

Second-Source Standards

What They Are, and When They Are Required

About the EPA Method Examples in This Guide

The second-source and calibration-verification principles discussed in this guide apply across a broad range of analytical methods and laboratory applications. EPA Methods [200.7](#) and [200.8](#) are referenced throughout as practical, publicly available examples of how established methods define source independence through the use of a Quality Control Sample (QCS). Their repeated use is illustrative and does not mean that second-source standards, source-independence requirements or the CPI products discussed are limited to these methods or to the analysis of water and waste samples.

The term “second source” describes the relationship between a verification material and the standards used for calibration, not a universal product type or requirement. Terminology, source requirements, frequency, concentration, matrix and acceptance criteria vary among regulatory methods, consensus methods, industry procedures and laboratory quality systems. Laboratories should verify the exact method language and documentation requirements applicable to their work.

Quick Answer

A second-source standard is a calibration-verification material obtained from a source independent of the calibration standards or stock standards, when required by the analytical method or quality system. In EPA Methods 200.7 and 200.8, the method-specific term is Quality Control Sample (QCS), and the QCS is used to verify calibration standards and/or instrument performance. Source requirements, frequency, concentration, and acceptance criteria must always be checked against the applicable method.

Why Second-Source Standards Matter

Calibration establishes the relationship between known analyte concentration and instrument response. But a calibration curve can still be biased if the calibration stock solution, dilution procedure, matrix, transcription, or preparation step contains an error.

A second-source standard provides an independent check on that calibration system. It helps the laboratory answer a practical question: does a material prepared from a source independent of the calibration standards confirm that the calibration is producing acceptable results?

For ICP-MS and ICP-OES laboratories, this distinction is important because terms such as second-source standard, independent source standard, ICV, calibration verification, QCS, and instrument performance check are sometimes used loosely. The exact requirement depends on the analytical method.

What Is a Second-Source Standard?

A second-source standard is a standard or quality-control material prepared from a source independent of the standards used to establish calibration, when required by the applicable method or laboratory quality procedure.



In routine laboratory language, second-source standards are often associated with initial calibration verification. In method language, however, the required material may have a different name, such as Quality Control Sample (QCS), calibration verification standard, laboratory control sample, or another method-specific term.

Key point

Do not assume that every ICV, CCV, IPC, QCS, or calibration verification material has the same source requirement. Read the method language first.

Second-Source vs. Same-Source: The Practical Difference

Material type	What it checks	Typical source relationship
Calibration standards	Establish the concentration-response relationship	Prepared from calibration stock standards or purchased calibration mixes
Second-source verification standard / QCS	Independently checks calibration standards and/or instrument performance	Obtained from an independent source or prepared from stock solutions different from calibration stocks, when required
Continuing calibration check / IPC / CCV	Monitors whether calibration remains acceptable during the analytical sequence	May be method-specific; not always required to be independent
Laboratory fortified blank / LFB	Assesses laboratory performance and method control through the preparation process	Method-specific; may be prepared from defined stock solutions

What Does “Independent Source” Mean?

At a minimum, an independent-source requirement means the verification material should not be traceable only to the same stock solution or preparation pathway used for calibration. The goal is to reduce the chance that a common preparation or source-material problem goes undetected.

Depending on the method, laboratory quality system, and accrediting body expectations, source independence may involve:

- A standard obtained from an outside commercial source.
- A material prepared from stock solutions different from those used for calibration.
- A different manufacturer or reference-material producer, when required by the quality system.
- A separately prepared verification material with documentation demonstrating its source relationship.
- A certificate or lot record that supports traceability, concentration, matrix, uncertainty, and expiration/stability requirements where applicable.

A different lot from the same supplier may or may not satisfy a particular independent-source requirement. That determination should be based on the method, the supplier documentation, and the laboratory's quality system.

Does an ICV Need to Be From a Second Source?

Sometimes yes. But the correct answer is method-dependent.

If the applicable method states that the verification material must be obtained from an outside or independent source, then the laboratory should follow that requirement. If the method does not specify an independent source, the



laboratory should follow its internal SOP, data-quality objectives, client requirements, accreditation requirements, and regulatory program requirements.

An ICV needs to be from a second source only when the applicable method or quality system requires it. For EPA 200.7 and EPA 200.8, the method-specific QCS is used for verification and has source requirements. Laboratories should not apply those exact requirements universally to unrelated methods.

