	0.839	0.607	0.262	0.612	0.413
0.508	0.878	0.152	0.263	0.991	0.868	0.621	0.265	0.960	0.646
0.223	0.441	0.283	0.432	0.527	0.941	0.919	0.731	0.322	0.302
0.838	0.412	0.307	0.176	0.647	0.377	0.806	0.240	0.240	0.792
0.892	0.269	0.041	0.362	0.116	0.758	0.805	0.600	0.728	0.955
0.558	0.990	0.066	0.325	0.587	0.173	0.540	0.778	0.689	0.126
0.962	0.033	0.186	0.881	0.934	0.367	0.845	0.171	0.396	0.965
0.052	0.407	0.705	0.925	0.354	0.889	0.709	0.040	0.809	0.576
0.642	0.129	0.172	0.009	0.040	0.743	0.388	0.156	0.626	0.699
0.034	0.813	0.748	0.474	0.138	0.594	0.120	0.940	0.456	0.787
0.709	0.949	0.024	0.520	0.082	0.583	0.861	0.151	0.899	0.451
0.301	0.523	0.705	0.380	0.162	0.364	0.842	0.434	0.884	0.927
0.598	0.671	0.639	0.549	0.783	0.617	0.805	0.125	0.808	0.297
0.138	0.433	0.339	0.062	0.691	0.232	0.554	0.703	0.270	0.396
0.310	0.716	0.387	0.597	0.631	0.494	0.511	0.265	0.275	0.404
0.074	0.488	0.760	0.630	0.970	0.670	0.463	0.506	0.164	0.568
0.191	0.485	0.476	0.295	0.579	0.103	0.501	0.917	0.330	0.816
0.851	0.319	0.543	0.211	0.054	0.088	0.063	0.546	0.494	0.511
0.400	0.199	0.953	0.643	0.082	0.873	0.647	0.647	0.971	0.537
0.166	0.144	0.177	0.775	0.671	0.981	0.172	0.549	0.157	0.047
0.909	0.124	0.327	0.267	0.178	0.839	0.174	0.509	0.538	0.641
0.942	0.600	0.039	0.994	0.153	0.825	0.590	0.895	0.352	0.676
0.543	0.931	0.129	0.018	0.812	0.460	0.323	0.862	0.842	0.324
0.493	0.855	0.268	0.126	0.090	0.568	0.717	0.714	0.711	0.007
0.117	0.524	0.961	0.716	0.769	0.741	0.149	0.504	0.399	0.304
0.846	0.604	0.749	0.429	0.546	0.105	0.309	0.531	0.478	0.363
0.733	0.753	0.932	0.919	0.990	0.332	0.227	0.656	0.831	0.778
0.687	0.169	0.109	0.587	0.541	0.957	0.209	0.589	0.871	0.772
0.764	0.856	0.074	0.797	0.419	0.064	0.366	0.391	0.412	0.414
0.854	0.744	0.431	0.823	0.778	0.839	0.726	0.371	0.207	0.527
0.533	0.044	0.366	0.346	0.792	0.396	0.103	0.513	0.586	0.968
0.076	0.639	0.187	0.013	0.579	0.410	0.826	0.286	0.257	0.956
0.222	0.959	0.743	0.654	0.240	0.219	0.072	0.336	0.465	0.667
0.912	0.667	0.534	0.355	0.708	0.220	0.865	0.695	0.531	0.623
0.732	0.359	0.816	0.984	0.554	0.414	0.425	0.461	0.293	0.708
0.736	0.320	0.535	0.227	0.650	0.542	0.380	0.099	0.822	0.619
0.069	0.545	0.362	0.488	0.198	0.351	0.747	0.923	0.192	0.145
0.719	0.476	0.825	0.612	0.083	0.681	0.788	0.955	0.511	0.541
0.787	0.734	0.029	0.324	0.428	0.807	0.225	0.973	0.286	0.265
0.109	0.845	0.972	0.360	0.489	0.154	0.688	0.633	0.059	0.285
0.689	0.323	0.363	0.270	0.950	0.486	0.022	0.263	0.041	0.786

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Plots & Maintains Control Charts

The Asphalt Mix Design Technician also plots and maintains control charts. A control chart is a graphical record of data taken from a repetitive process. A process is in statistical control when repeated measurements from the process behave as random samples dispersed around a target value.

The control chart used for asphalt concrete is based on the normal bell shape curve, which is illustrated in Figure 8-3. The control guides are obtained from standard deviations for the particular sieves and asphalt content. By using these guides and plotting the individual test results, the Contractor/Technician can predict when the process is getting out of control by using the warning signals that are shown on Figure 8-3 and in the Process Tolerance Warning Signals procedure box on the next page.

