U.S. Department of Transportation
Federal Highway Administration

Construction Program Management and Inspection Guide

FEDERAL

HIGHWAY

ADMINISTRATION

August 2004

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Notice

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Foreword

Over the last 15 years, the role and experience base of the Federal Highway Administration's (FHWA's) engineering staff have changed considerably. Today, our field engineers are typically involved in a diverse array of issues that were not common in the Federal-aid program of decades past. A decline in staffing resources and experience, coupled with increased demand on our current field engineering staff, requires a more focused and systematic approach to fulfill our construction stewardship responsibilities.

Past Federal highway legislation provided many State transportation agencies and FHWA divisions with a great deal of flexibility in delivering the program, including certification mechanisms for many types of construction projects. This increased State flexibility but reduced FHWA project oversight. Reorganization of FHWA, the elimination of the region offices, and a thrust towards other sensitive issues within the Federal-aid program have also contributed to a less visible construction stewardship presence by our field and Washington Headquarters offices. In spite of the many changes that have occurred, FHWA's role in ensuring the integrity of the Federal-aid construction program remains a critical responsibility in our continuing accountability to Congress and the public.

Between 1997 and 2000, total expenditures by all levels of government increased by over 25 percent for highway infrastructure. In 2000, highway expenditures totaled more than $127 billion, with over 70 percent going to reconstruction and preservation of existing roads and construction of new facilities. To continue meeting our construction stewardship responsibilities and to ensure safe, efficient, high-quality, Federal-aid construction, division office engineering staff must continually strive to find effective ways of conducting business. While this effort presents a tremendous challenge, we can meet it.

In December of 2001, FHWA leadership created the Construction Quality Improvement Team (CQIT) to address this challenge. This publication, *Construction Program Management and Inspection Guide*, is a significant product of the CQIT. It was developed to provide our field engineering staff a technical resource to consult in delivering an effective level of oversight and stewardship of the Federal-aid construction program. This document is not about business as usual, but rather about focusing on program practices and techniques that add value and help to ensure effective oversight and acceptable accountability. It provides specifics for implementing a wide variety of strategies that, with our State partners' involvement, will deliver quality construction products to our ultimate customers, that is, the traveling public.

I strongly urge each of you to become familiar with this document, visit the referenced Web sites, and review the other references identified as you undertake your renewed stewardship responsibilities. I believe this document is an excellent tool for adding value, enhancing technical expertise, ensuring the highest level of construction quality, and maintaining accountability.

King W. Gee
Associate Administrator
Office of Infrastructure

List of Acronyms

AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans With Disabilities Act
BPR	Bureau of Public Roads
CA	Certification Acceptance
CFR	Code of Federal Regulations
DBE	Disadvantaged Business Enterprise
EEO	Equal Employment Opportunity
EPA	Environmental Protection Agency
FAR	Federal Acquisition Regulations
FHWA	Federal Highway Administration
FP	Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects
FWS	Fish and Wildlife Service
HMA	Hot-mix asphalt
IID	Inspection-in-depth
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991, Public Law 102-240
NEPA	National Environmental Policy Act, USC 4321-4335
NHI	National Highway Institute
NHS	National Highway System
NHS-1995	National Highway System Designation Act of 1995, Public Law 104-59
NPDES	National Pollutant Discharge Elimination System
OMB	Office of Management and Budget
OSHA	Occupational Safety and Health Administration
PR/PE	Process review/Product evaluation
PS&E	Plans, Specifications, and Estimates

QA	Quality assurance
SAFETEA	Safe, Accountable, Flexible, and Efficient Transportation Equity Act of 2003
SHA	State highway agency
SHPO	State Historic Preservation Officer
STA	State transportation agency
TEA-21	Transportation Equity Act for the 21st Century, Public Law 105-178
USC	United States Code
USDOL	United States Department of Labor
USDOT	United States Department of Transportation

1. Introduction

The Federal Highway Administration's (FHWA's) field responsibilities and extent of involvement in project details have changed considerably over the years. Construction inspection procedures and techniques have undergone a number of changes to keep pace with changing times. Recent efforts to maintain a competent level of engineering awareness within the agency have prompted another change in direction. The wide variety of programs and reductions in staffing without a commensurate reduction in FHWA responsibility have further served to complicate the issue.

The role of FHWA field staff as stewards of federal requirements is to ensure compliance by supporting continuous quality improvement, promoting innovation and new technology, and providing value-added technical support. These responsibilities are best accomplished by developing professional relationships with our State counterparts in State transportation agency (STA) headquarters and in the field. The FHWA engineer should strive to be a value-added element in the administration of the Federal-aid program.

Traditionally the front-line FHWA engineer was known as the "area engineer." With reorganization, construction oversight responsibility is now carried out by field staff with a variety of titles, including "transportation engineer," "field engineer," "construction engineer," and similar designations. For the purposes of this Guide, these terms are used interchangeably.

FHWA's ultimate responsibility for stewardship and oversight of the Federal-aid highway program is affirmed in several sections of the United States Code. 23 USC 114 states: "The construction of any highways or portions of highways located on the Federal-aid system shall be undertaken by the respective State transportation departments or under their direct supervision.…such construction shall be subject to the inspection and approval of the Secretary." Subsection (c) of 23 USC 106, Project Approval and Oversight, provides for the States to assume some responsibilities of the Secretary for certain projects. However, subsection (d), Responsibilities of the Secretary, further states that "…nothing in this section, section 133 [Surface Transportation Program], or section 149 [Congestion Mitigation and Air Quality Improvement Program] shall affect or discharge any responsibilities or obligations of the Secretary under (1) section 113 [Prevailing rate of wage] or 114 [Construction], or (2) any Federal law…."

This Guide highlights FHWA roles and resources to assist the State in delivering a quality construction program. The Guide is intended to complement experience gained on actual construction sites. States have established processes and procedures to administer contracts and monitor successful program delivery. These procedures include monthly contract status reports, material testing, change order and claim evaluations, and other contract administration reporting that provides program-level information on contract delivery. These project documentation and source records should be readily available at the project site on all Federal-aid projects. FHWA engineers should make full use of all documentation to monitor the program and identify the potential areas of risk.

This Guide has been developed to assist FHWA field engineers in maintaining and improving technical competence and in selecting a balanced program of construction management techniques. The intent is to carry out this program using an appropriate level of risk management. It is FHWA's responsibility to ensure that the public is getting the best value for its expenditure of public resources in all of its programs.

The Guide serves to highlight technical features and techniques for making construction inspections that have proven to be effective. The Guide has several purposes:

- Providing familiarization for newer employees
- Serving as a refresher for veteran employees
- Assisting field offices in developing a balanced construction program by considering the relative merits of using a variety of construction program management and inspection techniques
- Highlighting technical elements to be integrated in construction inspections to provide a reasonable level of quality assurance in the construction program area

The following section provides a brief review of the history of the FHWA's project construction inspection practices and the current management of FHWA's construction monitoring program. This review serves as a background for discussing the construction program management and inspection responsibilities of FHWA field engineers.

2. Background

Historical Developments in Construction Inspection

Early History

During the early years, the Bureau of Public Roads (BPR) was the main technical source for State highway agencies and county road departments. BPR field engineers were frequently looked upon to help solve complicated design or construction problems. All active construction projects, other than those under the Secondary Road Plan, which was initiated in 1954, were typically inspected once a month. The National Highway System Designation Act of 1995 (NHS-1995) eliminated the Secondary Road Plan.

The Early Interstate Period

When Congress funded the Interstate Highway Program in the 1950s, only a few State highway agencies were staffed with enough engineers to design and construct a national highway network of such magnitude. The BPR, therefore, made monthly field reviews of all projects and conducted rigorous inspections-in-depth (IIDs). Most BPR engineers had strong field construction backgrounds, and their advice was actively sought on contract matters and field changes.

The Blatnik Era

In the early 1960s, with increased dollars being spent on construction of the Interstate Highway System, came charges of waste, fraud, and corruption. Many of the news media, including the Huntley-Brinkley Journal, Reader's Digest, and Parade Magazine, called the Federal and State governments to task for failing to control activities and expenditures.

A number of investigations were conducted by the Blatnik Committee of Congress (chaired by Rep. John Blatnik of Minnesota, former Chairman of the House Committee on Public Works), the General Accounting Office, and the BPR's Project Examination Division—forerunner of the Office of Audits and Investigations and later the Office of Inspector General. IIDs were used as a method to investigate corruption and fraud in response to the charge to the highway community to assure that its own house was in order.

Evolution of Highway Agencies

In 1967, the U.S. Department of Transportation (USDOT) was formed, and the BPR became the Federal Highway Administration. By the 1970s, the FHWA had developed considerable confidence in the technical competence and abilities in construction management of State highway agencies. A number of other topics, particularly social, economic, and environmental considerations, were vying for FHWA's attention.

FHWA faced the dilemma of not being able to maintain the previous level of project-level reviews. The answer to this problem was to turn a greater degree of direct project

responsibility over to the States in the form of Certification Acceptance, an alternative authorization procedure for administering non-Interstate Federal-aid projects, and to rely on a process review approach for the assurances that the Federal Government needed. The theory was that if the process was good, the product would be, too. This new independence may have been good for the States, but many FHWA field engineers coming aboard in the last two decades have not had the same field experience and technical exposure that FHWA engineers once had.

The enactment of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) dramatically changed the Federal-aid Highway Program and the Federal role. The Federal-State partnership was changed by offering the States more independence in carrying out a significant portion of the program by enabling FHWA to delegate to them, upon their request, the majority of Title 23 project decisions. These delegations are defined through stewardship agreements between the respective FHWA division offices and the (STAs). Non-Title 23 activities, however, such as the National Environmental Policy Act

(NEPA), civil rights, and right-of-way could not be further delegated. NHS-1995 and ISTEA provided additional flexibility, and the Transportation Equity Act for the 21st Century of 1998 (TEA-21), eliminated Certification Acceptance as an FHWA program.

A New Era of Engineering Awareness and Stewardship

In recent years, events have occurred that support FHWA's renewed construction involvement. This involvement is not the traditional project-level activity, but is focused more on overall, program-level management.

Increases in transportation funding have dramatically increased the numbers of projects under construction at any time. This growth in highway construction will probably continue in the future since more roads are operating near capacity and an increasing percentage of roads are in need of repair. Many of our older highways have outlived their original design life and are in need of rehabilitation or reconstruction. Heavy traffic complicates preservation and reconstruction projects. STAs are experiencing increased workloads, personnel cuts, and attrition of seasoned construction personnel.

In order to ensure that the public is realizing a quality product, FHWA has increased construction program involvement and technical assistance (Appendix A, Policy Memoranda Regarding Stewardship). This emphasis on increased construction involvement for FHWA has resulted in renewed attention to engineering while recognizing that a return to the old way of doing business is not possible. The FHWA needs to maximize its use of resources by selecting the most appropriate review programs and methodologies to fit each situation.

Operating with limited resources requires that FHWA focus its efforts and resources in high-risk areas. FHWA field engineers need to develop and carry out construction programs in concert with their STAs. In addition to its oversight responsibility, FHWA's involvement should complement and supplement the STA's construction program administration. The depth and consistency of this involvement should be as deemed necessary by each division's risk management analysis.

Flexibility and Accountability

Division Office Flexibility

The posture of FHWA's headquarters management is to delegate the maximum amount of authority and responsibility to the division office level. This gives the division administrator a great deal of flexibility in designing the division construction management program to meet local conditions and needs while still assuring proper stewardship. This delegation carries full accountability for the quality of the program and the final product. Definition of the division's oversight roles and responsibilities should be included in the local FHWA-STA stewardship agreement.

Guidance

Prior to 1991, FHWA's policy guidance encouraged project-level monitoring and inspection. In the 1990s, FHWA experienced a transition from project- to program-level oversight. The stewardship policy issued on June 22, 2001, titled "Policy on the Stewardship and Oversight of the Federal Highway Programs" (Appendix A) encouraged program-level oversight with project-specific verification. The memorandum "Stewardship and Oversight of the FHWA Construction Program," dated January 8, 2003 (Appendix A), continues to strive for assurance by reemphasizing FHWA's role in construction program management.

This Guide is a tool to assist the divisions in developing their construction management program and project-level involvement to assure a quality product. Each division is encouraged to periodically review and supplement the Guide as needed with additional guidance or instruction to address areas of concern or to meet the needs in its State.

Accountability

FHWA must be able to assure Congress and the American public that Federal-aid highway construction funds are expended in accordance with law, regulation, and policy and that the public is getting a quality product. Accountability resides with the division administrator in each State. Assurance can only be made when division offices have, as part of their stewardship programs, adequate construction involvement to be familiar with their STA's construction program and its delivery effectiveness. The role of FHWA headquarters is to provide policy guidance and technical assistance to the division offices. The FHWA Resource Center (www.fhwa.dot.gov/resourcecenter) and other field offices are also available to provide training and other technology support as requested.

3. Construction Program Management

General

By inference from 23 USC 114, FHWA has oversight responsibility for Federal-aid construction work: "The construction of any highways or portions of highways located on the Federal-aid system shall be undertaken by the respective State transportation departments or under their direct supervision.…such construction shall be subject to the inspection and approval of the Secretary." The purpose of FHWA's construction monitoring program is to facilitate the division administrator's evaluation of the State's use of Federal-aid funds and to provide support for the disbursement of Federal funds based on State policies, practices, and staffing. For the purpose of construction program management, the term construction pertains primarily to all post-award activities. However, knowledge of pre-award activities such as plans, specifications, and estimates (PS&E) development, mitigation measures, and the project award process is necessary. (Refer to 23 USC 101 (a)(3) for a definition of "Construction.")

Considerations

In evaluating the division's construction management program, consideration should be given to current agency emphasis areas and the findings of past years' programs. This evaluation should be incorporated in the division's risk assessment procedures. As appropriate, the risk assessment should provide for evaluating various phases of the STA program on a cyclic basis. For more information, see the "Risk Assessment Guide" on the FHWA Intranet: http://intra.fhwa.dot.gov/programadmin/risktoc.htm.

Program areas where no major problems exist may not require detailed review. As a part of the division's risk assessment, the basis for not making reviews should be documented in the division office files. Program areas having major problems and those where insufficient information is available for drawing conclusions are candidates to be included in the review cycle.

A fundamental component of construction program management is an understanding of contract administration and construction quality. Contract administration is broadly defined as taking a PS&E and producing a desired end product. Construction quality management involves traditional quality assurance measures employed to control and verify construction, material, and product quality. It also encompasses broader topics of continuous quality improvement such as optimization of decision-making processes, innovative contracting practices for enhancing quality, performance feedback mechanisms, and specification improvements and design refinements.

Quality construction is critical to a successful STA construction program. Completed construction projects represent tangible products by which the public measures the success of the STA in delivering its program objectives. The public ultimately defines the success of construction projects based on the level of delivered quality, which may include a variety of issues such as safety characteristics, operational efficiency during and after construction, materials quality and long-term durability, and financial value. The proper use and knowledge of effective construction quality management applications, at the program and the project level, can provide FHWA with confidence that completed, federally funded construction work meets the above objectives for success.

Most STAs are now using some form of statistical quality assurance specifications for their highway construction work. Statistically based specifications are an effective means of ensuring a quality product, and they are a fundamental component of construction quality management. Many STAs are also using other quality improvement methods, such as obtaining and using highway user feedback, developing performance measures and goals, and using various processes during construction to ensure quality workmanship. All of these quality improvement techniques fall within the broader context of construction quality management.

Quality assurance (QA) is the systematic processes necessary to ensure sure the quality of a product is what it should be. Quality assurance is an all-encompassing term that includes quality control, acceptance, independent assurance, dispute resolution, and the use of qualified laboratories and qualified personnel.

All STAs are required by the Code of Federal Regulations (23 CFR 637) to have a quality assurance program for Federal-aid highway construction projects on the National Highway System. Each division's construction program management activities should include elements for encouraging and assisting the STA in implementing or refining their QA program, and for assessing project level implementation of the program requirements. See Appendix B, Quality Assurance Resources, for additional guidance on quality assurance program elements.

Program Elements

FHWA's division-level construction management program should include both process and project-level involvement. A program should be developed to define the type and frequencies of inspections that can best be combined within the limits of available resources and the needs of the construction program.

The program should be designed to define the required level of periodic involvement and to encourage and maintain a professional working relationship with STA personnel who are responsible to assure continued and improved quality of highway construction. Construction program management includes both pre-award and post-award activities. The program should be flexible but should provide direction for FHWA field engineers.

The division administrator is responsible for developing a construction management program for evaluating the Federal-aid construction programs of the STAs and local governments. This Guide should be used as a tool in developing the program's elements: determining the level of inspection coverage, performing the inspections and reviews, preparing and distributing reports, monitoring findings, preparing special reports, and documenting the division's program.

Determine Frequency and Type of Inspections

Each division is responsible for determining the degree and intensity of inspection coverage necessary to administer the division's construction management program. In determining what constitutes "sufficient reviews or inspections," the division administrator needs to consider a variety of factors including the qualifications and capabilities of STA management, project staff, and contractors; the STA's operating procedures and internal review programs including local program oversight; previously identified problem areas; and unique project conditions.

Perform Inspections and Reviews

The division office is responsible for performing the inspections and reviews outlined in its construction management program. The division is encouraged to solicit the participation of headquarters and the Resource Center in reviews of new or unusual features or practices and for other assistance as appropriate. Reviews that are made jointly with headquarters, the FHWA Resource Center, or State personnel who have similar responsibilities should also be included in the division office's program.

Prepare and Distribute Reports

The division office is responsible for preparing and distributing copies of construction inspection and other reports. It is desirable that the report's content and distribution consider the views of potential readers as well as the potential use of the report. Preparation and distribution of reports will be discussed in greater detail later in this Guide; however, the importance of quality inspection documentation must be acknowledged. Documentation is essential to meet several program objectives:

- Define progress and quality of work
- Establish FHWA presence in the Federal-aid construction program
- Identify project or program problem areas
- Document resolution of identified concerns
- Share innovations and new technology

Monitor Findings

Division offices should document findings and resolutions from construction reviews and inspections. These findings should be used as input into subsequent risk assessments.

Prepare Special Reports

The program should encourage FHWA field engineers to prepare or assist their State partners in preparing reports on special or innovative construction materials, methods, and procedures. The FHWA field engineer should ensure appropriate circulation of reports as a technology-sharing activity.

Documentation

Division offices should document the effectiveness of their construction management programs. Documentation should include observations, findings and resolutions, and any special reports. This evaluation should also discuss quality management initiatives and summarize the capability and performance of the STA in carrying out its Federal-aid construction program. Additional detail is provided in the sidebar to the right.

Objectives of Inspection

Inspections, either at the project or program level, are the primary method used by FHWA for fulfilling its construction program oversight responsibilities. Oversight represents the compliance or verification component of FHWA's stewardship activities.

Project oversight requirements may be different depending upon the stewardship agreements, but the general objectives of construction inspections are the same. Although STAs may be delegated the authority to administer the program within the scope of 23 USC and related Federal laws, FHWA retains the responsibility to assure that projects are being administered in full compliance. Specific objectives are as follows:

1. Obtain assurance that the project has been completed in reasonably close conformity with plans and specifications including authorized changes and extra work. Provide a basis for acceptance of the project and reimbursement of project costs with Federal-aid funds.
2. Acquire information on problems and construction changes. Provide an opportunity for timely remedial action where applicable. Provide documentation of solutions to problems or commitments. Encourage other STA units' involvement and awareness of problems to avoid future reoccurrence.
3. Assess the State's abilities and effectiveness in managing and controlling Federal-aid construction projects with respect to items such as these:
   - Qualifications—training, certification, written guidance
   - Staffing, equipment, and facilities
   - Performance
   - Project documentation, including inspection diaries, test reports, etc.
4. Promote the development and implementation of quality management programs.

Construction Management Report

Possible Items Suitable for Inclusion

Number and value of contracts awarded by type.

Number and value of active projects by type and area.

Field engineer workload—project complexity.

Number of inspections and reviews made by type and area.

Process/Statewide Reviews by phase.

Selected Emphasis Reviews by phase.

Summary of reviews—objectives, findings (including frequency and significance), conclusions, recommendations, and disposition or actions taken.

Overall review of accomplishments as they relate to the division's "risk analysis."

Program modifications with supporting explanations.

- Impact of the construction inspection program: Does it make a difference?
- Productivity of reviews: What is effective?

Areas of concern: construction improvements needed or achieved.

- Adequacy of specifications and plans.
- Adequacy of construction supervision: manpower management, construction workload.
- Comments on State's construction manual.
- Comments on construction practices attributed to contract documents or bidding practices.
- Number of documented concerns with resolution.
- Program developments, such as materials sampling and testing by contractor, experimental projects and recycling, new methods and equipment, new specifications.
- Project cost or time creep trends.
- Environmental mitigation measures accomplished during construction.

Areas needing added emphasis—future construction inspection program needs.

Suggested program changes—program management, directives, etc.

Use of quality-level analysis.

Frequency and documentation of project contacts.

Activities that are not project-specific, such as State, district, or laboratory contacts and relationships.

Construction-related promotional activities.

Training received by State employees and its effectiveness and usefulness (not restricted to FHWA training).

FHWA and State organizational changes—functions and individuals.

Final assessment of the acceptability of the State's construction program.

Recommendations for reviews to be considered in the next fiscal year's risk analysis.

5. Offer technical and procedural advice. Recommend improved construction techniques and engineering supervision.
6. Report on special or innovative construction materials, methods, procedures, new equipment, and other technological innovations.
7. Professional development of FHWA and State review personnel.
8. Other items, such as these:
   - Establish contact and communications with project staff.
   - Become familiar with project.
   - Attend partnering workshops and project progress meetings.
   - Monitor and evaluate progress of work.
   - Provide support and encouragement for project personnel.
   - Focus division resources on critical construction features and practices.
   - Follow up on previous inspection findings.
   - Lessons learned.

Purposes of Construction Inspection Reports

Document Project History and Compliance

Construction inspection reports fulfill four basic requirements:

- Provide permanent file evidence that inspections are being made as required by Federal regulations.
- Provide a basis for acceptance of completed work.
- Document field conditions, contractor performance, and the State's project management.
- Document FHWA's role, observations, findings, resolution of identified problems, claims, and any other topics of interest.

FHWA project files are generally maintained through formal final acceptance before being stripped and sent to the Federal Record Center; however, FHWA reports are generally maintained in STA records for several years longer. Field inspection reports should be considered historical project records.

To establish timeframes for record maintenance, consult the Office of Management and Budget policy contained in Circular No. A-130, Revised (Transmittal Memorandum No. 4) and available at www.whitehouse.gov/omb/circulars/a130/print/a130trans4.html#1. The FHWA Files Management and Manual Records Disposition schedules are available on the FHWA Web site at www.fhwa.dot.gov/legsregs/directives/orders/m13241.htm.

The inspecting engineer should be aware that FHWA inspection reports are subject to Freedom of Information Act requirements, as described in Circular No. A-130. Potential readers can be from the general public, and inspection reports can be used in litigation. These possibilities underscore the importance of reporting only facts, observations, and professional recommendations, and not unnecessary personal opinion. More information is available at www.fhwa.dot.gov/foia/index.htm.

Convey Information to the Reader

The report writer should take into consideration a variety of potential readers. To be comprehensive and coherent, the report should cover these areas:

- Activities taking place on the project during the inspection.
- Observations and actions taken regarding quality and progress of work.
- Comments on the adequacy of the project administration by the contracting agency's representatives (staffing, supervision, documentation, measurement and payment of contract items, material issues, etc.).
- Adequacy of addressing traffic control, safety, and environmental issues.
- The STA's handling of change or extra work including proper justification for the work and adequacy of supporting documentation.
- Information on special or unusual technical topics.
- Follow ups from previous reports.

All reports should be clear, concise with facts, and free of unnecessary personal opinions, and should include positive and constructive observations. Above all, reports should be accurate and specific since the content may be used in evaluating or refuting contract claims.

The original report should be filed in the division's project file, a copy sent to the STA, and a copy circulated to the program technical specialist and appropriate management in the division office. Reports should be made available to headquarters and the FHWA Resource Center as appropriate.

Inspections: Types and Scope

This Guide suggests the use of specific types of construction inspections. The type of inspection will vary depending on the time at which it is conducted, the objective of the inspection, and the FHWA-STA stewardship agreement criteria. Various types of inspections may be combined depending on the circumstances. The following descriptions of construction inspection classifications have been developed to provide guidance for FHWA offices on construction monitoring activities.

The FHWA Construction and Maintenance Web page (www.fhwa.dot.gov/construction/reviews.htm) provides generic construction review guidelines to provide the FHWA division offices and STAs with examples of process and indepth reviews that have been undertaken by various field offices. These generic "samples" should be modified as appropriate to meet specific State program needs.