EPA Method 200.8 Example: QCS Source Requirements

EPA Method 200.8 is an ICP-MS method for determination of trace elements in waters and wastes. The method uses the term Quality Control Sample (QCS), not simply “second-source standard.”

In Method 200.8, the QCS is defined as a solution of method analytes of known concentrations used to fortify an aliquot of LRB or sample matrix. The method states that the QCS is obtained from a source external to the laboratory and different from the source of calibration standards. It is used to check laboratory or instrument performance.

Method 200.8 also states that the QCS should be obtained from a source outside the laboratory, diluted in 1% nitric acid to an appropriate concentration, stored in an FEP bottle when prepared as described, and prepared fresh quarterly or more frequently as needed.

For verification, Method 200.8 requires the laboratory to verify calibration standards and acceptable instrument performance with preparation and analysis of a QCS when beginning use of the method, on a quarterly basis, or as required to meet data-quality needs. The determined mean concentration from three QCS analyses must be within $\pm 10\%$ of the stated QCS value for calibration-standard verification.

EPA Method 200.7 Example: QCS Source Requirements

EPA Method 200.7 is an ICP-AES/ICP-OES method for determination of metals and trace elements in water and wastes. Like Method 200.8, it uses the method-specific term Quality Control Sample (QCS).

Method 200.7 defines the QCS as a solution of method analytes of known concentrations that is obtained from a source external to the laboratory and different from the source of calibration standards.

Section 7.12 of Method 200.7 states that analysis of a QCS is required for initial and periodic verification of calibration standards or stock standard solutions to verify instrument performance. The QCS must be obtained from an outside source different from the standard stock solutions and prepared in the same acid mixture as the calibration standards.

Method 200.7 specifies QCS use when beginning the method, on a quarterly basis, after the preparation of stock or calibration standard solutions, or as required to meet data-quality needs. For calibration-standard verification, the determined mean concentrations from three QCS analyses must be within $\pm 5\%$ of the stated values.

EPA 200.7 and EPA 200.8: Side-by-Side

Method	Technique	Method term	Source requirement	Verification role
EPA 200.8	ICP-MS	Quality Control Sample (QCS)	External to the laboratory and different from the calibration-standard source; outside-laboratory source described in Section 7.8	Verifies calibration standards and acceptable instrument performance when beginning use, quarterly, or as data-quality needs require
EPA 200.7	ICP-OES / ICP-AES	Quality Control Sample (QCS)	External/outside source different from calibration standards or	Required for initial and periodic verification of calibration standards or



			standard stock solutions; same acid mixture as calibration standards	stock standard solutions to verify instrument performance
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Second-Source Standard vs. Continuing Calibration Check

A second-source verification material is not the same analytical concept as a continuing calibration check.

A second-source or QCS-type material checks whether calibration standards and/or instrument performance are acceptable using an independent source. A continuing calibration check evaluates whether the calibration remains acceptable during the analytical sequence.

For example, EPA Method 200.8 requires continuing verification by running the calibration blank and calibration standards as surrogate samples immediately after calibration, after every ten analyses, and at the end of the sample run. That continuing verification requirement is not identical to the QCS source requirement.

Similarly, EPA Method 200.7 includes an Instrument Performance Check (IPC) solution used to periodically verify instrument performance during analysis. The method states that the IPC solution should be prepared from the same standard stock solutions used to prepare the calibration standards, while the QCS has a separate outside-source requirement. This is a useful example of why method terminology matters.

When Does a Method Require an Independent Source?

An independent source is required when the method, regulation, quality system, client requirement, or laboratory SOP requires it. Common triggers include:

- Initial verification of calibration standards or stock solutions.
- Periodic verification of calibration standards.
- Beginning use of a method.
- Quarterly verification, where specified.
- Preparation of new stock or calibration standard solutions.
- Corrective action after failed verification or suspected standard error.
- Accredited laboratory quality requirements or client-specific data-quality objectives.

Procurement Checklist for Second-Source Standards

Before purchasing or preparing a second-source standard, define the analytical requirement as precisely as possible.