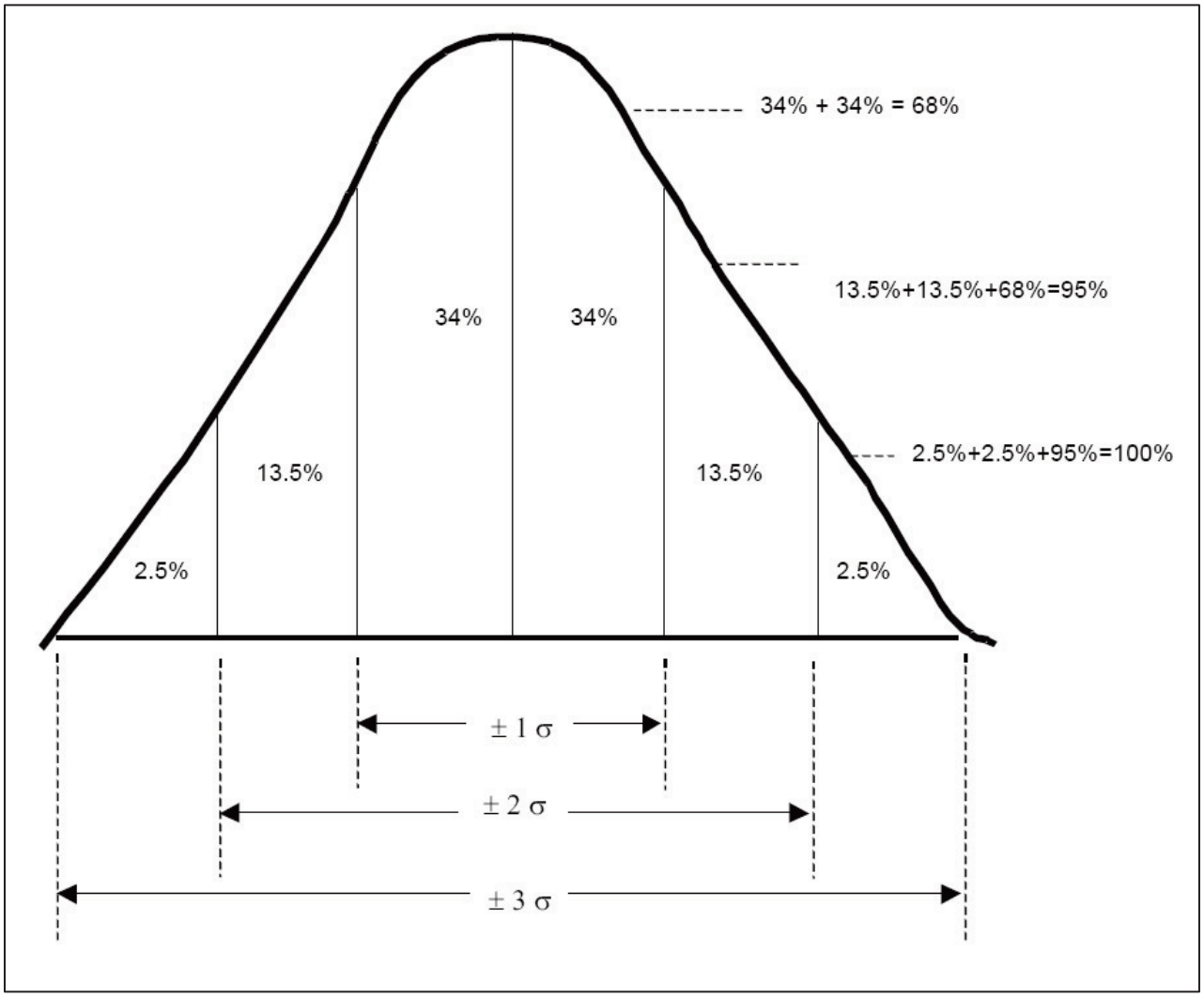


Figure 8-3: Bell Curve, Showing Standard Deviations

Process Tolerance Warning Signals

- When one (1) test result exceeds the number one warning signal (i.e., two standard deviations from the job mix), the Contractor/Technician should investigate his/her process due to the fact that approximately 95% of the material should fall within this range.
- When three (3) consecutive test results exceed the number two warning signal (i.e., one standard deviation from the job mix), the Contractor/Technician should investigate his/her process, since approximately 68% of the material should fall within this range.
- When eleven (11) consecutive test results fall on the same side of the job mix, the Contractor/Technician should also investigate his/her process. Eleven (11) is the statistical number that could indicate the JMF is no longer the mean of the test results and the Contractor/Technician is not getting full benefit of the process tolerances.

Department policy now requires the Contractor to plot his/her own control charts. If he/she desires, the Department will furnish, set-up, and help him/her to get started in the plotting. Figure 8-4 on the next page depicts samples of these charts.

How to Plot Control Charts. Follow these steps to plot control charts:

1. Fill out the heading as indicated on the chart.
2. Put in the appropriate control sieves for the particular type of mix.
3. Fill in the proper job mix values for the appropriate sieves from the job mix formula.
4. Draw in control guides (listed at the bottom of sheet for all sieve sizes) on approximate control sieves in different colors.
5. *Example*: Red lines for one-point controls and blue lines for three-point controls.
6. As soon as test values have been obtained on an individual sample, plot these values on their proper Control Sieve Chart.
7. After all eight samples of a lot have been run, average the test results and plot these over the fourth test number of the lot.

AWARENESS/IMPORTANT

Test averages must be plotted in a different color than individual test results.

Highlights a step in the procedure which is either unusual or very particular to this procedure. May also indicate awareness (additional information) or a cautionary concern in the procedure.

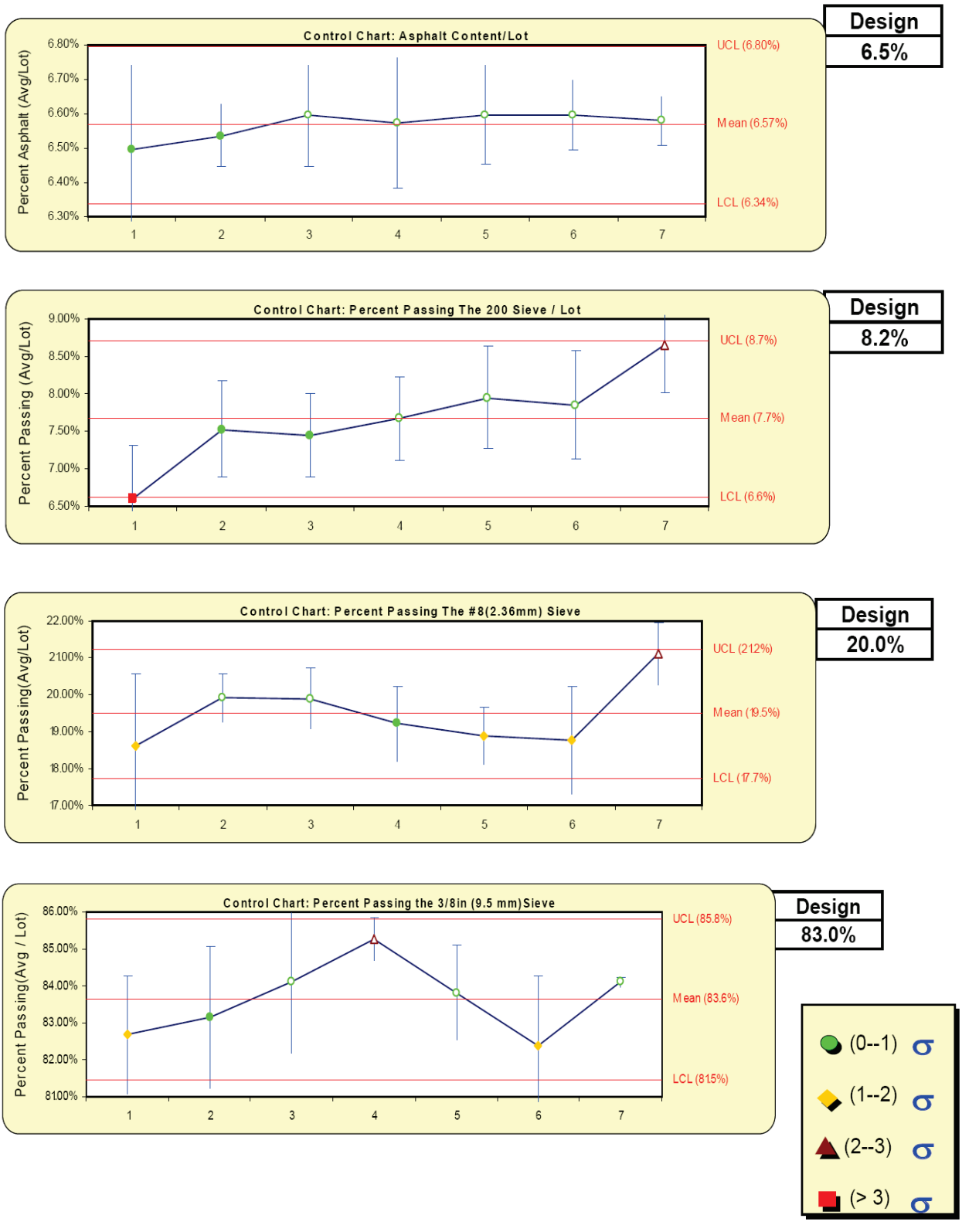


Figure 8- 4: Gradation Control Charts

The Weighperson

The Asphalt Concrete Producer or Contractor will supply their own Weighperson, shown at work in Figure 8-5. This person must be bonded unto the Commonwealth of Virginia in the amount of Ten Thousand Dollars ($10,000) and shall be certified by the District Materials Engineer that he/she is competent to perform the duties of a Weighperson.

