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Construction Quality Assurance for Federally Funded Local Public Agency Projects

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Introduction

All Federal-aid projects on the National Highway System (NHS)—including those administered by Local Public Agencies (LPA)—are subject to the quality assurance procedures in 23 CFR 637, Subpart B—Quality Assurance Procedures for Construction, applied by the Federal Highway Administration (FHWA) to any projects using Federal-aid funds. For projects outside of the NHS, the established procedures approved by the State Highway Agencies (SHA) can be used for material acceptance as long as they satisfy the intent of the Federal requirements. In accordance with 23 CFR 637, a comprehensive construction quality assurance program should consist of the following core elements: quality control, acceptance, independent assurance (IA), dispute resolution, personnel qualification, laboratory accreditation/qualification, workmanship, inspection, sampling, and testing.⁽¹⁾

National reviews of locally administered projects conducted by FHWA in 2006 and the Office of Inspector General from November 2009 through April 2011 revealed shortcomings not only in the efforts of LPAs to properly administer Federal-aid projects but also in the role and effectiveness of oversight activities performed by the FHWA Division Offices and the SHA to ensure LPA compliance with Federal requirements.^(2,3) One primary area of concern was with the oversight of construction quality. The report stated the following:

The team found that design and construction quality was highly variable, and the quality and availability of records made it difficult to verify compliance. It was also determined that material testing was often either not done or was undocumented leaving project quality and durability questionable. (p. 9)⁽²⁾

These reviews indicate that the construction quality assurance (QA) practices on many locally administered Federal-aid projects are in need of improvement. However, before improvements can be made, a more detailed understanding of the problem was needed from both the SHA and LPA perspectives.

Purpose

The purpose of this TechBrief is to summarize a comprehensive investigation of current construction QA practices from both SHA and LPA perspectives undertaken in 2012 and to present recommendations from this analysis.

The review included a content analysis of current SHA and LPA QA procedures, a national SHA/LPA survey of construction QA practices, and indepth interviews of a selected cross-section of State and local agency representatives. The recommendations resulting from this review focused on the current state of practice, issues or challenges, and best practices to improve construction QA.

Some of the specific areas identified in prior reviews and the project surveys and interviews include the development of LPA-specific guidelines and manuals, quality management by the SHAs, use of consultants, certification programs, and training. Related topics such as communication, specifications and standards, and risk-based tiered systems for LPA projects were also raised and analyzed as part of this review

Findings

Although the findings generally indicated that the elements required under 23 CFR 637 have been incorporated into LPA construction QA programs, the LPA-specific QA specifications, procedures, and guidelines still vary considerably, as do the FHWA-SHA stewardship agreements.

Furthermore, the LPA QA programs vary to an even greater extent regarding how construction QA is implemented, the level of QA expertise within the LPA, adequacy of

documentation, and the level of oversight provided by the SHAs. This variability was in part due to differences in the size and sophistication of the LPAs.

From the SHA perspective, the findings generally indicated that while there were still significant issues related to compliance with QA procedures and documentation, frequency of sampling and testing, and communication, there were few instances of poor quality or rework on LPA projects actually reported. The worst case outcomes involved withholding of Federal funds, most often related to non-compliance with QA procedures or lack of documentation. From the LPA perspective, the most important issues were the cost of construction QA for federally funded projects, and particularly the cost of compliance with Federal-aid construction QA requirements. The larger LPAs were generally in favor of assuming more responsibility and control of construction QA through certification or other means. Smaller LPAs with fewer resources were in favor of greater SHA oversight and consultant involvement in construction QA.

A number of strategies were cited regarding best practices for construction QA on LPA projects to address the issues reported by the respondents. These strategies included the use of LPA-specific specifications and guidance documents, QA training, improved communication, consultant oversight, and certification of LPAs. These practices were evaluated in greater depth, and recommendations are presented in the following sections.

The challenge for FHWA will be to improve SHA oversight of QA procedures and to develop practical QA procedures for LPAs while taking into account how to make the process more efficient for the various types, sizes, and scopes of LPA projects that receive Federal funds. In parallel with this work, the FHWA Every Day Counts II Initiative has developed a three-pronged strategy (certification programs, consultant services, and stakeholder partnering) to assist LPAs with the complexities of Federal-aid requirements and

processes while focusing in part on streamlining the delivery of LPA projects.⁽⁴⁾

Recommendations

Development of LPA-Specific Guidelines and Manuals

The majority of SHAs have developed LPA guidance manuals, yet these manuals revealed extreme differences in the breadth and depth of information provided to assist the LPAs. Several manuals focused primarily on preconstruction issues such as project selection, utility and railroad coordination, and right-of-way acquisition, with very little guidance provided for construction administration and QA.

State transportation departments should develop and maintain LPA-specific Guidance Manuals or LPA Project Delivery Manuals, which cover all of the project types and include sections that specifically address QA in construction. Improved compliance with Federal-aid QA requirements will result from the implementation of LPA-specific Guidance Manuals with more robust construction QA guidance.

