Commonwealth of Virginia

Department of General Services
Division of Consolidated Laboratory Services

Laboratory Inspection Checklist - VELAP Chapter 45

Laboratory Name: _____ DCLS ID: _____

Assessor Name: _____ Inspection Date: _____

CHEMICAL TESTING

Y N N/A

LOD/LOQ

1489 ☐☐☐	771 A	All procedures used shall be documented. Documentation shall include the quality system matrix type. All supporting data shall be retained.
1490 ☐☐☐	771 B	Limit of detection (LOD). The laboratory shall utilize a test method that provides an LOD that is appropriate and relevant for the intended use of the data.
1491 ☐☐☐	771 B	LODs shall be determined by the protocol in the mandated test method or applicable regulation.
1492 ☐☐☐	771 B	If the protocol for determining LODs is not specified, the selection of the procedure shall reflect instrument limitations and the intended application of the test method.
1493 ☐☐☐	771 B 1	The LOD shall be initially determined for the compounds of interest in each test method in a quality system matrix in which there are no target analytes or interferences at a concentration that would impact the results. Alternatively the LOD shall be determined in the quality system matrix of interest (see definition of matrix).
1494 ☐☐☐	771 B 2	LODs shall be determined each time there is a change in the test method that affects how the test is performed, or when a change in instrumentation occurs that affects the sensitivity of the analysis.
1495 ☐☐☐	771 B 3	The LOD shall be verified annually for each quality system matrix, method and analyte as specified in 1VAC30-45-760 B 1.
1496 ☐☐☐	771 C 1	Limit of quantitation (LOQ). Any established LOQ shall be above the LOD.
1497 ☐☐☐	771 C 2	Limit of quantitation (LOQ). The LOQ shall be verified annually for each quality system matrix, method and analyte according to the procedure specified in 1VAC30-45-760 B 2. Alternatively, the annual LOQ verification is not required if the LOD is reevaluated or verified according to subdivision 771 B 4 of this section.

SELECTIVITY

1506 ☐☐☐	774 A	Selectivity. The laboratory shall evaluate selectivity by following the checks established within the method, which may include mass spectral tuning, second column confirmation, ICP inter-element interference checks, chromatography retention time windows, sample blanks, spectrochemical absorption or fluorescence profiles, co-precipitation evaluations, and electrode response factors.
1507 ☐☐☐	774 B	Selectivity. A confirmation shall be performed to verify the compound identification when positive results are detected on a sample from a location that has not been previously tested by the laboratory.
1508 ☐☐☐	774 B	Selectivity. The confirmations for compound identification shall be performed on organic tests such as pesticides, herbicides, or acid extractable or when recommended by the analytical test method except when the analysis involves the use of a mass spectrometer.
1509 ☐☐☐	774 B	Selectivity. Confirmation is required unless stipulated in writing by the client.
1510 ☐☐☐	774 B	Selectivity. All compound identification confirmations shall be documented.
1511 ☐☐☐	774 C	Selectivity. The laboratory shall document acceptance criteria for mass spectral tuning.

MARGINAL EXCEEDANCES

1464 ☐☐☐	770 B 5 B	Marginal exceedances (ME). The number of allowable marginal exceedances is as follows: ___>90 analytes in LCS, number of analytes allowed in ME of the LCS control limit of no more than 5 analytes allowed. ___71-90 analytes in LCS, number of analytes allowed in ME of the LCS control limit of no more than 4 analytes allowed. ___51-70 analytes in LCS, number of analytes allowed in ME of the LCS control limit of no more than 3 analytes allowed. ___31-50 analytes in LCS, number of analytes allowed in ME of the LCS control limit of no more than 2 analytes allowed. ___11-30 analytes in LCS, number of analytes allowed in ME of the LCS control limit of no more than 1 analytes allowed. ___<11 analytes in LCS, no analytes allowed in ME of the LCS control limit.

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MARGINAL EXCEEDANCES

1465 ☐ ☐ ☐ 770 B 5 C — Marginal exceedance shall be random. If the same analyte exceeds the LCS control limit repeatedly, it is an indication of a systemic problem. The source of the error shall be located and corrective action taken.

1466 ☐ ☐ ☐ 770 B 5 C — Laboratories shall have a written procedure to monitor the application of marginal exceedance allowance to the LCS to ensure random behavior.