Figure 8-5. The Weighperson at Work

An example of the Weighperson Certification is illustrated in Figure 8-6. An example of the Weighperson Surety Bond (Form TL-103) appears as Figure 8-7.

Since the bonded Weighperson is an employee of the Producer or Contractor, no administrative supervision is received from the VDOT's Resident Engineer or District Materials Engineer.

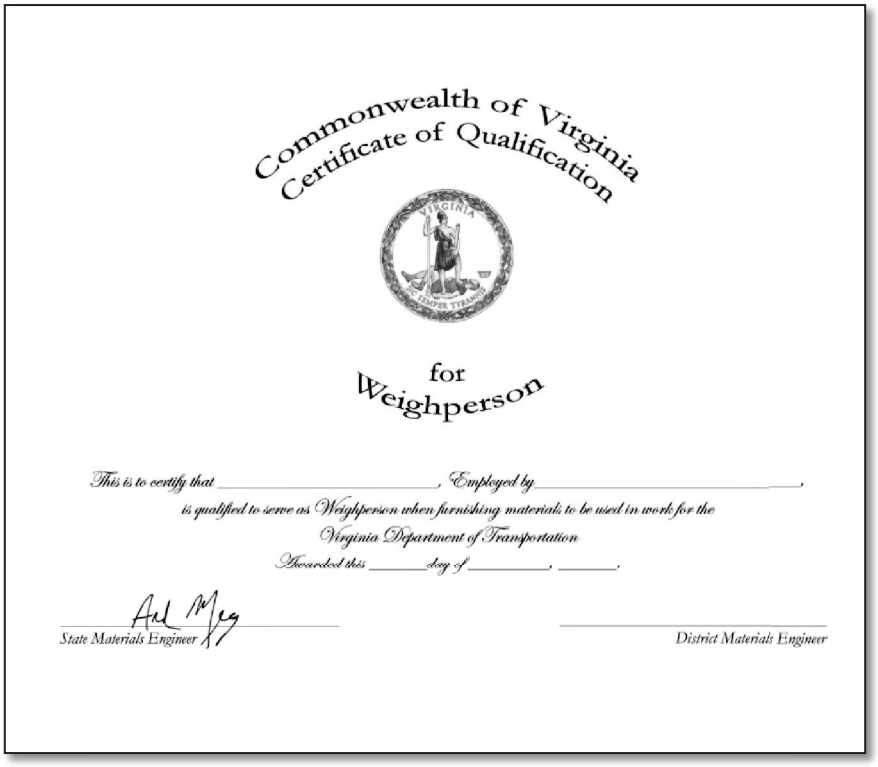


Figure 8-6: Weighperson Certification

The Weighperson does, however, receive technical guidance from the District Materials Engineer and his/her staff.

Form TL – 103
Bond Number
June 2, 2002

WEIGHPERSONS SURETY BOND
FOR
CONTRACTORS AND PRODUCERS OF MATERIAL FURNISHED BY THE TON
KNOWN ALL MEN BY THESE PRESENTS:

THAT _____of the City/County of _____, State of_____ doing business under the firm name of _____ an individual, partnership, or corporation _____ as PRINCIPAL, and the _____, a corporation, authorized to do business in the Commonwealth of Virginia, as SURETY, are held and firmly bound, effective the _____day of_____ , 20___ , unto the Commonwealth of Virginia, as obligee, in the full and just sum of Ten Thousand Dollars ($10,000) for the payment whereof well and truly to be made to the Commonwealth of Virginia, we bind ourselves, our successors and assigns ,jointly and severally, firmly by these presents:

WHEREAS, the herein before mentioned principal desires to conduct the business of furnished materials by the ton for incorporation in Virginia Department of Highways and Transportation road and bridge construction and maintenance work.

The condition of this obligation is such that, whereas, the above bound principal is or is about to conduct business as outlined above for which a surety bond is required.

NOW, THEREFORE, if the above bound principal will faithfully observe and perform the duties required by Section 109, Measurement of Quantities, of the Virginia Department of Highway s and Transportation Road and Bridge
Specifications, as amended, and indemnify said obligee, then the above obligation shall be void, otherwise to be and remain in full force and effect.

The continuing nature of this bond is such that it is required to be renewed annually on its anniversary date except the principal or the surety may terminate their obligations under this bond by giving sixty days' notice, in writing, by registered mail, to the obligee.

IN WITNESS WHEREOF the said principal has hereunder set his or its hand and affixed his or its seals and the said surety has caused its corporate name to be signed hereto and its corporate seal to be affixed hereunto by its duly authorized official or agent and executed this instrument the
_____day of _____, 20___.

Principal Corporate Seal Principal
BY: _____
President or Vice President

Surety Corporate Seal Surety

Figure 8-7: Weighperson Surety Bond

Primary Duties of a Weighperson

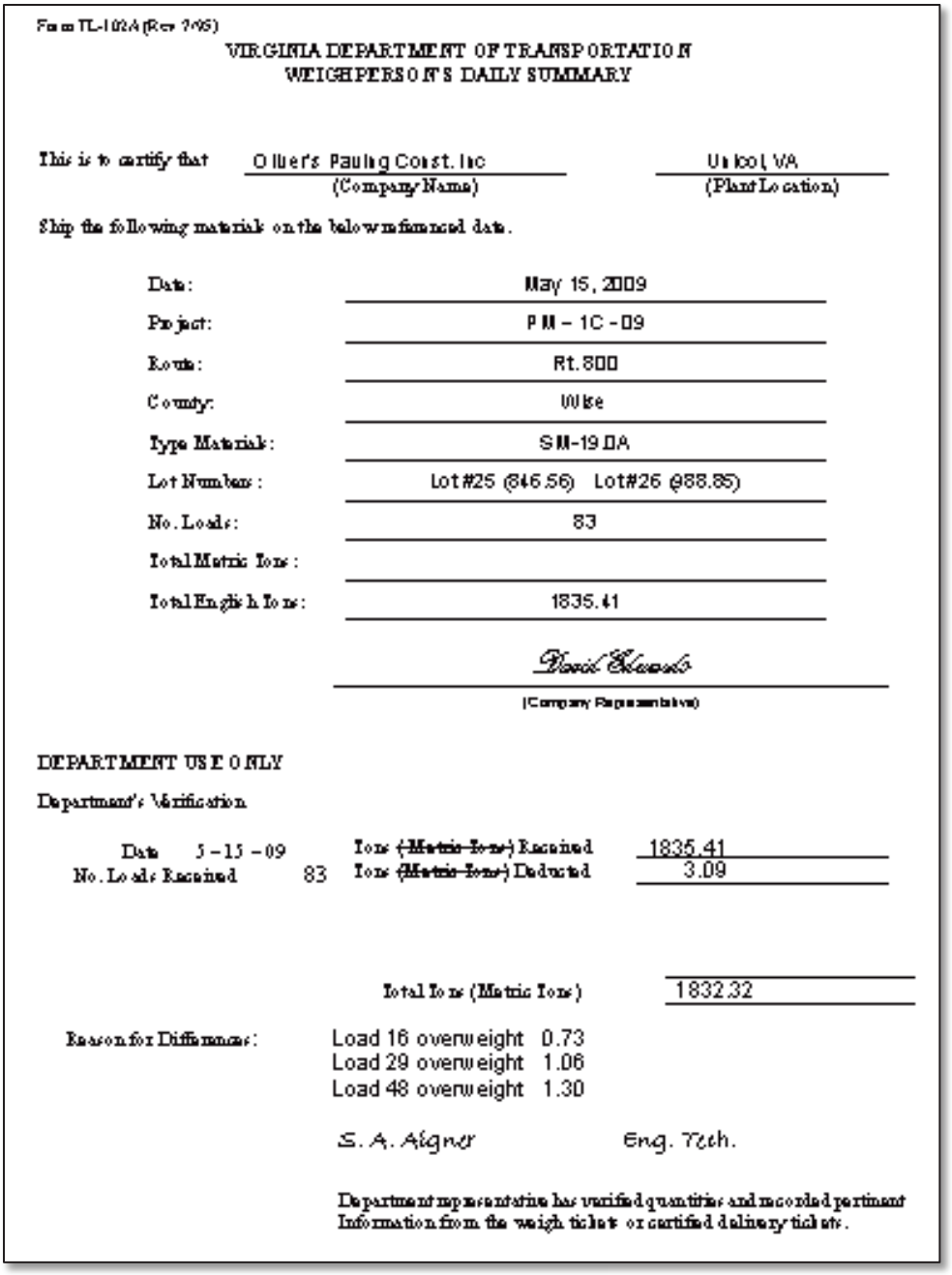
The primary duties of a Weighperson are as follows:

