A Guide for Preparing for SES Methods Group Exams

I. Introduction to SES Methods Groups Exams

The exams for the six different SES Methods Groups cover multiple and often overlapping EPA test methods and related regulatory requirements. The overwhelming majority of questions and correct answers on the exams are **derived directly from the text of the methods**. (See Resource 1 below for the Internet link to the CFR.) Further, you need to be aware that answering exam questions requires knowledge including but also **beyond sampling equipment configurations and the sample train operations.**

You can expect questions on an SES Methods Group exam requiring knowledge of method applicability, the range of relevant pollutants, interferences and remedies, equipment performance criteria, and acceptable alternative procedures. You also will find questions about **fundamental regulatory requirements**, pretest site acceptability checks, multi-method compatibility, and likely testing problems and possible corrective actions. The exams will include questions that require **an ability to perform some basic calculations and an understanding of the decisions to be drawn from calculated results**.

Preparing for one or more of the SES Methods Group exams can appear daunting. This guidance is intended to help you **understand the scope and structure of the exams, to help you organize your study for the exam, and to expedite your time during the exam**. The guidance discusses the rationale for which sections of the methods are particularly relevant to the questions on the exams and offers **examples of the types of questions** to expect on the exams. The guidance also identifies related concepts and principles relevant to the exams.

This guidance is **NOT INTENDED** to be a sole-source of study material for the exam. To be prepared for an SES Methods Group exam, **you must study and understand** the applicable regulatory sections and the relevant test methods and CEMS performance specifications. We intend that the discussion below help you focus your study on pertinent materials and information most related to the exams but you must still *read the methods*.

II. What is a qualified individual (QI) and how does that relate to the SES Methods Groups exams?

Relevancy - High. You should use this background knowledge to guide your exam preparation.

The ASTM Standard Practice D7036-12 says that a Qualified Individual (QI) is a person *who meets the requirements specified* in the practice. The practice stipulates that *"Only Qualified Individuals may supervise a test."* A QI must be on-site *for each test project…* and *qualified for each test method performed.* In short, **the QI should be the go-to person in planning, directing, and reporting on the field test**.

The ASTM standard practice requires a person pass a qualifications exam in order to be a QI. That exam should be designed such that the candidate demonstrates knowledge and understanding of the:

- methods as written,
- limitations of the methods,
- field conditions that may affect results,
- special considerations needed for low-level measurements,
- sample handling considerations,
- sources of uncertainty associated with methods, and
- proper operation and calibration of equipment.

That *operation and calibration* of the sampling equipment are listed last in the ASTM standard's qualifications exam elements is not to say that experience and competence in source test sample train operation are not critical to source testing success. Instead, the ASTM standard practice expects that the QI also demonstrate a **thorough and broad understanding of the principles, concepts, scope, and purpose of emissions testing**. The QI should be knowledgeable about issues of site-specific method applicability, potential for measurement interference and detection issues, calibration procedures and criteria, and basic calculations and reporting requirements.

In this program, the SES intends to be consistent with the ASTM D7036 Standard by providing **comprehensive qualifications exams** such that the QI can demonstrate that required thorough and broad knowledge of source emissions testing and testing methods.

III. What are some of the key underlying concepts of basic physics and chemistry in the testing methods and how do they relate to the SES Methods Groups exams?

Relevancy – Moderate to high. You should expect to have to answer a few questions on an exam requiring knowledge of some basic principles of physics and chemistry.

There are **some essential principles and physical relationships** that are fundamental to the design of the test method equipment, sampling train operations, and the calculations. These concepts **may not be explicitly described in a test method** but are inherent in conducting a source test. A sound knowledge of these **concepts and an ability to apply** them will be important to your success on an exam and as a QI. These basic knowledge concepts and a few other fundamental skills you should have at your disposal include:

- **Isokinetic versus anisokinetic sampling** – What bias direction could you expect in a particulate concentration measurement if the test were conducted under-isokinetically? Over-isokinetically?

- **Calculations** – You should have a basic **calculator-based familiarity** with the mathematics of at least the principal equations in the methods (e.g., using measured data determine pollutant and moisture concentration, flow rate, pollutant mass flow rate, isokinetic rate). You will **not** have access to a computer spreadsheet on the exam.

- **Corrections for moisture content** – In what direction does a measured gas concentration change when you convert from wet to dry conditions? What is the form of the equation?

- **Corrections to common or standard temperature and pressure** – What direction does a measured gas flow rate change when you correct to standard conditions of temperature and pressure? What are EPA standard conditions for temperature and pressure? What is the form of the equation?

- **Corrections for gaseous dilution** – What is the effect on a measured gas concentration value when you convert it to 0 percent O_2? To 0 percent excess air? To 12 percent CO_2? What are the forms of these equations?

- **Cyclonic flow, nonaxial flow** – What direction of bias can you expect for a velocity or a particulate sample measurement when the stack flow direction does not align perpendicular to the Pitot or sample nozzle face?

- **Dilution sampling and conditioned gas sampling** – How are the sampling train configurations different and what are the effects on the measured results when sampling for gaseous pollutants? (e.g., wet versus dry)?

- **F factors** – In the exhaust gases from fossil fuel and waste fuel combustion, what is the relationship between O_2 and CO_2? Between the fuel type and the exhaust gas flow rate or pollutant emissions rate? See Method 19.

- **Fundamental equations and relationships –** What calculations and technical relationships do you need to know to report the results of a test accurately and correctly but are not always explicit in the test methods?
  - Ideal gas law, PV = nRT
  - Length, area, volume, flow rate relationships and calculations (e.g., $A_{circle} = \pi r^2$ or $\pi D^2/4$; Q_{vol} = area x velocity; $Q_{mass} = Q_{vol} \times C_{pollutant}$)
  - Units conversions (e.g., grains to mg; ft^3 to L to m^3; seconds to minutes to hours; ft^2 to in^2; ng to µg to mg; mm Hg to psi; degrees F to absolute temperature)
  - Emissions values formats (e.g., concentration versus mass rate versus emissions factor; gr/std ft^3; lb/hr; ng/J; mg/kg of feed)

- **Gas sample meter box and other equipment calibrations** – What are the bias effects (e.g., directional and potential magnitude) on your sample measurements when equipment calibrations are in error?

- **Saturated and supersaturated gas streams** – What do these conditions mean in conducting a test and in calculating results?

- **Upstream and downstream** – What does upstream or downstream location mean when the gas flow is vertical, horizontal, or otherwise?

Example Question

Using basic knowledge of basic physics and chemistry principles, you should be able to answer a question on an exam such as:

You are sampling a particulate laden gas stream containing particle sizes ranging from less than 1 µm to over 15 µm in diameter. In which direction would a measured particulate mass concentration be biased if the sampling rate were 120 percent isokinetic?

A. The bias would be high relative to the actual mass concentration.
B. The bias would be low relative to the actual mass concentration.
C. There would be no bias in the measured mass concentration.
D. There would be measurement error in an unknown bias direction.

(The correct answer is B. Fundamental understanding of inertial movement.)

IV. What are the EPA regulatory General Provisions and how do they relate to the SES Methods Groups exams?

Relevancy – Moderate. You can expect a few questions on an exam derived directly from the definitions and performance test requirements in General Provisions to 40 CFR parts 60, 63, 72, and 75, depending on the methods covered in that exam.