Question	Why it matters
Which method is being followed?	The method determines terminology, concentration, source, frequency, acceptance limits, and corrective actions.
Does the method say outside, external, independent, or different source?	Those words define the source relationship that must be documented.
Which analytes are required?	The verification material must contain the analytes required by the method or laboratory procedure.
What concentration is required?	EPA 200.7 and EPA 200.8 specify method-specific concentration guidance for QCS solutions.
What matrix is required?	Some methods require the QCS or verification solution to match the calibration acid matrix.
What documentation is needed?	Certificate of Analysis, lot information, expiration/stability, traceability, and uncertainty may



	be needed for the quality system.
Does a CRM need to be used?	Use a CRM when required by the method or laboratory quality system; otherwise confirm that the RM documentation supports the intended use.
Can the same supplier provide both calibration and second-source materials?	Possibly, but the lab must confirm whether the source relationship satisfies the method and quality system.

How to Document Source Independence

To avoid ambiguity during audits or data review, laboratories should document how the second-source material differs from the calibration source.

- Supplier or producer name.
- Product name and catalog number.
- Lot number.
- Certificate of Analysis or equivalent documentation.
- Source relationship to calibration standards or stock solutions.
- Analyte concentrations and matrix.
- Expiration or retest date.
- Date received, date opened, and preparation records.
- Dilution/preparation worksheet for working verification solutions.
- Method section or SOP requirement being satisfied.

How CPI Supports Calibration Verification Workflows

CPI International supplies reference standards and ICP quality-control materials for laboratories performing trace-metals and elemental analysis. Relevant CPI categories include:

- [ICP Calibration Standards](#)
- [Initial Calibration Verification \(ICV\) Standards](#)
- [Continuing Calibration Verification \(CCV\) Standards](#)
- [ICP Quality Control Standards](#)
- [Single Element ICP Standards](#)
- [Custom Inorganic Standards](#)

For laboratories that need a verification material with specific analytes, concentrations, matrix, volume, or certification requirements, a custom inorganic standard may help match the method more closely than adapting a workflow around a predefined formulation.

When CRMs are required, laboratories should verify that the certificate, scope, traceability statement, uncertainty information, matrix, concentration, and expiration/retest information support the intended analytical use. Accreditation applies to the relevant facility, laboratory, or producer scope, not to the individual product.

Frequently Asked Questions

What is a second-source standard?

A second-source standard is a verification material obtained from a source independent of the calibration standards or stock standards when required by the analytical method or laboratory quality system.



Is a second-source standard the same as an ICV?

Not always. An ICV describes a calibration-verification function. A second-source requirement describes the source relationship of the verification material. Some methods use other terms, such as Quality Control Sample.

Does an ICV need to be from a second source?

Only when the applicable method, SOP, accreditation requirement, client requirement, or quality system requires it. EPA 200.7 and 200.8 use QCS language with specific source requirements.

Can a CCV be prepared from the same stock as calibration standards?

It depends on the method. Some continuing checks may be prepared from calibration stocks, while independent-source verification materials may have separate requirements. Follow the method wording.

What is the difference between QCS and IPC in EPA 200.7?

EPA 200.7 uses the QCS for initial and periodic verification of calibration standards or stock standards and requires an outside source different from the standard stock solutions. Its IPC solution is used to periodically verify instrument performance during analysis and is prepared from the same standard stock solutions used for calibration.

Can CPI provide custom second-source standards?

CPI can provide custom inorganic standards with specified analytes, concentrations, matrices, and volumes. The laboratory should confirm the formulation and documentation requirements needed to satisfy the applicable method or quality system.

Key Takeaway

Start with the method language

The safest way to determine whether a second-source standard is required is to read the applicable method and quality procedure. In EPA 200.7 and EPA 200.8, the Quality Control Sample has an independent or outside-source requirement, but continuing calibration checks and instrument performance checks may follow different source rules. Method terminology should drive purchasing, preparation, documentation, and corrective action.

References

U.S. EPA. Method 200.8: Determination of Trace Elements in Waters and Wastes by Inductively Coupled Plasma-Mass Spectrometry, Revision 5.4. <https://www.epa.gov/esam/epa-method-2008-determination-trace-elements-waters-and-wastes-inductively-coupled-plasma-mass>

U.S. EPA. Method 200.7: Determination of Metals and Trace Elements in Water and Wastes by Inductively Coupled Plasma-Atomic Emission Spectrometry, Revision 4.4. <https://www.epa.gov/esam/method-2007-determination-metals-and-trace-elements-water-and-wastes-inductively-coupled>