1. Ensure that trucks are properly tarred and in compliance with specifications and instructions.
2. Assure that all weights are true and correct.
3. Post in the scale house the: Certification, Surety Bond and current Virginia Weights and Measures Scale Inspection Report.
4. Furnish a signed weigh ticket for each load weighed. The ticket must include the date, truck number, load number, plant name, size and type of material, project, schedule or purchase order number and the weights specified herein.
5. Maintain sufficient documentation, such that the accumulative tonnage within each lot of material and the distribution of each lot of material by contract can be readily identified.
6. Submit by the end of the next working day, to each contract, a summary of the number of loads and total weights for each type of asphalt concrete material (on a TL-102A). Summaries can be mailed no later than the Monday following the calendar week of delivery in the following cases:
    - In the case of sporadic deliveries of tonnage material for purchase orders
    - In the case that it is impractical for load summaries to be submitted by the end of the next working day, as required.

It is up to the Weighperson to determine the method used to keep account of the tonnage of material that went to a particular project or maintenance purchase order and from which lot that material originated. However, the method of accountability must be efficient enough so that the District Materials Engineer can easily determine which project or projects received material from a lot in question.

One of the major duties of the Weighperson is to submit a daily summary sheet to the Project Inspector by the end of the next working day following delivery to the construction project. An example of this summary sheet is shown in Figure 8-8.

As can be noted from this example, information is included about the material shipped, the project (or purchase order if that is the case), who produced the material, the number of loads of material shipped, and the lots from which this material was produced. The Weighperson should also include the number of tons of material that were shipped from each lot indicated.



Form TL-102A (Rev 7/95)

VIRGINIA DEPARTMENT OF TRANSPORTATION
WEIGHPERSON'S DAILY SUMMARY

This is to certify that Oller's Paving Const. Inc (Company Name) Unicol, VA (Plant Location)

Ship the following material on the below referenced date.

Date:	May 15, 2009
Project:	PM – 1C - 09
Route:	Rt. 800
County:	Wise
Type Material:	SM-19.0A
Lot Number:	Lot#25 (846.56) Lot#26 (988.85)
No. Loads:	83
Total Metric Tons:	
Total English Tons:	1835.41

David Clements
(Company Representative)

DEPARTMENT USE ONLY

Department's Verification

Date 5 – 15 – 09
No. Loads Received 83

Tons ~~(Metric Tons)~~ Received 1835.41
Tons ~~(Metric Tons)~~ Deducted 3.09

Total Tons (Metric Tons) 1832.32

Reason for Difference: Load 16 overweight 0.73
Load 29 overweight 1.06
Load 48 overweight 1.30

S. A. Aigner Eng. Tech.

Department representative has verified quantities and recorded pertinent Information from the weigh tickets or certified delivery tickets.

Figure 8-8: Daily Summary Sheet

On the portion of the Weighperson daily summary sheet labeled "Department's Verification," the Inspector confirms if the tonnage of material indicated by the bonded Weighperson was received on the project. In this example, all material shipped was received on the project. If two loads of this material were rejected for some reason (e.g., failed visual inspection), then the inspector would list the total tonnage of material received on the project and place this total under **Tons Received**. This tonnage should agree with the total tons as shown by the Weighperson.

Then the Inspector would place total tonnage of the material rejected under **Tons Deducted**. The tonnage from these two lines are then subtracted and placed under **Total Tons**. The reason for the material deduction would then be given under the heading **Reason for Differences**. The Inspector's copies of the daily summary sheets are turned in at the end of the project and are checked against the final estimate and weigh tickets.

Since the bonded Weighperson is an employee of the Producer or Contractor, no administrative supervision is received from the Department's Resident Engineer or District Materials Engineer. As noted previously, the Weighperson does, however, receive technical guidance from the District Materials Engineer and his staff.

The specifications make it necessary to note a particular situation in which the Weighperson would need to divide or split tonnage of an individual truckload to accumulate enough tons to complete a lot.

The following example is designed to explain a procedure that may be used.

Note: The form used in this example is for illustrative purposes only and, therefore, should *not* be considered as a standard form for the Weighperson.

At the end of the first day's operation, 1600.00 accumulative tons of asphalt concrete, of Type BM-25.0, has been produced, as shown in the example in Figure 8-9.

SAMPLE METHOD OF ACCUMULATING TONNAGE

Black – Topp Paving Company

Material: Asphalt Concrete, Type BM-25.0

Date: 9-28-02
Sheet 1 of 1

TICKET NO.	LOAD NO.	TRUCK NO.	NET WT. TONS	ACCUM. NET WT. TONS	TIME	REMARKS
721	1	76	12.00	12.00	7:30 AM	LOT NO. 1
722	2	74	11.09	23.09	7:39 AM	
866	145	46	9.74	1600.00	4:17 PM	
	TOTAL		1600.00			

Figure 8-9: Day 1 Accumulating Tonnage Example, Sheet 1 of 1

As Figure 8-10 indicates, on the second day of operation, the first truck contains 11.00 tons of BM-25.0.

The accumulative tons for that load would be 1611.00.

At 11:02 A.M. of the second day, 1996.00 accumulative tons of material has been produced.

(Continue on next page.)

SAMPLE METHOD OF ACCUMULATING TONNAGE

Black – Topp Paving Company

Material: Asphalt Concrete, Type BM-25.0

Date: 9-29-02
Sheet 1 of 2

TICKET NO.	LOAD NO.	TRUCK NO.	NET WT. TONS	ACCUM. NET WT. TONS	TIME	REMARKS
867	146	76	11.00	1611.00	7:17 AM	LOT NO. 1
902	180	46	10.93	1996.00	11:02 AM	
903	181	74	4.00	2000.00	11:16 AM	
	TOTAL		400.00			

Figure 8-10: Day 2 Accumulating Tonnage Example, Sheet 1 of 2

The next truck contains 11.00 tons of material and is the 181st load in truck No. 74.