The EPA outlines the responsibilities and overall compliance requirements for owners of facilities subject to the source specific air emissions regulations in a part of the Code of Federal Regulations (CFR) called the **General Provisions.** The great majority of air emissions source tests result from a requirement to demonstrate compliance with federal regulations (e.g., 40 CFR parts 60, 61, 63, and 75) or state regulations (e.g., 40 CFR part 51). Because of this, the EPA regulations devote a significant portion of the General Provisions to **define the performance test and specify what is required of the source owner and the tester in conducting the testing.**

There are some specific sections of the general provisions that have information **essential to the source tester planning and conducting source tests**. Among these are:

Section 60.2 Definitions. Below are **some** of the terms defined in this section pertinent to the SES Methods Groups exams:

Alternative method
Continuous monitoring system
Equivalent method
Isokinetic sampling
Nitrogen oxides
Particulate matter
Proportional sampling
Reference method
Run
Standard conditions
Volatile Organic Compound

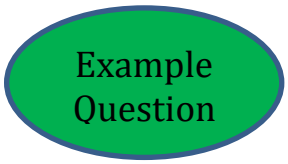
Section 60.8 Performance tests. This section outlines the conditions that support and define a source test. These **are fundamental to the tester's conduct of a compliance test** and to completing the SES Methods Groups exams successfully. For example:

> (e) The owner or operator of an affected facility shall provide performance testing facilities (e.g., sampling ports, access, sampling platforms, utilities);
> (f) Unless otherwise specified in the applicable subpart, each performance test shall consist of three separate runs using the applicable test method and the result is reported as the arithmetic mean of the results of three test runs; and

(h) Unless otherwise specified in the applicable subpart, each test location must be verified to be free of cyclonic flow and evaluated for the existence of emission gas stratification and the required number of sampling traverse points.

Section 60.13 Monitoring requirements. This section includes provisions **linking source testing to the certification of CEMS** pertinent to the tester's knowledge and the SES Methods Groups exams. For example:

(a) All required continuous emissions monitoring systems shall be subject to the provisions in applicable CEMS performance specifications (e.g., **relative accuracy testing** as per Performance Specification 2 in 40 CFR part 60, appendix B).



Using the information in the 40 CFR part 60 General Provisions, you should be able to answer a question on an exam such as:

Which of the following is an example of proportional sampling?

A. Constant rate sampling with equal dwell times at multiple sampling points in a stack with variable and non-uniform stack velocity.
B. Variable rate sampling (e.g., more than ±20 percent variability) with equal dwell times at multiple sampling points in a stack with a constant uniform stack gas velocity.
C. Isokinetic sampling.
D. Constant rate sampling with variable dwell times at multiple sampling points in a stack with constant uniform stack gas velocity.

(The correct answer is C. See 40 CFR part 60.2 definitions of Isokinetic sampling and Proportional sampling)

Section 63.2 Definitions. This rules in part 63 pertain to the National Emission Standards for **Hazardous Air Pollutants**. This particular section is similar in structure and content to 40 CFR part 60.2 as described above with the addition of:

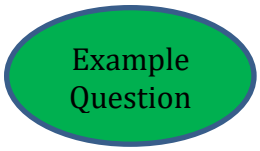
Continuous emission monitoring system
Hazardous air pollutant

Section 63.7 Performance testing requirements. The information in this section describes your responsibilities similar to those in 40 CFR 60.8 as described above with the addition of:

(c)(2)(i) Before conducting a required performance test, the owner or operator (usually the tester) shall develop and a **site-specific test plan** that

includes a test program summary, the test schedule, data quality objectives, and both an internal and external quality assurance (QA) program. The **data quality objectives** are the pretest expectations of precision, accuracy, and completeness of data; and
(f) Use of an alternative test method.

Section 63.8 Monitoring requirements. This section is similar to 60.13 as described above.



Using the information in the 40 CFR part 63 General Provisions, you should be able to answer a question on the exam such as:

A quality assurance (QA) program for a test for hazardous pollutants from a source subject to 40 CFR part 63 includes your activities to assess test data precision and bias. Which of the following is <u>not</u> an example of an appropriate QA assessment?

A. Sampling and analysis of replicate samples as part of an internal QA program.
B. During the compliance test, analyses of blind gas cylinder audit samples designed to audit the sampling system and the analyzer.
C. Analyses of audit samples by the same lab within a year prior to the performance test.
D. During the compliance test, collecting liquid or solid audit samples designed to audit the sampling system.

(The correct answer is C. See section 63.7(c)(2)(iii).)

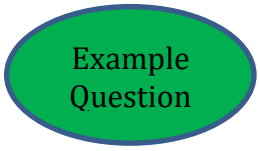
Section 72.2 Definitions. This section includes definitions of terms relative to the **Acid Rain rules** similar to those in 40 CFR parts 60 and 63 as described above with the addition of the following:

Add-on control
Air Emission Testing Body (AETB)
Calibration gas
Centroidal area
Diluent gas
EPA Protocol Gas
Flow monitor
Pollutant concentration monitor
Qualified individual (QI)
Span

Section 75.20 Initial certification and recertification procedures.
(c) Initial certification and recertification procedures

Section 75.22 Reference test methods.

Refers to use of the designated methods found 40 CFR part 60, appendix A.



Using the information in the 40 CFR part 75 General Provisions, you should be able to answer a Methods Group 5 question on the exam such as:

Which of the following procedures found in Method 7E is not allowed when you are conducting a part 75 (Acid Rain) CEMS RATA test?

A. Use Method 205 in Appendix M of 40 CFR Part 51 to prepare calibration gas mixtures.
B. Perform a stratification test at each test site to determine the appropriate number of sample traverse points.
C. Conduct a 3-point analyzer calibration error test before the first run and again after any failed system bias test.
D. Use dynamic spiking as an optional additional quality assurance check but not as an alternative to the interference and system bias checks of the method.

(The correct answer is A. See 40 CFR part 75.22(a)(5))

V. How does the EPA structure the content of the test methods and how can that help you prepare for the SES Methods Groups exams?

The EPA has published test methods in several sections of the CFR. Methods covered in the SES Methods Groups exams include those in 40 CFR parts, 51, 60, 61, and 63. **The EPA has applied a common organizational structure in publishing the test methods and CEMS performance specifications (methods).** Being familiar with the EPA methods structure and anticipating in which section you can find information pertinent to a question will greatly facilitate your preparing and sitting for an exam. This knowledge will help you go directly to the section that has the information particularly relevant to an exam question and facilitate your completing the exam.

Following is a discussion organized to reflect the EPA test method organizational structure. We have included some background about the contents of each test method section and tried to provide some guidance on how you may expect to apply the information in that section when taking an exam. There are also example exam questions.

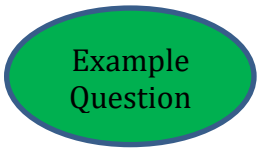
Section 1.0 *Scope and Application.*

Relevancy – High. You can expect multiple questions on any SES Methods Group exam derived directly from section 1 of the relevant EPA methods.