Process Review/Product Evaluation

Process review/product evaluations (PR/PEs) are comprehensive reviews that have three primary objectives:

- Assure that State processes, procedures, and controls are in substantial conformance with Federal requirements.
- Assure that projects are constructed in substantial conformance with State processes, procedures, and controls.
- Identify opportunities and implementation plans to advance existing processes, procedures, controls, and technology to the state of the practice or state of the art.

PR/PEs are oriented toward reviewing the STA's method of doing business with enough product verification to assure that the process is working satisfactorily. Process reviews are generally undertaken on a statewide or areawide basis and should include a review of the process at key decision points. As appropriate, State Oversight projects should be included in the sample of projects inspected as part of the PR/PE; refer to supplemental information in Appendix C, Sample Guidelines for Process Review/Product Evaluation Programs.

Inspections-in-Depth

Inspections-in-depth (IIDs) may be made on individual projects or may be part of a statewide review effort. IIDs are product oriented but involve the tracking of processes necessary to correct deficiencies or to identify and promote processes that produce high quality products on either a project or statewide basis. They are a detailed type of inspection involving the review of specifications, procedural manuals, and specific contract requirements.

IIDs, as well as PR/PEs, of a subject area will require a considerable degree of review effort (Appendix D, Guide for Making Inspections-in-Depth on Federal-Aid Highway Construction Projects). Considerable preliminary work is required to develop the appropriate review criteria. IIDs are useful to follow up on recommendations or implementation of changes defined by process reviews. A blending of both IID and PR/PE has proven to be most effective when balanced with other routine project reviews.

The team review concept with the STA's central office is recommended for both PR/PEs and IIDs in coordination to make the reviews more efficient and effective.

Project Inspection

Project inspection is an on-site review to evaluate project activities, the quality and progress of the work, and, if appropriate, to follow up on findings from previous inspections.These reviews are generally more limited in scope than a PR/PE, IID, or phased inspection.

Final Inspection

A final inspection is a review to determine the extent to which the project has been completed in reasonably close conformance with the plans, specifications, and authorized changes. The division administrator should develop and include, as a part of the construction management program, a process to determine the final inspection requirements for construction projects. This determination should consider the type, size, and complexity of the project, the degree to

which the project has been previously inspected by FHWA personnel, the adequacy of the STA's internal controls, and the extent of independent inspections and evaluations that have been provided by the State. The final inspections are conducted in accordance with the FHWA/STA stewardship agreement.

A final inspection may be accomplished by any of the following methods:

- An on-site review conducted at or near the completion of work.
- A review of project records that are provided by the State at the completion of work if prior on-site inspections have been conducted.
- If previous PR/PE or IID reviews of the STA's internal control programs for inspection of completed projects have indicated the STA has satisfactory procedures, the final inspection may be based on the finding that the STA is properly exercising its internal controls, and no additional review will be required.
- When similar types of work are included in an areawide project or projects using the same contractor, an inspection of a sample of contract work locations may fulfill the requirement for a final inspection.

Specialty Reviews

Sometimes division offices develop other types of review activities patterned after the basic inspection types in an effort to better meet their needs and the management style of the STA. Special emphasis reviews have been used successfully to focus attention on high priority/high visibility topics; as fact-finding tools for preliminary investigations; for evaluating project staffing levels; for making state-of-the-art evaluations; for determining the extent of suspected problem areas; or for concentrated problem solving efforts.

Emphasis area reviews will typically be less detailed than major phase reviews but will be more detailed than a project inspection. This type of review envisions that a concentrated effort will be expended over a number of projects to direct added emphasis to a particular item or phase for a short period of time.

Phase reviews will typically target a major phase of work where all parts, such as paving, will be reviewed. Minor phases or portions of major phases, such as crushing or plant operations, may occasionally be reviewed. Reviews will typically be comprehensive but may be in less detail than an IID.

Contact reviews are useful for monitoring the status of changing situations, change orders, and construction operations. They are also useful in maintaining effective rapport and working relationships with State counterparts and local officials, and they can facilitate the scheduling of more detailed inspections. They typically should not replace the more indepth reviews. However, they can be effective when properly controlled. While inspections should be on site, contacts by telephone or when passing through a project help to keep FHWA aware of project status and conditions.

Factors to Consider

In planning inspection activities, a number of factors need to be considered. Of prime importance is the objective of the inspection. Is it for fact-finding, program emphasis, problem identification, problem solving, verification, or another purpose? Identification of the objective may assist in determining the inspection technique to be used. Sometimes a broad-based review is desired, and at other times it may be appropriate to review only selected elements in some depth on a few typical or individually chosen projects.

Timing of the inspection in relation to construction activities can dictate or limit the type of inspection to be made. The time available for the inspection will help to determine if one of the more intensive types of inspections can be used. Sometimes it will be necessary to evaluate the potential benefits of making a greater number versus more indepth inspections.

Inspection selection decision should be based on program insight and knowledge of the STA's staffing and performance. This is an area of risk management where feedback from the field engineer is necessary to optimize not only review efforts but also construction program direction. It should be recognized that these post-award activities are a logical progression of pre-award actions (planning, environment, design, etc.) in which various standards, commitments, and conditions have been agreed to for compliance with a variety of Federal/State/Local requirements.

4. Inspection and Review Activities

The inspection and review process involves several steps: advance preparation, data gathering, conducting the physical review itself, evaluating and communicating the findings, writing and presenting the report, and distributing and archiving the report and related documentation.

Preparation

The work required in preparing for a review will depend on the type of review that is to be performed. However, the inspecting engineer should have a review objective and a review plan for every inspection.

Review Objective

The first step in making any review should be to determine what is to be accomplished and why. Initially this will help to determine the type of review to be made. The review objective should be continually checked during the planning and guideline preparation phase, during the review, and prior to concluding it, to assure that the reviewer is still on track and that the objective is being accomplished. Articulating and checking the objective may be as simple as the inspecting engineer asking the questions, "What do I intend to accomplish by being here?" and "Am I accomplishing this in an effective and efficient manner?" A more complex review may require a more formal approach.

Review Plan and Guidelines

In addition to a defined objective, a review plan and review guidelines should be prepared. In the case of an IID or PR/PE, the plan and guidelines should be in written form and may be in some detail. The plan may vary from a very detailed one all the way to a simple mental image in the case of some routine project inspections. For routine project inspections, it is important for the reviewer to know ahead of time the activities underway on the project. This information will help the FHWA engineer prepare for the review.

The plan must be flexible to accommodate unanticipated conditions that are frequently encountered in the field, but the reviewer needs a starting point and direction, some checkpoints along the way, and some basis for making an ongoing evaluation to determine where adjustments should be made.

An FHWA short course on process reviews is available to provide further guidance as well as generic samples of reviews undertaken in various states. Refer to the material contained in the short course and other references on the FHWA Construction Management Web page (Appendix E, Technical References and Resources).

Preliminary Data Gathering

Prior to an on-site review, the inspecting engineer should contact the project engineer and get acquainted with activities underway and major issues on the project. To improve efficiency and effectiveness, reviewers may prepare themselves by reviewing the following items:

- Correspondence, change orders, and material testing quality levels
- Previous reviews and progress reports
- Pre-award issues
- Plans and specifications, with emphasis on activities underway
- Bid tabulations
- Construction inspection program and emphasis areas
- State policy and procedures manuals
- Organization, staffing, and authority
- Applicable Federal and State regulations

Prior to undertaking an IID or PR/PE on a particular construction phase or process, it is recommended that appropriate National Highway Institute (NHI) or industry training materials be reviewed as a technical reference. If possible, a refresher course should be considered.

Conducting the Review

Many items can be reviewed during a construction inspection, and the list of possible concerns about each item reviewed is also extensive. The amount of detail to be covered depends on the scope of the inspection and the time available. All data gathering and analysis should relate to the objectives of the inspection. The list in the sidebar, page 4–2, shows some of the main items to be considered in conducting the reviews (refer also to Appendix C and Appendix D).

It is not necessary that all items shown on the list be covered on every inspection. Checklists are useful tools to assist the reviewer, however, inspecting engineers are cautioned against using solely a "checklist" approach to conducting any review. The engineer should have sufficient knowledge of the review subject to be able to obtain review information through observation, general discussion, and file review in lieu of using a checklist on site. Checklists tend to be confining, and their use can result in critical areas being overlooked if care is not taken.

Collecting and Evaluating Data

Field engineers should select methods for keeping notes that suit themselves, their workload, and the record-keeping procedures of their division office. Observations should be recorded while on the project or immediately following the inspection. Laptop computers or personal digital assistants can be of assistance in record keeping and project tracking.

Items to Consider for Review

1. Inspection Coverage

- a. Progress and quality of work
- b. Materials and quality control
  - (1) Project sampling and testing program
  - (2) Project special provisions
  - (3) Computation and use of quality levels analysis
  - (4) Product acceptance
  - (5) Innovative materials
- c. Workmanship
- d. Construction operations and features
  - (1) Adequacy of provisions for safety and traffic handling (traffic management plan, traffic control plan, public information and outreach, etc.)
  - (2) Accelerated techniques
  - (3) Innovative processes and procedures
- e. Project records
  - (1) Field checks by project personnel and others
  - (2) Quantity and quality of materials delivered, used, and rejected
  - (3) Construction work performed
  - (4) Methods and frequencies of checks on scales and other measuring devices
  - (5) Adequacy of field notes, diaries, and records supporting pay quantities
  - (6) Subcontracting
  - (7) Labor compliance, Equal Employment Opportunity, Disadvantaged Business Enterprise (DBE), and on-the-job training
- f. Changes and extra work including time extensions
- g. Compliance with environmental and American With Disabilities Act commitments and permit stipulations (erosion/pollution control—EPA-NPDES, 106 Cultural-SHPO, 404 permit-COE, Section 7-FWS, etc.)
- h. Staffing, inspector qualifications, facilities, and project control
- i. Claims and potential claims
- j. Compliance with contract requirements with respect to physical measurements (number of lanes, width of roadway/shoulders, clearance on structures, etc.)

2. Review of Work Items

- a. Right-of-way clearance, demolition
- b. Utilities
- c. Clearing and grubbing
- d. Earthwork and grading
- e. Environmental
  - (1) Erosion and sediment control
  - (2) Dust abatement
  - (3) Construction noise
  - (4) Other environmental commitments
- f. Drainage and minor structures
- g. Major structures
- h. Subbase and base
- i. Work zone
  - (1) Traffic management and traffic control planning
  - (2) Installation, and maintenance of traffic control devices
  - (3) Work safety
- j. Paving
  - (1) Flexible
  - (2) Rigid
- k. Roadsides
- l. Appurtenances
  - (1) Signs
  - (2) Signals
  - (3) Lighting
  - (4) Fencing
  - (5) Guardrail and other hardware
- m. Disadvantaged Business Enterprise Performance
  - (1) Verify that DBE on the job matches DBE as proposed in bid
  - (2) Performing in accordance with contract commitments
  - (3) Directing its own activities
  - (4) Performing a commercially useful function
- n. Miscellaneous
- o. Cleanup
- p. Intelligent transportation system features

Both photographs and sketches are recommended, as they can be of considerable value in depicting details, providing documentation, and reducing the report writing effort. Digital cameras are recommended.

Steps in Evalution

1. Record Facts

Facts are irrefutable: what is seen, what is recorded, what test results demonstrate, what actions are taken.

2. Make Observations

Observations may be factual or they may only represent the project as the inspecting engineer sees it. If an observation can be disputed, it should be supported. FHWA engineers may request that additional inspections, measurements, or tests be performed to verify opinions or satisfy concerns (see 23 CFR Subsections 1.5 and 1.36). This privilege should not be abused, but likewise it should not be overlooked.

3. Seek Opinions

When faced with decisions on controversial or highly technical topics, the STA project engineer and the FHWA engineer should take steps to assure that the appropriate technical and authoritative sources are consulted. Documentation of sources used provides assurance that the most appropriate decisions are being made and that the work is being adequately supervised.

4. Offer Advice Where Appropriate

The FHWA engineer is expected to have some degree of technical expertise and competence as well as access to subject area specialists. FHWA engineers should provide assistance or reassurance as appropriate but always with the understanding that they are not directing the operation. Advice or opinions offered should always be recorded in the inspection report. If the advice concerns the limit of Federal participation, this must be clearly understood.

5. Draw Conclusions

Based on all the available information, the inspecting engineer should draw conclusions on the acceptability of operations, actions taken, the finished product, and the quality of supervision. These conclusions serve as a basis for acceptance of the project and should serve to support the division's construction program risk assessment.

6. Make Decisions and Inform Affected Parties

If acceptance decisions must be made as a result of conclusions drawn, the inspection report should record these conclusions and all affected parties should be informed in a timely manner. Notification can be done in the inspection report or in other formal correspondence, as appropriate.

Inspection reports should have substance rather than just verbose wording. It is important not to lose track of what is observation, hearsay, fact, or opinion when it comes time to write the report. Reports should be as specific as possible, and ambiguity should be avoided. Hearsay should never be documented unless upon further review facts are found to support the hearsay. By following the six steps outlined in the sidebar, engineers can produce reviews that effectively meet their objectives. The sidebar on the next page highlights important precautions for inspection reports.

Inspectors may also refer to Appendix F, Examples of Reporting Practices, which critiques the appropriateness and significance of different reporting practices. The examples shown are extracts from actual reports and commentary. It will be helpful to review the extracts and comments, which can be applied to other reporting items as well.

Writing the Report

Forms

Inspections

Two FHWA forms are suggested for use in filing inspection reports for all Federal-aid projects:

- Form FHWA 1446 A (or similar) "Construction Inspection Report" (Appendix G, Project Implementation and Reporting Forms), may be used to report all construction inspections, including final inspections.
- Form FHWA 1446 B (or similar) "Final Acceptance Report" (Appendix G), may be used to report final acceptance, or the division office may include an alternative method of documenting final acceptance in its construction management program. (Note: The final acceptance report is not required, although some division offices use it to assist in project closeout and to support payment of final voucher.)

Other Reviews

The forms to be used for process reviews and emphasis area reviews where summary reports are to be prepared have not been prescribed. It is suggested that Form FHWA 1446 A be used for the individual project reports on which the summary will be based. A narrative report form is typically used for the summary with graphics or tabular displays as appropriate to demonstrate the importance or occurrence of findings.

Report Identification

Form FHWA 1446 A contains several identification boxes at the top of the page. These identify the inspection as initial, intermediate, or final and as a project inspection or an IID. Other identifiers in the heading can be helpful and are recommended. Also indicate if the review is project specific or part of a statewide effort.

Content

Inspection reports are a source document for FHWA's project oversight and involvement. They document project observations, findings, and recommendations; provide program and project information to FHWA management and other program managers; and transmit this information to various levels of STA management. The content of inspection reports should be factual and in line with the division office policy on report content. This will help to promote a degree of uniformity throughout the State. In determining the report content it is important to consider how the report may be used and by whom.

Outline

Using an outline for inspection reports can help ensure that all appropriate information is recorded and organized. The outline format is flexible, and the degree of standardization should be at the option of each division. All items may not be addressed in each report, but there are merits in following a routine sequence as outlined in the following sections.

Precautions

Some words of caution are in order to facilitate report-writing efforts:.

1. **Document the findings.** The inspecting engineer should make the reports factual, and be value added.
2. **Report specific observations.** Generalities tend to lead to confusion and speculations and gloss over findings.
3. **Avoid unsupported hearsay.** Reports should be written in a manner that clearly shows FHWA's involvement and knowledge of the operations.
4. **Provide for followup.** Findings and recommendations should be reported, tracked, and followed.

Examples of reporting practices are provided in Appendix F.

Body of Report

Purpose

A purpose of inspection statement can be useful in helping to keep the inspection on track and in informing the reader of what to expect in the report. If the original purpose of the inspection cannot be carried out, this should be explained.

Scope

It is not always apparent what the inspection engineer has done from reading some construction inspection reports. A scope-of-inspection statement can be useful in documenting the inspection activity although action-oriented statements in the report can accomplish the same purpose.

Work Completed

The reporting of work completed to date, placed near the beginning of the report, gives the reader a mental picture of the work site and improves understanding of the discussion that follows. If either the progress or quality of work is reported to be unsatisfactory, further comment is required to support the finding, discuss what is to be done to correct the situation, and clarify the status of Federal-aid participation in the cost of the work during the interim period pending correction of the unsatisfactory condition.

Work in Progress

The discussion of work in progress helps document whether or not the contractor is diligently pursuing the work, and the adequacy of the State's staffing. The amount of detail reported will vary with the time spent on the project and with the purpose and intensity of the inspection. As an example, documented knowledge of work progress serves as a basis for participation in time extensions or the assessment of liquidated damages.

Findings and Comments

As a result of the inspection, it should be possible to draw conclusions about the project work. Some conclusions can be expressed in terms of contract requirements, progress of work, the State's operating procedures, overall quality of construction, item/project overruns and changes, cost containment, and compliance with Federal regulations. Related observations to be discussed are public involvement, stakeholder feedback, weather, and third-party actions that may affect the work.

Opinions of the inspecting engineer should be based on experience and professional judgment. These observations are perfectly valid and frequently valuable. Where such items

are discussed with the State, it should be understood and stated as such in the report that they are only suggestions or information, particularly where differences of opinion may exist. It can be disconcerting when a report raises more questions than it answers.

Recommendations

As a result of the inspection, it may be desirable to make recommendations regarding further actions. Unlike the suggestions or information recorded in the Findings and Comments section, recommendations are items to which the State is expected to respond in a timely manner.

Followup Actions

The STA's resolution of previous recommendations should be discussed. Future followup actions should also be set forth in this section.

Supporting Documentation

Self-Sufficiency

Construction inspection reports should be able to stand on their own merit. This is not intended to imply that all information needs to be included in the body of the report; it is appropriate to reference other reports, documents, specifications, and sources.

Work Papers

All the information gathered during the inspection may not be suitable or necessary for inclusion in the report. Such information may be kept in the work papers and filed with the file copy of the report.

Photographs and Drawings

Sketches, drawings, photographs, and other illustrative material form an important part of the report, documentation, and work papers.

Processing and Distributing the Report

Form

Construction inspection reports, as official FHWA documents, should be professionally completed. They should be neatly prepared, legible, and grammatically correct. Standard reporting forms are available on FHWA-wide software (see Appendix G). Timeliness of reporting is important. It is recommended that preparation and distribution be accomplished within 2 weeks of the time the field review is completed to increase the value and effectiveness of the report. Inspection reports should be numbered in sequence for each project.

Review

It is recommended that there be at least one level of review by the division management prior to release. Field engineers should report on their observations, findings, recommendations, and conclusions as they see conditions and needs in the field. Recommendations and conclusions should be supportable and based on fact, technical soundness, and compliance with Federal policy.

The inspecting engineer should accept constructive criticism aimed at improving a report's conciseness and clarity but should not be expected to rewrite reports for minor reasons or to satisfy the supervisor's personal preference. Rather than revise reports, it may be preferable for the supervisor to add supplemental comments. These additions should be signed and dated.

Distribution

The division office should have a routine procedure for routing construction inspection reports. Some individuals will be designated to read all reports while others, such as bridge engineers, environmental specialists, and right-of-way officers, should be designated to receive only those reports containing topics within their specialties.

Inspecting engineers and their supervisors should be responsible for assuring that appropriate individuals have access to individual reports. A designated individual should be responsible for summarizing observations, findings, and followup actions. Significant data should be included in the division office control system.

The State and FHWA should agree on the distribution of reports within the STA. Distribution may be routine, or it may vary with the type and content of the reports. It is recommended that all construction inspection reports be transmitted to the State for appropriate distribution.

Followup Action, Controls, and Information Sharing

Followup

Frequently it will be necessary for the inspecting engineer to follow up on previous review findings and recommendations. The need for followup action may be created by a variety of conditions, such as the following:

- Obsolete or substandard procedures
- Plan deficiencies
- Changed conditions
- Contractor requests or disputes
- Construction deficiencies
- Supervision, inspection, and testing deficiencies
- Materials problems and low quality levels
- Excessive cost variance
- Construction time creep
- Inadequate or incomplete information
- Need for special or additional studies
- Construction and performance of experimental or other special features.
- Completion and implementation of environmental commitments

Implementation Responsibility

Depending on the findings and recommendations, the responsibility for implementation may rest at various levels within the STA or FHWA. Project-related findings should be discussed with the responsible project individual prior to leaving the site. The inspecting engineer is responsible for following through and for updating the division office control system. In cases where action is taken at the project level, resolution may occur at the time of the inspection or later. Repetitive findings generally require upper management program level correction. Both types of actions should be reported to document FHWA's involvement and to provide a basis for detecting repetitive problems and deficiencies.

Method of Presentation

A variety of methods exist for presenting findings to those responsible for taking further actions. The method used depends on the significance of the findings and the level within the STA to which the concern must be directed. Minor items may be presented verbally or by furnishing a copy of the inspection report. Significant items not fully resolved at the project level require followup in a future construction inspection report.

Findings from statewide reviews are usually presented to STA management at a closeout conference. Significant items requiring action require formal transmittal to STA management.

Division Office Control System

Each division office should have a control system for documenting, reporting, tracking, and resolving significant construction findings. Either engineering or administrative personnel may manage this control system. If the system is not managed by engineering personnel, there should be engineering participation to determine what findings are significant. Construction inspection reports should be routed to the individual responsible for the control system so findings may be logged, trends identified, and both evaluated for their significance. In addition to tracking construction observation and findings, this system should track positive trends, cost savings, new innovations, and technology enhancements.

See the sidebar on page 3–3 for a summary of items suitable for inclusion in the periodic evaluation of the STA's construction management program. A construction management report is a summary of strengths and weaknesses observed. This report can serve as an excellent

management tool and as the basis for future risk assessment and development of the division's stewardship report. This practice is not mandatory but discretionary, based upon each division's needs. It is also recommended that this type of evaluation report be coauthored by the division and the STA's central office.

Information Sharing and Technology Transfer

The division office's construction monitoring program should include procedures for reporting on special, experimental, or innovative construction materials, methods, or equipment. These procedures should be directed toward encouraging technology transfer (T2) and information sharing.

Experimental features are considered a material, process, method, equipment item, or other feature that (1) has not been sufficiently tested under actual service conditions to merit acceptance without reservation in normal highway construction, or (2) has been accepted but needs to be compared with alternative acceptable features for determining their relative merits and cost-effectiveness. FHWA procedures for incorporating experimental features can be found in www.fhwa.dot.gov/programadmin/contracts/expermnt.htm.

General reporting procedures should include these actions:

- Identifying appropriate features
- Working cooperatively with the STA
- Encouraging adequate monitoring and data gathering
- Ensuring report preparation
- Ensuring report distribution
- Followup as needed

Information on many valuable features, methods, and procedures is frequently not reported because people at the project level may not be aware of what is significant; because the information is not officially tagged with an experimental or similar title; or because the information is relatively new to the contracting agency. FHWA field engineers, as independent observers, need to make a conscientious effort to overcome these roadblocks to information sharing.

A natural reluctance to write reports is also a problem. Emphasis needs to be placed on the fact that reports need not be long, detailed, or prepared in a formal style to be of value. FHWA field engineers are encouraged to report on such features in normal or special construction inspection reports. Where appropriate or needed, FHWA should identify alternative resources to assist in data gathering and report writing. This may include other STA, FHWA, or industry resources, use of T2 funds, or other mechanisms. Engineers should coordinate with the division T2 engineer, division specialist, or other appropriate offices for information, technical assistance, and report distribution.

5. Summary

- Construction program management includes stewardship, oversight, leadership and technical support, and promotion of continuous quality improvement and new technologies.
- Construction program oversight has evolved from a project-specific to program-level emphasis. In the process, a variety of inspection techniques have been developed and should be considered for use under appropriate circumstances. While overall program guidance is provided in regulations and by FHWA's headquarters, division administrators have been given flexibility to manage their programs. Along with this delegation of authority comes responsibility and accountability. Much of this has been passed along to the individual division construction program manager (district engineer or equivalent staff position).
- Public agency oversight requires accountability that should be documented. The division should maintain a record of significant findings, recommendations, and their resolution. This is typically a portion of the division office's stewardship procedures.
- In addition to inspecting construction projects for acceptance purposes, inspections are required to obtain up-to-date information on problems and changes; to evaluate the work and the State's project management; to provide technical assistance and promote programs; to gather information for special reports; and to maintain rapport with STA project personnel.
- The reporting of construction inspection activities is necessary to document FHWA's efforts to carry out its assigned responsibilities to convey information about projects to appropriate parties within FHWA and the STA in accordance with Federal law and regulations.
- Inspection activities included in the division office's construction management program should be planned and scheduled using an appropriate combination of inspection techniques, in keeping with directives and guidelines that have been established, and in consideration of individual State characteristics and conditions.
- All inspections should have a review objective and a review plan, the form and comprehensiveness of which will vary with the type and detail of the review. Review guidelines and preliminary review activities will also contribute to a successful inspection.
- The list of possible items to be covered on an inspection is extensive. Possible items for inspection coverage and a list of work items for the reviewer's consideration are listed in the text and in the sidebar on page 4–2.
- Supportable facts, observations, opinions, hearsay, conclusions, and recommendations are all of value in construction inspection reports, but the inspecting engineer should be specific in identifying each. Unsupported hearsay should be avoided.
- The use of specific inspection report forms has been suggested for ease of report identification (see Appendix G). Following a reasonable consistent format for report writing helps to make the report orderly and easy to follow.
- An effort should be made to make reports reasonably self-sufficient without making them overly bulky. The inclusion of photographs and sketches can frequently be of value. Suggestions for writing quality reports are included in the text and in Appendix F.
- Division offices should route reports to appropriate parties internally and externally to ensure that they are informed of significant construction program activities.
- Engineers making findings and recommendations on construction projects have the responsibility to prepare a timely report.
- Technology transfer and quality assurance program activities are important integral elements of the total construction inspection program.