Four (4) of the tons of BM-25.0 from this truck are needed to complete the 2000 ton for Lot 1, as Figure 8-11 illustrates.

SAMPLE METHOD OF ACCUMULATING TONNAGE

Black – Topp Paving Company

Material: Asphalt Concrete, Type BM-25.0

Date: 9-29-02
Sheet 2 of 2

TICKET NO.	LOAD NO.	TRUCK NO.	NET WT. TONS	ACCUM. NET WT. TONS	TIME	REMARKS
903	181	74	7.0	7.0	11.16 AM	LOT NO. 2
904	1	17	12.21	19.21	11:31 AM	
919	16	36	11.00	177.34	3:04 PM	
	TOTAL		177.34			

Figure 8-11: Day 2 Accumulating Tonnage Example, Sheet 2 of 2

VDOT's Responsibility

	DEFINITIONS. The following terms will be used throughout this section:
Referee system	A system to allow for additional sampling and testing when there is doubt that the original test results are valid.
IA sampling	Sampling that is conducted for the purpose of independent assurance.

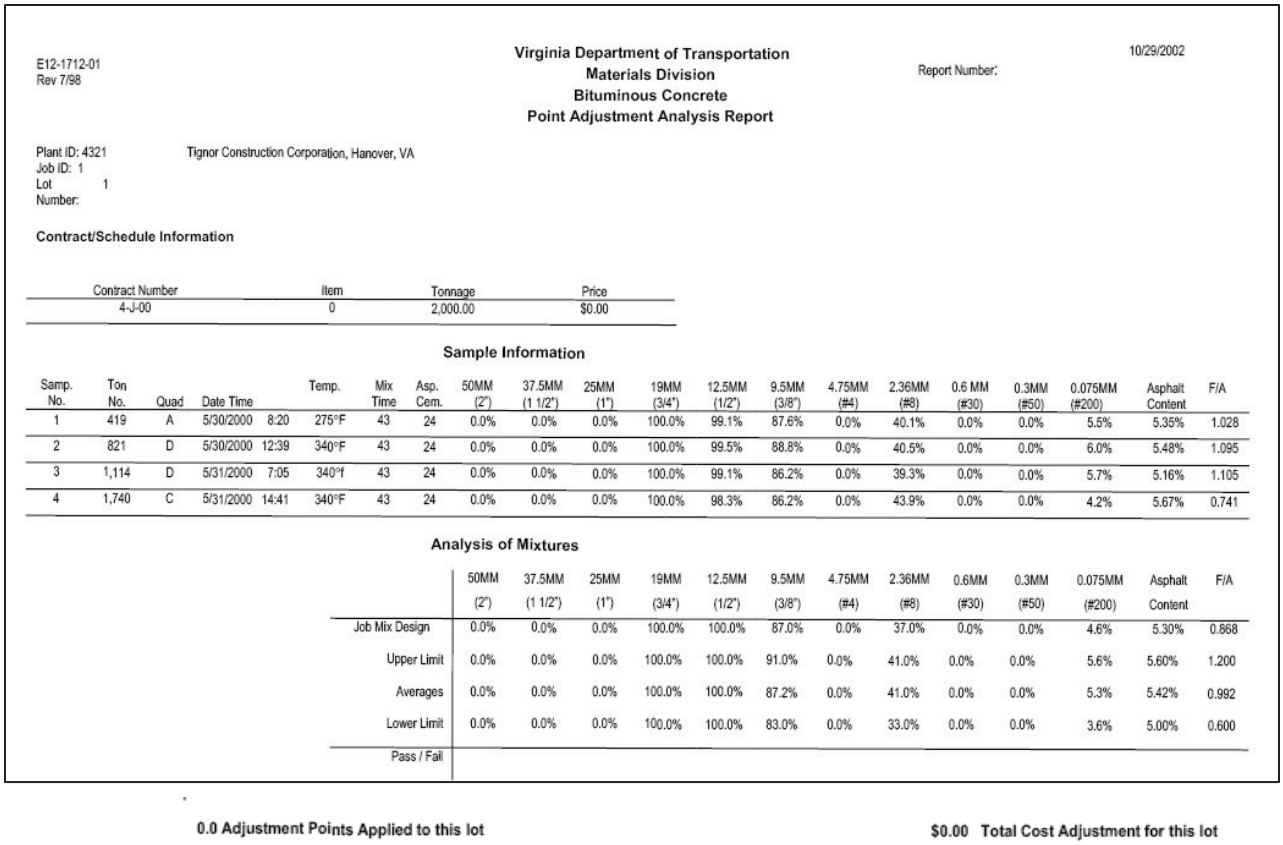
The Virginia Department of Transportation (VDOT) is responsible for:

1. Providing classroom technical instruction, examination and certification for all appropriate personnel.
2. Inspecting the plant before production begins to check for compliance with specification requirements governing plant and testing equipment. A record shall be prepared on a checklist-type form of all items covered during the plant inspections by the District Materials Engineer's representative.
3. Performing unannounced, periodic inspections of plants during production, including that of:
   - Stockpiles
   - Equipment
   - Weighing operations
   - Sampling
   - Testing
   - Records kept by the Contractor's technicians.

   Plants with a history of producing good materials and having well-trained personnel might be inspected as seldom as once a year, but plants with poor records should be inspected more often. A copy of the inspection report must be retained for district use and a copy forwarded to the State Materials Engineer.

4. Keeping a diary of plant visits, observations and comments made to the Contractor's representative.

5. Accepting the product in accordance with the specifications, based upon the Contractor's test results as illustrated in Figure 8-12, provided such results are statistically comparable to the Department's IA test results (as defined by VTM 59), shown in Figures 8-13 and 8-14.



E12-1712-01
Rev 7/98

Virginia Department of Transportation
Materials Division
Bituminous Concrete
Point Adjustment Analysis Report

Report Number:

10/29/2002

Plant ID: 4321 Tignor Construction Corporation, Hanover, VA
Job ID: 1
Lot Number: 1

Contract/Schedule Information

Contract Number	Item	Tonnage	Price
4-J-00	0	2,000.00	$0.00

Sample Information

Samp. No.	Ton No.	Quad	Date Time	Temp.	Mix Time	Asp. Cem.	50MM (2")	37.5MM (1 1/2")	25MM (1")	19MM (3/4")	12.5MM (1/2")	9.5MM (3/8")	4.75MM (#4)	2.36MM (#8)	0.6 MM (#30)	0.3MM (#50)	0.075MM (#200)	Asphalt Content	F/A
1	419	A	5/30/2000 8:20	275°F	43	24	0.0%	0.0%	0.0%	100.0%	99.1%	87.6%	0.0%	40.1%	0.0%	0.0%	5.5%	5.35%	1.028
2	821	D	5/30/2000 12:39	340°F	43	24	0.0%	0.0%	0.0%	100.0%	99.5%	88.8%	0.0%	40.5%	0.0%	0.0%	6.0%	5.48%	1.095
3	1,114	D	5/31/2000 7:05	340°f	43	24	0.0%	0.0%	0.0%	100.0%	99.1%	86.2%	0.0%	39.3%	0.0%	0.0%	5.7%	5.16%	1.105
4	1,740	C	5/31/2000 14:41	340°F	43	24	0.0%	0.0%	0.0%	100.0%	98.3%	86.2%	0.0%	43.9%	0.0%	0.0%	4.2%	5.67%	0.741