BLANK

1446 ☐ ☐ ☐ 770 A 1 — Negative control. Purpose. The method blank shall be processed along with and under the same conditions as the associated samples to include all steps of the analytical procedure.

1447 ☐ ☐ ☐ 770 A 1 — Negative control. Purpose. Procedures shall be in place to determine if a method blank is contaminated.

1448 ☐ ☐ ☐ 770 A 1 — Negative control. Purpose. Any affected samples associated with a contaminated method blank shall be reprocessed for analysis or the results reported with appropriate data qualifying codes.

1449 ☐ ☐ ☐ 770 A 2 — Negative control. Frequency. The method blank shall be analyzed at a minimum of one per preparation batch.

1450 ☐ ☐ ☐ 770 A 2 — Negative control. Frequency. In those instances for which no separate preparation method is used (e.g., volatiles in water) the batch shall be defined as environmental samples that are analyzed together with the same method and personnel, using the same lots of reagents, not to exceed the analysis of 20 environmental samples.

1451 ☐ ☐ ☐ 770 A 3 — Negative control. Composition. The method blank shall consist of a quality system matrix that is similar to the associated samples and is known to be free of the analytes of interest.

1452 ☐ ☐ ☐ 770 A 4 — Negative control. Evaluation criteria and corrective action. While the goal is to have no detectable contaminants, each method blank shall be critically evaluated as to the nature of the interference and the effect on the analysis of each sample within the batch.

1453 ☐ ☐ ☐ 770 A 4 — Negative control. The source of contamination shall be investigated and measures taken to minimize or eliminate the problem and affected samples reprocessed or data shall be appropriately qualified if:
a. The concentration of a targeted analyte in the blank is at or above the reporting limit as established by the test method or by regulation, and is greater than 1/10 of the amount measured in any sample.
b. The blank contamination otherwise affects the sample results as per the test method requirements or the individual project data quality objectives.
c. When a blank is determined to be contaminated, the cause shall be investigated and measures taken to minimize or eliminate the problem. Samples associated with a contaminated blank shall be evaluated as to the best corrective action for the samples (e.g., reprocessing or data qualifying codes). In all cases the corrective action shall be documented.

LCS

1454 ☐ ☐ ☐ 770 B 1 — Positive Control. Laboratory control sample (LCS): The LCS is used to evaluate the performance of the total analytical system, including all preparation and analysis steps. Results of the LCS are compared to established criteria and, if found to be outside of these criteria, indicates that the analytical system is "out of control." Any affected samples associated with an out of control LCS shall be reprocessed for re-analysis or the results reported with appropriate data qualifying codes.

1455 ☐ ☐ ☐ 770 B 2 — Positive control. Frequency. The LCS shall be analyzed at a minimum of one per preparation batch. Exceptions would be for those analytes for which no spiking solutions are available such as total suspended solids, total dissolved solids, total volatile solids, total solids, pH, color, odor, temperature, dissolved oxygen or turbidity.

1456 ☐ ☐ ☐ 770 B 2 — Positive control. Frequency. In those instances for which no separate preparation method is used (example: volatiles in water) the batch shall be defined as environmental samples that are analyzed together with the same method and personnel, using the same lots of reagents, not to exceed the analysis of 20 environmental samples.

1457 ☐ ☐ ☐ 770 B 3 — Positive control. Composition. The LCS is a quality system matrix, known to be free of analytes of interest, spiked with known and verified concentrations of analytes. NOTE: the matrix spike may be used in place of this control as long as the acceptance criteria as stringent as for the LCS. Alternatively the LCS may consist of a media containing known and verified concentrations of analytes or as Certified Reference Material (CRM). All analyte concentrations shall be within the calibration range of the methods.

1458 ☐ ☐ ☐ 770 B 3 — Positive control. Composition. The components to be spiked shall be as specified by the mandated test method or other regulatory requirement or as requested by the client.