The key to a successful construction management program is the acceptance of responsibility and accountability by the field engineer and support from FHWA management.

APPENDIX A

Policy Memoranda Regarding Stewardship

"Policy on Stewardship and Oversight of the Federal Highway Programs," June 22, 2001

"Stewardship and Federal Highway Programs," January 8, 2003

"Stewardship and Oversight of the FHWA Construction Programs," January 8, 2003

U.S.Department of Transportation
Federal Highway Administration

Memorandum

Subject:	**INFORMATION:** Policy on Stewardship & Oversight of the Federal Highway Programs	Date: June 22, 2001
From:	Vincent F. Schimmoller */S/Original Signed by* Deputy Executive Director	Reply to Attn of: HIPA-30
To:	CBU Program Managers SBU Directors Directors of Field Services Resource Center Managers Division Administrators Federal Lands Highway Division Engineers	

The issuance of this policy rescinds the June 4, 2001, policy on the same subject, to reflect editorial changes made after final coordination with the division administrators and State agencies.

I. BACKGROUND

Federal funding is provided to assist States and Federal Agencies in providing transportation services through the various Federal Highway Administration (FHWA) programs. By law, the nature of the majority of these Federal programs is Federal assistance for State administered programs. The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) and the Transportation Equity Act for the 21st Century (TEA-21) increased the role of State Transportation Agencies (STD) in project approvals. These changes did not alter the fact that the FHWA is the Federal Agency responsible for ensuring compliance with Federal requirements in the delivery of the Federal highway program. These changes did affect how FHWA implements this responsibility. The flexibility afforded in the ISTEA and the TEA-21 allowed STDs to assume the Secretary's responsibilities for design, plans, specifications, estimates, contract awards and inspection of many Federal-aid projects. Policy, guidance, training, and other FHWA material implementing the oversight provisions of ISTEA were written to initiate change within the agency regarding our approach to the oversight component of the stewardship of the Federal highway program. However, the implementation of the policies and guidance resulted in inconsistent interpretations of the FHWA responsibility for ensuring compliance on "exempt" projects.

The purpose of this document is to restate the FHWA responsibilities in the delivery of the Federal highway programs.

II. TERMINOLOGY

In order to ensure that this policy statement is consistently interpreted, the following definitions have been established.

Stewardship: *The efficient and effective management of the public funds that have been entrusted to the FHWA.*

Oversight: *The act of ensuring that the Federal highway program is delivered consistent with laws, regulations and policies.*

Stewardship reflects our responsibility for the development and implementation of the Federal highway programs. It involves all FHWA activities in delivering the Federal highway program, such as leadership, technology deployment, technical assistance, problem solving, program administration and oversight.

Oversight is the compliance or verification component of FHWA stewardship activities. Narrowly focused, oversight activities ensure that the implementation of these Federal highway programs is done in accordance with the applicable laws, regulations, and policies. More broadly focused, oversight activities enable the FHWA to ensure the effective delivery and operation of the transportation system envisioned in our base statutes.

In short, it must be recognized that Congress and the public hold the FHWA accountable for ensuring that the Federal highway programs are both efficient and effective, and are consistent with applicable laws, regulations and policies.

III. POLICY

The policy applies to all organizational elements of the FHWA and all FHWA programs. The FHWA has stewardship and oversight responsibilities for all FHWA programs, and these program responsibilities include Title 23 and non-Title 23 program areas. While STDs may assume certain project approval authorities in accordance with Section 106, Title 23, United States Code, the FHWA is ultimately accountable for ensuring that the Federal highway program is delivered consistent with established requirements. The FHWA responsibility is the same when Federal Agencies assume authorities for the implementation of Federal Lands Highway Program. The FHWA has program oversight responsibilities regardless of project approval authorities assumed by the STD or Federal Agency. The FHWA oversight is conducted through a wide range and variety of mechanisms. These include process reviews, program evaluation, program management activities, and project involvement activities. The FHWA stewardship activities, beyond oversight, include continuous process improvement initiatives, technical assistance, technology deployment, performance measurement, project involvement activities, and sharing best practices.

The FHWA unit offices (Headquarters and divisions) will evaluate the risks/benefits in the implementation of FHWA programs and establish activities to develop confidence that the STD or Federal Agency mechanisms and activities are sufficient. Oversight activities will be included in the unit's annual performance plan.

When a STD or Federal Agency assumes project approval responsibilities, it must have mechanisms in-place to assure that all project actions will be carried out according to laws, regulations, and policies. This applies to projects administered by the STD or local public agencies (LPA). These mechanisms include the agreement required under Section 106, Title 23, United States Code, processes, procedures, and program manuals. The FHWA must conduct verification activities to assure that the STD or Federal Agency implementation of the Federal highway programs conform with laws, regulations and policies and the STD or Federal Agency is carrying out its roles and responsibilities according to the law, regulations, policies, and any established agreement with the FHWA. The FHWA oversight and independent verification activities are similar to the quality assurance portion of quality control/quality assurance programs prevalent in many construction and materials programs.

IV. IMPLEMENTATION

The National Strategic Plan sets strategic goals for FHWA stewardship activities. The FHWA Performance Plan identifies key stewardship initiatives that will be conducted nationally for the immediate fiscal year. Each office must develop annual unit performance plans that guide its stewardship efforts. These plans must be aligned with the FHWA Annual Performance Plan. The FHWA must balance its activities to achieve strategic goals while reaching a level of confidence that Federal requirements are being met. As a result, each office is expected to include some level of oversight activities in its unit performance plan.

Each office is expected to use a risk/benefit analysis or similar prioritization process to identify the appropriate oversight initiatives and effectively allocate personnel resources based on risks and benefits. The process should consider items such as strategic goals, mutual FHWA and STD or Federal Agency initiatives to improve quality, cost, and the FHWA level of confidence in oversight mechanisms and activities. Ideally, this prioritization process would be conducted in cooperation with the STD or Federal Agency. This process should result in a mixture of initiatives to achieve strategic goals, meet customer needs and expectations, yield high benefits or pay-offs, result in systemic improvement, deploy innovative technology, provide technical assistance, and to ensure that the Federal highway program is being delivered consistent with laws, regulations, policies and strategic goals. The process should also result in reviews that include project and program verification so that FHWA has confidence in the quality of the delivery of the Federal highway programs.

Stewardship and oversight initiatives that focus on broad program areas must play a prominent role in the plan since these reviews are more likely to yield systemic improvements and a resultant higher pay-off for the effort invested. Project level verification may also be included depending on several factors such as level of Federal interest, technical complexity, statutory requirements, and partner capabilities. Program reviews should include a sampling of Interstate, National Highway Safety (NHS), and non-NHS projects for verifying adequate STD/Federal implementation of the program and making program or project improvement recommendations.

ACTIONS:

- Activities and initiatives must be considered during the development of the annual performance plan that achieve initiatives in the FHWA Strategic Plan and Performance Plan and assure the Federal highway

program is delivered consistent with laws, regulations, policies and strategic goals.

- Each office is expected to use a prioritization process to allocate its resources in the development of its annual performance plan.
- Program reviews, process reviews/product evaluations, program evaluation techniques and continuous process improvement initiatives should play a prominent role in FHWA stewardship and oversight activities.
- Program reviews, process reviews/product evaluations and continuous process improvement initiatives should include a sampling of Interstate, NHS, and non-NHS projects.

FHWA oversight approaches and mechanisms should be developed in cooperation with the STD or Federal Agency.

MEMORANDUM

U.S. Department of Transportation
Federal Highway Administration

Subject: **INFORMATION**: Stewardship and Federal Highway Programs

Date: January 8, 2003

From: /s/ Original signed by:
J. Richard Capka
Deputy Administrator

Refer To: HIAM-20

To: Associate Administrators
Chief Counsel
Directors of Field Services
Division Administrators
Federal Lands Highway Division Engineers

The attached memorandum from King reflects excellent work on Infrastructure's part to address the implementation requirements surrounding our Federal highway responsibilities for stewardship. The June 22, 2001, issued "Policy on the Stewardship and Oversight of the Federal Highway Program" (Stewardship Policy) had directed that certain appropriate implementation actions be undertaken.

As you are aware, I recently initiated some leadership discussions on stewardship that, among other things, will attempt to provide some framework around which additional stewardship implementation strategies and "nuts and bolts" activities can be developed. Our leadership and program management responsibilities are key to the successful delivery of the national highway programs.

As King points out, the implementing directives will be continually "reviewed for relevancy and updated, as appropriate." We will continue to develop and provide additional implementation guidance not only from Infrastructure but also from the other functional areas that will clarify our responsibilities without being overly prescriptive in instruction. The guidance will be coordinated and synchronized to ensure a consistent management philosophy throughout the program development and project delivery process.

This is an exciting time for us, both as we approach reauthorization and as we witness the Nation's transportation challenges grow, requiring our continued effective stewardship to meet the needs of the Nation.

Attachment

MEMORANDUM

U.S. Department of Transportation
Federal Highway Administration

Subject: **INFORMATION**: Stewardship and Oversight of the FHWA Construction Programs

Date: January 8, 2003

From: /s/ Original signed by:
King W. Gee
Associate Administrator for Infrastructure

Refer To: HIAM-20

To: Associate Administrators
Chief Counsel
Directors of Field Services
Resource Center Managers
Division Administrators
Federal Lands Highway Division Engineers

On June 22, 2001, FHWA issued the Policy on the Stewardship and Oversight of the Federal Highway Programs (Stewardship Policy). The Stewardship Policy reaffirmed that, regardless of the project responsibilities delegated to the States (or other Federal Agencies), FHWA is ultimately responsible for the Federal highway programs. The Stewardship Policy applies to all FHWA programs. The purpose of this memorandum is to re-affirm FHWA's policy position to ensure that each FHWA division office stewardship program provides assurances that highway improvements are constructed to a desired quality and that Federal-aid construction funds are expended in a manner consistent with applicable Federal laws and regulations.

Quality construction is fundamental to meeting the mission of the Agency. Achievement of the Agency's national objectives is dependent on highway improvements being constructed to a desired level of quality in order to ensure that they perform as intended. Quality construction improves system performance, resulting in reduced impacts on traffic, congestion, and the environment. Safety is improved through minimizing work zone frequency, duration, and disruption of the normal traffic flow. Quality construction results in improved economic efficiency of our highway investments.

Since the passage of the ISTEA of 1991, changes in Federal legislation have significantly altered the environment through which the FHWA delivers the Federal-aid program. These legislative changes have provided the State departments of transportation with expanded authority to act on behalf of the FHWA in ensuring that projects constructed using the Federal-aid highway funds result in long-lasting, economical and high-quality transportation improvements. However, this expanded authority has not diminished the FHWA's responsibility and accountability to Congress and the public.

FHWA Responsibility for Construction Oversight

The basis for our authority can be found in 23 United States Code, (U.S.C.). Representing the Secretary of Transportation we are charged with certain responsibilities. For example, in 23 U.S.C. 114, it states:

> "The construction of any highways or portions of highways located on the Federal-aid system shall be undertaken by the respective State transportation departments or under their direct supervision. ... such construction shall be subject to the inspection and approval of the

Secretary."

In addition, in accordance with 23 U.S.C. 302 (a), it is the responsibility of FHWA to insure that:

> "Any State desiring to avail itself of the provisions of this Title shall have a State transportation department which shall have adequate powers, and be suitably equipped and organized to discharge to the satisfaction of the Secretary the duties required by this Title."

Subsection (a) of 23 U.S.C. 109 further requires that:

> "...the Secretary shall ensure that the plans and specifications for each proposed highway project under this chapter provide for a facility that will (1) adequately serve the existing and planned future traffic of the highway in a manner that is conducive to safety, durability, and economy of maintenance; and (2) be designed and constructed in accordance with criteria best suited to accomplish the objectives described in paragraph (1)..."

Subsection (c) of 23 U.S.C. 106, Project approval and oversight, provides for the States to assume some responsibilities of the Secretary for certain projects. However, subsection (d), Responsibilities of the Secretary, further states that:

> "...nothing in this section, section 133 [Surface transportation program], or section 149 [Congestion mitigation and air quality improvement program] shall affect or discharge any responsibilities or obligations of the Secretary under (1) section 113 [Prevailing rate of wage] or 114 [Construction], or (2) any Federal law..."

Construction Stewardship

In order to carry out these responsibilities, division office stewardship programs should provide for program-level and project-level construction oversight, problem solving, technical assistance, quality improvement, and deployment of state-of-the-art technology. The stewardship programs should include elements that address full-oversight projects, State administered projects, and major projects, as appropriate. As a minimum, the stewardship program should:

1. Evaluate the State and local agencies' transportation construction programs, including their procedures and controls for assuring transportation improvements are constructed in accordance with approved standards and acceptable contracting methods.

2. Evaluate the quality of materials, equipment, construction practices, and work force used for the purpose of evaluating the quality of the constructed product.

3. Provide technical assistance in problem solving and recommendations for improvements to State and local construction programs to ensure that high quality products are constructed.

4. Provide sharing of identified state-of-the-art practices and innovations in materials, equipment, construction practices and contracting methods for the purposes of highlighting best practices.

Risk Assessment

Because of the large amount of public funds involved, construction programs are inherently high-risk areas. The division office risk assessments should include an assessment of the risk associated with the State and local transportation agencies' Federal-aid construction programs for the purpose of determining oversight priorities. Consistent with the Stewardship Policy, the primary focus should be the identification and prioritization of high-risk construction areas such that the appropriate level of division office resources can be allocated to manage the associated risk.

Guidance and Implementation Tools

An effort is currently underway to review and update the existing technical guidance related to the FHWA construction programs. The specific statutory requirements pertaining to construction will be identified and implementing directives will be reviewed for relevancy and updated, as appropriate. Tools to assist in the implementation of construction oversight, such as inspection guides and training opportunities, are also being developed. Specific tools include the following:

1. *National Specification Website*- In coordination with AASHTO, a national highway construction specification website is currently being developed which will provide a method to electronically access and search construction specifications from all of the State DOT's , Federal Lands Highway, and other transportation agencies. This website will also make available emerging specifications in areas of quality assurance, performance-related specifications, and other new specification types (warranties, design-build, lane rentals, etc.) A pilot version of the website is now being tested. The final website, containing the specifications from all of the States, is scheduled to be completed by spring 2003.

2. *Construction Program Management and Inspection Handbook*- This handbook will assist FHWA engineers in maintaining and improving technical competence in a selected and balanced program of construction inspection techniques. The handbook will also provide the field engineer with tools for developing and carrying out a program of risk management with reasonable assurance that FHWA is getting the most value for the expenditure of its resources on construction inspection. A draft version of the handbook was given limited distribution in October 2002, for peer review. Copies of the final handbook will be distributed to all divisions, when it is completed in spring 2003.

3. *General Construction Program Policy and Guidance*- It is recognized that much of our regulation, policy, procedure, technical guidance, and training applicable to project delivery still needs to be revised to match the ISTEA and the TEA-21 legislative changes. With this in mind, an effort is now underway to evaluate the current program regulations, policies, and agency positions that apply to the Federal-aid construction program and project oversight, and to identify areas in need of update. Additionally, a Construction Program Guide webpage is being developed, which will consolidate all construction-related regulations, policy and guidance information, and will make this information electronically accessible. This webpage should be open for general use by January 2003.

4. *National Network of FHWA Construction Contacts*- A network of construction contacts throughout FHWA was established fall 2002. Future meetings and workshops involving this "Virtual Team" will provide a forum for technology transfer and information sharing, technical support, and a mechanism for targeting future high priority work initiatives in the construction field. A full list of these contacts is available under FHWA's Construction and Maintenance webpage at http://www.fhwa.dot.gov/construction/.

Updated information concerning these tools will be transmitted as it becomes available.

APPENDIX B
Quality Assurance Resources

See also "Quality Assurance" in Appendix E, Technical References and Resources

U.S. Department of Transportation
Federal Highway Administration

Memorandum

Subject: INFORMATION: Quality Assurance Guide Specification and Implementation Manual for Quality Assurance

Date: AUG 2 1996

From: Chief, Highway Operations Division

Reply to Attn of: HNG-23

To: Regional Administrators
Division Administrators
Federal Lands Highway Program Administrator

This memorandum transmits to you the companion reports *AASHTO Quality Assurance Guide Specification* and *AASHTO Implementation Manual for Quality Assurance* dated February 1996. The AASHTO initially published these two documents as one report in 1993 under the title *AASHTO Quality Control/Quality Assurance Specification and Implementation Guide*. We have also attached a copy of 23 CFR 637(b), *Quality Assurance Procedures for Construction*, which controls material acceptance on NHS projects. This regulation became effective June 29, 1995.

Please note that the Guide Specification is not yet approved as an official AASHTO Specification, but rather it has been approved as a report of the AASHTO Subcommittee on Construction. The process of incorporating this into the official AASHTO Guide Specifications is just beginning the normal rewrite process. Ultimately, the specification must be approved by the AASHTO Board of Directors.

Even though a majority of agencies recognize the positive elements of implementing quality assurance programs for construction, the individual procedures often vary. These AASHTO reports provide uniform guidance to develop and implement quality assurance standard specifications. While these reports substantially follow 23 CFR 637(b), *Quality Assurance Procedures for Construction*, some differences exist.

One key difference between the *AASHTO Implementation Manual for Quality Assurance* and 23 CFR 637(b) is that the AASHTO guide provides for the use of either split or independent samples for verification of contractor test results while 23 CFR 637(b) allows only independent samples for verification. As explained on page 16 of the AASHTO guide, the use of split samples only verifies the contractor's test procedures and equipment, not the quality of the material. The use of samples obtained and tested independently assesses material, sampling, and testing variability. Therefore, an acceptance program which uses split samples or witnessed tests for verification does not ensure the material quality and meets neither the letter nor the intent of 23 CFR 637(b).

Continued on next page

On the other hand, the use of split samples in the independent assurance program provides a check on testing equipment and procedures. This complements the verification program and ensures the credibility of the testing program. We point out that the *AASHTO Implementation Manual for Quality Assurance* (page 22) offers the option of using either split or independent samples for independent assurance. This does not agree with the regulation that independent assurance testing may only be performed on split samples. We recognize the value of both split and independent samples, however, they do not provide interchangeable information.

Should you have any questions, please contact Mr. Frank Bednar of the Quality Initiative Group at 202-366-1565, or Mr. Roger Surdahl of the Materials Group at 202-366-1563, both of the Highway Operations Division.

for Donald P. Steinke

Attachment

Contractor Quality Control Plans: Contractor Guidelines and Example

Federal Lands Highway Office
Engineering and Operations Division (HFL-20)

February 1998

These guidelines are intended to assist Federal Lands Highway (FLH) contractors in the preparation of acceptable Quality Control Plans. They are based on the requirements contained in Section 153 of the Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects (FP). The guidelines are not contractual requirements and do not supplement or supersede any contractual requirements.

Introduction

A contractor quality control plan (CQCP) is the documentation of the contractor's process for delivering the level of construction quality required by the contract. This document is intended to provide guidance to Federal Lands contractors, subcontractors, and suppliers as to what is expected from CQCPs and what the criteria for accepting and using the requirements for these plans will be.

The CQCP is a framework for the contractor's process for delivering quality construction. The plans and specifications define the expected results or outcome. The CQCP outlines how those results will be achieved. While it is not possible to determine from the CQCP whether the level of construction quality will be acceptable, it is possible to verify that the contractor, as an organization, has addressed the basic elements of its quality process. These guidelines address not only what should be in the CQCP in order for it to be acceptable to the Government, but also what elements the Government's QA process needs to have in order to assure quality without usurping the contractor's responsibilities.

It is not possible to determine from the content of the CQCP whether quality construction will result. The plan is not approved, but accepted based only on whether the plan clearly addresses all the issues it is required by the contract to address.

FAR and FP Requirements

Federal Acquisition Regulation (FAR) Clause 52.246-12, Inspection of Construction, is the foundation and basis for all contract requirements dealing with quality control and quality assurance. In summary, the clause has these provisions:

- Requires the contractor to maintain an adequate inspection system and perform inspections that will ensure contract compliance.
- Requires the contractor to maintain inspection records and make them available to the Government.
- Allows [but does not require or obligate] the Government to do its own tests and inspections and requires the contractor to assist.
- Says that Government tests and inspections are for its benefit and do not take the place of the contractor's quality control obligations.
- Says that anytime the contractor tells the Government that work is ready for inspection and it is not (i.e., it is in not in compliance), the Government may charge the contractor for the costs of its inspections and tests.
- Says that the contractor is obligated to comply with the contract whether or not a Government inspector is present.
- Says that the Government may order previously completed work torn apart for inspection, and that if it is not in compliance, the contractor will pay for the inspection and the correction of the work. If it is in compliance the Government will pay for the inspection and disruption to the work.

Note that nothing in the FAR clause requires that the contractor's inspection system be described in writing or that it be submitted to the Government for approval in advance of the work. These requirements are contained in FP-96, Section 153. In addition, Section 153 contains a basic outline of what should be included in the CQCP. The outline should be repeated for each major category of construction.

Outline of Contractor Quality Control Plan Requirements

FP-96, Subsection 153.02

(a) Process control testing. List the material to be tested, tests to be conducted, the location of sampling, and the frequency of testing.

(b) Inspection/control procedures. Address each of the following subjects in each phase of construction:

(1) Preparatory phase.

(a) Review all contract requirements.

(b) Ensure compliance of component material to the contract requirements.

(c) Coordinate all submittals including certifications.

(d) Ensure capability of equipment and personnel to comply with the contract requirements.

(e) Ensure preliminary testing is accomplished.

(f) Coordinate surveying and staking of the work.

(2) Startup phase.

(a) Review the contract requirements with personnel who will perform the work.

(b) Inspect startup of work.

(c) Establish standards of workmanship.

(d) Provide training as necessary.

(e) Establish detailed testing schedule based on the production schedule.

(3) Production phase.

(a) Conduct intermittent or continuous inspection during construction to identify and correct deficiencies.

(b) Inspect completed phases before scheduled Government acceptance.

(c) Provide feedback and system changes to prevent repeated deficiencies.

(c) Description of records. List the records to be maintained.

(d) Personnel qualifications.

(1) Document the name, authority, relevant experience, and qualifications of person with overall responsibility for the inspection system.

(2) Document the names, authority, and relevant experience of all personnel directly responsible for inspection and testing.

(e) Subcontractors. Include the work of all subcontractors. If a subcontractor is to perform work under this Section, detail how that subcontractor will interface with the contractor's and/or other subcontractor's organizations.

Plan Development

Unless the contractor already has a documented company QC plan, it may be helpful to discuss what is required and how detailed it will be. Generally, discussion of the basic who, what, where, when, and how should comprise three to six pages, with an additional two to four pages of detailed information for each major category of work. This is not including supplemental materials such as subcontractor/supplier plans, certifications, test data, and personnel résumés. Also, if the QC plan contains a lot of repetitions of contract specifications, meaningless platitudes from quality textbooks, and other fluff, its necessary length will be longer.

Quality—and the processes that deliver quality—is a somewhat open ended concept. No matter how much detail is in the plan, it can always be argued that more could be, or should be, included.

Organizational Structure

One of the first issues a contractor, or any organization must face when designing its QC/QA procedures, is how these systems will relate to and impact its organizational structure.

Separate Quality Staff. Testing is a very specialized function. A contractor may elect to hire a separate staff or subcontractor to perform testing and to generate the documentation required by the FAR Clause and the FP. But the testing and documentation are only part of the inspection system required by the contract. If the entire inspection system is performed by personnel separate from production personnel, that would mirror the traditional relationship between contractor and agency organizations. If a contractor has a separate quality staff, it is important to define the relationship between those personnel and the production organization. What will be the disposition of failing tests/inspections? Who will have authority to order production ceased? Under what circumstances? What will be the conditions of restarting production?