Analysis of Mixtures

	50MM (2")	37.5MM (1 1/2")	25MM (1")	19MM (3/4")	12.5MM (1/2")	9.5MM (3/8")	4.75MM (#4)	2.36MM (#8)	0.6MM (#30)	0.3MM (#50)	0.075MM (#200)	Asphalt Content	F/A
Job Mix Design	0.0%	0.0%	0.0%	100.0%	100.0%	87.0%	0.0%	37.0%	0.0%	0.0%	4.6%	5.30%	0.868
Upper Limit	0.0%	0.0%	0.0%	100.0%	100.0%	91.0%	0.0%	41.0%	0.0%	0.0%	5.6%	5.60%	1.200
Averages	0.0%	0.0%	0.0%	100.0%	100.0%	87.2%	0.0%	41.0%	0.0%	0.0%	5.3%	5.42%	0.992
Lower Limit	0.0%	0.0%	0.0%	100.0%	100.0%	83.0%	0.0%	33.0%	0.0%	0.0%	3.6%	5.00%	0.600
Pass / Fail													

0.0 Adjustment Points Applied to this lot

$0.00 Total Cost Adjustment for this lot

Figure 8-12: Price Adjustment Test report

The sole purpose of the IA sample, taken by the Producer's Certified Technician in the presence of the QA Monitor, is to verify the accuracy of the Producer's testing program. If the comparisons indicate the IA test results are not in agreement with the Contractor's results, the VDOT will investigate to determine the source of the difference. The decision table that follows guides decision making when identifying and explaining any differences that exist.

CONDITION	ACTION
IF an assignable cause can be determined for the difference…	…***THEN*** the material will be accepted, adjusted or rejected in accordance with the specification.
IF an assignable cause cannot explain the difference …	…***THEN*** the Department may call for the referee system to determine the final disposition of the material.
IF it is determined that the contractor's test results are not representative of the product…	…***THEN*** the Department will take such action as it deems appropriate to protect the interest of the Commonwealth.

6. Providing a referee system, which may be invoked at the request of the Contractor or Department, and which will require the sampling and testing of material taken from the roadway where the questionable material was placed.

7. Monitoring sampling during the first production week. If the production is less than 30,000 tons, sample 4-10 samples per type mix. Thereafter, the sample for production must follow the specifications depicted in the table below:

PRODUCTION CONDITION	SAMPLE COUNT
Under 20,000 tons	2 samples per production week
20,000 to 29,999 tons	3 samples per production week
30,000 to 49,999 tons	4 samples per production week
50,000 to 79,999 tons	5 samples per production week
80,000 tons or more	6 samples per production week

AWARENESS/IMPORTANT

Samples shall be taken in accordance with VTM 48, and split from the Producer's sample, such that each half is not less than 10 lb.

Highlights a step in the procedure which is either unusual or very particular to this procedure. May also indicate awareness (additional information) or a cautionary concern in the procedure.

The rate of IA sampling is mandatory and it is the responsibility of the District Materials Engineer to see that it is accomplished. Should the monitoring effort fall behind the required frequency of sampling/testing, the District Administrator is to be advised immediately. Sufficient personnel are to be provided for the monitoring effort.

The results of the Contractor's acceptance samples and the Department's IA samples will be used to create datasets that are constantly reviewed and compared throughout production.

Matched Comparison Report . The average and variability of the split samples will be monitored using the paired 't' and F tests. These paired (Matched) statistics are designed to evaluate procedures and equipment, as both labs will be testing identical samples due to the splitting procedure.

A non-comparison on the Matched Comparison Report should trigger the following checks in both labs:

- Check the splitting procedure itself, to ensure VTM 48 is being followed exactly
- Check the procedures used in the labs to further reduce the sample to testing size
- Check all scales, sieves and ovens used to conduct the testing

Non-Matched Comparison Report. The average and variability of the Department's samples will be compared to the Contractor's acceptance samples that do not have corresponding VDOT split samples using the student 't' and F tests. These Non-Matched statistics are designed to verify that material consistency is being maintained when the Department has not sampled the production period.

The success of the Quality Assurance Program will be determined to a large extent by the effectiveness of the monitoring effort. Deficiencies revealed through this effort should be addressed promptly and decisively. The State Materials Engineer is to be consulted in the event of a possible deliberate act of omission or commission on the part of a Contractor which compromises the rights and/or interests of the Department.

8. Observing the manner in which sampling is performed by the Contractor. Not only is the "when," "where" and "how" of taking the sample important, but also the care that is taken to properly reduce the sample to testing size.

Directing and Observing Proper Sampling

- The Department's representative will direct when the sample shall be taken.
- He/she will observe the Contractor/Technician taking and splitting (quartering) the sample.
- The Department's representative will take one-half of the sample to serve as the IA. The Contractor/Technician will perform the tests on the other half, which shall be considered as the next quality control sample for the Contractor.
- The sample size shall be such that, when properly halved, each sample should be not less than 10 lbs.

Virginia Department of Transportation
Materials Division
Bituminous Concrete
Comparison Analysis Report