This section sets the **boundaries** for a applying a method and contains information critical to test planning. Specifically and succinctly, this section stipulates **what a method measures and where or when you can or cannot apply the method**.

For example, section 1.1 of Method 2 states that the method is for the determination of average velocity and volumetric flow rate of a gas stream (i.e., what the method measures and where). Section 1.2 outlines some gas stream conditions that would render the method not applicable (i.e., cyclonic or swirling gas streams). The same section then outlines some means to counter those conditions in order to make the method applicable (e.g., different location, straightening vanes, or alternative procedures).

Section 1 of a method identifies the characteristics, **pollutant, or pollutants the method is intended to measure**. Some methods, such as section 1.1 of Method 29, contain a table of analytes that the method can measure. The EPA methods use this section also to **define the limits of a method**. For example, Performance Specification 2, section 1.2 indicates that the specification is not designed to evaluate the installed CEMS performance over an extended period of time nor does it identify specific calibration techniques and other auxiliary procedures to assess the CEMS performance.



Using the information in section 1 of an EPA method or performance specifications, you should be able to answer a question on the exam such as:

Which of the following does Method 29 not measure?

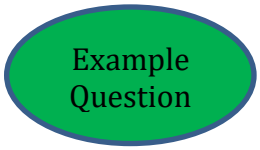
A. Beryllium
B. Calcium
C. Mercury
D. Zinc

(The correct answer is B. See Method 29, section 1.1)

In addition, section 1 of a method usually contains information about **measurement sensitivity**. For example, section 1.1 of Method 10 states that measurement sensitivity for CO is *(t)ypically <2% of Calibration Span*.

Section 1 of the EPA methods also contains information about a method's ***data quality objectives*** often including some information about how the method achieves those objectives. Section 1.2 of Method 7E, for example, specifies the use of EPA traceability protocol calibration gases in Method 7E and is intended to ensure the accuracy of the data at the actual emission levels encountered.

Section 1 of an EPA method will also identify what other methods the tester should understand and be able to apply when conducting the relevant test method. For example, section 1.4 of Method 202 lists Methods 1, 2, 3, 4, 5, 17, and 201A as requiring a tester's thorough knowledge before trying to conduct Method 202. This section of Method 202 also refers to multiple versions of Method 5 to use or not to use if one must measure filterable PM in addition to condensable PM.



Using the information found in section 1 an EPA test method or CEMS performance specifications, you should be able to answer a question on the exam such as:

Which of the following is a possible option to the procedure outlined in Method 3 for determining the molecular weight of a fossil fuel combustion stack gas?

A. Measure stack temperature and pressure and convert volume flow rate to standard conditions.
B. Use a method to measure either CO_2 or O_2 and do stoichiometric calculations to determine dry molecular weight.
C. Assign a value of 27.0 for dry molecular weight, in lieu of actual measurements, for processes burning natural gas, coal, or oil.
D. Measure stack temperature and moisture content and use a psychrometric chart.

(The correct answer is B. See Method 3, section 1.3.)

Section 2.0 *Summary of Method.*

Relevancy – High. You should expect to have to answer <u>multiple</u> questions on an exam using the information that can be found in section 2 of the relevant method and you very often will save valuable exam time over searching other parts of the method.

Section 2 of a method will provide **the core of the information critical to understanding how a method actually works including a description of the equipment, sample collection and recovery procedures, and the analytical principles**.

The section also identifies relevant operating conditions (e.g., isokinetic or integrated sampling, upper and lower sample filter temperatures, how multiple sample gas components are separated and stabilized, how the sample is protected from interferences).

For example, in just a few lines section 2.1 of Method 16a states that *(a)n integrated gas sample is extracted from the stack. SO_2 is removed selectively from the sample using a citrate buffer solution. TRS compounds are then thermally oxidized to SO_2, collected in hydrogen peroxide as sulfate, and analyzed by the Method 6 barium-thorin titration procedure.*

The section outlines the prescribed analytical procedures and often indicates conditions for **acceptable alternative procedures or means to extend a method's applicability** (e.g., alternative analytical techniques for various metals collected in Method 29 samples relative to analytical sensitivity needs). In another example, Method 26A includes a note that "*If the tester intends to use this sampling arrangement to sample concurrently for particulate matter, the alternative Teflon probe liner, cyclone, and filter holder should not be used. The Teflon filter support must be used. The tester must also meet the probe and filter temperature requirements of both sampling trains.*"

Example Question

Using the information found in section 2 an EPA test method or CEMS performance specifications, you should be able to answer a question on the exam such as:

Which of the following analytical techniques does Method 26 specify for determining the concentration of halide ions in the separate solutions?

A. Ion chromatography.
B. Gas chromatography/infrared.
C. Gas chromatography/mass spectrometry.
D. Barium/thorin titration.

(The correct answer is A. See Method 26, section 2.1)

Section 3.0 *Definitions*.

Relevancy – High. You should expect multiple questions on exams for Group Exams 3, 4, and 5 derived directly from section 3 of the relevant methods.

Section 3 of the EPA methods contains **definitions of terms specific and critical to conducting the method**. Many of the methods leave this section reserved; that is, there are no definitions included specifically for some methods. Other methods, particularly the **instrumental test methods** (e.g., Method 3A, 6C, and 7E), **Method 30B**, and the **CEMS performance specifications** (e.g., Performance Specification 2) define multiple terms. For example, Method 7E contains definitions for 19 terms, Performance Specification 2 defines 11 terms. For these methods, the terms are sometimes specific key procedures and equipment configurations critical to conducting instrument calibrations and performance checks.

When a method defines certain terms, you can be sure that **understanding those terms is essential to performing the method correctly**.

Example Question

Using the information found in section 3 an EPA test method or CEMS performance specifications, you should be able to answer a question on the exam such as:

What is the term used in Method 7E to identify the collection of equipment used to determine the NO_X concentration?

A. Gas Analyzer.
B. System Calibration Mode.
C. Measurement System.
D. Continuous Monitoring System.

(The correct answer is C. See Method 7E, section 3.13)

Section 4.0 *Interferences*

Relevancy – High. You should expect to have to answer multiple questions on an SES Methods Group exam about possible sampling or analytical interferences or the conditions (e.g., type of process or control device) that can produce such possible interferences.

Section 4 of the EPA methods contains information about materials in stack gases that can interfere with collection or analysis of the target pollutant(s). The section can raise red flags about potential for **interferences from common stack gas constituents and about what types of biases such interferences might cause.** For example, section 4.1 of Method 6 cites that free ammonia reacts with SO_2 in the sample gas to form particulate sulfite and by reacting with the analytical indicator. Free ammonia can exist downstream of wet alkaline scrubbers and cause a low bias or in ill-defined end point in the analytical titration.

This section in the methods can also provide guidance about **means to detect or avoid such interferences.** For example, section 4.1 of Method 6 goes on to describe how one can detect potential interference from free ammonia by the presence of white particulate matter in the probe and isopropanol bubbler. The method also notes that if you suspect or detect ammonia interference, *alternative methods, subject to the approval of the Administrator are required.* This type of information should be critical to your planning a test.