Combined Staff. Quality management experts generally discourage separating quality control personnel from production personnel. It pits one part of the organization against another. This built-in adversity is seen as both inefficient and requiring additional staff. Ideally, quality control should be achieved by developing an organizational culture which encourages quality—a culture which is

embraced by everyone in the organization. However, for an organization transitioning from a traditional to a quality management system, superimposing a QC/QA staff on its existing organization may make sense while that organizational culture is being developed.

Process Control Testing

Testing provides a reflection of quality and the process. But only changes to the process can improve quality. Extensive testing needed to identify defects so that they can be corrected is an indication of a poor process. Ideally, frequencies of QC testing are dependent on characteristics of the overall process. In a transition environment, however, when contractors are not used to designing comprehensive QC systems, it may be necessary for the agency to provide guide frequencies to minimize the risk of serious deficiencies undetected until late in the process.

It is easy to become preoccupied with testing when describing the plan. Testing is easily defined and leaves a clear documentation trail. But the organizational resources that actually will control the quality of the construction are by far the most important part of the plan, even though describing these resources and procedures [the process] in writing is often difficult.

The contract may contain a listing of mandatory contractor testing including sampling points, frequencies, and time limits for delivering results. This testing is intended primarily for the agency's use in documenting quality assurance and accepting the work. Some contracts require additional testing identified as process control testing, which is intended to provide real-time information during the construction and production of materials to allow the contractor to adjust or control the process and ensure that quality assurance testing at the end of the process will indicate compliance. Whether or not the contract specifies process control testing, it is up to the contractor to address whether or not it is needed in the CQCP.

The standard acceptance plan in Section 106.05 of the contract is used for most pavement structure and structural concrete items. While much of the work is not accepted statistically, the criteria on which the statistically based plan is structured are consistent with the intended acceptance criteria of all work. In general these are the criteria:

- The plan is based on an acceptable quality level (AQL) of 5 percent defects. That is, if production is uniform and no more than 1 out of every 20 quality assurance tests fails, the process can be assumed to be in control and additional process control testing (and other actions) are not indicated.
- If defects rise to 10 percent (1 out of 10 QA tests fail), that suggests additional process control testing and other actions may be indicated.
- If defects rise to 15 percent or higher (more than 1 out of 6 QA tests fail), that is approximately equivalent (depending on sample size) to a pay factor of less than 0.90. This indicates serious process control problems, and the Government may require that process to be suspended while the contractor modifies the process control procedure (including testing) to address the problem.

In addition to those tests specifically required by the contract, the contractor is required to tabulate in the CQCP all process control testing which will be necessary to assure that the work and material comply with the terms of the contract when they are ultimately subjected to quality assurance testing. Note that, although process control testing is listed first in Subsection 153.02, it may make more sense to not complete or finalize this section until after the inspection/control procedures are defined.

Inspection/Control Procedures

This is the narrative portion of the CQCP, and it is the hardest part of the plan to develop and describe. Most organizations are used to intuitive processes, or processes that have evolved over time to reflect the personalities and desires of supervisory personnel. Describing and documenting these processes concisely in writing is often difficult. There is almost no physical limit to the length and detail included in this section. Every requirement, every sentence in the contract, could precipitate a paragraph or more of detailed process control procedures to describe how that requirement will be fulfilled. From a practical point though, this is excessive. For most typical FLH construction projects, the narrative covering inspection/control procedures should adequately address the quality process basics in two to four pages for each phase of construction (see

below). This does not include testing schedules, certifications, personnel résumés, and other attachments. In addition, if the narrative includes excessive redundancies, paraphrasing of the contract, and other extraneous materials, these will add to the required length. The fact that many of the detailed requirements of the contract are not specifically addressed in the CQCP does not mean they can be ignored. The contract itself is the foundation for the outcomes expected from the CQCP.

> *The failure of the contractor to inspect and control any aspect of the construction process, whether or not it is specifically addressed by the CQCP, is a basis for adverse action under the contract, which may include required enhancement to the CQCP itself.*

Categories of Construction

A typical contract may be divided into three to five categories depending on the nature of the work and the organizations performing the work. These categories are referred to as phases in Subsection 153.02, but to avoid confusion with sequential phases described below, they are referred to as categories here. For example, stakeout, erosion control, clearing, excavation, embankment, drainage, and slope protection might be grouped together as a single category of Grading and Drainage.

Sometimes how categories are defined is influenced by which subcontractors or crews do the work, since each may have its own organizational relationships. It should be left up to the contractor to group items of work in logical categories to facilitate the development of the CQCP. Typical categories are as follows:

- Grading and Drainage
- Masonry
- Pavement Structure
- Permanent Traffic Control
- Safety Appurtenances
- Seeding and Landscaping
- Structures
- Temporary Traffic Control

Preliminary, Startup, and Production Phases

The FP requires each of the three sequential phases to be addressed separately. So for five categories of construction, a five by three matrix is generated which constitutes the inspection/control part of the CQCP.

The preliminary phase includes evaluation of equipment, materials, and other resources prior to work being started. It also involves comparing contract requirements with training and other needs.

Startup includes the additional management, training, and inspection resources usually needed when a new operation is started.

Production addresses the routine QC resources necessary after the process is established.

Who, What, Where, When, and How?

For each category and phase of the operation, the QC plan should answer these questions as they relate to the category and phase:

Who will be responsible for QC during the operation? The Quality Control Technician may be assigned responsibility for testing and documentation and perhaps even training and monitoring of startup. As the operation moves toward production, however, foremen or other supervisory personnel will probably be assigned increasing responsibility. If the management official is too high in the organization—say the overall project superintendent — then it is less likely he/she will have the time to perform detailed QC functions. In that case, subordinate personnel should be specifically identified.

What will that person do to ensure contract compliance? What authority will the person have over operations? What portion of the time the operation is in progress will the identified person actually be present to perform QC responsibilities? Testers and inspectors cannot control quality if their responsibilities are limited to testing, measuring, and documentation. "What" should address not only personnel but materials and equipment used in the construction. These items often have stated or implied contract requirements, and the QC system must verify that those requirements are met.

Where will these activities be performed? Will optional process control testing be performed on-site or at a commercial laboratory? Will manufactured materials be inspected at the plant, at the contractor's facility, or at the site of work? Will the equipment be inspected at the yard, or will inspections be performed at the site?

When will these activities be performed? The earlier QC activities are performed, the more latitude the contractor has in dealing with problems. However, when activities are performed too early, there is a risk of unforeseen changes or glitches prior to actual construction. When will test results be available? This is a key component of the QC plan that determines largely how responsive it can be to deficiencies.

How will inspections be performed? Using a standard checklist? Using the specifications themselves (quality assurance criteria), etc.? The more generalized and vague the inspection procedures are, the more likely they will not be consistently effective. However, not having a checklist is not a cause for disapproving a QC plan unless a checklist is specifically required.

The CQCP should minimize any parroting or paraphrasing of requirements in the contract, and should avoid simply promising to comply with the contract. These kinds of statements and assurances are of essentially no added value. The CQCP must go beyond the contract requirements and address the contractor's organizational process for consistently delivering those requirements.

Subcontractors and Suppliers

When subcontractors and suppliers (other than suppliers of commercial items) provide part of the work, then the QCP needs to be clear whether their QC responsibilities will be independent or a part of the prime contractor's responsibilities. If they are independent, then the subcontractors or suppliers QCP must be developed and submitted for approval, through the prime. Otherwise, the prime must address how it will monitor and verify subcontractor/supplier quality as a part of its plan. In either case the prime is contractually responsible for all the work, but being contractually responsible is not the same as having an active role in the quality delivery process.

Manufactured Materials

An important part of the CQCP is the process for verifying that manufactured materials comply with the requirements of the contract.

Commercial Items. These are materials manufactured and sold to the general public, as opposed to materials made to the unique specifications of the agency. For most commercial items, the contractor's responsibilities are limited to verification that the materials are as required or permitted in the contract, and that the delivered materials are in fact those approved materials. Some materials which are arguably commercial are considered of critical importance and have specific QC/QA requirements in the contract.

Noncommercial Items. These are materials manufactured offsite, but specifically to agency specifications for this project. QC plan coverage for noncommercial items should be a separate document from the manufacturer, or the manufacture of those items should be included in the QC plan of the contractor or a subcontractor. Like critical commercial items, critical noncommercial items may have specific QC/QA requirements in the contract.

Records and Documentation.

While good documentation is often a reflection of good quality control, documentation is not the same thing as quality control. Documentation should be the minimum necessary to concisely document the adequate function of the process.

Personnel Qualifications

While some contracts may have specific required qualifications for contractor quality control and testing personnel, the initial judgment as to whether a given person is or is not qualified is generally left to the contractor. However, during contract administration, the agency may be more assertive in monitoring the qualifications of these personnel. When the contract has specific experience requirements, the contractor should describe how the person's previous training and experience addresses these requirements.

Partial Plans

It is possible that subcontractors, suppliers, and overall responsibilities for some latter phases of the construction will have not been arranged at the time the prime is ready to begin on the initial phases. It is permissible for the contractor to submit, and the agency to accept, a partial plan. However, the work not covered by the plan may not begin until the plan is supplemented to cover that work.

Contractor Evaluation

The performance of all contractors is required to be evaluated in accordance with FAR 36.201. Although most contractors are evaluated as satisfactory or better, it is important to understand the agency's process for dealing with serious or chronic unsatisfactory performance. Evaluations are made of five individual elements, plus an overall evaluation:

- Quality of Work
- Timely Performance
- Effectiveness of Management
- Compliance With Labor Standards
- Compliance With Safety Standards

The first of these five elements, Quality of Work, essentially overlaps the contractor's inspection system requirements under FAR Clause 52.246-12, Inspection of Construction. That is, a contractor that fails to maintain an effective quality control (inspection system) will generally warrant an unsatisfactory rating in the Quality of Work category. Deficient contractors must be clearly notified of the deficiencies and provided an opportunity to correct them.

Evaluations may be shared with other contracting agencies and private entities. FLH Divisions may participate in the Corps of Engineers' Construction Contractor Appraisal Support System (CCASS), which makes evaluations available to other participating Federal agencies.

Evaluations may be used in part for determinations of responsibility prior to award of sealed bid contracts or in evaluating past performance as a part of source selection for a negotiated contract.

If the prime contractor's performance would be evaluated as satisfactory but for the performance of a major subcontractor, it is permissible to execute a separate evaluation of the subcontractor, following the same rules as if it were a prime.

Example Quality Control Plan

ABC Construction Company
P. O. Box 357
Red River, CA 94781

August 18, 1997

Federal Highway Administration
P. O. Box 78
Sutterville, CA 94832

Gentlemen:

Re: CA FH 93-1(3), Gold Rush Highway
Quality Control Plan

The following items comprise our Quality Control Plan (QCP) required by Subsection 153.02 of the Contract.

1. All work will be performed in accordance with the contract requirements. ABC will maintain an inspection system which assures compliance with the contract requirements. Any indication of system deficiencies whether discovered as a result of the Government's or ABC's checks and tests will result in modifications to the system to correct these deficiencies.

2. This QCP does not endeavor to repeat or summarize contract requirements. It describes the process which ABC will use to assure compliance with those requirements. The QCP documents broad categories of contract work in accordance with Subsection 153.02. Necessary details dealing with minor items that may be overlooked in this plan will be addressed informally between the Quality Control Technician (QCT) and the Project Engineer (PE), as the work progresses; and will be documented in writing if so requested by the PE. It is understood that the level of QC accountability and control exercised by ABC on these items will be consistent with the details of this plan.

3. The Project Superintendent, Mr. Ralph Altway, will have overall responsibility for quality control on the project. Mr. Altway has had similar responsibilities on other Federal (Corps of Engineers) and State (Caltrans) projects. He is a NICET Level IV Technician and Certified by Caltrans as a QC Technician.

4. Mr. Leon Williams will be the QCT for the project. He will report directly to Mr. Altway. Mr. Williams is also a NICET Level IV Technician and Certified by Caltrans and Nevada DOT as a QC Technician. He has been employed in this role by ABC for nearly three years. He will be responsible for overseeing day-to-day construction operations from a QC standpoint. He will assure that all required tests and documentation are completed, and that the results are furnished to the Government in the time frame required. Mr. Williams is empowered to suspend any operations which he deems to be in noncompliance with the contract, and/or order corrective measures to assure compliance. Mr. Williams will complete the Inspector's Daily Record required by Subsection 153.04.

5. As the number of operations or their dispersion on the project starts to overextend Mr. Williams, QC responsibilities will specifically be assigned to ABC's supervisory personnel specifically responsible for given operations; or an assistant to him will be provided. In either case, standards of application of the QCP will be the same. The names, experience, and qualifications of any personnel assuming QCP responsibilities will be provided to the Government in advance.

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6. ABC has an experienced and highly professional staff that is used to the responsibility entailed by the QC requirements. We therefore do not anticipate any personnel or training problems in complying with them. If any such problems occur, ABC will take whatever actions are necessary to correct them including retraining, providing more supervision, or removal of poorly functioning personnel.

7. Grading

   Preparatory Phase

   QCT will go over erosion control requirements with PE and order silt fence and other authorized materials at least two weeks before work starts.

   QCT will go over clearing limits and slope limits with PE and Grading Foreman.

   Startup Phase

   ABC will Install silt fences and temporary culverts as necessary along pioneer road.

   QCT will obtain materials samples for T-99 proctor tests as soon as cuts are started. Provide PE with splits of samples. Provide completed proctor worksheets within 48 hours.

   Grading Foreman's name will be provided to Government as soon as known.

   QCT will go over lift thickness and other contract requirements with Grading Foreman.

   Production Phase

   After startup, Grading Foreman will be responsible for continuous monitoring of QC.

   QCT will periodically monitor work and density with a nuclear gauge. These tests will be at about one (passing) test per 1000 m^3 of compactable (nonrock) material. Final test on each lift will include a one-point proctor and rock correction. QCT will advise Grading Foreman of test results.

   Failing tests will be followed by appropriate corrective (reworking/recompaction) efforts and retesting. If the rate of initial failing tests exceeds one out of five, the QCT and Grading Foreman will meet and formally document the corrective actions to the embankment construction process which will be taken to resolve the problem.

   Grading Foreman will order drying operations or more water when compaction tests or appearance of fills material indicate that moisture is a problem.

   Density tests will be documented in tabular form showing date, time, location, offset, depth below grade, and test result. Results will be provided to PE by the next working day.

   Each day QCT will plot test results on control charts in the ABC project lab.

8. Drainage

   Preparatory Phase

   QCT will obtain survey crews' stakeout notes and review culvert design prior to submittal to PE for approval. QCT will obtain approved designs and order culvert and end section materials.

   Precast inlets and similar items will be obtained from Williams Precast Co. of Susanville. Copies of their materials data, mix designs, and QC plan will be obtained and furnished to PE 30 days prior to start of work.

   Cast-in-place concrete will be furnished under Section 601 and obtained from Sutterville Quality Concrete (SQC). QCT will obtain documentation from SQC. QCT will go over their procedures with them before production.

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QCT will identify a source of backfill material to be used if natural material is too rocky or otherwise unsuitable. QCT will test the material (proctor) and provide results to PE.

QCT will inspect culvert materials upon arrival and obtain valid materials certifications and submit to PE.

QCT will go over stakeout notes and contract requirements with pipe crew foreman prior to start of work. Pipe foreman will be identified to PE prior to start of work.

Startup Phase

QCT will work nearly continuously with the pipe crew on the first day to verify layout procedures, bedding preparation, and assembly.

QCT will go over proctor data and operation of nuclear gauge with pipe foreman. They will agree on what passing density readings are for the borrow backfill and other possible backfill materials.

QCT will go over backfill, lift thickness, and density monitoring procedures.

For cast-in-place concrete, QCT will be at plant to verify QC procedures at the start of production. QCT will perform required QC at the site.

Production Phase

Pipe foreman will be responsible for QC during construction.

QCT will visit each installation on a random basis to take density tests required by the contract. For each of these tests, a one-point proctor will be run. Record of density tests will be furnished to the PE by the following working day.

For cast-in-place concrete QCT will obtain all required documentation and furnish to PE. QCT will be at placement site enough to perform required QC tests. QCT will go over QC procedures with foreman, who will be responsible for QC when the QCT is absent.

9. Subgrade

Preparatory Phase

QCT will coordinate with grading foreman and survey crew as to how subgrade will be staked, controlled, and finished.

QCT will go over with grading foreman, any problems with subgrade materials quality—rocky material, clay, or other unsuitable. Such materials will be used in other than subgrade locations.

Startup Phase

QCT will coordinate with grading foreman and PE the acceptable standards and tolerances for subgrade finishing.

Production Phase

Grading foreman will be responsible for day to day QC.

Grading foreman will advise PE when each segment of subgrade is ready for acceptance.

QCT will take subgrade density tests at required frequency using nuclear gauge. One-point proctors will be run about once every two to three tests or whenever materials change.

Test results will be plotted on control charts by QCT and also furnished to the PE by the next working day.

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10. Base Course

Preparatory Phase

Base course will be obtained from Whippel Mountain Aggregates, Inc. (WMA)

QCT will obtain suppliers quality tests and samples of material for the PE at least 30 days prior to base work beginning.

QCT will perform proctor tests on base course. QCT will also perform initial gradation tests on stockpile just prior to startup.

QCT will review supplier's QC procedures including stockpiling, moisture control, process control testing, and weighing.

QCT will develop dumping spread sheets for base course foreman.

Startup Phase

QCT will go over delivery and dumping procedures with base course foreman.

QCT will go over spreading and compaction procedures with base course foreman.

Base course will be pugmill mixed and delivered at optimum moisture and in nonsegregated condition so that processing on the grade will be minimal.

Production Phase

WMA will be responsible for plant QC. WMA will perform at least one gradation test per day as long as at least 80% of tests pass. Frequency will be increased if there are more failing tests.

Grading foreman will be responsible for receiving, dumping, tabulating tonnages, and delivering receiving reports to PE at the end of each day.

Grading foreman will perform occasional (at least one per day) depth checks to verify spread rates.

QCT will obtain gradation samples at the required frequency. Samples will be split, with the splits delivered to the PE.

11. Asphalt Items

Preparatory Phase

All asphalt items will be furnished by Allied Paving (AP) of Sutterville. Materials will be hauled to the site by ABC's hauling sub, and paving or installation of materials will be by ABC.

AP has a lab certified by Caltrans at the plant. Lab supervisor is William Brown, Certified Asphalt Technician in California.

QCT will obtain required mix design submittals and samples from AP and deliver to PE at least 30 days before work is scheduled to start. AP's QC/Mix Design technician is Allen Rockford, who has 15 years in this position and is a certified asphalt technician in California and Nevada. Mr. Rockford will be the contact for any technical discussions during the mix approval process.

With the mix designs, AP will furnish a separate QC plan dealing with their plant operations, personnel, etc.

Startup Phase

QCT will review all specification requirements with paving foreman prior to start of work.

QCT will be in charge of production start up procedures. Documentation and tests will be at his directions and submitted to the PE. Full production will start when approved by PE.

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Production Phase

Paving foreman will be responsible for QC on a daily basis. QCT will conduct periodic inspections.

QCT or designee will obtain mix sample and cores. Splits will be provided to PE for acceptance. Contractor samples will be delivered to AP's plant lab for testing. Results will be provided through the QCT by the following day. We will attempt to set up a system to provide results by FAX.

AP will obtain AC samples at the plant and deliver (through QCT) to PE for testing.

Test results will be plotted on control charts in ABC's on-site lab. QCT will run QL Pay at the end of each day, or the beginning of the next. Quality problems evident either from inspections or test results will be dealt with under the direction of the QCT. Work will be suspended if problems cannot be resolved expeditiously.

12. Structural Concrete

Preparatory Phase

Wahoo Readymix in Martin, CA, will provide PC concrete under Section 552 for the box culverts. Wahoo's plant is certified by Caltrans as is their Quality Supervisor, Mr. Larry Ryland. Mr. Ryland will provide documentation (through ABC's QCT) of proposed mix design (previously approved by Caltrans) and all materials 30 days or more prior to first delivery. Wahoo will also be responsible for all plant QC and inspection of trucks.

QCT will be responsible for on-site QC operations other than the concrete mix itself, e.g. resteel, forming, concrete placement, finishing, etc. Resteel will be inspected upon delivery for proper certification, dimensions, storage, etc. QCT will be responsible for stakeout and foundation preparation prior to forming.

Startup Phase

QCT will coordinate with Wahoo to schedule delivery operations. Wahoo will send one or more certified concrete technicians to each concreting operations. Technicians will be responsible for any final mix adjustments, delivery ticket validation, screening (air, slump, temperature), and acceptance testing, as required by FHWA inspector. Cylinders will be cured on-site at ABC's lab, and taken to Wahoo's lab for breaking. QCT will advise FHWA of scheduled breaks and provide opportunity for witnessing.

QCT will inspect forming and resteel operations from their inception and work with crews to assure acceptable tolerances and other compliance. QCT will inspect placement operations including vibrating and finishing. QCT will inspect curing operations and work with ABC crews to resolve any problems. All required documentation will be completed by QCT and delivered to FHWA by the day following each placement operation.

Production Phase

Wahoo will continue to provide on-site QC for each concrete delivery.

Once resteel and forming crews are lined out, QCT will make spot checks of their operations, plus a final inspections two hours or so prior to each placement. QCT will inspect curing. QCT will inspect all surfaces upon stripping and go over any necessary repairs and finishing operations.

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13. Miscellaneous Items

This covers items, mostly involving installation of manufactured items, such as guardrail, delineators, fencing, etc.

Preparatory Phase

QCT will verify all certification requirements, inspect material upon delivery and submit certifications and other documentation to PE.

QCT will work with survey crew and PE to verify exact stakeout requirements and resolve any potential stakeout problems.

Startup Phase

QCT will go over the specification requirement and stakeout data with the foreman in charge of installation.

QCT will normally be present when any operation begins to resolve problems and verify specification compliance.

Production Phase

Foreman will normally be responsible for QC during production. QCT will make spot checks approximately once a day or more frequently if there are problems.

QCT will perform tests required by the contract and furnish results to PE. QCT will advise PE when segments of the work are ready for acceptance.

Please advise me if there are any additions or supplements you would like us to make to this QCP. If there are changes to any items (personnel, suppliers, etc.), we will attempt to provide the PE notice in advance of their impact on the work.

We need concurrence to proceed with at least the clearing and grading portion of the work by June 1 in order to stay on our schedule.

Sincerely yours,

Ralph Altway

Superintendent

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Examples: Good, Fair, and Poor Quality Control Plan Elements

Guardrail, Preliminary

Poor	Fair	Good
All guardrail materials will be checked for contract compliance before use. All employees are empowered to inspect and reject materials not complying with the contract.	All guardrail materials will be checked by the Quality Control Technician (QCT) for contract compliance before use. Materials not in compliance will be isolated and rejected. Survey crew will layout guardrail in accordance with the plans before construction.	Upon delivery of guardrail, posts, and hardware, QCT will check for proper identification, certification, and damage during shipment. Before scheduled construction, components will be reinventoried, checked, and compared to layout requirements. QCT will review layout procedures with the Project Engineer (PE). Will coordinate with survey crew on stakeout. Will check each stakeout for possible transition problems. Will notify the PE of opportunity to check.

Guardrail, Startup

Poor	Fair	Good
QCT will inspect guardrail crew's operations during startup. Any deficiencies will be brought to the attention of the Foreman.	QCT will continuously work with stakeout crew and installation crew when operations begin, to assure a common understanding of contract requirements and standards/tolerances etc.	Prior to scheduled beginning of installation, QCT will verify that stakeout has been accomplished in accordance with requirements. QCT will go over a checklist of required quality characteristics with the Foreman. The Foreman will be responsible for routine quality monitoring after startup.

Guardrail, Production

Poor	Fair	Good
The QCT will periodically check on operations during construction to assure contract compliance.	The QCT will inspect installation operations every day to verify specification compliance and document completion of each installation.	The QCT will inspect installation operations at least twice a day, verifying compliance with stakeout, as well as rail height, post plumbness, etc. The QCT (or the Foreman if QCT is not available) will document completed work and cleanup and advise the PE of such completed work for acceptance. Additional inspection/training will be provided if installation crew personnel changes or deficiencies are noted.