Plant ID: 1007 Barb & Shumaker, Abingdon, VA
Job ID: 1004 SM-9.5A

Lot Number	Sample Number	50MM (2")	37.5MM (1 1/2")	25MM (1")	19MM (3/4")	12.5MM (1/2")	9.5MM (3/8")	4.75MM (#4)	2.36MM (#8)	0.6MM (#30)	0.3MM (#50)	0.075MM (#200)	Asphalt Content	F/A
Job Mix Design		0.0%	0.0%	0.0%	0.0%	100.0%	94.0%	60%	36%	0.0%	0.0%	6.0%	5.80%	1.03
Plant Data														
1	1	0.0%	0.0%	0.0%	0.0%	100.0%	90.5%	58.3%	33.7%	0.0%	0.0%	5.2%	6.02%	0.86
1	2	0.0%	0.0%	0.0%	0.0%	100.0%	92.1%	56.5%	34.2%	0.0%	0.0%	5.8%	5.82%	1.00
1	3	0.0%	0.0%	0.0%	0.0%	100.0%	93.7%	60.2%	36.3%	0.0%	0.0%	6.4%	6.10%	1.05
1	4	0.0%	0.0%	0.0%	0.0%	100.0%	87.3%	58.8%	37.5%	0.0%	0.0%	6.6%	6.10%	1.08
2	1	0.0%	0.0%	0.0%	0.0%	100.0%	91.5%	56.4%	31.3%	0.0%	0.0%	5.9%	5.70%	1.04
2	2	0.0%	0.0%	0.0%	0.0%	100.0%	93.9%	61.1%	36.4%	0.0%	0.0%	6.9%	5.87%	1.18
2	3	0.0%	0.0%	0.0%	0.0%	100.0%	92.8%	59.6%	33.4%	0.0%	0.0%	6.4%	5.91%	1.08
2	4	0.0%	0.0%	0.0%	0.0%	100.0%	93.4%	63.2%	38.4%	0.0%	0.0%	6.5%	5.88%	1.11
3	1	0.0%	0.0%	0.0%	0.0%	100.0%	93.0%	59.8%	36.3%	0.0%	0.0%	6.4%	5.82%	1.10
3	2	0.0%	0.0%	0.0%	0.0%	100.0%	92.7%	60.1%	37.3%	0.0%	0.0%	6.5%	5.89%	1.10
4	3	0.0%	0.0%	0.0%	0.0%	100.0%	94.3%	59.8%	36.4%	0.0%	0.0%	5.8%	6.00%	0.97
4	4	0.0%	0.0%	0.0%	0.0%	100.0%	93.4%	60.2%	34.4%	0.0%	0.0%	6.0%	5.79%	1.04
5	1	0.0%	0.0%	0.0%	0.0%	100.0%	91.9%	62.6%	38.9%	0.0%	0.0%	5.4%	5.43%	0.99
5	2	0.0%	0.0%	0.0%	0.0%	100.0%	90.1%	59.0%	35.6%	0.0%	0.0%	6.1%	5.62%	1.09
5	3	0.0%	0.0%	0.0%	0.0%	100.0%	87.3%	54.9%	35.1%	0.0%	0.0%	5.5%	5.53%	0.99
5	4	0.0%	0.0%	0.0%	0.0%	100.0%	92.7%	61.2%	38.0%	0.0%	0.0%	5.9%	5.72%	1.03
6	1	0.0%	0.0%	0.0%	0.0%	100.0%	91.3%	59.4%	38.9%	0.0%	0.0%	7.0%	5.88%	1.19
6	2	0.0%	0.0%	0.0%	0.0%	100.0%	88.6%	56.1%	34.2%	0.0%	0.0%	6.2%	5.68%	1.09
6	3	0.0%	0.0%	0.0%	0.0%	100.0%	92.8%	64.0%	40.5%	0.0%	0.0%	6.7%	6.03%	1.11
6	4	0.0%	0.0%	0.0%	0.0%	100.0%	91.6%	59.3%	38.1%	0.0%	0.0%	6.7%	5.72%	1.17
7	1	0.0%	0.0%	0.0%	0.0%	100.0%	94.0%	60.0%	36.0%	0.0%	0.0%	6.0%	5.80%	1.03
Plant Data Summary														
Count:		21	21	21	21	21	21	21	21	21	21	21	21	21
Mean:		0.0%	0.0%	0.0%	0.0%	100.0%	91.9%	59.5%	36.2%	0.0%	0.0%	6.2%	5.8%	1.1
Standard Deviation:		0.00	0.00	0.00	0.00	0.00	2.06	2.28	2.22	0.00	0.00	049	0.18	0.08
Monitor Data														
5	1	0.0%	0.0%	0.0%	0.0%	100.0%	93.3%	64.7%	40.7%	0.0%	0.0%	5.4%	5.76%	0.94
5	2	0.0%	0.0%	0.0%	0.0%	100.0%	91.1%	58.7%	36.4%	0.0%	0.0%	5.8%	5.20%	1.12
5	3	0.0%	0.0%	0.0%	0.0%	100.0%	90.9%	60.4%	39.0%	0.0%	0.0%	5.9%	5.63%	1.05
5	4	0.0%	0.0%	0.0%	0.0%	100.0%	92.8%	60.7%	38.1%	0.0%	0.0%	5.7%	5.49%	1.04
6	1	0.0%	0.0%	0.0%	0.0%	100.0%	94.1%	63.8%	41.7%	0.0%	0.0%	7.0%	6.27%	1.12
6	2	0.0%	0.0%	0.0%	0.0%	100.0%	88.4%	55.4%	35.9%	0.0%	0.0%	6.4%	5.72%	1.12
6	3	0.0%	0.0%	0.0%	0.0%	100.0%	92.5%	62.3%	39.5%	0.0%	0.0%	6.5%	5.92%	1.10
Monitor Data Summary														
Count:		7	7	7	7	7	7	7	7	7	7	7	7	7
Mean:		0.0%	0.0%	0.0%	0.0%	100.0%	91.9%	60.9%	38.8%	0.0%	0.0%	6.1%	5.7%	1.1
Standard Deviation:		0.00	0.00	0.00	0.00	0.00	1.91	3.17	2.13	0.00	0.00	0.55	0.34	0.07

Figure 8-13: Sample Comparison Analysis Report

Virginia Department of Transportation
Materials Division
Bituminous Concrete
Matched Comparison Analysis Report

Plant ID: 1007 Barb & Shumaker, Abingdon, VA
Job ID: 1004 SM-9.5A

		50MM (2")	37.5MM (1 1/2")	25MM (1")	19MM (3/4")	12.5MM (1/2")	9.5MM (3/8")	4.75MM (#4)	2.36MM (#8)	0.6MM (#30)	0.3MM (#50)	0.075MM (#200)	Asphalt Content	F/A
Job Mix Design		0.0%	0.0%	0.0%	0.0%	100.0%	94.0%	60%	36%	0.0%	0.0%	6.0%	5.80%	1.03
Lot Number	Sample Number													
Plant Data														
5	1	0.0%	0.0%	0.0%	0.0%	100.0%	91.95%	62.5%	38.97%	0.0%	0.0%	5.4%	5.43%	0.99
5	2	0.0%	0.0%	0.0%	0.0%	100.0%	90.1%	59.0%	35.6%	0.0%	0.0%	6.1%	5.62%	1.09
5	3	0.0%	0.0%	0.0%	0.0%	100.0%	87.3%	59.4%	35.1%	0.0%	0.0%	5.5%	5.53%	0.99
5	4	0.0%	0.0%	0.0%	0.0%	100.0%	92.7%	61.2%	38.0%	0.0%	0.0%	5.9%	5.72%	1.03
6	1	0.0%	0.0%	0.0%	0.0%	100.0%	91.3%	59.4%	38.9%	0.0%	0.0%	7.0%	5.88%	1.19
6	2	0.0%	0.0%	0.0%	0.0%	100.0%	88.6%	56.1%	34.2%	0.0%	0.0%	6.2%	5.68%	1.09
6	3	0.0%	0.0%	0.0%	0.0%	100.0%	92.8%	64.0%	40.5%	0.0%	0.0%	6.7%	6.03%	1.11
Plant Data Summary														
	Count:	7	7	7	7	7	7	7	7	7	7	7	7	7
	Mean:	0.0%	0.0%	0.0%	0.0%	100.0%	90.7%	59.6%	37.3%	0.0%	0.0%	6.1%	5.7%	1.1
	Standard Deviation:	0.00	0.00	0.00	0.00	0.00	2.10	3.31	2.35	0.00	0.00	0.59	0.20	0.07
Monitor Data														
5	1	0.0%	0.0%	0.0%	0.0%	100.0%	93.3%	64.7%	40.7%	0.0%	0.0%	5.4%	5.76%	0.94
5	2	0.0%	0.0%	0.0%	0.0%	100.0%	91.1%	58.7%	36.4%	0.0%	0.0%	5.8%	5.20%	1.12
5	3	0.0%	0.0%	0.0%	0.0%	100.0%	90.9%	60.4%	39.0%	0.0%	0.0%	5.9%	5.63%	1.05
5	4	0.0%	0.0%	0.0%	0.0%	100.0%	92.8%	60.7%	38.1%	0.0%	0.0%	5.7%	5.49%	1.04
6	1	0.0%	0.0%	0.0%	0.0%	100.0%	94.1%	63.8%	41.7%	0.0%	0.0%	7.0%	6.27%	1.12
6	2	0.0%	0.0%	0.0%	0.0%	100.0%	88.4%	55.4%	35.9%	0.0%	0.0%	6.4%	5.72%	1.12
6	3	0.0%	0.0%	0.0%	0.0%	100.0%	92.5%	62.3%	39.5%	0.0%	0.0%	6.5%	5.92%	1.10
Monitor Data Summary														
	Count:	7	7	7	7	7	7	7	7	7	7	7	7	7
	Mean:	0.0%	0.0%	0.0%	0.0%	100.0%	91.9%	60.9%	38.8%	0.0%	0.0%	6.1%	5.7%	1.1
	Standard Deviation:	0.00	0.00	0.00	0.00	0.00	1.91	3.17	2.13	0.00	0.00	0.55	0.34	0.07
Report Summary														
	(F):	0.00	0.00	0.00	.0.00	0.00	0.82	0.92	0.82	0.00	0.00	0.89	2.70	0.89
	(F.99)	8.47	8.47	8.47	8.47	8.47	8.47	8.47	8.47	8.47	8.47	8.47	8.47	8.47
	AM-AC:	0.0	0.0	0.0	0.0	0.0	1.2	1.3	1.4	0.0	0.0	0.0	0.0	0.0
	MU:	0.0	0.0	0.0	0.0	0.0	3.2	5.2	3.6	0.0	0.0	0.9	0.5	0.1