Some methods note that materials used in **sample train preparation** can also interfere with the sample collection. For example, section 4.2 of Method 13A notes that *Grease on sample-exposed surfaces may cause low F–results due to adsorption.* This method allows the use of stopcock grease to assemble leak-tight sampling trains but cautions the tester to be alert to keeping the probe, filter, and inner surfaces of the glassware free of grease (i.e., avoid sloppiness).

Other EPA methods, particularly the instrumental test methods, direct the user to an **interference check procedure** and associated acceptance criteria. For example, section 4.0 of Method 7E notes that *interferences may vary among instruments and that instrument-specific interferences must be evaluated through the interference test*. The term *interference check* is defined in section 3.11, the relevant procedures are in section 8.2.7, and Table 7E-4 lists the potential interference gases relevant to conducting the method.

Example Question

Using the information found in section 4 an EPA test method or CEMS performance specifications, you should be able to answer a question on the exam such as:

What type of measurement bias might you expect if there is iodine present on a Method 30B sorbent trap?

A. No measurement bias.
B. Positive measurement bias.
C. Negative measurement bias.
D. Measurement bias of unknown direction.

(The correct answer is C. See section 4.0 of Method 30B.)

Section 5.0 *Safety*.

Relevancy – low. There may be only one or two questions on an exam about a particular safety practice or sample handling issue and only to the degree a method specifically identifies it.

Section 5 of the EPA methods addresses issues of **personal safety in handling chemicals and equipment**. The guidance in this section is often general such as: *This method may involve hazardous materials, operations, and equipment. This test method may not address all of the safety problems associated with its use. It is the responsibility of the user of this test method to establish appropriate safety and health practices and to determine the applicability of regulatory limitations prior to performing this test method.*

Some methods include additional information about the corrosiveness, toxicity, or other safety concern associated with particular materials required by the method. This information may include some direction for treatment if the user is exposed. For example, section 5.2 of Method 26A notes the sulfuric acid and sodium hydroxide are hazardous corrosive agents. The section adds that: *Personal protective equipment and safe procedures are useful in preventing chemical splashes. If contact occurs, immediately flush with copious amounts of water for at least 15 minutes. Remove clothing under shower and decontaminate. Treat residual chemical burns as thermal burns.*

An EPA method also may refer to a potentially dangerous chemical reaction of particular concern when using the method (e.g., an exothermic reaction when sodium hydroxide is mixed with water).

The EPA methods direct Air emissions testing companies and government organizations establish safety and health practices tailored to their operations and staff. Additionally, there are other regulations and other drivers that organizations use to address safety practices (e.g., OSHA standards) beyond the information covered in the EPA methods.

Example Question

Using the information found in section 5 an EPA test method, you should be able to answer a question on the exam such as:

When recovering Method 29 samples, which of the following practices does not apply in addressing the potential reaction of the potassium permanganate with the acid in the acidic $KMnO_4$ absorbing solution storage bottle?

A. Ensure that the sample bottle is completely full with no air pocket.
B. Do not fill the sample bottle completely.
C. Vent the sample bottle to relieve excess pressure.
D. Use a No. 70-72 hole drilled in the container cap and Teflon liner.

(The correct answer is A. See section 5.3 of Method 29.)

Section 6.0 *Equipment and Supplies*

Relevancy – High. You should expect to have to answer multiple questions on an exam derived directly from section 6 of the test methods.

Section 6 of the EPA methods specifies the equipment, performance criteria, and other supplies needed to conduct a test using one or more of the methods. The organizational order of the section **follows logically from the collection of the sample though analyses**. We have separated the discussion below by the general type of sampling and analyses methods – manual extractive sampling and instrumental measurement methods.

A. Manual extractive sampling methods.

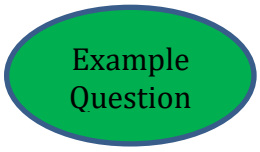
Many of the EPA test methods use physical **sample extraction and collection on filters, reaction with impinger solutions, or separation and suspension in a solution.** Section 6 for these methods will be specific about the **sampling train elements** beginning with the initial sample/sample train interface (e.g., the probe nozzle, probe liner). The description will include each component and the appropriate construction material (e.g., impingers of borosilicate glass). The section will include component specific design characteristics (e.g., impinger volume, probe diameter) and operational requirements (e.g., ability to maintain temperature sufficient to prevent condensation). The section will often refer to a **schematic of the train containing other vital information**. The section will also identify materials used to assemble the train (e.g., stopcock grease) and connecting pieces. The section will also list the **components needed to operate the train** (e.g., valves, pump, and metering devices including temperature and pressure sensors, barometric gauges, and volume flow rate meters).

Many manual extractive sampling methods use this section to describe **possible alternative equipment** and sometimes other equipment required for certain stack

operating conditions. For example, section 6.1.1.2 of Method 5 prescribes other probe liner construction material, quartz glass, for stack temperatures 900^0F and above. There may also be reference to **required operating conditions** that are specified elsewhere in the method but are repeated for emphasis in the equipment section. For example, section 6.1.1.7 specifies the location of a filter temperature sensor and that *"The filter temperature sensor must be monitored and recorded during sampling to ensure a sample gas temperature exiting the filter of 120 ± 14 °C (248 ± 25 °F)."*

For methods that use manual extractive sampling, the section also describes the **tools needed for sample recovery** (e.g., probe brushes and funnels) and the **sample storage and shipping containers**. The EPA will use this section to describe construction materials and characteristics (e.g., resistant to chemical attack by acetone) as well as the numbers and sizes.

The last part of section 6 of manual extractive sampling methods describes the tools and analytical equipment involved in the **analysis of the samples**. These are the materials and equipment used in the lab sometimes located on-site, sometimes in a remote location.



Using the information found in section 6 an EPA manual extractive test method, you should be able to answer a question on the exam such as:

Which of the following is <u>not</u> a characteristic of the Method 5 sample filtering system?

A. The filter holder is constructed of borosilicate glass, with a glass or Teflon frit filter support and a silicone rubber gasket, unless otherwise approved.
B. The filter holder is attached immediately at the outlet of the probe (or cyclone, if used).
C. The filter holder is heated and the temperature around the filter is monitored to ensure the sample gas temperature exiting the filter of 120 ± 14 °C (248 ± 25 °F) during sampling unless another temperature is approved.
D. The filter holder must be shielded from light during sampling and prior to sample recovery.

(The correct answer is D. See Method 5, sections 6.1.1.5 and 6.1.1.6.)

B. Direct instrumental analysis methods and CEMS performance specifications.

For the instrumental test methods, such as Method 7E, section 6 describes the **measurement system and operational conditions for maintaining sample integrity**. For example, section 6.1(4) of Method 7E says that all measurement system components must ensure **minimal contact between any condensate and the sample gas** before analysis. The method may specify certain construction materials or procedures for assuring that the materials used are subjected to **performance tests and meet acceptance criteria**. For example, Method 7E, section 6.1(1) specifies that all sample interface components that are **not evaluated in the system bias or system calibration error test** must be glass, Teflon, or stainless steel.

It is significant that starting with the definitions (e.g., Method 7E, section 3.1), the EPA instrumental test methods, including Method 7E, **distinguish between dilution and non-dilution measurement systems** in terms of equipment, procedures, and performance criteria.