A Model Quality Control Plan

Overview

The model quality control (QC) plan that follows is intended to serve as a generic tool to assist contractors in preparing complete and useful QC plans. Developed by the New England Transportation Technician Certification Program (NETTCP), the model plan follows a recommended standard format that includes 10 separate sections plus appendices. Each section addresses a major QC Plan item, as follows:

- Terms and Definitions (optional)
- 1.0 Applicable Specifications
- 2.0 Quality Control Organization
- 3.0 Quality Control Laboratories
- 4.0 Materials Control
- 5.0 Quality Control Sampling and Testing
- 6.0 Production Facility Management
- 7.0 Field Management
- 8.0 Acceptance of Work (optional)
- 9.0 Other Relevant Contractor QC Plans
- Appendices

The Model QC Plan is an example of a completed Earthwork QC Plan for a fictitious major transportation construction project. QC Plans for other materials (e.g., HMA, PCC, etc.) can be developed following the same standard format (section and subsection headings) provided in the Model Plan. It is recommended that transportation agencies adopt the format (section and subsection headings) provided in the NETTCP Model QC Plan as a standard for contractors to follow.

The level of detailed information in any QC Plan will obviously change depending upon the size and complexity of the individual construction project. The Plan is designed as a template and guide. As a minimum, all text that is shaded grey throughout the Model QC Plan will require replacement or deletion to address the specific quality control information related to a given project.

Note

Every QC plan should include examples of forms and reports that the contractor will use to document and report the results of QC monitoring to the transportation agency. These sample documents can appear as appendices to the QC plan. The samples included will differ from plan to

plan depending on the type of project. For example, in the fictitious model presented here for Earthworks, several sample documents are named as appendices to the plan:

- Project Drawings List
- Material Source Characterization Sampling and Testing Forms
- Standard Test Report Forms
- Weekly Schedule of Production Operations
- Standard Inspection Report Forms for Production Quality Control
- Weekly Schedule of Materials Placement Operations
- Control Charts Used for Materials Placement
- Standard Inspection Report Forms for Field Quality Control

Each QC plan should include samples of forms and reports that are appropriate to the project type.

State Route 99 Construction Project
Anytown, USA
Transportation Agency Contract #54321

ABC Contractors, Inc.

NETTCP Model QC Plan

Construction Quality Control Plan

Section 1 - Earthwork

October 28, 2003 Draft

Submitted By: _____ _____
ABC Contractors, Inc. Date

Approved By: _____ _____
Transportation Agency Date

Section 1 - Earthwork

This Quality Control Plan (QC Plan) identifies the specific resources and procedures which will be utilized by ABC Contractors to control the quality of all Earthwork materials and ensure that all associated Work is completed in accordance with Project Specifications.

Terms and Definitions

The following terms and definitions are applicable to this QC Plan:

- **Contractor Information Testing (CIT)** – Testing that is performed at the discretion of the QC Inspector (non-random) for information to guide Production or Field Placement of material.
- **Control Strip** – An area of Earthwork placed at the beginning of each new Earthwork operation which is used to establish the rolling pattern and compactive effort required to achieve the In-Place Target Density at Optimum Moisture Content.
- **Control Strip Section** – One of 3 approximately equal parts of a Control Strip which are sequentially placed and tested for In-Place Density and Moisture Content.
- *Crushed Stone – Processed Earthwork material used for "Embankment Under Bridge Foundations" which meets the materials specification requirements contained in Subsection M2.01.0.*
- *Earth Excavate – Earthwork material, obtained from On-Site excavation (cut) activity, which is used for "Roadway Embankment Material", and which meets the materials specification requirements contained in Section M1.01.0 (Ordinary Borrow) and contains up to 50% boulders or rock fragments with a maximum size of 600 millimeters largest dimension.*
- **Field Quality Control (FQC)** – All sampling, testing, and inspection activity performed to control the quality of Field Placement operations.
- *Gravel Borrow – Earthwork material, obtained either from On-Site excavation (cut) activity or from Off-Site Borrow Producers, which is used for "Roadway Embankment Material", "Embankment Under Bridge Foundations", or "Backfill Material for Structures and Pipes", and which meets the materials specification requirements contained in Subsection M1.03.0.*
- *Ordinary Borrow – Earthwork material, obtained either from On-Site excavation (cut) activity or from Off-Site Borrow Producers, which is used for "Roadway Embankment Material", and which meets the materials specification requirements contained in Subsection M1.01.0.*
- **Producer** – A Subcontractor who supplies either "project produced" materials or "commercially manufactured" materials for incorporation into the Work.
- **Production Quality Control (PQC)** – All sampling, testing, and inspection activity performed by ABC Contractors or their Producers to control the quality of material produced at the Production facility.

- **Rock Excavate – Earthwork material, obtained from On-Site excavation (cut) activity, which is used for "Backfill Material for Muck Excavation" or "Roadway Embankment Material", and which is comprised of boulders or rock fragments with a maximum size of 1 meter largest dimension.**
- **Source Characterization (SC)** – Sampling and testing performed to determine the specific "**Earthwork Material Type**" which an individual material source location (On-Site or Off-Site) contains.
- **Source Quadrant – An area of defined boundaries at an individual Earthwork material source location (On-Site or Off-Site) which has been evaluated by Source Characterization sampling and testing.**
- **Special Borrow – Earthwork material, obtained either from On-Site excavation (cut) activity or from Off-Site Borrow Producers, which is used for "Backfill Material for Muck Excavation" or "Roadway Embankment Material", and which meets the materials specification requirements contained in Subsection M1.02.0.**

1.0 Applicable Specifications

The relevant specifications for all **Earthwork** activities are as indicated below.

1.1 – Standard Specifications

This QC Plan applies to all Work covered by the following sections of **Transportation Agency** Standard Specifications for **Highways and Bridges, 1995 Metric Edition:**

- **Division II - Section 150: Embankment**
- **Division II - Section 170: Grading**
- **Division III - Section M1: Soils and Borrow Materials, limited to:**
  - **Subsection M1.01.0 Ordinary Borrow**
  - **Subsection M1.02.0 Special Borrow**
  - **Subsection M1.03.0 Gravel Borrow (Type a)**
  - **Subsection M1.04.0 Sand Borrow (Type b)**
  - **Subsection M1.08.0 Impervious Soil Borrow**
- **Division III - Section M2: Aggregates and Related Materials, limited to:**
  - **Subsection M2.01.0 Crushed Stone**
  - **Subsection M2.01.1 Grading Requirements (37.5 mm)**

1.2 – Supplemental Specifications

Transportation Agency Supplemental Specifications, **December 23, 1998 Metric Edition,** applicable to Work addressed by this QC Plan include:

- **Division II - Section 150: Embankment**
- **Division II - Section 170: Grading**

1.3 – Project Special Provisions

Special Provisions applicable to Work addressed by this QC Plan include:

- **Division II - Section 150: Embankment (June 26, 2001)**
  - **Subsection 150.20 General**
  - **Subsection 150.66 Gravel Borrow for Bridge Foundations**
  - **Subsection 150.69 Crushed Stone for Stabilized Construction Entrances**
  - **Subsection 150.70 Gravel Borrow for Sidewalk**
  - **Subsection 150.72 Sedimentation Control**

1.4 – Project Drawings

A current listing of drawings applicable to all Work addressed by this QC Plan will be maintained by **ABC Contractors**. The "Project Drawings List" will be updated and submitted monthly to **Transportation Agency** in electronic format. An example copy of the "Project Drawings List: **Section 1 – Earthwork**" is contained in Appendix __ (see Note, page B–17).

1.5 – Standard Drawings

All Standard Drawings related to **Earthwork** contained in the **Transportation Agency Construction and Traffic Standard Details (1996)** are applicable to Work addressed by this QC Plan.

2.0 Quality Control Organization

The personnel and their corresponding responsibilities for all **Earthwork** Quality Control activities are as indicated below.

2.1 – QC Plan Manager

The QC Plan Manager is **Mr. "Plan Manager", P.E.** He is employed by **ABC Contractors, Inc. (ABC Contractors)**. Mr. "Plan Manager" is located at the **ABC Contractors State Route 99** Project Office in **Anytown, USA** and can be contacted as follows:

Office Phone: **(508) 123-4567**

Cell Phone: **(508) 123-4568**

Pager: **(508) 123-4500**

The QC Plan Manager has responsibility and authority for the following items:

- Development and submission of this QC Plan for **Transportation Agency** approval
- Overall coordination of personnel performing QC inspection, sampling, and testing at all Off-Site Production facilities, QC Laboratories, and On-Site Field operations
- Approval of Material Sources prior to the start of any related work addressed by this QC Plan
- Ensure that Producers have required certifications and qualified personnel and laboratories
- Complete adherence to all QC requirements and activities contained in this QC Plan
- Initiating Work suspension and determining appropriate corrective action when testing or inspection identifies nonconforming materials or construction as outlined under Section 6.5 and Section 7.6 below
- Review and evaluation of all QC documentation for content and completeness
- Maintaining the **"QC Record System – Earthwork"** in accordance with Section 5.5 below
- **Preparing and submitting a "Weekly QC Summary Report" to Transportation Agency within 7 Calendar Days following the end of the reporting period**

2.2 – Qualified Off-Site Production Facility QC Personnel

Personnel assigned to perform Off-Site Production Facility QC sampling, testing, and inspection of **Earthwork** materials will be as indicated in the table below. ***A current listing of qualified Off-Site Production Facility QC personnel will be included in the "Weekly QC Summary Report."***

Project Segment	QC Position	Personnel - Company	Qualifications
1, 2, 3	Soils Inspector	Various – Producers (See Weekly QC Summary Report)	NETTCP Soils and Agg. Inspector (See Weekly Report)

Off-Site Production QC activities by **ABC Contractors** will be scheduled as necessary and will generally involve the collection of samples for **Source Characterization testing from potential Earthwork** material Producers.

Where **Earthwork** materials Producers possess their own qualified QC personnel and laboratories, the results of the Producer's QC inspection and testing may be used by **ABC Contractors**. In such instances, the Producer will perform **Source Characterization** sampling and testing in accordance with the required test methods and frequencies outlined in Section 4.0 below.

Off-Site Production Facility QC personnel have responsibility and authority for the following items:

- Obtaining random **Source Characterization** samples of **Earthwork** materials at each Production Facility
- Inspecting **Earthwork** Production operations at each Production Facility
- Preparing and signing standard QC Inspection report forms for each Production location
- Identifying Production Facility practices or materials which do not conform with the requirements of the relevant specifications and this QC Plan, and discussing appropriate corrective action with the Production Facility Superintendent and the QC Manager
- Suspending the transport of **Earthwork** materials to On-Site placement locations when materials are not in conformance with the relevant specification requirements or when corrective actions have been determined necessary and are not implemented

2.3 – Qualified QC Laboratory Personnel

Personnel assigned to perform QC Laboratory sampling and testing of **Earthwork** materials are identified in the table below. ***A current listing of qualified QC Laboratory personnel will be included in the "Weekly QC Summary Report."***

Project Segment	QC Position	Personnel – Company	Qualifications
1, 2, 3	Laboratory Supervisor (ABC Contractors Anytown, USA)	Bob Supervisor – XYZ	NETTCP Soils and Agg. Technician # SAT 100
1, 2, 3	Laboratory Technician	Cathy Technician – XYZ	NETTCP Soils and Agg. Technician # SAT 190
1, 2, 3	Laboratory Technician	Mike Technician – XYZ	NETTCP Soils and Agg. Inspector # SAI 450

QC Laboratory personnel have responsibility and authority for the following items:

- Sampling of **Earthwork** materials
- Laboratory testing of **Earthwork** materials
- Preparing and signing standard Test Report Forms (TRFs) for each test completed
- Properly storing all **Earthwork** material samples
- Identifying **Earthwork** materials test results which do not conform with the requirements of the relevant specifications and this QC Plan, and discussing with the QC Manager

2.4 – Qualified On-Site Field QC Personnel

Personnel assigned to perform On-Site Field QC sampling, testing, and inspection of Earthwork materials are identified in the table below. ***A current listing of qualified On-Site Field QC personnel will be included in the "Weekly QC Summary Report."***

Project Segment	QC Position	Personnel - Company	Qualifications
1	Lead QC Inspector	Kevin Boulder – XYZ	NETTCP Soils and Agg.Inspector # SAI 491
2	Lead QC Inspector	George Troxler – XYZ	*Not Currently NETTCP Certified*
3	Lead QC Inspector	Mike Gravel – XYZ	*Not Currently NETTCP Certified*
1, 2, 3	Soils Inspector	*Various – XYZ (See Weekly QC Summary Report)*	NETTCP Soils and Agg. Inspector (See Weekly QC Summary Report)

On-Site Field QC personnel have responsibility and authority for the following items:

- Obtaining random Field samples of **Earthwork** materials for laboratory testing
- Performing In-Place sampling and testing of **Earthwork**
- Preparing and signing standard Test Report Forms (TRFs) for each test completed
- Inspecting On-Site **Earthwork** production and placement operations
- Preparing and signing standard QC Inspection report forms for each placement location
- Identifying On-Site Field placement practices or materials which do not conform with the requirements of the relevant specifications and this QC Plan, and discussing appropriate corrective action with the **Segment** Field Superintendent and the QC Manager
- Suspending the placement of **Earthwork** materials when materials are not in conformance with the relevant specification requirements or when corrective actions have been determined necessary and are not implemented

3.0 Quality Control Laboratories

The Quality Control Laboratories to be used for all **Earthwork** materials and their corresponding testing responsibilities are as indicated below.

3.1 – Qualified Primary QC Laboratory

The primary QC Laboratory responsible for performing sampling and testing of **Earthwork** materials is identified in the table below.

Project Segment	Laboratory	Location	Qualifications
1, 2, 3	ABC Contractors State Route 99 Project Laboratory	Anytown, USA	NETTCP Laboratory Qualification Program – Category 2-T: Soils, Aggregates (MM/DD/YY)

The ABC Contractors **State Route 99** Project Laboratory is responsible for performing testing of all **On-Site Earthwork** materials as well as testing of any **Off-Site Borrow** material. The following tests will be performed on **Earthwork** materials by this laboratory:

- **Soil Classification** — AASHTO M145
- **Gradation** — AASHTO T11 and T27
- **Liquid Limit** — AASHTO T89
- **Plastic Limit/Plasticity Index** — AASHTO T90
- **Optimum Moisture Content** — AASHTO T99 and AASHTO T180
- **Maximum Dry Density** — AASHTO T99 and AASHTO T180
- **Coarse Particles Correction** — AASHTO T224
- **Grain-Size Analysis** — AASHTO T311

3.2 – Qualified Subcontractor or Consultant Laboratories

Other qualified Subcontractor or Consultant laboratories that will perform QC sampling and testing of **Earthwork** materials are identified in the table below.

Project Segment	Laboratory	Location	Qualifications
1, 2, 3	XYZ Company Laboratory	Soil City, USA	AASHTO Accreditation Program: Soils (08/15/00)

The **XYZ Company** Laboratory in **Soil City, USA,** will serve as a backup to assist the Primary QC Laboratory in performing testing of all **On-Site Earthwork** materials as well as testing of any **Off-Site Borrow for Embankment.** The following tests will be performed on **Earthwork** materials by this laboratory:

- **Soil Classification** — AASHTO M145
- **Gradation** — AASHTO T11 and T27
- **Liquid Limit** — AASHTO T89
- **Plastic Limit/Plasticity Index** — AASHTO T90
- **Maximum Wear (LA Abrasion)** — AASHTO T96
- **Optimum Moisture Content** — AASHTO T99 and AASHTO T180
- **Maximum Dry Density** — AASHTO T99 and AASHTO T180
- **Coarse Particles Correction** — AASHTO T224
- **Grain-Size Analysis** — AASHTO T311

4.0 Materials Control

The types, sources, properties, and procedures for storing of materials to be used for each **Earthwork** category are as indicated below.

4.1 – Material Types and Source(s) of Supply

Earthwork material will be classified according to the following **Earthwork** Item categories:

- **Backfill Material for Muck Excavation**
- **Roadway Embankment Material**
- **Embankment Material under Bridge Foundations**
- **Backfill Material for Structures**
- **Backfill Material for Pipes**

4.1.1 – Backfill Material for Muck Excavation

The types and potential sources of material currently identified for use as **Backfill Material for Muck Excavation** are listed in the table below.

Backfill Material for Muck Excavation

Material Type	Material Source
Rock Excavate	▼ On-Site, Segment 1, Rte 99 Median ▼ On-Site, Segment 3, Rte 99 Median
Special Borrow	▼ On-Site, Segment 1 ▼ On-Site, Segment 2 ▼ Borrow Producer (TBD)

ABC Contractors will submit updated information on the types and sources of **Backfill Material for Muck Excavation as part of the "Weekly Schedule of Earthwork Materials Production Operations"** as outlined under Section 6.1 below.

4.1.2 – Roadway Embankment Material

The types and sources of material currently identified for use as **Roadway Embankment** are listed in the table below. At this time, sufficient quantities of **Earth Excavate, Rock Excavate, Ordinary Borrow, and Gravel Borrow** appear to be available **On-Site** for **Roadway Embankment** construction. If **Off-Site** sources of these materials are determined necessary by **ABC Contractors**, the table will be updated to reflect these sources.

Roadway Embankment Material

Material Type	Material Source
Rock Excavate	▼ On-Site, Segment 1, Rte 99 Median ▼ On-Site, Segment 3, Rte 99 Median
Earth Excavate	▼ On-Site, Segment 1, Rte 99 Median ▼ On-Site, Segment 3, Rte 99 Median
Ordinary Borrow	▼ On-Site, Segment 1 ▼ On-Site, Segment 2 ▼ On-Site, Segment 3 ▼ Borrow Producer (TBD)
Gravel Borrow	▼ On-Site, Segment 1 ▼ On-Site, Segment 3 ▼ Borrow Producer (TBD)
Special Borrow	▼ On-Site, Segment 1 ▼ On-Site, Segment 2 ▼ Borrow Producer (TBD)

ABC Contractors will submit updated information on the types and sources of **Roadway Embankment Material as part of the "Weekly Schedule of Earthwork Materials Production Operations"** as outlined under Section 6.1 below.

4.1.3 – Embankment Material Under Bridge Foundations

The types and potential sources of material currently identified for use as **Embankment Material under Bridge Foundations** are listed in the table below.

Embankment Material Under Bridge Foundations

Material Type	Material Source
Gravel Borrow	▼ *Borrow Producer (TBD)*
Crushed Stone	▼ *Borrow Producer (TBD)*

ABC Contractors will submit updated information on the types and sources of **Embankment Material under Bridge Foundations as part of the "Weekly Schedule of Earthwork Materials Production Operations"** as outlined under Section 6.1 below.

4.1.4 – Backfill Material for Structures

The types and potential sources of material currently identified for use as **Backfill Material for Structures** are listed in the table below.

Backfill Material for Structures	
Material Type	**Material Source**
Gravel Borrow	▼ Borrow Producer (TBD)

ABC Contractors will submit updated information on the types and sources of **Backfill Material for Structures as part of the "Weekly Schedule of Earthwork Materials Production Operations"** as outlined under Section 6.1 below.

4.1.5 – Backfill Material for Pipes

The types and potential sources of material currently identified for use as **Backfill Material for Pipes** are listed in the table below.

Backfill Material for Pipes	
Material Type	**Material Source**
Ordinary Borrow	▼ On-Site, Segment 1 ▼ On-Site, Segment 2 ▼ On-Site, Segment 3 ▼ Borrow Producer (TBD)
Gravel Borrow	▼ Borrow Producer (TBD)

ABC Contractors will submit updated information on the types and sources of **Backfill Material for Pipes as part of the "Weekly Schedule of Earthwork Materials Production Operations"** as outlined under Section 6.1 below.

4.2 – Material Properties

Earthwork material Source Characterization and Mix Designs will be performed as described below.

4.2.1 – Material Source Characterization Sampling and Testing

Earthwork materials will be fully characterized by ABC Contractors prior to their use in the intended location. **Grids** will be established and maintained at each **Earthwork** source location identifying **"Quadrants."** Each **Quadrant** will be numbered for Source Characterization identification **(e.g. SC-1, SC-2, SC-99, etc.)**. **ABC Contractors** will submit the results of Source Characterization testing for each Source **Quadrant** of **Earthwork** material to **Transportation Agency** a minimum of **two (2)** calendar days prior to placement of any material from the Source **Quadrant**. The following table identifies the specific Source Characterization testing that will be performed on all **Earthwork** materials.

Material Type	Material Source Characterization Sampling and Testing Characteristic Tested	Test Method	Test Frequency
Rock Excavate	Maximum Size (< 1m)	Visual/Tape	Minimum 4/Day/Quadrant
Earth Excavate (M1.01.0 Modified) (Contains Boulders < 600 mm)	Soil Classification	AASHTO M145	Minimum 4/Quadrant
	Liquid Limit	AASHTO T89	Minimum 4/Quadrant
	Plastic Limit/ PI	AASHTO T90	Minimum 4/Quadrant
	Maximum Dry Density (Method D)	AASHTO T180	Minimum 4/Quadrant
	Optimum Moisture Content	AASHTO T180 (Method D)	Minimum 4/Quadrant
	Coarse Particles Correction	AASHTO T224	Minimum 4/Quadrant
	Grain-Size Analysis	AASHTO T311	Minimum 4/Quadrant
Ordinary Borrow (M1.01.0)	Soil Classification	AASHTO M145	Minimum 4/Quadrant
	Liquid Limit	AASHTO T89	Minimum 4/Quadrant
	Plastic Limit/ PI	AASHTO T90	Minimum 4/Quadrant
	Maximum Dry Density	AASHTO T99 (Method C)	Minimum 4/Quadrant
	Optimum Moisture Content	AASHTO T99 (Method C)	Minimum 4/Quadrant
	Coarse Particles Correction	AASHTO T224	Minimum 4/Quadrant
	Grain-Size Analysis	AASHTO T311	Minimum 4/Quadrant
Gravel Borrow (M1.03.0)	Soil Classification	AASHTO M145	Minimum 4/Quadrant
	Gradation	AASHTO T11, T27	Minimum 4/Quadrant
	Maximum Dry Density	AASHTO T180 (Method D)	Minimum 4/Quadrant
	Optimum Moisture Content	AASHTO T180 (Method D)	Minimum 4/Quadrant

Continued on next page

(Continued from page B-29)

Material Type	Material Source Characterization Sampling and Testing Characteristic Tested	Test Method	Test Frequency
Special Borrow (M1.02.0)	Soil Classification	AASHTO M145	Minimum 4/Quadrant
	Gradation	AASHTO T11, T27	Minimum 4/Quadrant
	Plastic Limit/ PI	AASHTO T90	Minimum 4/Quadrant
	Maximum Dry Density	AASHTO T180 (Method D)	Minimum 4/Quadrant
	Optimum Moisture Content	AASHTO T180 (Method D)	Minimum 4/Quadrant
	Maximum Percentage of Wear (LA Abrasion)	AASHTO T96	Minimum 4/Quadrant
Crushed Stone (M2.01.0)	Soil Classification	AASHTO M145	Minimum 1/10,000 m^3
	Gradation	AASHTO T11, T27	Minimum 1/10,000 m^3
	Maximum Percentage of Wear (LA Abrasion)	AASHTO T96	Minimum 1/10,000 m^3
	Flat and Elongated Particles	ASTM D4791	Minimum 1/10,000 m^3

All **Earthwork** Source Characterization samples will be obtained randomly in accordance with ASTM D3665. The random sample locations within each Source **Quadrant** will be determined by **Station, Offset, and Elevation** within the Quadrant. All random sample locations will be documented on NETTCP Standard Test Report Form D3665 or D3665RNG. A copy of these Random Sampling Forms is located in Appendix __ (see Note, page B–17).

All **Earthwork** Source samples will be obtained following **AASHTO T2** and split in accordance with **AASHTO T248**.

All Source Characterization sampling and testing results will be documented on the following Standard Test Report Forms (TRFs):

Form No.	Source Characterization Standard Test Report Forms Form Title
M145-T89-T90	Classification of Soils (Includes Liquid Limit and Plastic Limit)
NETTCP T27	Sieve Analysis Test Report
NETTCP T96	Resistance to Degradation of Aggregate by Abrasion Test Report
T99	Moisture-Density Relations of Soils (Standard)
T180	Moisture Density Relations of Soils (Modified)
T311	Grain-Size Analysis of Granular Soil Materials
Rock Size	Evaluation of Maximum Rock Size in Earthwork Materials

A copy of the standard TRFs used for Source Characterization sampling and testing is located in Appendix __ (see Note, page B–17).

4.2.2 – Mix Designs

Earthwork Materials "Mix Designs" are **generally not** required. Source Characterization testing will determine whether specific **Earthwork** Materials sources meet the specification requirements for a particular material type required (i.e. **Ordinary Borrow, Gravel Borrow, Special Borrow, etc.**).

4.3 – Processing of Existing Materials

Where **On-Site excavate** proposed to be used for **Earthwork is found to not meet specification requirements**, the following procedures will be used to process or blend the material to meet the requirements of a **specific Earthwork Material Type**:

- A blended material "Mix Design" will be developed by the Project Laboratory.
- A stockpile of the **excavate**, not to exceed **one day's production**, will be blended with other material per the "Mix Design."
- At the completion of blending of the stockpile, samples will be obtained and Source Characterization testing will be performed to confirm that the blended material meets the specification requirements.

