

# California High-Speed Rail Program



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## Request for Proposal for Design-Build Services for Construction Package 2-3

### Book IV, Part D.4 – Statistical Sampling Testing Program Plan

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# California High-Speed Rail Program



## Statistical Sampling and Testing Program Plan Revision 0

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## 1.0 DEFINITIONS

**California High Speed Rail Authority** – The State entity responsible for planning, implementation, and operation of a high-speed rail system serving California's major metropolitan areas.

**Contractor** – A generic term used within this document to refer to construction contractors, material suppliers, and design-builders that deliver works to CHSRA.

**Independent assurance program** – Activities that are an unbiased and independent evaluation of all the sampling and testing procedures used in the acceptance program.

**Project and Construction Management team** – Provides management and oversight of the Design-Builder for the California High Speed Rail Authority

**Qualified laboratories** – Laboratories that are capable as defined by appropriate programs established by each PCM team.

**Qualified sampling and testing personnel** – Personnel who are capable as defined by appropriate programs developed by each PCM team.

**Quality assurance** – QA emphasizes actions at a management level that directly improve the chances that QC actions will result in a product or service that meets requirements. QA includes ensuring the project requirements are developed to meet the needs of all relevant internal and external agencies, planning the processes needed to assure quality of the project, ensuring that equipment and staffing is capable of performing tasks related to project quality, ensuring that contractors are capable of meeting and carrying out quality requirements, and documenting the quality efforts.

**Quality control** – Techniques that are used to assure that a product or service meets requirements and that the work meets the product or service goals. QC is the act of taking measurements, testing, and inspecting a process or product to assure that it meets specification. Products may be design drawings/calculations or specifications, manufactured equipment, or constructed items. QC also refers to the process of witnessing or attesting to, and documenting such actions.

**Random sample** – A sample drawn from a lot in which each increment in the lot has an equal probability of being chosen.

**Statistical sampling and testing** – Sampling and testing performed to validate the quality of the product.

**Vendor** – A supplier of project-produced material that is not the contractor



## 2.0 ACRONYMS

**AASHTO** – American Association of Highway and Transportation Officials

**ASTM** – American Society of Testing and Materials

**CFR** – Code of Federal Regulations

**CHSR** – California High Speed Rail

**CHSRA** – California High Speed Rail Authority

**CHSRP** – California High Speed Rail Program

**FHWA** – Federal Highway Administration

**FRA** – Federal Railway Administration

**FTA** – Federal Transit Administration

**IA** – Independent Assurance

**PCM** – Project and Construction Management

**QA** – Quality Assurance

**QC** – Quality Control

**SSTP** – Statistical Sampling and Testing Program



### 3.0 PURPOSE

The purpose of the Statistical Sampling and Testing Program Plan is to describe the requirements that make up the Statistical Sampling and Testing Program (SSTP) to validate the quality of construction and materials for the California High Speed Rail (CHSR) Program.

### 4.0 RESPONSIBILITIES

The California High Speed Rail Authority (CHSRA or Authority) Quality Program Manager is responsible for developing the Statistical Sampling Program for the CHSR as well as reviewing and monitoring the implementation of project-specific Statistical Sampling and Testing plans to ensure consistency and effectiveness.

The Project and Construction Management (PCM) teams are responsible for developing and implementing project-specific Statistical Sampling and Testing Plans. In addition, they are responsible for maintaining qualified testing laboratories to carry out the functions of the SSTP.

Laboratory managers are responsible for complying with the laboratory qualification requirements developed by the PCMs.

Design-Build contractors are responsible for cooperating and coordinating with the Authority's designated statistical sampling and testing personnel and for ensuring their sampling and testing operations are being conducted in accordance with contract requirements. They are to notify the California High Speed Rail Authority within a reasonable timeframe of upcoming tests.

### 5.0 SCOPE

Statistical sampling test results are used for validating the quality of the contractor's products. The SSTP is based in part on the requirements set forth in Title 23 Code of Federal Regulations Part 637 Subpart B – *Quality Assurance Procedures for Construction* (23 CFR 637). Two key quality terminologies and definitions within 23 CFR 637 are:

- Quality Control - *All contractor/vendor operational techniques and activities that are performed or conducted to fulfill the contract requirements.*
- Quality Assurance - *All those planned and systematic actions necessary to provide confidence that a product or service will satisfy given requirements for quality.*

These definitions for QA and QC differ slightly from those used by the Federal Transit Administration (FTA), as presented in their definitions section. The FTA emphasizes management level responsibilities for QA. Furthermore, the FTA's definition does not specify which party or parties are responsible for QC. For consistency purposes, the Authority has adopted the FTA's definition for QA and QC throughout all California High Speed Rail Program (CHSRP) documents, including this Statistical Sampling and Testing Program Plan. Although these terminologies may differ, the essential components of the SSTP are in keeping with 23 CFR 637 for verification sampling and testing requirements.





## 6.0 TESTING LABORATORIES AND PERSONNEL

All PCM, contractor, and vendor testing used in the acceptance decision shall be performed by qualified laboratories.

At a minimum, the laboratory qualification program developed by the PCMs shall include:

- Provisions for regularly checking test equipment
- Requirements for the laboratory to keep records of calibration checks

Any laboratory that is used in dispute resolution sampling and testing shall be accredited in the testing to be performed by the AASHTO Accreditation Program or a comparable laboratory accreditation program approved by the FRA or FHWA as applicable.