Section 6 of instrumental test methods identifies **sampling and analysis system components** in a manner similar to that for extractive manual sampling and analyses methods. This includes specifications for construction materials and design characteristics. Particular to instrumental test method sampling systems is sample **conditioning equipment.** The design and operation of sample conditioning equipment for a particular measurement system hinges upon whether the sample is to be **analyzed wet or dry** and the use of **dilution sampling probes**. The instrumental methods also describe the **components used in calibrating the measurement system** and, in like manner, distinguish between dilution and non-dilution sampling systems.

An important part of this section of the instrumental test methods is the **summary of technical and operational specifications for the analytical techniques** used. The instrumental test methods often specify **particular analytical principles** that apply (e.g., chemiluminescence analyzers for NO_X). Section 6.2.8.1 discusses performance procedures and criteria for the use of **dual-range analyzers** applicable when you encounter a source with a wide range of emissions concentrations.

Example Question

Using the information found in section 6 of an EPA instrumental test method or CEMS performance specifications; you should be able to answer a question on the exam such as:

Which of the following is not an acceptable calibration gas manifold when using Method 7E and a dilution-type measurement system?

A. A system that introduces calibration gases directly to the gas analyzer in direct calibration mode.
B. A system that introduces calibration gases into the measurement system, at the probe, in system calibration mode.
C. A system able to flood the sampling probe and vent excess gas in the measurement system calibration mode.
D. A gas dilution subsystem that transports large volumes of purified air to the in-stack dilution-type sample probe and a probe controller is needed to maintain the proper dilution ratio.

(The correct answer is A. See Method 7E, section 6.2.6.)

Section 7.0 *Reagents and Standards*

Relevancy – Moderate. You can expect to have to answer a few questions on an exam from the section 7 of a relevant method.

Section 7 of the EPA test methods contains the **chemicals and other materials you will use in conducting a test**. There are some differences between how the sections are organized for manual extractive sampling methods and instrumental test methods.

A. Manual extractive sampling methods.

The initial part of section 7, section 7.1, of the manual extractive sampling methods (e.g., Methods 5 and 6) describe the **reagents and other materials needed in the sampling train for sample collection**. These include filters, impinger solutions, and drying agents. Other materials described in this initial section may include materials, such as ice, that do not come in contact with the sample but are necessary for sample collection.

The methods that collect samples through chemical reaction (sometimes called *wet chemistry methods,* such as Methods 6, 7, 8, 11, 12, 26, 26A, 29, among others) provide detail about the **sample collection solutions and their preparation**. For example, Method 6, section 7.1.3 prescribes a 3 percent hydrogen peroxide (H_2O_2) prepared by adding *10 ml of 30 percent H_2O_2 to 90 ml of water*. This section also prescribes that the H_2O_2 solution by prepared fresh daily.

These methods sometimes prescribe solutions and procedures for **cleaning sampling train glassware**. Method 29, for example, section 7.4 includes specifications for HNO_3, water, and 10 percent HNO_3 used specifically for cleaning the sampling glassware prior to a test. Section 7 of the manual extractive sampling methods also includes the reagents and other materials needed for analyses, sometimes used at the test site (e.g., lab/trailer) but often used at a laboratory located off site.

Example Question

Using the information found in section 7 of an EPA manual extractive test method, you should be able to answer a question on the exam such as:

In selecting filters for a Method 29 sampling train, what is the maximum metals content (i.e., for each metal) you must verify that your filters meet?

A. 1.3 µg/in.^{2}
B. 13.0 µg/in.^{2}
C. 1.3 mg/in.^{2}
D. 13.0 mg/in.^{2}

(The correct answer is A. See section 7.2.1.)

B. Direct instrumental analysis methods.

Section 7 of the instrumental test methods, such as section 7.1 of Method 7E, focus on the **specifications and ranges of the calibration gases** needed to conduct the method. The methods specifically reference *EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards*, *September 1997, as amended August 25, 1999, EPA-600/R-97/121*. You should be familiar with the requirements of this document, sometimes called *Protocol 1*, particularly with **the acceptability criteria and cylinder gas expiration dates**.

Section 7 of Method 7 and other instrumental test methods specify the **concentration ranges** needed for calibration gases used during the test (e.g., low-level, mid-level, and high-level Protocol 1 cylinder gases). The methods relate these calibration gas concentration ranges to the measurement method **calibration span** (see definitions).

Example Question

Using the information found in section 7 of an EPA instrumental test method, you should be able to answer a question on the exam such as:

When conducting a test (not a part 75 CEMS RATA program) in accordance with Method 6C, which of the following practices is not allowed relative to the calibration gases?

A. You may use blended gases that meet the Traceability Protocol if the additional gas components are shown not to interfere with the analysis.
B. You may use a zero gas for the low-level calibration gas if it meets the requirements under the definition for "zero air material" in 40 CFR 72.2.
C. You may use prepare calibration gas mixtures from EPA Traceability Protocol gases in accordance with Method 205 in appendix M to 40 CFR part 51.
D. You may use a calibration gas beyond its *Protocol 1* expiration date if you recertify the gas concentration within 30 days following the test.

(The correct answer is D. See section 7.1 of Methods 6C and 7E.)

Section 8.0 *Sample Collection, Preservation, Storage, and Transport*

Relevancy – High. You should expect to have to answer multiple questions on an SES Methods Group exam derived from information found in section 8 of a relevant method.

Section 8 of the EPA methods presents the procedures you use to collect a representative sample, verify acceptable sample train performance, conduct the test run, conduct quality control steps to ensure sample integrity, recover the sampling train, and store and transport samples for analysis. This information and procedures in this section of the methods provide **the nuts and bolts of the source emissions test**.

Section 8 of both the manual extractive sampling methods (e.g., Method 5) and the instrumental test methods (e.g., Method 7E) include **pretest preparation procedure**s. These steps may include preparing sample collection media (e.g., drying silica gel, checking and weighing filters), selecting appropriate nozzles and probes for isokinetic sampling, determining run time and sample point dwell times, and, for instrumental test methods, verifying and selecting calibration gases.

This section for both the manual extractive sampling methods and the instrumental test methods includes procedures for **selecting suitable sampling or measurement locations** and for determining the minimum number and location of sampling traverse points. Most methods reference **Method 1** for determining sample point location to some degree. Method 7E, section 8.1.2 additionally includes **a comprehensive procedure for determining stratification conditions at the selected measurement location.** This

section of the method requires the tester to use the results of the stratification check to determine the minimum number and location of sample traverse points.

Significantly, Performance Specification 2, sections 8.1.2 and 8.1.3 distinguish between the **CEMS measurement location and the reference method measurement location and traverse points.** The procedure for establishing the sample traverse points for a Performance Specification 2 CEMS RATA are derived from but are not entirely the same as defined in Method 7E.

A second major part of section 8 of the EPA methods covers sample train preparation including **assembling the train, calibrating and leak checking, and other measurement system performance check procedures.** This section in Method 7E prescribes initial measurement system performance tests including calibration error test, NO_2 to NO conversion efficiency test, system bias check, system response time test, and an interference check. Each of the procedures included in section 8 of the methods must be completed successfully for the test to go forward. Additionally, you must **repeat most of these checks with acceptable results at the end of each test run and at other times** to validate each run.