4.4 – Material Storage and Stockpiling

All **Earthwork** materials will be properly stored and maintained to prevent contamination or commingling of different materials. Storage and stockpiling procedures will be as follows:

- The limits of each storage or stockpile location will be clearly marked by **grade stakes** legibly marked indicating the corresponding Source Characterization sample number (i.e. SC-1, SC-2, etc.) contained in the Project "**Soils** Source Characterization Log."
- All active/working stockpiles of **Earthwork** materials will be characterized in accordance with Section 4.2.1 above a minimum of **once per week**.

5.0 Quality Control Sampling and Testing

The requirements and procedures to be used for QC sampling and testing of **Earthwork** are as indicated below.

5.1 – Lot and Sublot Sizes

Each Lot of **Earthwork** material will represent material from the same source, be produced or obtained under the same controlled process, and will possess normally distributed specification properties. Each Lot will be divided into Sublots of equal size in order to assess the Quality Characteristics of the Lot. The Lot size and corresponding Sublot size for each **Earthwork** Item are identified in the following table.

Earthwork Item	Earthwork Lot and Sublot Sizes Material Type(s)	Lot Size	Sublot Size
Backfill Material for Muck Excavation (Section 150.65)	▼ Rock Excavate ▼ Special Borrow	Total Quantity (m^3) of Backfill material type, per material Source, per Project	(See Table 5.4.1)
Roadway Embankment Material (Section 150.62 and Section 150.63)	▼ Rock Excavate ▼ Earth Excavate ▼ Ordinary Borrow ▼ Gravel Borrow ▼ Special Borrow	Total Quantity (m^3) of Embankment Material Type, per Material Source, per per Project Segment	(See Table 5.4.2)
Embankment Material Under Bridge Foundations (Section 150.66 and Section 150.67)	▼ Gravel Borrow ▼ Crushed Stone	Total Quantity (m^3) of Embankment material type, per material Source, per Project Segment	(See Table 5.4.3)
Backfill Material for Structures (Section 150.64	▼ Gravel Borrow	Total Quantity (m^3) of Backfill material type, per material Source, per Project Segment	(See Table 5.4.4)
Backfill Material for Pipes (Section 150.64)	▼ Gravel Borrow ▼ Ordinary Borrow	Total Quantity (m^3) of Backfill material type, per material Source, per Project Segment	Segment

5.2 – Random Sampling Plan

ABC Contractors will establish a Random Sampling Plan for QC sampling and testing for each Lot of **Earthwork** material prior to placement of the Lot. All **Earthwork** samples will be obtained randomly in accordance with ASTM D3665. The random sample location for each Sublot will be determined by **Station, Offset, and Depth** within the Sublot.

All random sample locations will be documented on NETTCP Standard Test Report Form D3665 or D3665RNG. A copy of the Random Sampling Forms is located in Appendix __ (see Note, page B–17). **ABC Contractors** will provide **Transportation Agency** a copy of the Random Sampling locations (i.e. completed NETTCP Form D3665) for each **Earthwork** placement operation, during the start of the placement operation each day.

5.3 – Sample Identification System

All **Earthwork** material samples will be clearly identified as follows:

- **Project Segment (i.e. 1, 2, 3)**
- Material Type (i.e. **Rock Excavate, Earth Excavate, Ordinary Borrow,** etc.)
- Sample Type (QC, CIT) and Random/Non-Random
- Lot Number and Sublot Number
- Sample Location (i.e. **Rte 99 Median, Borrow Subcontractor,** etc.)
- Station, Offset, and Depth
- Sample Date
- Technician or Inspector

5.4 – QC Sampling and Testing Requirements

The specific requirements (Quality Characteristics, frequency, location, methods) for QC sampling and testing of each **Earthwork** item are outlined in the tables below.

5.4.1 – Backfill Material for Muck Excavation

QC Sampling and Testing Requirements					
Quality Characteristic	**Test Method(s)**	**Lot Size**	**Sublot Size/ Test Frequency**	**Point of Sampling**	**Sampling Method**
Gradation	AASHTO T11 AASHTO T27	Total Quantity of Backfill Material Type / Source / Project Segment	1 Sample/ 5,000 m³ for 1st 50,000 m³ 10,000 m³ thereafter	From In-Place Lift of Backfill	Random T2, T248
Maximum Dry Density and Optimum Moisture Content	AASHTO T99 (Method C) AASHTO T180 (Method D)	Total Quantity of Backfill Material Type / Source / Project Segment	1 Sample/ 5,000 m³ for 1st 50,000 m³ and 1 Sample/ 10,000 m³ thereafter	From In-Place Lift of Backfill	Random T2, T248
Maximum Rock Size (< 1 m)	Visual/Tape	Total Quantity of Backfill Material Type / Source / Project Segment	Minimum 4/Lift/Day	From In-Place Lift of Backfill	Random Visual
Maximum Lift Thickness (< 300 mm)	Rod/Grade Stake	Total Quantity of Backfill Material Type / Source / Project Segment	Minimum 4/Lift/Day	From In-Place Lift of Backfill	Random Visual
In-Place Density and Moisture Content (Per Targets)	AASHTO T310 (Method B)	Total Quantity of Backfill Material Type / Source / Project Segment	1 Sample/1,000 m³, but not less than 1/Placement Location/Day	From Compacted Backfill	Random T310

5.4.2 – Roadway Embankment Material

QC Sampling and Testing Requirements

Quality Characteristic	Test Method(s)	Lot Size	Sublot Size/ Test Frequency	Point of Sampling	Sampling Method
Gradation	AASHTO T11 AASHTO T27	Total Quantity of Embankment Material Type / Source / Project Segment	1 Sample/ 5,000 m³ for 1st 5,000 m³ and 1 Sample/ 10,000 m³ thereafter	From In-Place Lift of Embankment	Random T2, T248
Maximum Dry Density and Optimum Moisture Content	AASHTO T99 (Method C) AASHTO T180 (Method D)	Total Quantity of Embankment Material Type / Source / Project	1 Sample/ 5,000 m³ for 1st 50,000 m³ and 1 Sample/ Segment thereafter	From In-Place Lift of Embankment 10,000 m³	Random T2, T248
Maximum Rock Size (< 1 m)	Visual/Tape	Total Quantity of Embankment Material Type / Source / Project Segment	Minimum 4/Lift/Day	From In-Place Lift of Backfill	Random Visual
Maximum Lift Thickness (< 600 mm for Earth Excavate)	Rod/Grade Stake	Total Quantity of Embankment Material Type / Source / Project Segment	Minimum 4/Lift/Day	From In-Place Lift of Embankment	Random Visual Maximum
Maximum Lift Thickness (< 300 mm for Ordinary Borrow and Gravel Borrow)	Rod/Grade Stake	Total Quantity of Embankment Material Type / Source / Project Segment	Minimum 4/Lift/Day	From In-Place Lift of Embankment	Random Visual
Maximum Lift Thickness (< 200 mm for Special Borrow)	Rod/Grade Stake	Total Quantity of Embankment Material Type / Source / Project Segment	Minimum 4/Lift/Day	From In-Place Lift of Embankment	Random Visual
In-Place Density and Moisture Content (Per Targets)	AASHTO T310 (Method B)	Total Quantity of Embankment Material Type / Source / Project Segment	1 Sample/1,000 m³, but not less than 1/Placement Location/Day	From Compacted Embankment	Random T310

5.4.3 – Embankment Material Under Bridge Foundations

QC Sampling and Testing Requirements					
Quality Characteristic	Test Method	Lot Size	Sublot Size/ Test Frequency	Point of Sampling	Sampling Method
Gradation	AASHTO T11 AASHTO T27	Total Quantity of Embankment Material Type / Source / Project Segment	1 Sample/ Placement Location	From In-Place Lift of Embankment	Random T2, T248
Maximum Dry Density and Optimum Moisture Content	AASHTO T99 (Method C) AASHTO T180 (Method D)	Total Quantity of Embankment Material Type / Source / Project Segment	1 Sample/ Placement Location	From In-Place Lift of Embankment	Random T2, T248
Maximum Stone Size (< 75 mm)	Visual/Tape	Total Quantity of Backfill Material Type / Source / Project Segment	Minimum 4/Lift/Day	From In-Place Lift of Backfill	Random Visual
Maximum Lift Thickness (< 300 mm)	Rod/Grade Stake	Total Quantity of Embankment Material Type / Source / Project Segment	Minimum 4/Lift/Day	From In-Place Lift of Embankment	Random Visual
In-Place Density and Moisture Content (Per Targets)	AASHTO T310 (Method B)	Total Quantity of Embankment Material Type / Source / Project Segment	Gravel Borrow: 1 Sample/ Each Lift/ Placement Location/Day Crushed Stone: N/A	From Compacted Embankment	Random T310

5.4.4 – Backfill Material for Structures

QC Sampling and Testing Requirements

Quality Characteristic	Test Method(s)	Lot Size	Sublot Size/ Test Frequency	Point of Sampling	Sampling Method
Gradation	AASHTO T11 AASHTO T27	Total Quantity of Backfill Material Type / Source / Project Segment	1 Sample/ 1,000 m^3	From In-Place Lift of Backfill	Random T2, T248
Maximum Dry Density and Optimum Moisture Content	AASHTO T99 (Method C) AASHTO T180 (Method D)	Total Quantity of Backfill Material Type / Source / Project Segment	1 Sample/ 1,000 m^3	From In-Place Lift of Backfill	Random T2, T248
Maximum Stone Size (< 75 mm)	Visual/Tape	Total Quantity of Backfill Material Type / Source / Project Segment	Minimum 4/Lift/Day	Minimum Lift of Backfill	Random Visual
Maximum Lift Thickness (< 150 mm)	Rod/Grade Stake	Total Quantity of Backfill Material Type / Source / Project Segment	Minimum 4/Lift/Day	From In-Place Lift of Backfill	Random Visual
In-Place Density and Moisture Content (Per Targets)	AASHTO T310 (Method B)	Total Quantity of Backfill Material Type / Source / Project Segment	1 Sample/100 m^3, but not less than 1/Lift/Day	From Compacted Backfill	Random T310

*5.4.5 – Backfill Material for Pipes**

QC Sampling and Testing Requirements					
Quality Characteristic	Test Method(s)	Lot Size	Sublot Size/ Test Frequency	Point of Sampling	Sampling Method
Gradation	AASHTO T11 AASHTO T27	Total Quantity of Backfill Material Type / Source / Project Segment	1 Sample/ 1,000 m³	From In-Place Lift of Backfill	Random T2, T248
Maximum Dry Density and Optimum Moisture Content	AASHTO T99 (Method C) AASHTO T180 (Method D)	Total Quantity of Backfill Material Type / Source / Project Segment	1 Sample/ 1,000 m³	From In-Place Lift of Backfill	Random T2, T248
Maximum Stone Size (< 75 mm)	Visual/Tape	Total Quantity of Backfill Material Type / Source / Project Segment	Minimum 4/Lift/Day	From In-Place Lift of Backfill	Random Visual
Maximum Lift Thickness (< 150 mm)	Rod/Grade Stake	Total Quantity of Backfill Material Type / Source / Project Segment	Minimum 4/Lift/Day	From In-Place Lift of Backfill	Random Visual
In-Place Density and Moisture Content (Per Targets)	AASHTO T310 (Method B)	Total Quantity of Backfill Material Type / Source / Project Segment	Gravel Borrow: 1 Sample/100 m of Trench, but not less than 1/Lift/Day Ordinary Borrow: 1 Sample/100 m of trench, but not less than 1/Placement Location/Day	From Compacted Backfill	Random T310

(*) Backfill Material for Pipes will include Gravel Borrow and Ordinary Borrow to be placed as follows:

Gravel Borrow – Gravel Borrow shall be used for bedding and backfilling of pipe to a point 600 mm above the top of pipe.

Ordinary Borrow – Ordinary Borrow shall be used to backfill the remaining depth of trench from the top of the Gravel Borrow to the top of the finished subgrade.

5.5 – QC Test Result Reporting

All QC sampling and testing of **In-Place Earthwork** materials will be documented on the following Standard Test Report Forms (TRFs):

Form No.	Form Title
NETTCP T27	Sieve Analysis Test Report
T99	Moisture-Density Relations of Soils (Standard)
T180	Moisture Density Relations of Soils (Modified)
T310	Soils In-Place Density and Moisture Content Test Report
Rock Size and Lift	Maximum Rock Size and Lift Thickness Test Report

A copy of the Standard TRFs used for QC sampling and testing of **Earthwork** materials is located in Appendix __ (see Note, page B–17).

ABC Contractors will retain a complete record of all completed **Earthwork** testing and inspection in accessible files which will be labeled as the "QC Record **System – Earthwork**." The QC Record **System** will contain the following QC documents:

- The approved **Earthwork** QC Plan
- Original copies of all completed **Earthwork** QC Standard Test Report Forms (including Random Sampling Forms)
- **Earthwork** Control Charts
- Summaries of all **Earthwork** test results
- Records of **Earthwork** Daily Production quantity information

ABC Contractors will also submit copies of all completed QC sampling and testing Report Forms to **Transportation Agency** with each *"Weekly QC Summary Report."*

5.6 – QC Sample Storage and Retention Procedures

All physical QC samples of **Earthwork** material will be split prior to testing in accordance with relevant AASHTO and NETTCP procedures.

The split sample portion of **Earthwork** material not used for testing will be retained in the original sample bag with proper identification. The split sample will be stored in the Sample Storage Room at the Laboratory which performed the test for a minimum of **60 Days** following testing.

6.0 Production Facility Management

The activities and procedures to be followed for QC during production of **Earthwork** materials are as indicated below.

6.1 – Schedule of Production Operations

ABC Contractors will provide Transportation Agency with a *"Weekly Schedule of Earthwork Materials Production Operations"* **on each Friday** prior to the week of production. A copy of the *"Weekly Schedule of Earthwork Materials Production Operations"* is located in Appendix __ (see Note, page B–17). The **weekly schedule of Production Operations** will identify the following:

- Material Type
- Material Source
- Production Location
- Estimated Production Quantity

ABC Contractors will track the actual production quantities on a daily basis and maintain a "Record of **Earthwork** Production" for each week. Copies of the "Record of **Earthwork** Production" will be made available to **Transportation Agency** in the *"Weekly QC Summary Report."*

6.2 – Production Facilities and Equipment

ABC Contractors and their Subcontractors and Suppliers will utilize conventional facilities and equipment for the production of all **Earthwork** materials. The major types of facilities and equipment to be utilized for On-Site and Off-Site production are summarized below.

Material Source Production Facility	Production Equipment
On-Site, Segment 1, 2, and 3	▼ Crawler Drills (Multiple, Various Make) ▼ Explosives and Blasting Mats ▼ Backhoes (Multiple, Various Make) ▼ Tractor/Dozers (Multiple, Various Make) ▼ Front End Loaders (Multiple, Various Make) ▼ End Dump Trucks (Multiple, Various Make)
Bedrock Industries, Bedrock, MA	▼ Tractor/Dozers (Multiple, Various Make) ▼ Rock Crusher ▼ Conveyor Belt ▼ Front End Loaders (Multiple, Various Make) ▼ End Dump Trucks (Multiple, Various Make)
Borrow Producer(s) (TBD)	▼ Tractor/Dozers (Multiple, Various Make) ▼ Front End Loaders (Multiple, Various Make) ▼ End Dump Trucks (Multiple, Various Make)

6.3 – Production Quality Control Activities

Production Quality Control (PQC) personnel will perform the following inspection, sampling, and testing activities at the frequencies indicated:

6.3.1 – Pre-Production QC Activities

- Conduct a Pre-Production Quality Control Audit at each **Earthwork Source** facility or location in **accordance with COMP Part XIII** prior to the start of **Earthwork** production.
- Maintain a reference **grid** system (Stations, Offsets) and boundaries for each **Earthwork Source** facility or location.
- **Determine and document random sampling locations of Earthwork materials at Production Facility in accordance with Section 4.2.1 above.**
- Obtain and properly label all Source Characterization (SC) samples of **Earthwork** materials at the frequencies indicated in Section 4.2.1 above.
- Transport **Earthwork** Source Characterization samples to the appropriate laboratory for testing.
- Ensure that Source Characterization sampling and testing is completed for each **Source Quadrant** prior to production/removal of material from the **Source Quadrant.**
- Inspect stockpiles to ensure that different **Earthwork** material types are not commingled or contaminated.

6.3.2 – Production QC Activities

- Visually monitor **Earthwork** materials production to ensure no change in material type within the **Source Quadrant.**
- Determine and document random sampling locations for each Sublot of **Earthwork** material produced.
- Obtain and properly label all PQC Field samples of **Earthwork** materials.
- Transport **Earthwork** PQC Field samples to the appropriate laboratory for testing.
- Perform PQC sampling and testing of **Earthwork** in accordance with the required test methods and frequencies outlined in Section 5.0 above.
- Prepare and sign standard Test Report Forms (TRFs) for each test completed.
- Maintain Production Facility Control Charts per Section 6.4 below.
- Monitor loading and transportation of **Earthwork** materials to ensure that the correct materials are being transported to the correct Project location.
- **Ensure that all Borrow Pits are neatly trimmed and finished to the minimum grades and dimensions required under Section 150.21 of the Standard Specifications.**
- Document Off-Site and On-Site **Earthwork** Production QC inspection activities and findings on standard QC Inspection Report Forms (IRFs) for each production location in accordance with Section 6.6 below.
- Identify Production Facility practices or materials which do not conform with the requirements of the relevant specifications and this QC Plan, and discuss appropriate corrective action with the Production Facility Superintendent and the QC Manager.

6.4 – Production Facility Control Charts

Control Charts may be used by **ABC Contractors** and their **Earthwork** material Producers to control production operations as described below.

6.4.1 – Off-Site Production Control Charts

Off-Site **Earthwork** material Producers will use Control Charts as needed to provide adequate control of their production operations. Prior to production, **ABC Contractors** will request each **Earthwork** material Producer to identify and submit examples of any Control Charts to be used. **ABC Contractors** will monitor and discuss the Control Charts with the Producer during **Earthwork** production.

6.4.2 – On-Site Production Control Charts

At this time, the application of Control Charts does not appear necessary for the production of On-Site Earthwork materials (i.e. Earth Excavate). However, in the event that Rock Crushing operations are established to produce Earthwork materials from On-Site Rock Excavate, Control Charts will be maintained to monitor control of the operation.

6.5 – Procedures for Corrective Action of Non-Conforming Materials

The following procedures will be followed for corrective action of non-specification materials encountered at the Source/Production facility:

- If contaminated materials are encountered, the limit of contaminated material will be identified. The contaminated material will be clearly marked off by signs labeled "No Use On **Rte 99**."
- If a change in material type is encountered within a Source Lot, additional sampling and testing will be performed to characterize the material. The disposition of such material will be as follows:
  - If the material meets specification requirements for another Project Material Type, then the material will be approved for use at an appropriate location for that Material Type.
  - **If the material can be blended with other material and subsequently meet specification requirements for a Project Material Type, then the material will be approved for use at an appropriate location for that Material Type.**
  - If the material does not meet specification requirements for a Project Material Type, the material will not be permitted for use on the Project. **ABC Contractors** will prepare a Non-Conformance Report (NCR) for such material **in accordance with Part X of the CQMP**. If the source of such material is On-Site (e.g. **Rte 99 Median**), **ABC Contractors** will dispose of the material Off-Site at an approved disposal site. If the source of such material is Off-Site (e.g. **Borrow**), the material will be clearly marked off by signs labeled "No Use On **Rte 99**."

6.6 – Production QC Inspection Reporting

All PQC inspection activities will be documented on the following standard QC Inspection Report Forms (IRFs):

Form No.	Form Title
PQC-PPA	Production QC - Pre-Production Audit Report
PQC-IDR	Production QC – Inspectors Daily Report

A copy of the Standard IRFs used for Production QC inspection of Earthwork materials is located in Appendix __ (see Note, page B–17).

7.0 Field Management

The activities and procedures to be followed for QC during placement of Earthwork materials are as indicated below.

7.1 – Schedule of Field Placement Operations

ABC Contractors will provide Transportation Agency with a "Weekly Schedule of Earthwork Materials Placement Operations" on each Friday prior to the week of placement. A copy of the "Weekly Schedule of Earthwork Materials Placement Operations" is located in Appendix __ (see Note, page B–17). The weekly schedule of Placement Operations will identify the following:

- Project Segment
- Placement Location
- Maximum Placement Depth
- Intended Placement Locations (Roadway, Station Limits)
- Material Type(s)
- Estimated Placement Quantities
- Material Source(s)

ABC Contractors will track the actual placement quantities on a daily basis and maintain a "Record of Earthwork Placement" for each week. Copies of the "Record of Earthwork Placement" will be made available to Transportation Agency.

7.2 – Field Placement Facilities and Equipment

ABC Contractors will utilize conventional facilities and equipment for the placement of all Earthwork materials. The major types of facilities and equipment to be utilized for Earthwork placement are summarized below for each type of Earthwork Item.

Earthwork Item	Placement Equipment
Backfill Material for Muck Excavation and Roadway Embankment Material	▼ End Dump Trucks (Multiple, Various Make) ▼ Tractor/Dozers (Multiple, Various Make) ▼ Vibratory Rollers - 50 Ton (Multiple, Various Make) ▼ Sheepsfoot Rollers (Multiple, Various Make) ▼ Water Trucks (Multiple, Various Make)
Embankment Material Under Bridge Foundations	▼ End Dump Trucks (Multiple, Various Make) ▼ Tractor/Dozers (Multiple, Various Make) ▼ Vibratory Rollers - 50 Ton (Multiple, Various Make)
Backfill Material for Structures and Pipes	▼ End Dump Trucks (Multiple, Various Make) ▼ Backhoes (Multiple, Various Make) ▼ Front End Loaders (Multiple, Various Make) ▼ Vibratory Sled Compactors (Various Make)

7.3 – Establishment of Compaction Rolling Pattern (Control Strips)

Control Strips will be constructed at the start of each **Earthwork** placement operation. A new Control Strip will be constructed whenever one of the following occurs:

- A new **Earthwork** Lot
- A change in weather
- A change in environment
- A PWL < 85% for 3 or more consecutive QC Test Results

The Control Strips will be used to establish an **effective rolling pattern** and the corresponding compactive effort required to achieve the **in-place Target Density (Maximum Dry Density) at Optimum Moisture Content**. The procedure to be followed for developing a Control Strip is outlined as follows:

7.3.1 - Earthwork Compacted by Rollers

Step A. – The Control Strip will be established on the first **lift** to be constructed within an area not to exceed **30m long by 15m wide**. The Strip will be divided longitudinally into 3 approximately equal Control Strip Sections.

Step B. – Material will be **loose** placed in the first Control Strip Section. The Field Superintendent, **Roller Operator(s)** and QC Field Inspector will visually assess **the moisture content of Earthwork** placed and determine whether additional moisture is needed to achieve **Optimum Moisture Content**.

Step C. – The Field Superintendent, **Roller Operator(s)** and QC Field Inspector will discuss and agree upon the proposed number and sequence of **passes and compactive mode(s) (static, vibratory)** to be used for the particular **Earthwork** being placed.

Step D. – The **Roller Operator(s)** will **compact** Control Strip Section #1 following the agreed upon number and sequence of **passes and compactive** mode(s).

Step E. – After **compacting** Control Strip Section #1, the Roller Operator will suspend operation. The QC Inspector will perform Contractor Information Testing (CIT) within Control Strip Section #1and obtain a minimum of three separate (Random or Non-Random) In-Place **Density and Moisture Content** readings.

Step F. – The Field Superintendent, **Roller Operator(s)** and QC Field Inspector will review the In-Place **Density and Moisture Content** readings for Control Strip Section #1 and determine any necessary adjustment to the number and sequence of **passes and compactive** mode(s).

Step G. - The Roller Operator will move on to Control Strip Section #2 and compact the material following the agreed upon number and sequence of passes and compactive mode(s).

Step H. – After compacting Control Strip Section #2, the Roller Operator will suspend operation and permit the QC Inspector to obtain a minimum of three separate random In-Place Density and Moisture Content readings in Control Strip Section #2.

Step I. – The CIT results for Control Strip Section #2 will be evaluated by the QC Inspector using Quality Level Analysis (QLA). The QLA must indicate a Percent Within Limits (PWL) of 85% or more for the In-Place Density and Moisture Content as indicated in Section 8.1 below.

Step J. – If the PWL for Control Strip Section #2 is 85% or greater, then the number and sequence of passes and compactive mode(s) used in Control Strip Section #2 will be established as the approved "Compaction Pattern" for the remainder of the placement operation on that day.

Step K. – If the PWL for Control Strip Section #2 is less than 85%, then Steps **F** through **I** above will be repeated on segment #3.