Figure 8-14: Sample Matched Comparison Analysis Report (Form E12-1714-01)

The Referee System

In the event the test results obtained from one of the eight samples or the mean (average) of the eight samples taken to evaluate a particular lot appear to be questionable, the referee system, upon receipt of written request, will be applied as follows:

1. In the event the test results obtained from one of the eight samples taken to evaluate a particular lot appear to be questionable, the *Contractor* may request in writing that the results of the questionable sample be disregarded, whereupon the Contractor shall have either an AASHTO-accredited laboratory or the Department laboratory perform tests on five additional samples taken from randomly selected locations in the roadway where the lot was placed.

   In the event the *Engineer* determines that one of the eight test results appears to be questionable, the Department will perform tests on five additional samples taken from the randomly selected locations in the roadway where the lot was placed.

   The test results of the seven original (i.e. unquestioned), samples will be averaged with the test results of the five road samples, and the mean of the test values obtained for the twelve samples will be compared to the requirements for the mean of twelve tests as specified in Table II-15, represented as Figure 8-15 on the next page.

2. In the event the *Contractor* questions the mean of the eight original test results obtained for a particular lot, the Contractor may request in writing approval to have either an AASHTO-accredited laboratory or Department laboratory perform additional testing of that lot.

   In the event the *Engineer* determines that the mean of the eight original test results are questionable, the Department will perform additional testing of that lot. The test results of the eight samples will be averaged with the test results of the four additional samples taken from randomly selected locations in the roadway where the lot was placed, and the mean of the test values obtained from the twelve samples will be compared to the requirements for the mean of twelve tests as specified in Table II-15.

   If the Contractor requests additional tests, the Contractor shall sample the material and have either an AASHTO-accredited laboratory or Department laboratory test the material in accordance with Department-approved procedures. The Engineer may opt to observe the sampling and testing.

   In the event the mean of the test values obtained for the twelve samples conforms to the requirements for the mean of twelve tests, the material will be considered acceptable. In the event that the mean of the test values obtained for the twelve samples does not conform to the requirements for the mean result of twelve tests, the lot will be adjusted in accordance with the adjustment rate specified in Section 211.09 of the specifications.

Samples of the size shown herein shall be saw cut by the Contractor for testing without the use of liquids:

Application Rate	Minimum Sample Size
125 lb./yd.2	8 by 8 in.
150 lb./yd.2	7 by 7 in.
200 lb./yd.2	6 by 6 in.
300 lb./yd.2	5 by 5 in.

Table II-15. Process Tolerance for Eight Tests (Plus and Minus Tolerance), Section 211.08
Process Tolerance on Each Laboratory Sieve and Asphalt Content - Percent Plus & Minus

No. Tests	Top Size	1.5 in	1 in	3/4 in	1/2 in	3/8 in	No. 4	No. 8	No. 30	No. 50	No. 200	AC*
1	0.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	6.0	5.0	2.0	0.60
2	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	4.3	3.6	1.4	.43
3	0.0	4.4	4.4	4.4	4.4	4.4	4.4	4.4	3.3	2.8	1.1	.33
4	0.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	2.5	1.0	.30
5	0.0	3.6	3.6	3.6	3.6	3.6	3.6	3.6	2.7	2.2	0.9	0.27
6	0.0	3.3	3.3	3.3	3.3	3.3	3.3	3.3	2.4	2.0	0.8	0.24
7	0.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.3	1.9	0.8	0.23
8	0.0	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.1	1.8	0.7	.21
12	0.0	2.3	2.3	2.3	2.3	2.3	2.3	2.3	1.7	1.4	0.6	0.17

**Asphalt content will be measured as extractable asphalt or mass after ignition*
Source: VDOT *Road and Bridge Specifications*, Section 211.08.

Figure 8-15: Process Tolerances Chart

Chapter Eight Knowledge Check

1. Who is responsible for the submission of the job mix formula?
   A. Plant Inspector
   B. Asphalt Plant Contractor/Technician
   C. District Materials Engineer
   D. District Materials Asphalt Concrete Technician

2. Who approves the job mix formula?
   A. Plant Inspector
   B. Asphalt Mix Design Contractor/Technician
   C. District Materials Engineer
   D. None of the above

3. Whose responsibility is it to assure that all materials are properly handled and stored?
   A. Asphalt Mix Design Contractor/Technician
   B. Plant Inspector
   C. District Materials Engineer
   D. District Materials Aggregate Technician

4. Asphalt cement used for state work does not need to be certified or tested.
   A. True
   B. False

5. Whose responsibility is it to sample, make proportioning determinations and make all adjustments necessary to insure proper operational control?
   A. Plant Inspector
   B. Contractor's Asphalt Mix Design Technician
   C. District Materials Engineer's representative
   D. None of the above

6. A chart that alerts the Producer when to investigate his/her process is known as the:
   A. Process tolerance chart
   B. Control chart
   C. Standard deviation chart
   D. Reference chart

7. Samples taken from equal portions of a lot at locations which have been selected solely by chance are known as:
   A. Random samples
   B. Representative samples
   C. Stratified random samples
   D. Progress samples

8. A method to reevaluate asphalt concrete when there is doubt that the original test results are valid, is known as the:
   A. Acceptance range
   B. Referee system
   C. Bell system
   D. Process tolerance

9. Where should monitor samples be taken?
   A. On the road
   B. At the plant

10. Monitor samples are taken by the Producer's Certified Asphalt Plant Level I Technician in the presence of the District Monitor.
    A. True
    B. False

11. What is the maximum time required after production starts before taking the first sample?

12. What procedure should be used when two samples are randomly selected to be taken from one truckload of material?

13. How should the sample be taken from the truck?

14. What is the normal size of a lot?

15. What is the difference between random sampling and representative sampling?

16. In stratified random sampling, what would be the number of samples required per 4000 ton lot?

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