Section 8 of the methods, of course, includes the **procedures for conducting the test**. The manual extractive sampling methods explain the **sampling train operation.** The instrumental test methods describe **sample collection** and the EPA performance specifications define the **calibration drift test procedure and the relative accuracy test procedure**. These sections direct you in setting the duration of the test run and traverse point dwell times, establishing and maintaining sampling rates, data collection frequency and content, the measurement system operations including criteria for initiating and ending each run, determining the number of runs that constitute a completed test, and procedures to apply when you encounter some atypical condition.

The EPA methods include post-run procedures and acceptance criteria for checks such as **leak tests** for manual extractive sampling methods **and measurement system bias check and drift assessments** for instrumental test methods. For the manual extractive sampling methods, section 8 importantly includes detailed procedures for sample recovery, sample storage and shipping, and what blanks to save for later analyses.

Section 8 of EPA methods often require that you **calculate a factor or condition that you will use to determine the outcome of the test**. Method 5 (and other isokinetic sampling methods) section 8.6 requires that you calculate the isokinetic rate to **determine whether the run was valid or you must conduct another test run**. Section 8.7 of Method 7E requires that you calculate the **moisture correction, as** needed, to correct the measured gas concentrations to a dry basis. Section 8.4.6 of Performance Specification 2 requires that you **calculate the mean difference between the (reference method) and CEMS values in the units of the emission standard** in completing the calculations outlined later in the method (i.e., section 12)**.**

Example Question

Using the information found in section 8 of a method, you should be able to answer a question on the exam such as:

When you are conducting a RATA following Performance Specification 2 for an SO_2 CEMS (not a part 75 CEMS RATA program), which of the following factors do you not need to consider in correlating reference method (RM) and CEMS data?

A. Time and duration of runs, including system response time.
B. Temperature used in determining concentrations.
C. Moisture and diluent concentration basis.
D. The applicable emissions limit.

(The correct answer is D. See sections 8.4.3 and 8.4.5 of Performance Specification 2.)

Section 9.0 *Quality Control.*

Relevancy – Moderate to high. You can expect a few questions on an SES Methods Group exam derived from information more easily found in section 9 of a method than by searching in other sections.

Section 9 of EPA test methods is usually a **summary of the quality assurance and quality control (QA/QC) measures** applicable to the method. In many cases, EPA uses this section to provide a table listing QA/QC checks defined elsewhere in the method along with the applicable acceptance criteria. For some methods, the section may be reserved. For others, the section may include a combination of a summary table and more detailed procedures and calculations. Method 5, for example includes a table that lists only the sample train leak check requirement. The remainder of the section describes **volume metering system** checks including the procedures, calculations, and acceptance criteria.

The QA/QC table in section 9 of Method 7E, on the other hand, is comprehensive. The table lists planning elements (e.g., *identify data user*). It also includes all of the **instrumental interference, drift, bias, and calibration check procedures** required in the method, the relative acceptance criteria, and whether each of the elements is suggested, mandatory, or alternative.

Example Question

Using the information found in section 9 of a method, you should be able to answer a question on the exam such as:

Based on results of your stratification check when conducting a Method 7E test, which of the following would indicate that you may use single-point sampling?

A. The concentrations for at least 75 percent traverse points are with ± 5 percent or ±0.5 ppm of the mean concentration.
B. The concentrations for all of the traverse points are with ± 5 percent or ±0.5 ppm of the mean concentration.
C. The concentrations for at least 75 percent traverse points are with ± 10 percent or ±1.0 ppm of the mean concentration.
D. The concentrations for all percent traverse points are with ± 10 percent or ±1.0 ppm of the mean concentration.

(The correct answer is B. See Method 7E, section 9, Summary Table of QA/QC.)

Section 10.0 *Calibration and Standardization.*

Relevancy – Low to moderate. You can expect to have to answer a few questions on an exams derived from information found in section 10 of a relevant method.

For most manual extractive sampling methods, such as Method 5, this section prescribes equipment **calibration procedures and acceptance criteria** for laboratory checks done prior to you using the sample train equipment in the field or following your returning the equipment to the lab. The elements of the sample train checked using the procedures in section 10 is comprehensive and includes the dry gas meter, probe heater, temperature sensors, and the barometer. The section defines the standard materials against which the performances of sampling train components are checked.

Section 10 of instrumental test methods refer to the calibration requirements and procedures that are done in the field prior to and following the test. This section is reserved in the CEMS performance specifications deferring to the on-site drift and relative accuracy checks.

Example Question

Using the information found in section 10 of a method, you should be able to answer a question on the exam such as:

You have completed a three-run test with Method 5. The post-test dry gas meter (DGM) calibration check shows that the DGM coefficient values before and after a test series differ by more than 5 percent. Which of the following is not an appropriate follow-up step?

A. Recalibrate the dry gas meter over the full range of orifice settings.
B. Void the test series.
C. Calculate the emissions values using the lower of the pre-test or post-test calibration coefficient that results in the lower total sample volume.
D. Calculate the emissions values using the mean of the pre-test and post-test calibration coefficients.

(The correct answer is D. See Method 5, section 10.3.2 and 10.3.3.)

Section 11.0 *Analytical Procedure.*

Relevancy – Low.

Section 11 in most manual extractive sampling methods describes the analytical procedures applied to samples once returned from the field to the lab. The SES has determined that the methods groups exams represent field test preparation and procedures generally supervised and observed by the QI. The result is that the SES Methods Groups exams include **no questions derived directly from the sections describing laboratory analytical procedures**.

Exception - there are questions on the exams derived from section 11 in Methods 1, 3, and 3B (i.e., traverse point location, Orsat operations and quality control checks). It is also worth noting that there are questions on the SES Methods Group exams that **require the use of data derived from sample analyses**. You will find questions on the exams requiring knowledge of the format of the analytical results to use in calculations and in accounting for analytical blank values and analytical detection limits (see section 12).

Example Question

Using the information found in section 11 of a method, you should be able to answer a question on the exam such as:

For which of the following measurement locations or conditions would you least likely expect nonaxial or cyclonic flow conditions (e.g., average α >20 ^{0})?

A. Measurement location downstream of a cyclone demister following a Venturi scrubbers.
B. Measurement location less than 4 diameters downstream of a tangential duct connection.
C. Measurement location more than 8 diameters downstream of an elbow in the duct and more than 2 diameters upstream of the duct exit.
D. Measurement location less than 8 diameters downstream of an in-line axial fan.

(The correct answer is C. See Method 1, section 11.4.1.)

Section 12.0 *Data Analysis and Calculations.*

Relevancy – Moderate to high. You should expect to have to answer a few questions on an exam requiring a calculation or an understanding of relationships defined by the equations (e.g., an increase in one value means an increase, decrease, or no effect on an outcome).