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	Y	N	N/A		
LCS					
1459	☐	☐	☐	770 B 3 A	Positive control. Composition in the absence of specified spiking components and for those components that interfere with an accurate assessment such as spiking simultaneously with technical chlordane, toxaphene and PCBs, the spike should be chosen that represents the chemistries and elution patterns of the components to be reported.
1460	☐	☐	☐	770 B 3 B	Positive control. Composition in the absence of specified spiking components and for those test methods that have extremely long lists of analytes, a representative number may be chosen. The analytes selected should be representative of all analytes reported. The following criteria shall be used for determining the minimum number of analytes to be spiked. However, the laboratory shall insure that all targeted components are included in the spike mixture over a two-year period. ___For methods that include 1-10 targets, spike all components; ___For methods that include 11-20 targets, spike at least 10 components or 80%, whichever is greater; ___For methods with more than 20 targets, spike at least 16 components.
1461	☐	☐	☐	770 B 4 A	Positive control. Evaluation criteria and corrective action. The results of the individual batch LCS are calculated in percent recovery or other appropriate statistical technique that allows comparison to established acceptance criteria. The laboratory shall document the calculation.
1462	☐	☐	☐	770 B 4 B	Positive control. Evaluation criteria and corrective action. The individual LCS is compared to the acceptance criteria as published in the mandated test method. Where there are no established criteria, the laboratory shall determine internal criteria and document the method used to establish the limits or utilize client specified assessment criteria.
1463	☐	☐	☐	770 B 4 C	Positive control. Evaluation criteria and corrective action. Samples analyzed along with a LCS determined to be "out of control" shall be considered suspect and the samples reprocessed and re-analyzed or the data reported with appropriate data qualifying codes.
DUPLICATES					
1479	☐	☐	☐	770 E 1	Sample specific controls. Matrix duplicates are defined as replicate aliquots of the same sample taken through the entire analytical procedure.
1480	☐	☐	☐	770 E 2	Sample specific controls. The frequency of the analysis of matrix duplicates may be determined as part of a systematic planning process (e.g., Data Quality Objectives) or as specified by the mandated test method.
1481	☐	☐	☐	770 E 3	Sample specific controls. Matrix duplicates are performed on replicate aliquots of actual samples. The composition is usually not known.
1482	☐	☐	☐	770 E 4 A	Sample specific controls. For the matrix duplicate evaluation criteria and corrective actions the laboratory shall document the calculation for relative percent difference or other statistical treatments.
1483	☐	☐	☐	770 E 4 B	Sample specific controls. Where there are no established matrix duplicate evaluation criteria and corrective actions, the laboratory shall determine internal criteria and document the method used to establish the limits.
1484	☐	☐	☐	770 E 4 B	Sample specific controls. For matrix duplicates results outside established criteria corrective action shall be documented or the data reported with appropriate data qualifying codes.
SURROGATES					
1485	☐	☐	☐	770 F 2	Sample specific control. Surrogates spikes. Except where the matrix precludes its use or when not commercially available, surrogate compounds shall be added to all samples, standards, and blanks for all appropriate test methods.
1486	☐	☐	☐	770 F 4	Sample specific control. Surrogates spikes. The results are compared to the acceptance criteria as published in the mandated test method. Where there are no established criteria, the laboratory should determine internal criteria and document the method used to establish the limits.
1487	☐	☐	☐	770 F 4	Sample specific control. Surrogates spikes. Where there are no established criteria, the laboratory should determine internal criteria and document the method used to establish the limits.
1488	☐	☐	☐	770 F 4	Sample specific control. Surrogates spikes. Surrogates outside the acceptance criteria shall be evaluated for the effect indicated for the individual sample results. Data quality objectives or other site-specific requirements may guide the appropriate corrective active. Results reported from analyses with surrogate recoveries outside the acceptance criteria should include appropriate data qualifiers.
MATRIX SPIKE					

