



**Asphalt Plant
Level I & Level II
Certification Study Guide**

Revised 10.15

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**Virginia Department of Transportation
Asphalt Concrete Plant Level I & II Certification School Agenda**

Day One – Level I

7:45-8:00	Registration/Introduction	
8:00-8:30	Introduction - Chapter 1 Project Communication & Safety - Chapter 2	Angela Beyke
8:30-9:30	Components of Asphalt Concrete- Chapter 3	Angela Beyke
9:30-11:30	Asphalt Concrete Mixtures - Chapter 4	Todd Rorrer
11:30-12:30	Lunch	
12:30-2:30	Asphalt Concrete Plants - Chapter 5	Todd Rorrer
2:45-4:30	Sampling & Sieve Analysis of Aggregates - Chapter 6	Angela Beyke

Day Two – Level II

8:00-10:15	Blending Aggregates - Chapter 7	Angela Beyke
10:30-11:30	Duties of the Technicians - Chapter 8	Angela Beyke
11:30-12:30	Lunch	
12:30-4:30	Testing of Asphalt Concrete Mixtures - Chapter 9 Lab Demonstrations	Todd Rorrer Ben Carter & Jennifer Adkins

Day Three – Level II

8:00-9:30	Quality Acceptance & Data Processing - Chapter 10	Angela Beyke
9:30-11:30	Questions/exam review (or start exam early)	
11:30-12:30	Lunch	
12:30-4:30	Exam	

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AWARENESS/IMPORTANT



This manual is a practical guide and not to be used as a source for VDOT specifications.

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.

Preface

This training guide covers asphalt components and properties, mixtures, plants and production, common problems, technician duties and testing/quality assurance processes. The guide's audience is the plant personnel who are responsible for these operations – both contractor personnel who do the work, and agency personnel who oversee and inspect the work. This training program has been designed to enable the following audiences to achieve specific outcomes and certifications:

Job Role	Outcome	Certification Level
VDOT Personnel		
<i>Asphalt Plant Technician</i>	Through inspection processes, ensure asphalt production facilities are capable of producing the level of quality product required for specifications of the VDOT job while being compliant with CFR 737.	<ul style="list-style-type: none"> • Level I • Level II
<i>Asphalt Laboratory Technician</i>	Ensures that quality assurance (QA) testing on the asphalt components and products meet specifications of VDOT job and supports compliance measures with CFR 637.	<ul style="list-style-type: none"> • Level I • Level II
<i>QA Manager</i>	Management and supervision of the two previous job roles to ensure their outcomes are produced consistently over time, and without error	<ul style="list-style-type: none"> • Level I • Level II
Industry Personnel		
<i>Mix Design Technician</i>	Quality mixes that are designed and produced at plant to meet VDOT contract specifications and CFR 637 requirements	<ul style="list-style-type: none"> • Level I • Level II • Asphalt Plant Mix Design
<i>Plant Technician</i>	Ensures the quality of the materials produced in plant meet mix design requirements for VDOT job and are compliant with CFR 637	<ul style="list-style-type: none"> • Level I
<i>Plant Operator</i>	Oversees and ensures plant operations meet the mix designs to VDOT contract specifications and CRF 637 requirements	<ul style="list-style-type: none"> • No VDOT Certification Required
<i>Loader Operator</i>	Ensures components of the job mix are introduced properly into the mix	<ul style="list-style-type: none"> • No VDOT Certification Required
<i>QC Manager</i>	Ensures that the outcomes of the previous four (Industry) jobs consistently meet or exceed the customer (VDOT) requirements, while being compliant with CFR 637	<ul style="list-style-type: none"> • No VDOT Certification Required

Figure 1-1. Outcome and Certification Level by Job Role to be achieved through Training Workshop

The course will provide each technician with an understanding of his/her role in the overall pavement performance and a working knowledge of the techniques and processes used to safely select, mix, produce, and test asphalt to specifications. Likewise, course attendees will have an understanding of improper preparation of materials, their adverse effect, and ultimately the behavior and resulting problem in the finished product. As plant experts, we understand that equipping the technician with this information will give him/her the confidence to make proper day-to-day decisions and will ensure that good quality control is maintained throughout to the end product.

We hope this guide and the course it accompanies will promote a common understanding of the processes involved and thereby result in improved asphalt-concrete production.

Asphalt Plant Certification Information

Listed below are the different certifications related to asphalt-concrete production (Plant Level I, Plant Level II), a brief statement of course coverage, the certification components or requirements related to each level, and the course prerequisites related to each course. Please note: A technician may be certified as any one or more of these, or possibly all of these. Some certifications require a lower level certification before advancement to the next level of certification.

Certification & Course	Certification Components	Prerequisites for Courses
Plant Level I <i>Course Coverage:</i> <i>Awareness of VDOT Asphalt Specifications and Test Methods.</i> <i>Knowledge of Asphalt mixtures and sampling.</i>	<i>Written Exam -</i> <ul style="list-style-type: none"> ▪ Before taking the exam you must show photo identification and sign the Technician Certification Application. ▪ You must pass with a minimum score of 70% and have one opportunity for re-testing. <i>Proficiency Exam -</i> <ul style="list-style-type: none"> ▪ Before taking the exam you must show photo identification ▪ You have one opportunity for re-testing. Passing the written and proficiency exam results in an Asphalt Plant Level I Certification.	<ul style="list-style-type: none"> ▪ No Pre-Req.
Plant Level II <i>Course Coverage:</i> <i>Awareness of VDOT Asphalt specifications and test methods.</i>	<i>Written Exam -</i> <ul style="list-style-type: none"> ▪ Before taking the exam you must show photo identification and sign the Technician Certification Application. ▪ You must pass with a minimum score of 70% and have one opportunity for re-testing. <i>Proficiency Exam -</i> <ul style="list-style-type: none"> ▪ Before taking the exam you must show photo identification ▪ You have one opportunity for re-testing. Passing the written and proficiency exam results in an Asphalt Plant Level II Certification.	Plant Level I

Figure 1-2. Certifications and Pre-Requisites related to Asphalt-Concrete, Plant Production

Upon satisfactory completion of all requirements, the technician will be issued a certificate/certification of Plant proficiency. A certificate will be issued for each type certification. Initial certification will be effective for five (5) years beginning from the year of passing the appropriate written exam.