LPA-Tailored Specifications and Standards

Some State transportation departments have developed LPA-specific specifications. The development of LPA-specific materials and construction specifications that are more suitable to fit a particular LPA project purpose is a worthwhile investment with the potential to reduce the number of instances of nonparticipation of Federal funds.

Several SHAs require the use of the standard specifications used on State projects. While this practice simplifies the QA oversight of LPA projects for the SHA, it may not result in the most cost-effective approach to meeting those QA requirements and may place more of a cost burden on the LPAs than necessary to achieve construction quality for less critical projects. It is recommended that SHAs currently using this approach should consider piloting a project with LPA-tailored

specifications that provide more flexibility in QA requirements and then assess the benefits to both the SHA and the LPA.

Risk-Based Tiered QA System for LPA Projects

Quality management by the SHA can be tailored to the LPA type, size, or project risk/complexity. For larger “certified” LPAs, SHA oversight may be limited to risk-based annual reviews or audits. For smaller or non-certified LPAs, the SHA or its consultant staff may perform IA services, periodic site visits and inspections, or provide full-time consultant inspection services and close-out QA reviews and audits.

In the effort to make LPA project delivery more effective and efficient, the expectations of quality should be more closely aligned with the LPA project purposes. The materials sampling and testing activities for QA could be potentially revised to be more of a risk-based (or tiered) system that considers the LPA project’s purpose and scope. The options for establishing a risk-based system could be based on a project cost threshold, or the criticality of the project or the element to be constructed. For more critical projects or elements, more frequent site inspections and/or testing would be required. It is clear that the move to a risk-based system should be calibrated to each particular State. For less critical projects, random site visits or QA audits would be applied in conjunction with the delegation of approval authority and responsibilities within an SHA, particularly for less critical projects in which the risks to QA are lower.

This recommended delegation of certain responsibilities to the SHA regional level would serve to streamline internal SHA approvals and reviews on LPA projects, as well as allow better tracking of LPA staff levels and capabilities. The implementation and maintenance of an integrated electronic tracking system for LPA projects would be instrumental to successfully delegating responsibilities.

Use of Consultants

The use of consultants for QA management of LPA projects can present both challenges and benefits to agencies. Many SHAs require that LPAs hire consultants on all federally funded projects regardless of the project's purpose, which has the potential to significantly increase project costs.

Therefore, an SHA should establish criteria outlining which types of LPA projects require the use of consultants (e.g., a tiered level of effort) to allow smaller LPAs to use more of the Federal funds on construction of project components as opposed to project management.

The hiring of management consultants to help ensure that Federal-aid QA requirements are met for the QA activities related to the LPA program is an effective practice for an SHA that does not have adequate staff to cover the number of active LPA projects at any given time. However, the SHA is required to maintain involvement and oversight in the LPA program and use program reviews or audits at a specified frequency to ensure consistent oversight and no evidence of conflict of interest between the different levels of consultants involved in the overall LPA program, per 23 CFR 172.9(a), 23 CFR 635.105, and FHWA Memo: Responsible Charge.^(5,6,7)

Certification Programs

A significant number of SHAs have adopted LPA certification or qualification programs, as recommended through the FHWA Every Day Counts (EDC 2) 2012 initiative. These programs use criteria for LPAs to ensure that the LPA is qualified to manage project activities that use Federal-aid funds. The benefits of a certification program may include the areas of compliance, risk mitigation, resource and cost reduction, and local ownership (allowing certified LPAs to manage and own their projects).⁽⁴⁾ However, more clarity is needed to define what the criteria for LPA certification should be, particularly for QA.

Smaller LPA Programs

Smaller LPAs generally prefer more involvement and guidance from the SHA when the SHA has adequate SHA staff to manage the construction phase of federally funded projects on behalf of the LPAs. If the SHA does not have adequate staff, then it is recommended that consultants be used for oversight in a management role or for inspection and testing. Typically, in these States IA will also be managed by the SHA rather than the LPAs. If the SHA will be performing the IA on an LPA project, then it can be challenging to keep track of ongoing testing to schedule the requisite IA activities; thus, LPAs should cooperate fully with the SHA's IA personnel. For large projects, the use of a system-based approach to IA (in which IA frequency is based on covering all active testers and equipment over a period of time, independent of the number of tests completed on a particular project) can also be an effective strategy.

Larger LPA Programs

Larger LPAs may prefer more autonomy and retention of administrative control of QA and other costs in the construction of federally funded LPA projects. The implementation of an LPA certification program would allow larger agencies to take more responsibility for QA. Any certification programs in which the LPA will have full responsibility for QA should also have a recertification program that includes mandatory periodic training that all LPA engineering and/or public works staff should attend. The SHA is still required by Federal regulations to conduct their routine random audits on the large agencies that are certified through the use of a system-based IA program.

The larger agencies seeking certification should conduct a demonstration project prior to being permitted more independence with QA of construction and materials to provide the SHA with the opportunity to assess an LPA's capabilities in performing quality oversight and the appropriate quality assurance documentation. It is advisable that projects with critical elements be selected as the

demonstration projects to be used for the decision in certifying or recertifying an LPA.