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MATRIX SPIKE					
1468	☐	☐	☐	770 C 2	Sample specific controls. General. The laboratory shall have procedures in place for tracking, managing, and handling matrix specific QC criteria including spiking appropriate components at appropriate concentrations, calculating recoveries and relative percent difference, evaluating and reporting results based on performance of the QC samples.
1469	☐	☐	☐	770 D 2	Sample specific controls. Matrix spike. The frequency of the analysis of matrix specific samples shall be determined as part of a systematic planning process (e.g., Data Quality Objectives) or as specified by the test method.
1470	☐	☐	☐	770 D 3	Sample specific controls. Matrix spike. The components to be spiked shall be as specified by the mandated test method. Any permit specified analytes, as specified by regulation or client requested analytes shall also be included in the components to be spiked.
1471	☐	☐	☐	770 D 3 A	Sample specific controls. Matrix spike. If there are no specified components, the laboratory shall spike for those components that interfere with an accurate assessment such as spiking simultaneously with technical chlordane, toxaphene and PCBs, the spike should be chosen that represents the chemistries and elution patterns of the components to be reported.
1472	☐	☐	☐	770 D 3 B	Sample specific controls. Matrix spike. If there are no specified components, the laboratory shall spike for those test methods that have extremely long lists of analytes, a representative number may be chosen using the following criteria for choosing the number of analytes to be spiked.
1473	☐	☐	☐	770 D 3 B	Sample specific controls. Matrix spike. If there are no specified components, the laboratory shall spike per the following: The laboratory shall insure that all targeted components are included in the matrix spike mixture over a two year period. (1) For methods that include 1-10 targets, spike all components; (2) For methods that include 11-20 targets, spike at least 10% or 80%, whichever is greater; (3) For methods with more than 20 targets, spike at least 16 components.
1474	☐	☐	☐	770 D 4 A	Sample specific controls. Matrix spike. The results from matrix spike/matrix spike duplicate are primarily designed to assess the precision and accuracy of analytical results in a given matrix and are expressed as percent recovery (%R) relative percent difference (RPD), or other appropriate statistical technique that allows comparison to established acceptance criteria.
1475	☐	☐	☐	770 D 4 A	Sample specific controls. Matrix spike. The laboratory shall document the calculation for %R, RPD or other statistical treatment used.
1476	☐	☐	☐	770 D 4 B	Sample specific controls. Matrix spike. The results are compared to the acceptance criteria as published in the mandated test method.
1477	☐	☐	☐	770 D 4 B	Sample specific controls. Matrix spike. Where there are no established criteria, the laboratory shall determine internal criteria and document the method used to establish the limits.
1478	☐	☐	☐	770 D 4 B	Sample specific controls. Matrix spike. For matrix spike results outside established criteria corrective action shall be documented or the data reported with appropriate data qualifying codes.
QC					
1467	☐	☐	☐	770 C 1 & 2	Sample specific controls. General. The laboratory shall document procedures for determining the effect of the sample matrix on method performance. These controls alone are not used to judge laboratory performance. Examples of matrix specific QC include: Matrix Spike (MS); Matrix Spike Duplicate (MSD); sample duplicates; and surrogate spikes.
EQUIPMENT					
1512	☐	☐	☐	775 A	Constant and consistent test conditions. The laboratory shall assure that the test instruments consistently operate within the specifications required of the application for which the equipment is used.
GLASSWARE					
1513	☐	☐	☐	775 B	Constant and consistent test conditions. Any cleaning and storage procedures that are not specified by the test method shall be documented in laboratory records and SOPs.
REAGENTS & MEDIA					
1499	☐	☐	☐	773 A	Chemical testing: quality of standards and reagents. The source of standards shall comply with 1VAC30-45-740 C.
1500	☐	☐	☐	773 B 1	Chemical testing: quality of standards and reagents. Reagents. In methods where the purity of reagents is not specified, analytical reagent grade shall be used.

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REAGENTS & MEDIA					
1501	☐	☐	☐	773 B 1	Chemical testing: quality of standards and reagents. Reagents. Reagents of lesser purity than those specified by the test method shall not be used.
1502	☐	☐	☐	773 B 1	Chemical testing: quality of standards and reagents. Reagents. The labels on the container should be checked to verify that the purity of the reagents meets the requirements of the particular test method.
1503	☐	☐	☐	773 B 1	Chemical testing: quality of standards and reagents. Reagents. Such information shall be documented.
1504	☐	☐	☐	773 B 2	Chemical testing: quality of standards and reagents. Water. The quality of water sources shall be monitored and documented and shall meet method specified requirements.
1505	☐	☐	☐	773 B 3	Chemical testing: quality of standards and reagents. The laboratory will verify the concentration of titrants in accordance with written laboratory procedures.
DATA ANALYSIS					
1498	☐	☐	☐	772	The procedures for data reduction, such as use of linear regression, shall be documented.