7.3.2 - Earthwork Compacted by Hand Operated Compacters

Step A. – The Control Strip will be established on the first lift to be constructed within an area not to exceed 24m long by 1m wide. The Strip will be divided longitudinally into 3 approximately equal Control Strip Sections.

Step B. – Material will be loose placed in the first Control Strip Section. The Field Superintendent, Compactor Operator and QC Field Inspector will visually assess the moisture content of Earthwork placed and determine whether additional moisture is needed to achieve Optimum Moisture Content.

Step C. – The Field Superintendent, Compactor Operator(s) and QC Field Inspector will discuss and agree upon the proposed number and sequence of passes and compactive mode to be used for the particular Earthwork being placed.

Step D. – The Compactor Operator will compact Control Strip Section #1 following the agreed upon number and sequence of passes and compactive mode.

Step E. – After compacting Control Strip Section #1, the Compactor Operator will suspend operation. The QC Inspector will perform Contractor Information Testing (CIT) within Control Strip Section #1and obtain a minimum of three separate (Random or Non-Random) In-Place Density and Moisture Content readings.

Step F. – The Field Superintendent, Compactor Operator and QC Field Inspector will review the In-Place Density and Moisture Content readings for Control Strip Section #1 and determine any necessary adjustment to the number and sequence of passes and compactive mode.

Step G. - The Compactor Operator will move on to Control Strip Section #2 and compact the material following the agreed upon number and sequence of passes and compactive mode(s).

Step H. – After compacting Control Strip Section #2, the Compactor Operator will suspend operation and permit the QC Inspector to obtain a minimum of three separate random In-Place Density and Moisture Content readings in Control Strip Section #2.

Step I. – The CIT results for Control Strip Section #2 will be evaluated by the QC Inspector using Quality Level Analysis (QLA). The QLA must indicate a Percent Within Limits (PWL) of 85% or more for the In-Place Density and Moisture Content as indicated in Section 8.1 below.

Step J. – If the PWL for Control Strip Section #2 is 85% or greater, then the number and sequence of passes and compactive mode(s) used in Control Strip Section #2 will be established as the approved "Compaction Pattern" for the remainder of the placement operation on that day.

Step K. – If the PWL for Control Strip Section #2 is less than 85%, then Steps **F** through **I** above will be repeated on segment #3.

7.4 – Field Quality Control Activities

Field Quality Control (FQC) personnel will perform inspection, sampling, and testing of Earthwork as described below.

7.4.1 – Pre-Placement QC Activities

- Check Earthwork line and grade for conformance to the design documents.
- Ensure that all erosion control measures are in place per approved plans and specifications.
- Ensure that the existing ground has been cleared, grubbed and stripped as specified in Section 101 and 120 of the Standard Specifications, prior to the placing of any Earthwork materials.
- Verify that all vegetation and other organic material is removed within and immediately adjacent to Earthwork placement location.
- Determine that excavations have been conducted to suitable founding material and grade.
- Where Earthwork material is to be placed against existing earth slopes steeper than 1 Vertical:3 Horizontal, ensure that the slope is broken up into steps of random width in order to provide a suitable bond between the existing ground and the new material.

7.4.2 – Placement QC Activities

- Ensure that Control Strips are constructed at the start of each Earthwork placement operation and as required thereafter per Section 7.3 above.
- Ensure that stumps, rubbish, sod, or other unsuitable materials are not incorporated in the Earthwork.
- Ensure that frozen Earthwork materials are not placed and that Earthwork is not placed on material frozen to a depth of over 75 millimeters.
- Ensure that correct Earthwork material type, per Section 4.1 above, is being delivered/received at the intended placement location.
- Ensure that Earthwork is placed in successive layers of uniformly distributed material and compacted over the full width of the cross-section.
- Monitor lift placement to ensure that maximum lift thicknesses specified in Section 5.4 above are not exceeded.
- Ensure that each lift of compacted Earthwork materials is visibly crowned to allow drainage of surface water and rainwater off the surface.
- Monitor maximum Rock Size and maximum Stone Size in Earthwork materials for conformance with the requirements of Section 5.4 above.
- Ensure that where Rock Excavate is placed, all voids and interstices are filled with an appropriate clean, granular Earthwork material type identified in Section 4.1 above.

- Ensure that the placed Earthwork moisture content is near the optimum moisture content established through Source Characterization testing (Section 4.2 above) and through the Control Strip (Section 7.3 above).
- Ensure that moisture is added when Earthwork material is too dry and that Earthwork which is too wet is dried by disking, harrowing, blading, rotary mixing, or other approved means so that proper compaction can be achieved.
- Monitor compaction patterns against the approved Control Strip "Compaction Pattern" and perform Contractor Information Testing (CIT) to ensure that the in-place density is near the target (100%) in-place density.
- Ensure that no rock in excess of 150 millimeters in its largest dimension is incorporated in the top 600-millimeter layer of Earthwork immediately below the finished Subgrade elevation.
- Perform check measurements during placement of Roadway Embankment Material final Subgrade Course (Special Borrow) in accordance with Section170.61 of the Standard Specifications to ensure proper depth and elevations of finished Subgrade within +/-15 millimeters.
- Ensure that Roadway Embankment Material 3 meters or more in height from the elevation of the Subgrade to the original ground elevation is constructed to the elevation of the proposed Subgrade and then allowed to settle for 60 days (or other period as specified by the Design Engineer) before the pavement structure is constructed thereon.
- Ensure that Embankment Material Under Bridge Foundations is placed in embankment prior to driving piles.
- Determine and document random sampling locations for each Sublot of Earthwork material placed.
- Obtain and properly label all Field samples of Earthwork materials.
- Transport Earthwork Field samples to the appropriate laboratory for testing.
- Perform In-Place QC sampling and testing of Earthwork in accordance with the required test methods and frequencies outlined in Section 5.0 above.
- Prepare and sign standard Test Report Forms (TRFs) for each test completed.
- Maintain Control Charts per Section 7.5 below.
- Document On-Site Earthwork QC inspection activities and findings on standard QC Inspection Report Forms (IRFs) for each On-Site placement location per Section 7.7 below.
- Identify On-Site Field placement practices or materials which do not conform with the requirements of the relevant specifications and this QC Plan, and discuss appropriate corrective action with the Segment Field Superintendent and the QC Manager.

7.5 – Placement Control Charts

Control Charts may be used by **ABC Contractors** to control placement operations for each of the **five Earthwork** Item categories as described below.

7.5.1 – Control Charts for Backfill Material for Muck Excavation

Since the placement of Backfill Material for Muck Excavation will generally involve smaller Earthwork quantities at sporadic locations, the application of Control Charts as a tool to provide field control for this Earthwork Item will yield limited QC information. Accordingly, Control Charts will not be used for placement of Backfill Material for Muck Excavation.

7.5.2 – Control Charts for Roadway Embankment Material

The placement of **Roadway Embankment Material** will involve large quantities of **Earthwork** within **each Project Segment.** Accordingly, Control Charts will be used as a tool to assist in the field control for placement of this **Earthwork** Item. Control Charts will be maintained for each Lot of **Roadway Embankment Material** by the QC Field Inspection staff. Control Charts will monitor the In-Place **Density and Moisture Content** of each Lot. The Mean QC Test results will be plotted according to daily subgrouping.

7.5.3 – Control Charts for Embankment Material Under Bridge Foundations

The placement of **Embankment Material Under Bridge Foundations** will involve large quantities of **Earthwork** within **each Project Segment**. Accordingly, Control Charts will be used as a tool to assist in the field control for placement of this Earthwork Item. Control Charts will be maintained for each Lot of **Embankment Material Under Bridge Foundations** by the QC Field Inspection staff. Control Charts will monitor the In-Place **Density and Moisture Content** of each Lot. The Mean QC Test results will be plotted according to daily subgrouping.

7.5.4 – Control Charts for Backfill Material for Structures

Since the placement of Backfill Material for Structures will generally involve smaller Earthwork quantities at various locations, the application of Control Charts as a tool to provide field control for this Earthwork Item will yield limited QC information. Accordingly, Control Charts will not be used for placement of Backfill Material for Structures.

7.5.5 – Control Charts for Backfill Material for Pipes

Since the placement of Backfill Material for and Pipes will generally involve smaller Earthwork quantities at various locations, the application of Control Charts as a tool to provide field control for this Earthwork Item will yield limited QC information. Accordingly, Control Charts will not be used for placement of Backfill Material for Pipes.

An example of the types of Control Charts which will be used for **Earthwork** placement is contained in Appendix __ (see Note, page B–17).

7.6 – Procedures for Corrective Action of Non-Conforming Materials

The following procedures will be followed for corrective action of non-specification materials encountered during placement of **Earthwork** Items:

- If the **Earthwork** material delivered/received at the placement location is not the correct Material Type (i.e. **Earth Excavate, Ordinary Borrow, Special Borrow**, etc.), it will be removed (if placed) and returned to the material source.
- If the **Earthwork** material delivered/received at the placement location is determined to be the correct Material Type, but does not meet specification requirements (e.g. ***gradation***), the limits of such material will be determined and it will be removed from the Project. Further receipt and placement of **Earthwork** material from the source will be suspended until Quality Control personnel have determined and corrected the cause of non-specification material.
- If new **Earthwork** material delivered/received at the placement location is commingled with existing On-Site non-specification material (e.g. ***Organic material, Other***), the limits of the commingled area will be determined and the commingled material will be removed and disposed of at an approved Off-Site location.
- ***If rock contained in Earthwork material is determined to exceed the specified size limits (e.g. Earth Excavate: <600 mm), appropriate equipment will be used to break the rock to conform to the maximum size requirements, or the rock will be removed and disposed of at an approved Off-Site location.***
- ***If the percentage of rock contained in Earthwork material is determined to exceed the specified limit (e.g. Earth Excavate: < 50%), the material will either be spread and blended with other material to conform with requirements or it will be removed.***
- If the ***lift thickness*** of **Earthwork** material is determined to **exceed** the specified limits, the ***lift*** will be ***cut using appropriate equipment and regraded to conform to the maximum lift thickness requirements.***
- If an individual QC test result for in-place ***density or in-place moisture content*** is outside the Engineering Limits contained in Section 8.6 below, placement of **Earthwork** material in the corresponding Sublot will be stopped. The following steps will be taken:
  - A Re-Test within 300 mm of the original random test location may be performed *only* if the cause of the results is believed to be due to sampling/testing error.
  - If a Re-Test is not warranted, or if a Re-Test is performed and the test results of the Re-Test are also outside the Engineering Limits, then three (3) additional random QC tests may be performed within the Sublot. The results of the 3 additional random QC tests will be evaluated as follows:
    - If all three tests are above the Lower Engineering Limit (**95%**), then the Sublot will be accepted and all of the test results (the original failing result + the 3 passing results) will be included for Quality Level Analysis.
    - If any one of the 3 additional random QC tests is below the Lower Engineering Limit (95%), then the Sublot will not be accepted. Field QC personnel will troubleshoot to determine if the failing results are due to:
    - Improper **compaction** procedure
    - Inadequate ***moisture content***
    - Other

- Once the cause of the failing test results is determined, appropriate corrective action will be taken (e.g. **Add moisture, Regrade and compact**. The failing **Earthwork** material will be **reworked** and three additional random QC tests will be performed for the Sublot. The results of the 3 additional random QC tests will be evaluated in accordance with the steps above until all 3 additional test results are within the Engineering Limits and the overall Percent Within Limits (PWL) for the Sublot equals or exceeds **85%.**

- **Earthwork** material that cannot be reworked to achieve the specified in-place **density and in-place moisture content** will be disposed of Off-Site.

7.7 – Field QC Inspection Reporting

All FQC inspection activities will be documented on the following standard QC Inspection Report Forms (IRFs):

Form No.	Form Title
FQC-MRIR	Field QC – Material Receiving Inspection Report
FQC-IDR	Field QC – Inspectors Daily Quality Surveillance Report*
FQC-EBIR	Field QC – Embankment and Backfill Inspection Report

* For Off-Site Earthwork Producer material only

A copy of the Standard IRFs used for Field QC inspection of **Earthwork** materials is located in Appendix __ (see Note, page B–17).

8.0 Acceptance of Work

Transportation Agency is responsible for acceptance of all work completed. Acceptance will be based on the results of sampling and testing along with visual inspection. The procedures for acceptance of all **Earthwork** Items will be as indicated below.

8.1 – Use of Quality Control Information for Acceptance

ABC Contractors' QC sampling, testing, and inspection results will be included in the acceptance determination provided that:

1) All QC procedures and activities are completed in accordance with the requirements set forth in this QC Plan.
2) Correlation Testing is conducted prior to production and placement of material.
3) All QC test results used in the acceptance determination are from random samples.
4) All QC information (sampling, testing, inspection) is Validated by **Transportation Agency.**
5) All QC test results for each Quality Characteristic are within the Engineering Limits identified in Section 8.6 below and the Percent Within Limits (PWL) identified in Section 8.7 below.

8.2 – Transportation Agency Acceptance Activities

Transportation Agency will perform Acceptance sampling, testing, and inspection at a minimum frequency of 20% of the QC activities outlined in this QC Plan. All Acceptance sampling and testing will be randomly performed independent of **ABC Contractors'** QC sampling and testing (i.e. No Split Samples). **Transportation Agency** will establish random locations for Acceptance sampling and testing in accordance with ASTM D3665. All random sample locations will be documented on NETTCP Standard Test Report Form D3665 or D3665RNG.

All physical Acceptance samples of material will be split prior to testing in accordance with relevant AASHTO and NETTCP procedures. The split sample portion of material not used for testing will be retained in the original sample bag with proper identification. The split sample will be stored in the Sample Storage Room at the Laboratory which performed the test for a minimum of **60** Days following testing.

8.3 – Correlation Testing Prior to Production

Transportation Agency Acceptance personnel and **ABC Contractors** QC Personnel will perform Correlation Testing on split samples prior to the start of construction. The purpose of the Correlation samples is to correlate the laboratory and field Acceptance testing results with the laboratory and field QC testing results to determine any between laboratory/field testing equipment variability before production begins. The results of Correlation testing will be documented on the relevant Standard Test Report Forms contained in Appendix __ (see Note, page B–17).

8.4 – Validation of QC Test Results

Validation is defined as the process of comparing two independently obtained sets of test results (i.e. **Transportation Agency**'s Acceptance test results to **ABC Contractors**' QC test results) during the progress of the work to determine whether they came from the same Population of material. The Validation will be performed through a statistical comparison of **Transportation Agency**'s Acceptance test results and **ABC Contractors**' QC test results. The statistical comparison of test results will be made using the test result standard deviations (***F-test*)** and the test result means (***t-test***) at a significance level of 0.01 and in accordance with the procedures contained in Appendix F of the *AASHTO Implementation Manual For Quality Assurance* (February 1996).

If the Validation results indicate that **ABC Contractors**' QC test results and **Transportation Agency**'s Acceptance test results came from the same Population, then the QC test results will be included with the Acceptance test results in the final acceptance determination as outlined in Sections 8.6 and 8.7 below. If the Validation results indicate that **ABC Contractors**' QC test results and **Transportation Agency**'s Acceptance test results are not from the same Population, then only **Transportation Agency**'s Acceptance test results will be used in the final acceptance determination.

8.5 – Quality Limits

Two types of Quality Limits will be applied to Validated QC and Acceptance testing results for the acceptance determination. These are "**Engineering** Limits" and "**Specification** Limits", which are defined as follows:

Engineering Limits – Absolute limits, established on the basis of Engineering study or judgment, which each individual test result for a given Lot must fall within. Work represented by individual test results which are above or below the Engineering Limits will not be accepted.

Specification Limits – Limiting values, established on the basis of statistical concepts and analysis, which are used to assess the Percent Within Limits (PWL) for a given Lot. The Mean of all individual test results for a given Lot must fall within the Specification Limits and the PWL must meet or exceed the specified PWL in order for the Lot to be accepted.

8.6 – Application of Engineering Limits in the Acceptance Determination

All work shall be performed to the lines, grades, cross-sections, dimensions, and material requirements set forth in the plans, specifications and this QC Plan. Each Lot of Earthwork material shall be uniform in character and reasonably close to the prescribed Target values and within the Engineering Limits for each of the Quality Characteristics outlined in the tables below. If a QC or Acceptance test result for an individual Sublot falls outside of the Engineering Limits, the material contained in the Sublot represented by the failing test result will be reworked or disposed of in accordance with the procedures outlined in Section 7.6 above.

8.6.1 – Backfill Material for Muck Excavation

			Targets and Engineering Limits		
Material Type(s)	Quality Characteristic		Lower Engineering Limit	Target	Upper Engineering Limit
Rock Excavate	Maximum Rock Size		-	-	1 meter
Special Borrow (M1.02.0)	Soil Classification (AASHTO M145)		A-3 or Portion of A-2 and A-1 per M1.02.0		
	(AASHTO T311)	150 mm Sieve	-	Per SC	100
		50 mm Sieve	90	Per SC	100
		4.75 µm Sieve	20	PerSC	65
		75 µm Sieve	0	Per SC	12
	Plasticity Index (AASHTO T90)		-	-	6%
	Maximum Percentage of Wear (LA Abrasion) (AASHTO T96)		-	-	50%
	Maximum Dry Density (W_{dm}) (AASHTO T180, Method D)		SC – 5 kg/m³	Per SC	SC + 5 kg/m³
	Optimum Moisture Content (W_{mo}) (AASHTO T180, Method D)		SC - 2%	Per SC	SC + 2%
	Maximum Lift Thickness		-	-	300 mm
	In-Place Density (AASHTO T310, Method B)		95% W_{dm}	100% W_{dm}	
	In-Place Moisture Content (AASHTO T310, Method B)		W_{mo} - 2%	(W_{mo})	W_{mo} + 2%

8.6.2 – Roadway Embankment Material

Material Type(s)	Quality Characteristic		Targets and Engineering Limits		
			Lower Engineering Limit	Target	Upper Engineering Limit
Rock Excavate	Maximum Rock Size		-	-	1 meter
Earth Excavate (M1.01.0 Modified)	Soil Classification (AASHTO M1145)		A-1, A-2-4, or A-3 + Up to 50% Boulders/Rock < 600 mm		
	Grain Size Analysis (AASHTO T311)	+ 6.3 mm Sieve	Per AASHTO M145	Per SC	Per AASHTO M145
		- 6.3 mm Sieve		Per SC	
	Liquid Limit (AASHTO T89)		-	-	Per AASHTO M145
	Plasticity Index (AASHTO T90)		-	-	Per AASHTO M145
	Maximum Dry Density (W_{dm}) (AASHTO T180, Method D)		SC - 5 kg/m^3	Per SC	SC + 5 kg/m^3
	Optimum Moisture Content (W_{mo}) (AASHTO T180, Method D)		SC - 2%	Per SC	SC + 2%
	Maximum Rock/Boulder Size		-	-	600 mm
	Maximum Lift Thickness		-	-	600 mm
	In-Place Density (AASHTO T310, Method B)		95% W_{dm}	100% W_{dm}	-
	In-Place Moisture Content		W_{mo} - 2%	(W_{mo})	W_{mo} + 2%

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*8.6.2 – **Roadway Embankment Material** (Continued from page B-52)*

Material Type(s)	Quality Characteristic		Targets and Engineering Limits		
			Lower Engineering Limit	Target	Upper Engineering Limit
Rock Excavate	Maximum Rock Size		-	-	1 meter
Ordinary Barrow (M1.010)	Soil Classification (AASHTO M1145)		A-1, A-2-4, or A-3 + Up to 50% Boulders/Rock < 600 mm		
	Grain Size Analysis (AASHTO T311)	+ 6.3 mm Sieve	Per AASHTO M145	Per SC	Per AASHTO M145
		- 6.3 mm Sieve		Per SC	
	Grain Size Analysis (AASHTO T311)	6.3 mm Sieve	Per AASHTO M145	Per SC	Per AASHTO M145
		-6.3 mm Sieve		Per SC	
	Liquid Limit (AASHTO T89)		-	-	Per AASHTO M145
	Plasticity Index (AASHTO T90)		-	-	Per AASHTO M145
	Maximum Dry Density (W_{dm}) (AASHTO T99, Method C)		SC – 5 kg/m^3	Per SC	SC + 5 kg/m^3
	Optimum Moisture Content (W_{mo}) (AASHTO T99, Method C)		SC - 2%	Per SC	SC + 2%
	Maximum Rock/Boulder Size		-	-	300 mm
	Maximum Lift Thickness		-	-	300 mm
	In-Place Density (AASHTO T310, Method B)		95% W_{dm}	100% W_{dm}	-
	In-Place Moisture Content (AASHTO T310, Method B)		W_{mo} - 2%	(W_{mo})	W_{mo} + 2%

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*8.6.2 – **Roadway Embankment Material** (Continued from page B-53)*

Material Type(s)	Quality Characteristic		Targets and Engineering Limits: Lower Engineering Limit	Target	Upper Engineering Limit
Special Borrow (M1.02.0)	Soil Classification (AASHTO M145)		A-3 or Portion of A-2 and A-1 per M1.02.0		
	Gradation (AASHTO T11) (AASHTO T27)	150 mm Sieve	-	Per SC	100
		50 mm Sieve	90	Per SC	100
		4.75 µm Sieve	20	Per SC	65
		75 µm Sieve	0	Per SC	12
	Plasticity Index (AASHTO T90)		-	-	6%
	Maximum Percentage of Wear (LA Abrasion) (AASHTO T96)		-	-	50%
	Maximum Dry Density (W_{dm}) (AASHTO T180, Method D)		SC - 5 kg/m^3	Per SC	SC + 5 kg/m^3
	Optimum Moisture Content (W_{mo}) (AASHTO T180, Method D)		SC - 2%	Per SC	SC + 2%
	Maximum Lift Thickness		-	-	200 mm
	In-Place Moisture Content (AASHTO T310, Method B)		95% W_{dm}	100% W_{dm}	-
	In-Place Moisture Content W_{mo} - 2%		W_{mo} - 2%	(W_{mo})	W_{mo} + 2%

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*8.6.2 – **Roadway Embankment Material** (Continued from page B-54)*

Material Type(s)	Quality Characteristic		Targets and Engineering Limits		
			Lower Engineering Limit	Target	Upper Engineering Limit
	Soil Classification (AASHTO M145)		Hard, durable stone and sand per M1.03.0		
Gravel Borrow (M1.03.0)	Gradation (ASHTO T11) (ASHTO T27)	12.5 mm Sieve	50	Per SC	85
		4.75 mm Sieve	40	Per SC	75
		300 µm Sieve	8	Per SC	28
		75 µm Sieve	0	Per SC	10
	Plasticity Index (AASHTO T90)		N.P.	N.P.	N.P.
	Maximum Dry Density (W_{dm}) (AASHTO T180, Method D)		SC - 5 kg/m^3	Per SC	SC + 5 kg/m^3
	Optimum Moisture Content (W_{dm}) (AASHTO T180, Method D)		SC - 2%	Per SC	SC + 2%
	Maximum Lift Thickness		-	-	300 mm
	In-Place Density (AASHTO T310, Method B)		95% W_{dm}	100% W_{dm}	-
	In-Place Moisture Content (AASHTO T310, Method B)		W_{mo} - 2%	(W_{mo})	W_{mo} + 2%

8.6.3 – Embankment Material Under Bridge Foundations

Material Type(s)	Quality Characteristic		Targets and Engineering Limits: Lower Engineering Limit	Target	Upper Engineering Limit
Gravel Borrow (M1.03.0)	Soil Classification (AASHTO M145)		Hard, durable stone and sand per M1.03.0		
	Gradation (AASHTO T11) (AASHTO T27)	12.5 mm Sieve	50	Per SC	85
		4.75 mm Sieve	40	Per SC	75
		300 µm Sieve	8	Per SC	28
		75 µm Sieve	0	Per SC	10
	Plasticity Index (AASHTO T90)		N.P.	N.P.	N.P.
	Maximum Dry Density (W_{dm}) (AASHTO T180, Method D)		SC - 5 kg/m^3	Per SC	SC + 5 kg/m^3
	Maximum Stone Size		-	-	75 mm
	Maximum Lift Thickness		-	-	300 mm
	In-Place Density (AASHTO T310, Method B)		95% W_{dm}	100% W_{dm}	-
	In-Place Moisture Content (AASHTO T310, Method B)		W_{mo} - 2%	(W_{mo})	W_{mo} + 2%
Crushed Stone (M2.01.0)	Rock Classification		Durable, crushed natural rock per M2.01.0		
	Flat and Elongated Particles (4:1) (ASTM D4791)		-	-	15%
	Gradation (AASHTO T11) (AASHTO T27)	Per Nominal Maximum Stone Size: 63 mm Sieve Through 1.18 mm Sieve	Per M2.01.0 Table 1	Per SC	Per M2.01.0 Table 1
	Maximum Percentage of Wear (LA Abrasion) (AASHTO T96)		-	-	45%
	Maximum Lift Thickness		-	-	300 mm