Training

The training of LPAs and their consultants has a high level of effectiveness for reducing the frequency of issues with QA, in particular when the instructional content covers certification, inspection, testing, documentation, and other QA-related activities for both LPA and SHA staff.

General training on LPA contract administration should be supplemented with more specific targeted training related to use of electronic systems and forms, as well as QA inspection and testing for specific project types or elements. Because of the high incidences of staff turnover and low budgetary resources at LPAs, Web-based training should be developed as an alternative or supplementary measure to classroom training.

Training should be parceled out in shorter segments (less than 1 h in length) not only to keep each module concise but also to be indepth and focused on current challenges. The SHAs should work with their FHWA Division counterparts to dedicate long-term funding for the development and maintenance of these training courses.

Future training topics should include system-based and project-based IA programs; estimation techniques for the cost of construction engineering, including the Construction Engineering and Inspection and testing consultants; importance and impact of materials-sampling frequency; daily construction records for LPA projects; construction dispute resolution for LPA projects; and management of materials testing subcontracts.

Communications

Communication practices such as periodic stakeholder partnering or community of practice meetings with all of the project players, as recommended by the FHWA EDC 2 program, can improve the understanding of Federal-aid project requirements. Effective project-level practices include the requirement of specific QA plans for LPA projects and SHA attendance at predesign walkthroughs and

preconstruction meetings to define required roles and responsibilities earlier as well as identify issues early on before design.

The success of LPA projects in the construction phase can be attributed to frequent communication between the LPA staff and the SHA construction and IA staff; however, the communication should be strategic, be clear, and extend beyond training.

FHWA can work with the SHAs to establish mitigation plans on a periodic basis to track how well the policies and practices related to the mitigation of materials and construction QA issues are working. This partnership also provides an opportunity to identify any new issues that have evolved and require the generation of new guidance, training, or tools for the SHAs and LPAs.

Summary

The Federal funds available to subrecipients through the LPA program offer the opportunity for further improving the vast network of secondary roads and minor arterials that are often in need of major repairs. While smaller LPAs generally lack the resources to consistently and correctly complete the QA documentation required on federally funded projects, the larger LPAs have the training, staff qualifications, and capabilities to take on more of the QA role. It is recommended that a tiered system should be considered by SHAs in the certification of LPAs; the projects awarded to smaller LPAs would be managed either by consultants (hired by either the SHA or the LPA) or by the SHA. With the suggested tiered approach, the LPA will still be required to have a Responsible Charge (RC) staff because a consultant cannot be the RC staff for the LPA. There were reported benefits and challenges to both types of management strategies, and the individual SHA would decide how to address these challenges in its particular State.

Further Information

The following resources provide further information on this topic:

- Federal Highway Administration, (2012), *Federal-aid Essentials for Local Public Agencies: Project Construction and*

Contract Administration, <http://www.fhwa.dot.gov/federal-aidessentials/>.

- Office of Pavement Technology, (2012), *Independent Assurance Programs*, TechBrief, Publication No. FHWA-HIF-12-001, Federal Highway Administration, McLean, VA.
 - Office of Pavement Technology, (2013), *Quality Assurance Stewardship Review Summary Report for Fiscal Years 2009 Through 2012*, Federal Highway Administration, McLean, VA.
3. Federal Highway Administration, (2009), *Local Public Agency Federal-aid Project Oversight & Program Stewardship–FY 2008 Status Report*, Office of Program Administration, Washington, DC.
 4. Federal Highway Administration, (2012), *Every Day Counts 2012 Initiatives*, last accessed April 4, 2014, <https://www.fhwa.dot.gov/everydaycounts/edctwo/2012/local.cfm>.
 5. *Compensation*, Code of Federal Regulations, Title 23, Part 172.9, Subpart a, U.S. Government Printing Office, Washington, DC.

References

1. *Quality Assurance Procedures for Construction*, Code of Federal Regulations, Title 23, Part 637, Subpart B, U.S. Government Printing Office, Washington, DC.
2. Federal Highway Administration, (2006), *The Administration of Federal-aid Projects by Local Public Agencies*, National Review Program Final Report, Program Improvement Team, Washington, DC.
6. *Construction and Maintenance*, Code of Federal Regulations, Title 23, Part 635, U.S. Government Printing Office, Washington, DC.
7. Office of Program Administration, (2011), *Information: Responsible Charge*, memorandum, Federal Highway Administration, Washington, DC.

Researchers – For information related to materials and construction quality assurance research, contact Richard Duval (Research Civil Engineer of Infrastructure Analysis and Construction) at richard.duval@dot.gov. Additional information related to the Materials Quality Assurance Program can be obtained by contacting the FHWA Quality Assurance Team: Michael Rafalowski (Office of Pavement Technology) at michael.rafalowski@dot.gov and Dennis Dvorak (Pavement and Materials Technical Service Team) at dennis.dvorak@dot.gov.

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