Section 12 of the EPA methods covers the calculations to be completed using the measured results. The sections open with **nomenclature** including terms and values that define the format of the calculated results. For example, the nomenclature list includes terms for standard conditions of pressure and temperature repeated from the regulatory General Provisions (see discussion above). The nomenclature list includes some terms that require **some fundamental knowledge not provided in the methods**. For example, determining the area of a nozzle, A_n, requires one to calculate the area of a circle ($A = \pi D^2/4$) and to convert that area to ft^2. The methods sometimes dos not provide the equations to determine absolute temperature (T_{abs} in ^{0}R = T in ^{0}F + 460) or to calculate mean values (e.g., average dry gas meter temperature and average orifice pressure drop; $T_m = \sum T/n$).

The next parts of section 12 are usually **organized in a step-wise manner**. That is, the methods first provide equations for calculating various intermediate elements or terms used in subsequent equations leading to the final calculation of the emissions concentration or emission rate.

The calculations section of the instrumental test methods (e.g., Method 7E) also provides equations for calculating various **measurement system performance elements** including analyzer calibration error, system bias, system calibration error, drift assessment, and NO_2—NO conversion efficiency. It is noteworthy that sections 12.10 of Method 7E and

section 12.1.1 of Performance Specification 2 provide an **equation to correct measured "wet" concentrations to "dry"** using the measured stack gas moisture content.

Example Question

Using the information found in section 12 of an EPA method, you should be able to answer a question on the exam such as:

You have completed the RATA for an SO_2 CEMS using Performance Specification 2. You determined that the mean difference between the reference method (RM) emissions values and the CEMS emissions values is -0.025 lb/MMBtu and the confidence coefficient is 0.030 lb/MMBtu. If the mean RM value for the RATA is 0.68 lb/MMBtu, what is the CEMS relative accuracy?

A. 0.007 percent
B. 0.081 percent
C. 0.7 percent
D. 8.1 percent

(The correct answer is D. See section 12.5, Performance Specification 2.)

Section 13.0 *Method Performance.*

Relevancy – High. You should expect to have to answer multiple questions on an SES Methods Group exam derived directly from section 13 of the methods, especially for Methods Groups 3 and 5.

Section 13 of an EPA method often states a test method's capabilities in terms of **expected method precision, bias, and minimum detection limit**. Section 13 in method may also express a maximum or upper range of pollutant concentrations the method as published can be expected to handle.

The instrumental test methods and performance specifications use section 13 to define the **limits or specifications that you and your test equipment must meet in order to validate a test result or for a CEMS to pass the RATA**. These limits are usually expressed as maximum or minimum values (e.g., percent drift, bias, relative accuracy) determined from data collected during various measurement system performance checks.

Example Question

Using the information found in section 13 of an EPA method, you should be able to answer a question on the exam such as:

You have completed the analyzer calibration error check for a Method 7E NO_x test and found the low, mid, and high level calibration error values to be 0.3, 0.35, and 0.4 ppm, respectively. If the calibration span value is 70 ppm, what is the status of the measurement system relative to the calibration error check?

A. The measurement system passes the calibration error check.
B. The measurement system fails the calibration error check and you must repeat the test.
C. The measurement system fails the calibration error check but you may salvage the data by recalibrating the measurement system and adjusting the results to the new calibration curve.
D. The data measured at the lower end of the calibration range are acceptable but you must reject data measured at higher than 35 ppm.

(The correct answer is A. See section 13.1 of Method 7E.)

Sections 14.0, *Pollution Prevention*, and 15.0, *Waste Management.*

Relevancy – None.

There are no questions on the SES methods groups exams derived from Sections 14 and 15 of the EPA test methods.

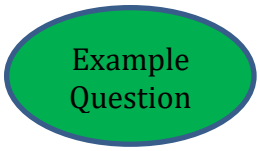
16.0 *Alternative Procedures.*

Relevancy – Moderate. You should expect to have to answer a few questions on an exam derived directly from section 16 of a relevant method.

Section of the methods and performance specifications contain alternatives to certain procedures in the title method. Many of these describe **alternative calibration procedures**. For example, section 16.1 of Method 5 describes the procedures required to use a calibrated dry gas meter in lieu of a wet test meter or spirometer in calibrating the sample train volume metering system. Section 16.2 of Method 5 (and elsewhere in manual extractive test methods) describes the use of critical orifices as volume metering system calibration standards.

Section 16.1 of Method 7E, a **dynamic spike procedure** used to validate your test data for a specific test matrix in place of the interference check and pre- and post-run system bias checks. Note that the dynamic spike procedure must be approved for use when conducting CEMS RATA testing for part 75.

Section 16 of some methods provides for calculating emissions results in an alternative format or use of an altered or modified sampling train to produce alternative results. Section 16.1 of Method 6A outlines use of a modified sampling train, no volume measurement, to produce emissions data in units of lb/MMBtu. Section 16.1 of Method 12 describes how to modify the sampling train and the sample recovery procedures to allow for the simultaneous measurement of particulate matter and lead emissions. Some methods (e.g., Methods 12 and 29) use section 16 to list alternative analytical techniques.



Using the information found in section 16 of an EPA method, you should be able to answer a question on the exam such as:

Which of the following is an acceptable alternative to the reference procedure in Method 4 for measuring the moisture content in a combustion stack for a process not using a scrubber?

A. Previous experience.
B. Wet bulb-dry bulb techniques.
C. The Method 4 approximation method.
D. F factors.

(The correct answer is D. See section 16.4 of Method 4.)

VI. How is the ASTM D 6784 – 02 (Ontario Hydro Method) for measuring mercury organized and how can that help you with a Methods Group 4 exam?

The SES Methods Group 4 exam covers the measurement of hazardous metals and understanding how to apply the Ontario Hydro (OH) method is important to your success on the Methods Group 4 exam. The method is organized somewhat differently than are the EPA test methods but the information in the various sections very closely mirror those in the EPA methods.

Section 1 of the OH method addresses the **scope and applicability** of the method in much the same way as section 1 of an EPA method. **Section 3** of the OH method **defines terms** used in the procedures. This section also includes the **symbols and terms used in the calculations** similar to the initial part of section 12 of the EPA methods. The **relevancy** of these two sections for exam purposes would be equal to that for the corresponding sections in the EPA methods.

Section 4 of the OH method includes the **summary of the method** in the manner of section 2 of the EPA methods. **Section 6** of the OH method about **interferences** is brief (there are no interferences). The OH method refers to **section 16** for information about **precision and bias**. As discussed above, you can expect to be able to answer questions on a Methods Group 4 exam using information in sections 4 and 16 of the OH method.

Section 7 of the OH method specifies the **equipment** necessary to conduct the procedures. This section corresponds to section 6 of the EPA methods. There are a number of references to **EPA Method 5 equipment and configurations** in this section of the OH method. You can expect a **high level of relevancy** for the information in section 7 similar to that for section 6 of the EPA methods on a Method Group 4 exam.

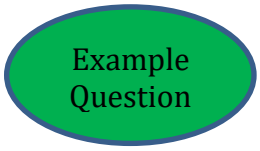
Section 8 describes the **reagents and materials**, including specifications for sample containers, needed to conduct the procedure. This section corresponds to section 7 of the EPA methods and the **relevancy** of the information in this section is similar. **Section 9** of the OH method covers the **safety issues** associated with collecting, storing, and shipping samples. The **relevancy** of the information in this section when sitting for a Methods Group 5 exam is similar to that for **section 5 of the EPA methods**.