Failure of an exam or proficiency test will require the person to re-attend the instructor-led class and pass the exam and proficiency if required to become certified.

TOOLS AND EQUIPMENT



Your test results and card may be found at the VDOT University website listed below.

- VDOT Employees: <https://virtualcampus.vdot.virginia.gov>
- All other students: <https://virtualcampus.vdot.virginia.gov/external>

If you are enrolled in this class or hold any VDOT Materials certifications, do not register as a new user when you go to this site.

- If you do not know your logon or password, call (804) 328-3158. DOT Employees: <https://virtualcampus.vdot.virginia.gov>
- All other students: <https://virtualcampus.vdot.virginia.gov/external>

Describes what tools, equipment and tests are required to complete the job safely and with the highest level of quality.

About This Guide

This guide was designed using several techniques to improve learning and retention.

Each chapter in the guide begins with a brief introduction and a listing of learning objectives related to the chapter. Please review these objectives before beginning the chapter. This will help you develop a mental context and a set of expectations for chapter content, preparing you for more effective learning.

Within the chapters you will find a variety of techniques being used to improve learning, depending on the chapter content and type of information being conveyed. Some of these include:

- Step-by-step procedures and photos directing “how to” activity
- Decision tables for “if-then” situations
- Graphics to provide context and additional information
- Step-by-step examples for completing sample problems
- Worksheets to guide procedural calculations and a reference section of formulas used in calculations (Chapter 10).

Chapters 3-10 end with a Knowledge Check section intended to prepare you for the certification exam. Answers to these Knowledge Checks are included in Appendix F for your reference, enabling you to check your learning.

This guide also uses various visual cues to symbolize several consistent concepts throughout the chapters. These are highlighted because they contain foundational knowledge or other information that is critical for you to understand. Below and on the next page you will see the visual cues used, as well as a description of each.

DEFINITION	
	A definition will be provided.
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.	

TOOLS AND EQUIPMENT	
	Describes what tools, equipment and tests are required to complete the job safely and with the highest level of quality.
<i>Describes what tools, equipment and tests are required to complete the job safely and with the highest level of quality.</i>	

BEST PRACTICE



Describes a best practice to be utilized when possible.

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.

PROCEDURE



Describes a condition where equipment and procedure integrity is at risk. This is used to alert personnel to operating procedures and practices, which if not observed, could result in severe damage to the machine, its components or the end product.

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.

AWARENESS/IMPORTANT



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.

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.

INSPECTION AND MEASUREMENTS



Describes inspection, Quality Assurance and/or Quality Control practices.

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.

SAFETY WARNING



Describes a condition where personal safety may be at risk. This is used to alert personnel to operating procedures & practices which, if not observed, may result in personal injury.

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.

History and Introduction to Asphalt

The modern use of asphalt for road and street construction began in the late 1800s, and grew rapidly with the emerging automobile industry. Since that time, asphalt technology has made giant strides such that today the equipment and techniques used to build asphalt pavement structures are highly sophisticated.

One rule that has remained constant throughout asphalt's long history in construction is that an asphalt concrete layer is only as good as the materials and workmanship that go into it. No amount of sophisticated equipment can make up for use of poor quality materials, poor sampling and testing techniques and/or poor production practices.

Asphalt concrete is composed of three basic components - asphalt binder, mineral aggregate and air voids. Aggregates are generally classified into two groups – (1) coarse and (2) fine; and normally they together constitute 90 to 96 percent by weight of the total mixture. Asphalt binders are classified by various grading systems and normally constitute 4 to 10 percent of the total mixture. Another very important, but often overlooked component of an asphalt mix is air voids.

There are many different types of asphalts and many different types of aggregates. Consequently, it is possible to make different kinds of asphalt concrete. Among the most common types of asphalt concretes are:

- Dense-graded hot mix asphalt (Superpave Mixtures)
- Gap Graded hot mix asphalt (Stone Matrix Asphalt or SMA)
- Open-graded asphalt or porous friction course
- Ultra-Thin Bonded Wearing Course
- Asphalt Surface Treatments
- Emulsified asphalt mixes (cold mixes)
- Permeable Asphalt Drainage Course
- Others, In-Place Recycled Mixes (both hot and cold)

This training program primarily addresses asphalt-concrete (AC) produced at conventional plant temperatures or through a warm mix technology. AC is a paving material that consists of asphalt binder and mineral aggregate with appropriate air voids. The asphalt binder, either asphalt cement or a modified asphalt-cement, acts as a binding agent to glue aggregate particles into a dense mass and to waterproof the mixture. When bound together, the mineral aggregate acts as a stone framework to impart strength and toughness to the system. The performance of the mixture is affected both by the properties of the individual components and the combined reaction in the system.