All statistical sampling and testing data to be used in the acceptance decision shall be executed by qualified sampling and testing personnel.

At a minimum, the personnel qualification program developed by the PCMs should include the following concepts:

- Formal training of personnel including all sampling and testing procedures with instructions on the importance of proper procedures and the significance of test results
- Hands-on training to demonstrate proficiency of all sampling and testing to be performed
- A period of on-the-job training with a qualified individual to assure familiarity with appropriate procedures
- A written examination and demonstrated proficiency of the various sampling and testing methods
- Requalification at regular intervals
- A documented process for removing personnel that perform the sampling and testing procedures incorrectly



## 7.0 SAMPLING AND TESTING

The PCM's project-specific Statistical Sampling and Testing Plan shall indicate which materials used on the CHSR require sampling and testing by the contractor and by the PCM. It shall identify the specific attributes to be inspected that reflect the quality of the finished product and locations in the construction or production operation which the PCM anticipates performing sampling and/or testing. The PCM is encouraged to develop a Qualified Products List for manufactured materials.

All samples taken for use in the decision to accept or reject construction or materials shall be random samples. Any contractor testing results used in the acceptance decision must be validated by the PCM's sampling and testing. PCM testing shall be performed on samples that are taken independently of the contractor's samples. In order for a sample to be considered independent, each sample must contain independent information reflecting all sources of variability associated with the material, process, sampling and testing in the test results.

Additionally, Federal requirements state that sampling and testing activities of the PCM cannot be performed by contractor employees even if witnessed by the PCM or Authority. The contractor's technicians may provide labor to assist in statistical sampling if PCM personnel maintain control of the sampling process. Situations may arise where labor regulations, hazardous conditions, and liability issues may dictate some contractor involvement in statistical sampling; nevertheless, contractor personnel should be limited. The PCM may use the services of the contractor's personnel to assist in obtaining independent statistical samples when the following requirements are adhered to:

- 1) The statistical sample location or time has been randomly selected by the PCM and is only given to the contractor immediately prior to sampling.
- 2) The contractor's personnel are used only to provide labor to assist in physically obtaining the statistical sample of the material.
- 3) PCM personnel are present to witness the taking of the statistical sample.
- 4) Both the PCM witness and contractor labor are qualified sampling personnel.
- 5) The PCM statistical sampler controls the sampling process by choosing the location or timing and directing the taking of the statistical sample.
- 6) The Authority statistical sampler immediately takes possession of the statistical sample.

When the above requirements are met, PCM sample independence is maintained. However, these situations should be the exception and not the rule. The statistical sampling is expected to be performed entirely by PCM personnel whenever practical.

## 8.0 SAMPLING FREQUENCY

Statistical sampling and testing shall be conducted on materials at frequencies specified within each PCM's project-specific Statistical Sampling and Testing Plan. These Plans shall include general guidance to personnel responsible for the program and allow for adaptation to specific project conditions and needs. Additional sampling and testing may be performed when the quality of the material is in question. PCMs should review their Design-Build contractor's Inspection Test Plan to aid in determining the appropriate scope and frequency of sampling and testing activities.



## 9.0 DISPUTE RESOLUTION

The PCM shall establish a dispute resolution system to address the resolution of discrepancies occurring between the PCM's sampling and testing and the contractor's sampling and testing. The dispute resolution system may be administered entirely within the PCM.

Should the PCM test results not validate those of the contractor, PCM follow on activities should include:

- An investigation into the cause of the non-validation
- An increase of the rate of PCM testing for the item in question

In some cases, even though the contractor's test results are not statistically validated, the material may be completely acceptable. In these cases, further investigation to determine the root cause of the discrepancy is still warranted.

The use of engineering judgment in accepting non-validated construction or materials must be documented and supported by sound engineering reasoning. The PCM should keep a log of engineering decisions. Materials that do not meet contract requirements must also be documented through an NCR and further reported to the Engineer of Record.

## 10.0 DOCUMENTATION

Records shall be maintained for the life of the project and in accordance with the Authority's Document Control Plan. All project records and documents shall be turned over to the Authority at project close-out. Documentation to be maintained includes but is not limited to:

- Names and qualifications of PCM technicians
- Names and qualifications of contractor technicians
- Contractor testing records and results
- The PCM's statistical testing records and results
- Testing procedures/manuals
- Training plans
- Documentation of training



## REFERENCES

- 1) "23 CFR Part 637," *Subpart B – Quality Assurance Procedures for Construction*, Federal Highway Administration, Washington DC, July 2006, <http://www.fhwa.dot.gov/pavement/0637bsup.cfm>.
- 2) "Construction Quality Assurance for Design-Build Highway Projects," *Publication No. FHWA-HRT-12-039*, Federal Highway Administration, Washington DC, April 2012, <http://www.fhwa.dot.gov/publications/research/infrastructure/12039/12039.pdf>.
- 3) "Use of Contractor Test Results in the Acceptance Decision, Recommended Quality Measures, and the Identification of Contractor/Department Risks," *Publication No. T 6120.3*, Federal Highway Administration, Washington DC, August 2004, <http://www.fhwa.dot.gov/construction/t61203.cfm>.
- 4) *Questions and Answers on the Quality Assurance Regulation (23 CFR 637)*, Federal Highway Administration, Washington DC, April 2011, <http://www.fhwa.dot.gov/pavement/materials/qanda637.cfm>.