Sections 10 and 11 of the OH method contain the procedures for selecting the sampling site, determining the sampling time, and preparing the sampling train in a manner similar to sections 6 and 7 of the EPA methods. **Relevancy** of the materials in these sections to the number of possible questions on a Methods Group 4 exam is also similar. The OH method includes the calibration procedures in **section 12** and refers liberally to Method 5 procedures and acceptance criteria.

The OH method uses **section 13** to define the procedural steps in sampling and sample recovery. As noted above about section 8 of the EPA methods, the relevancy of the

information in section 13 of the OH method is **high** especially for the sample recovery steps and cautions. The method emphasizes the need to **maintain sample integrity** when measuring for Hg. You should be able to answer questions about the number and contents of **OH method the order and content of sample containers collected during sample recovery including blanks**.

Sections 14 and 15 of the OH method divide the **calculations** between the **flue gas** elements (e.g., gas volume, moisture) and **mercury concentrations. Relevancy** of the information in these two sections to the number or type of questions you should expect on the exam is about the same as for the information in section 12 of the EPA methods (**high**). You should be able to answer questions about the relationship between different factors as evidenced by the calculations but the actual calculations you may have to do to complete the exam will be limited to fairly basic forms.



Using the information found in section 4 of the OH method, you should be able to answer a question on the exam such as:

Which of the following is <u>not</u> one of the separate mercury fractions collected by the ASTM D 6784-02 (Ontario Hydro method) sampling train?

A. Particle-bound mercury.
B. Oxidized mercury.
C. Elemental mercury.
D. Mercury ^{III}.

(The correct answer is D. See section 4 of ASTM D 6784-02.)

VII. How are the part 75 CEMS RATA testing requirements in Appendix A organized and how can that help you with a Methods Group 5 exam?

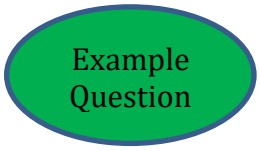
The SES Methods Group 5 exam is expressly designed to cover the requirements of part 75 (Acid Rain) CEMS RATA testing. Almost all of the measurements for the RATA of a part 75 CEMS apply test methods and performance specifications from 60 CFR part 60 and described in detail above. There are some significant differences between the part 75 CEMS performance criteria and those in part 60. For example, the **tester must evaluate the relative accuracy for each measurement component of a part 75 CEMS** (i.e., pollutant concentration, moisture concentration, diluent concentration, and flow). As noted above, Performance Specification 2 of part 60 instead requires that the tester determine the CEMS RATA only in units of the relevant emissions limit.

There are also some data corrections and other adjustments to CEMS data (e.g., bias specific to part 75) and not addressed in part 60. The following of sections of **40 CFR part 75, appendix A** include the bulk of the procedures for conducting a part 75 CEMS RATA and performance criteria.

The Methods Group 5 exam will include questions about the instrumental test methods in part 60 (i.e., Methods 3A, 6C, and 7E) and Performance Specification 2 in the manner discussed above. In preparing for the Methods Group 5 exam, you should also expect questions about the performance procedures and criteria derived from the following sections in appendix A, part 75:

Appendix A to Part 75—Specifications and Test Procedures
1.1 Gas Monitors (definitions of point and path monitors)
1.2 Flow Monitors (acceptability of monitor location)
2.1.2.2 Maximum Expected Concentration
3. Performance Specifications
3.1 Calibration Error
3.2 Linearity Check
3.3 Relative Accuracy
3.3.1 Relative Accuracy for SO_2 Monitors (acceptance limits)
3.3.2 Relative Accuracy for NO_X-Diluent Continuous Emission Monitoring Systems
3.3.3 Relative Accuracy for CO_2 and O_2 Monitors
3.3.4 Relative Accuracy for Flow Monitors
3.3.6 Relative Accuracy for Moisture Monitoring Systems
3.3.7 Relative Accuracy for NO_X Concentration Monitoring Systems
3.4 Bias
3.4.1 SO_2 Pollutant Concentration Monitors, NO_X Concentration Monitoring Systems and NOX-Diluent Continuous Emission Monitoring Systems
3.4.2 Flow Monitors
5. Calibration Gas
5.1 Reference Gases
5.2 Concentrations

6. Certification Tests and Procedures
6.1 General Requirements
6.1.2 Requirements for Air Emission Testing – requirement for RATA testing to be conducted by an AETB and for all testing to be overseen and supervised by a QI in accordance with ASTM D7036-04.
6.2 Linearity Check (General Procedures)
6.3 7-Day Calibration Error Test
6.4 Cycle Time Test
6.5 Relative Accuracy and Bias Tests (General Procedures)
(a) Perform each RATA while the unit (or units, if more than one unit exhausts into the flue) is combusting the fuel that is a normal primary or backup fuel for that unit.
(c) For monitoring systems with dual ranges, perform the relative accuracy test on the range normally used for measuring emissions.
6.5.1 Gas Monitoring System RATAs (Special Considerations)
6.5.2 Flow Monitor RATAs (Special Considerations)
6.5.5 Reference Method Measurement Location
6.5.6 Reference Method Traverse Point Selection
6.5.6.1 Stratification Test
6.5.6.3 Stratification Test Results and Acceptance Criteria
6.5.7 Sampling Strategy
6.5.10 Reference Methods
7. Calculations



Using the information found in section 3 of 40 CFR part 75, appendix A, you should be able to answer a question on the exam such as:

Which of the following best represents the relative accuracy acceptance requirement for a part 75 NO_x-diluent CEMS?

A. RA is not to exceed 10.0 percent or ±0.020 lb/mmBtu, whichever is greater.
B. RA is not to exceed 10.0 percent or ±10 ppm, whichever is greater.
C. RA is not to exceed 20.0 percent or 10 percent of the emissions standard, whichever is greater.
D. RA is not to exceed 15.0 percent of the applicable emissions standard.

(The correct answer is A. See section 3.3.2 of 40 CFR part 75, appendix A.)

VIII. Other Exam Study Resources (available on-line)

1. EPA Code of Federal Regulations, Title 40, parts 51, 60, 63, 72, and 75 - http://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title40/40tab_02.tpl

2. Methods Covered Under Each Group Exam - http://sesnews.org/?q=node/48

3. SES Qualified Source Testing Individual Exams Frequently Asked Questions - http://sesnews.org/files/FAQ_7-2012.pdf

4. SES QSTI/QSTO exam guideline - http://www.sesnews.org/files/GuideQSTIExamSuccessv4.rtf

5. EPA Emissions Measurement Center Frequently Asked Questions - https://www3.epa.gov/ttn/emc/facts.html

6. EPA Emissions Measurement Center Guideline Documents - https://www3.epa.gov/ttn/emc/guidlnd.html

7. EPA Emissions Measurement Center Technical Information Documents - https://www3.epa.gov/ttn/emc/informd.html

8. EPA 40 CFR Part 75 Monitoring Policy Manual - http://www.epa.gov/sites/production/files/2015-05/documents/part_75_emissions_monitoring_policy_manual.pdf

9. On-line QSTI Quiz guides by Will Brooks - https://quizlet.com/Will_Brooks2, http://quizlet.com/50340356/qsti-group-one-study-guide-flash-cards/