8.6.4 – Backfill Material for Structures

Material Type(s)	Quality Characteristic		Targets and Engineering Limits		
			Lower Engineering Limit	Target	Upper Engineering Limit
	Soil Classification (AASHTO M145)		Hard, durable stone and sand per M1.03.0		
Gravel Barrow (M1.03.0)	Gradation (AASHTO T11) (AASHTO T27)	12.5 mm Sieve	50	Per SC	85
		4.75 mm Sieve	40	Per SC	75
		300 µm Sieve	8	Per SC	28
		75 µm Sieve	0	Per SC	10
	Plasticity Index (AASHTO T90)		N.P.	N.P.	N.P.
	Maximum Dry Density (W_{dm}) (AASHTO T180, Method D)		SC - 5 kg/m^3	Per SC	SC + 5 kg/m^3
	Optimum Moisture Content (W_{mo}) (AASHTO T180, Method D)		SC - 2%	Per SC	SC + 2%
	Maximum Stone Size		-	-	75 mm
	Maximum Lift Thickness		-	-	150 mm
	In-Place Density (AASHTO T310, Method B)		95% W_{dm}	100% W_{dm}	-
	In-Place Moisture Content (AASHTO T310, Method B)		W_{dm} - 2%	(W_{mo})	W_{mo} + 2%

8.6.5 – Backfill Material for Pipes

Material Type(s)	Quality Characteristic	Targets and Engineering Limits		
		Lower Engineering Limit	Target	Upper Engineering Limit
Ordinary Borrow (M1.01.0)	Soil Classification (AASHTO M145)		A-1, A-2-4, or A-3	
	Grain Size Analysis (AASHTO T311) + 6.3 mm Sieve	Per AASHTO M145	Per SC	Per AASHTO M145
	Grain Size Analysis (AASHTO T311) - 6.3 mm Sieve		Per SC	
	Liquid Limit (AASHTO T89)	-	-	Per AASHTO M145
	Plasticity Index (AASHTO T90)	-	-	Per AASHTO M145
	Maximum Dry Density (W_{dm}) (AASHTO T99, Method C)	SC - 5 kg/m^3	Per SC	SC + 5 kg/m^3
	Optimum Moisture Content (W_{mo}) (AASHTO T99, Method C)	SC - 2%	Per SC	SC + 2%
	Maximum Rock/Boulder Size	-	-	300 mm
	Maximum Lift Thickness	-	-	300 mm
	In-Place Density (AASHTO T310, Method B)	95% W_{dm}	100% W_{dm}	-
	In-Place Moisture Content (AASHTO T310, Method B)	W_{mo} - 2%	(W_{mo})	W_{mo} + 2%

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*8.6.5 – **Backfill Material for Pipes** (Continued from page B-58)*

Material Type(s)	Quality Characteristic		Targets and Engineering Limits		
			Lower Engineering Limit	Target	Upper Engineering Limit
Gravel Borrow (M1.03.0)	Soil Classification (AASHTO M145)		Hard, durable stone and sand per M1.03.0		
	Gradation (AASHTO T11) (AASHTO T27)	12.5 mm Sieve	50	Per SC	85
		4.75 mm Sieve	40	Per SC	75
		300 µm Sieve	8	Per SC	28
		75 µm Sieve	0	Per SC	10
	Plasticity Index (AASHTO T90)		N.P.	N.P.	N.P.
	Maximum Dry Density (W_{dm}) (AASHTO T180, Method D)		SC - 5 kg/m^3	Per SC	SC + 5 kg/m^3
	Optimum Moisture Content (W_{mo}) (AASHTO T180, Method D)		SC - 2%	Per SC	SC + 2%
	Maximum Stone Size		-	-	75 mm
	Maximum Lift Thickness		-	-	150 mm
	In-Place Density (AASHTO T310, Method B)		95% W_{dm}	100% W_{dm}	-
	In-Place Moisture Content (AASHTO T310, Method B)		W_{mo} - 2%	(W_{mo})	W_{mo} + 2%

8.7 - Application of Quality Level Analysis in the Acceptance Determination

In addition to evaluation for conformance with the Engineering Limits identified above, the QC and Acceptance test results for each Lot of **Earthwork** material will be continuously evaluated using Quality Level Analysis (QLA) for the following Quality Characteristics:

- **In-Place Density**
- **In-Place Moisture Content**

The QLA for each Lot must indicate a Percent Within Limits (PWL) of **85%** or higher, based upon the Targets and Specification Limits indicated in the Table below, in order for the Work to be accepted by **Transportation Agency**.

Quality Level Analysis - Targets and Specification Limits

Quality Characteristic	Target	Specification Limits	
		LSL	USL
In-place Density	100% of W_{dm}	95% of W_{dm}	None
In-place Moisture	Optimum (W_{mo})	W_{mo} – 1%	W_{mo} + 1%

9.0 – Other Relevant contractor QC Plans

All Subcontractor and Producer QC activities for **Earthwork** are addressed within this QC Plan. There are no separate Subcontractor or Producer QC Plans included as Appendices at this time.

In the event that separate Subcontractor or Producer QC Plans are submitted for **Earthwork** activity, this **ABC Contractors** Quality Control Plan for **Section 1 – Earthwork** will be amended to include such Plans and resubmitted for **Transportation Agency** approval.

APPENDIX C

Sample Guidelines for Process Review/Product Evaluation Programs

See also review information in Appendix E, Technical Resources

California Division Office Procedure Memorandum

SUBJECT: Program Review/Product Evaluation Program

D6101 February 10, 1993

I. Table of Contents

II. References

23 CFR 640.115 Evaluations
FAPG G6021.2 Monitoring of Federal-aid Highway Design Projects
PM D6021 Design Monitoring Program
PM D6420 Construction Monitoring Program
PM D6520 Certification Acceptance Procedures
PM D1601 Program Review/Product Evaluation Program Guide

III. Purpose

This issuance supersedes the December 9, 1982, Procedure Memorandum "Process Review - Engineering Management Assessment Plan."

The purpose of this Division Office Procedure Memorandum is to describe the Program Review/Product Evaluation Program (PR/PE). The program provides a basis to fulfill requirements for the administration of the Federal-aid program as prescribed in regulations and directives. The program also evaluates the quality of the work performed and maintains lines of communication with responsible State and Local Agency representatives for the transfer of technology. Additionally, the program facilitates a continual evaluation of the Division's operations to ensure quality engineering and environmental processes and products.

IV. Background

In 1977, the California Certification Acceptance (CA) Plan was approved for Local Agency projects and amended in the same year to include all State-administered projects not on the Interstate system. This was the beginning of the California Division Office's process review program for conducting oversight responsibilities on CA projects. The process review program continued until 1991 when the Intermodal Surface Transportation Efficiency Act of 1991 was implemented. Major changes to Title 23 USC in program direction and permissive delegations to the States were introduced. A major provision of the new Act allowed the States to accept increased levels of authority that exempted various types of Federal-aid highway projects from FHWA project review and oversight. In response to the authority granted by this provision, FHWA entered into agreement with Caltrans, approved May 12, 1992, that provided Caltrans with the maximum delegation of authority allowed by law. This authority, granted through Stewardship agreements, delegated oversight authority to Caltrans for "Exempt" projects. In order to better address these program changes and new directions, it is FHWA's policy to increasingly rely on the State organizations for detailed, project-related actions. In keeping with this policy, the Program Review/Product Evaluation will be the California Division Office's primary mode of operation in carrying out its program oversight responsibilities. This does not preclude the use of other program monitoring techniques, including project-specific activities when appropriate.

Factors to be considered in advancing this policy include:

- Level of Federal Interest
- Technical Complexity
- Local Circumstances
- Risk Management
- Statutory Requirements

This Program Review/Product Evaluation Program will cover all activities for exempt projects on the National Highway System (NHS), projects administered under Certification Acceptance, and non-Title 23 activities for non-NHS projects.

V. Overview of the Program Review/Product Evaluation Program

The Program Review/Product Evaluation (PR/PE) program is an annual monitoring program that provides the Division Office with a control technique that documents and assures FHWA that State and local agencies are complying with Certification Acceptance procedures and Stewardship agreements. The PR/PE is performed through management reviews and special emphasis reviews. These reviews will evaluate the adequacy of the processes, procedures, and products developed by Caltrans in project development and construction activities. Based on these reviews, assurances can be established that a process is being implemented as intended and is producing the desired product. The purpose is to provide oversight and improvements of policies, procedures, techniques or methods on a statewide or area-wide basis. The PR/PE reviews can be broad in scope, covering a major activity or program such as conceptual studies, preliminary plan development, or PS&E preparation, or they can be more specific in scope, covering products or elements such as geometrics, pavement design/construction, safety, structures, etc. Occasionally a broad review could generate a specific review that could be addressed in an upcoming program or during the present year if it is deemed necessary.

The annual schedule for the PR/PE program will be developed through recurring and cyclical review activities. The recurring reviews are regulatory, statutory, or administrative requirements. As required by FAPG 640.115, the cyclical reviews are considered on a four-year basis and will be developed using special emphasis areas covering the State's administration of CA and exempt NHS projects. Detailed procedures for the development of the annual program schedule are discussed below.

The Program Review/Policy Coordination Section (PR/PC) will develop the annual engineering review schedule. The Planning, Research, and Environment (PR&E), Administration, and Right of Way (R/W) Offices will be responsible for developing respective annual review schedules in accordance with this D-memo with assistance from the Program Review/Coordination Section.

VI. Development Procedures for Annual Program Schedule

Prior to the beginning of each fiscal year, the Program Review/Product Evaluation Engineer(s) will develop the annual program schedule. The subject areas for review are identified from external sources (outside PR/PC) and from the list of special emphasis areas (see page C–5).

The external sources and special emphasis areas are explained below:

1. Washington/Region Offices. This source defines national and regional emphasis areas.

2. Division Office Management. Reviews initiated by the Division Office generally are identified as statewide policy concerns.

3. Caltrans Management. Caltrans Headquarters Offices (i.e., Office of Highway Construction, Office of Project Planning and Development, Office of Local Streets and Roads, etc.) provide input and historical reference for high risk, problem, or procedural areas that are a concern.

4. Design, Construction and Maintenance Monitoring Programs. These programs will produce historical data derived from design reviews, construction inspection reports, phase inspections, maintenance monitoring reviews, and related activities.

5. Special Emphasis Areas. This is a prepared list of potential major review elements for the PR/PE program (see page C-5). This list covers a multitude of phases in the development, design, and construction of Federal-aid projects, but is not considered all-inclusive.

The process the Division Office will use to identify reviews that will be beneficial to FHWA and Caltrans is called the "criteria assessment model." The criteria assessment model is a process that will help evaluate and objectively rate each potential topic to determine the need for a PR/PE review. The criteria assessment was developed to consider five distinct areas in advancing the Division Office's program. They are as follows:

- Level of Federal Interest
- Technical Complexity
- Local Circumstances
- Risk Management
- Statutory Requirements

(The Criteria Assessment Review Form is shown on page C-7.)

The Program Review/Policy Coordination Section will convene a select group of FHWA and Caltrans officials, considering available time/resources, to complete the selection of reviews. The composition of this group is to be considered flexible. The number of individuals comprising this group should be large enough, yet variable, to provide for objectivity in the relative numerical rankings which are assigned during the criteria assessment. Each potential review topic shall be addressed in an objective and impartial manner when utilizing the model. The criteria assessments should not be viewed as absolute for selection or non-selection of a particular review. However, there should be documentation to support selection or non-selection when the criteria assessment ranking is overridden by management or executive decision-making.

VII. Milestones

1. August 20: All external sources listed above should be solicited for any additional subject areas. The subject areas provided by the external sources will be combined with the Special Emphasis Area list to develop a working list of potential areas to be reviewed.

2. September 1: The working list is evaluated by the Program Review/Policy Coordination Section for those areas which should receive first consideration for PR/PE review. This evaluation should include historical data and input from the external sources. Those areas considered to be a problem area or concern are transferred to a "short list." Likewise, those areas where there is potential for improvement should also be included on the short list.

3. September 15: The "short list" is advanced through the criteria assessment model for an objective rating and priority ranking. The criteria assessment model also provides documentation of the relative ranking for those reviews that were not selected. Once the criteria assessment modeling is completed, the final list is provided to the Division Office and Caltrans management for any additional input on the proposed schedule.

4. October 1: The Annual Program Schedule including the review schedules developed by PR&E, Administration, and R/W shall be approved.

The reviews completed may not be considered for the special emphasis list for the ensuing three years. At the end of the four-year cycle, the group of subjects dropped from consideration are then returned to the special emphasis area list. This method is repeated yearly by adding the subjects reviewed four years prior.

VIII. Program Approval and Review Procedures

The annual program schedules proposed by the R/W, Administration, and PR&E offices shall be submitted to the Program Review/Policy Coordination Section for compilation by September 15 of each year. Each office will be responsible for documenting the selection process.

Prior to the submittal and approval of the annual program schedule, a proposed schedule of review topics and assignments will be circulated to all staff members to assess the impact on other engineering and administrative operations within the Division Office. The Program Review/Policy Coordination Section will then submit the final annual program schedule and proposed review assignments to the Assistant Division Administrator for review and approval.

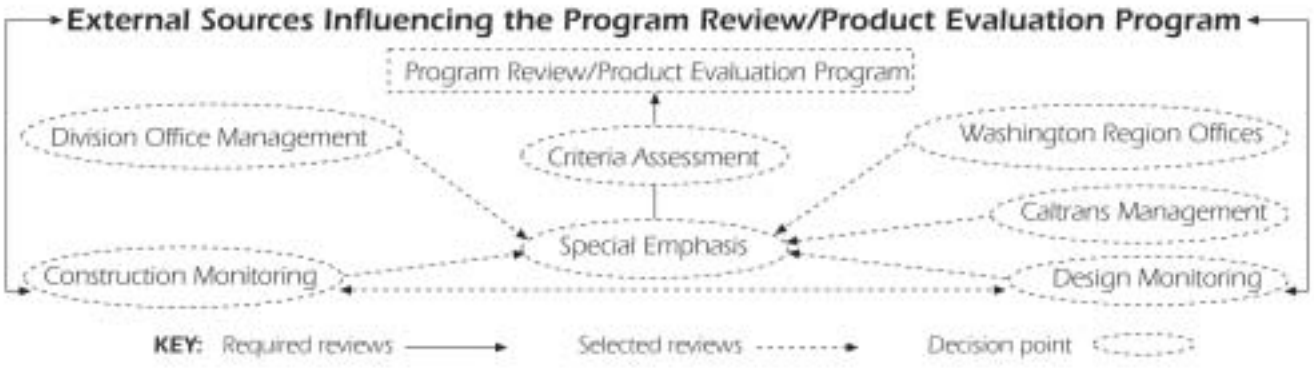
Establishment and conduct of reviews will be in accordance with the procedures outlined in Process Review Guide Memorandum D1601.

If at any time a review is considered to be unnecessary or excessive, cancellation or down scoping can be requested through the Chief, Program Review/Coordination Section. Documentation supporting the recommendation will be initiated by the Review Coordinator with final approval by the Assistant Division Administrator. While the review activities are proceeding, the PR/PE engineer(s) will coordinate and track all reviews performed by review teams.

Roger Borg
Division Administrator

Graphical Timeline

Working List Developed	Short List Developed	Criteria Assessment Completed	Schedule Approved
Aug 20	Sept 1	Sept 15	Oct 1



Special Emphasis Areas

Design

- Selection of 3R Strategy, Adequacy of Structural Section
- Accommodation of Safety Features, Roadside Safety
- Accommodation of the Handicapped
- Design Standards, Design Exceptions, Commitments to FHWA
- Drainage, Hydraulic Analysis, Floodplain Risk Assessment
- Foundations Analysis for Bridge Design
- Seismic Analysis
- Traffic Through Construction
- Traffic Management Planning
- Traffic Signals and Traffic Signal Systems
- Railroads and Utilities Agreements and Plans
- Bridge Widening and Rehabilitation
- Bridge Design
- Consultant Services
- Highway Landscaping
- Pavement, Pavement Selection
- Culverts and Retaining Walls
- Signs and Markings
- Safety Roadside Rest Areas
- Standard Plans
- HOV Lanes, Ramp Meters
- Plans, Specifications, and Estimates Approval of Local Agency Projects
- Oversight of Local Agency Delegations (Certification Acceptance)
- Federal-Aid Requirements
  - 50% Minimum Federal Funds
  - State Preference in the Selection of Materials
  - Materials Produced by Convict Labor
  - Local Hiring Preferences
  - Publicly Owned Equipment
  - Patented or Proprietary Products
  - Warranty Clauses
  - State-Owned or State-Furnished Materials
  - Salvage Credit
  - Public Interest Findings

Environment

- Public Involvement, Public Hearings
- Accomplishment of Mitigation Measures
- Noise Walls, Selection, Design, and Construction
- Processing of Local Agency Documents

Construction *(also see Contract Administration)*

- Grading and Drainage
- Subbase and Base
- Asphalt Concrete Pavements
- Portland Cement Concrete Pavements
- Signs, Signals, and Traffic Control Devices
- Guardrail and Median Barriers
- Traffic Safety in Work Zones (see 23 CFR 630.1010 (e))
- Bank and Slope Protection
- Bridges and Major Structures
- Culverts and Retaining Walls
- Materials Sampling and Testing
- Inspection/Project Administration by Consultants
- Oversight of Local Agency Projects
- Experimental Features/Projects
- OSHA Safety
- Bridge Deck Construction

Contract Administration (See Non-regulatory Supp. FAPG 23 CFR 635A, para. 8a)

- Determination of Contract Time
- Plan Development and Preparation of Specifications and Contract Provisions
- Estimating, Accuracy of the Engineer's Estimate
- Licensing and Bonding
- Advertising and Bid Opening
- Alternate Bids
- Bid Analysis and Award of Contract
- Project Staffing and Supervision
- Subcontracting (See 23 CFR 635.116 (b))
- Change Orders and Time Extensions
- Force Account Procedures, Equipment Rental Rates
- Progress Payments
- Liquidated Damages
- Claims
- Bidrigging, Suspension, and Debarment
- Oversight of Local Agency Projects
- Contract Provisions
  - Nondiscrimination, Nonsegregated Facilities
  - Payment of Predetermined Minimum Wage
  - Statements and Payrolls
  - Record of Materials, Supplies and Labor
  - Subletting or Assigning the Contract
  - Safety and Accident Prevention
  - False Statements
  - Implementation of the Clean Air Act and Federal Water Pollution Control Act
  - Buy America
  - Disadvantaged Business Enterprise Goals
  - On-the-Job Training
  - Cargo Preference
  - Noncollusion Certification
  - Changed Conditions
  - Indian Preference
  - Suspension and Debarment Certification
  - Restrictions Against Foreign Contractors
  - Termination

Administration of Federal-aid Projects

- Administration of Public Law Funds
- Administrative Costs
- Agreements and Program Delegation
- Document Coding
- External Audits
- Federal-aid Billing
- Final Vouchering
- Program Approval, Fiscal, and MMA
- Approved Administrative Rates

Right-of-Way

- Appraisals
- Business Relocation
- Local Agency Right-of-Way Program Activities
- Property Management
- Residential Relocation
- Right-of-Way Billing
- Acquisitions
- Legal Settlements and Court Awards
- Outdoor Advertising
- Utilities

EEO, Civil Rights, DBE and Labor Compliance (also see Construction)

- Title VI and EEO Requirements and Complaints
- Supportive Services
- DBE Certification

Planning and Research

- Ridesharing
- Certification of Metropolitan Planning Organizations
- Public Involvement

Traffic and Safety

- Section 402 Program Activities
- MUTCD Compliance

Consultant Services

- In Design
- In Construction

Criteria Assessment Review Form

SUBJECT AREA: _____ **FISCAL YEAR:** _____

The following decision factors shall be used in the process of evaluating the need for process review/product evaluations. Respond to each of the questions with a rating of 1 for low, 3 for medium, and 5 for high; the criteria assessment will summarize the ratings for each factor and subsequently determine the overall rating of all factors.

Level of Federal Interest		
How does it relate to the current emphasis areas(s)?		
What is the level of investment?		
What is the level of national concern?		
Technical Complexity		
What is the level of new or innovative technology?		
What is the level of experience for those involved in the process/product?		
What is the advocacy role in new or innovative technology?		
Local Circumstances		
What is the degree of obvious trends or concerns?		
To what extent are there known weaknesses?		
How does it relate to the length of time since the last review?		
Risk Management		
What is the risk element?		
What is the shareholders' stake?		
What is the opportunity to achieve substantive results?		
Statutory Requirements		
What are the risks of noncompliance?		
What are the strengths of statutory requirements?		
What is the degree of conflict if there is noncompliance?		
Total the ratings for the 15 items and divide the total by 15. Use the result as the overall rating.		
Overall Rating		

Illinois Division Office Guidelines for Conducting Process Reviews

The following is general guidance on how a typical process review should be conducted. This guidance is based on a compilation of "best practices" and recommendations from management at both FHWA and IDOT. Flexibility of these guidelines is necessary because many action items vary depending on the topic of the process review.

The guidance has been organized into the following categories:

1. Selection of Process Review Topics
2. Selection of Team Members/Identification of Review Team Leaders
3. Development of Purpose and Scope
4. Guideline Development
5. District Reviews
6. Statewide Close-out Report
7. Conducting the Statewide Close-out Meeting
8. Evaluation of Process Review Quality
9. Follow-up to Process Review Observations
10. Attachments
    - Sample Statewide Close-out Report
    - Sample Process Review Letterhead for Transmitting Process Review
    - Process Review Flowchart
    - Summary of Duties: Process Review Program Coordinator

Selection of Process Review Topics

The current format of inviting IDOT and FHWA management together for an annual joint meeting in early September is the preferred method of selecting topics for process reviews. This September meeting is desirable in order for the review topics to be finalized by October 1 and announced and advertised at the annual IDOT Program Development Engineer's Meeting (September/October) and the Project Implementation Engineer's Meeting (January/February). The format of the annual process review topic selection meeting should remain the same as in the past. All IDOT Deputy Directors should attend as well as a representative from each IDOT Central Office Bureau. FHWA should be represented by the Division Administrator, Assistant Division Administrator, Team Leaders, and program specialists (i.e., bridge engineer, environmental specialist, etc.). Others interested in attending should be invited to listen to the discussion in a gallery format.

The FHWA and IDOT process review program coordinators will be responsible for collecting, organizing, and distributing a proposed list of topics. IDOT and/or FHWA personnel should submit topics to either of the process review program coordinators. These submittals should consist of a briefing (one or two paragraphs) explaining why the topic should be chosen, an example of any specific incidences for correction, and what outputs are anticipated from the process review (specification change, new policy, new product, etc.). The target deadline for submission of topics should be August 15 of each year. The process review program coordinators should distribute the list of potential topics (with briefings) to all IDOT Bureau Chiefs, Deputy Directors, and FHWA management at least two weeks prior to the annual topic selection meeting. This will allow for better preparation and evaluation of topics and will eliminate some of the "on-the-spot" decision making.

Before the annual topic selection meeting, all FHWA engineers/specialists will meet to discuss the proposed topics and provide feedback to management on recommended review activities. It is recommended that appropriate IDOT staff meet prior to the annual meeting for the same purpose.

FHWA transportation engineers and specialists should be gathering information for process review topics throughout the year from the Districts. The Districts should be solicited for topics on an informal basis, when the transportation engineers are in the Districts. At every FHWA Engineers/Specialists meeting (generally held every two months), there should be time set aside for discussion of future process review topics. A current list of possible topics (with briefings) should be kept on the common directory of FHWA's LAN system for review and comment.

IDOT should perform similar activities for soliciting topics from the Districts. In the past, memos were sent to all District Bureaus of Project Implementation asking for process review proposals. Other District Bureaus have indicated that they would also like to have an opportunity for

input. It is recommended, therefore, that the Central Office continue to ask for topics from the Districts, but the invitation should be extended to all District Bureaus, including Program Development and Operations.

Selection of topics should be based on real or perceived opportunities for improvement, and consideration should be given to a fairly uniform distribution of review topics among the various IDOT Bureaus or program areas. Final topic selection should be based on consensus of both IDOT and FHWA management. The number of reviews chosen should take into consideration the workload on IDOT Districts, Central Office, and FHWA staff. The Districts have indicated they can handle one or two reviews per Bureau per year. There was general agreement that the number of engineering process reviews conducted per year should be five or six.

Selection of Team Members/Identification of Review Team Leaders

Teams should be selected shortly after the annual process review topic selection meeting in order to get the reviews organized and guidelines developed in a timely manner. Traditionally, teams have not been selected until December with the first team meeting not held until the first part of the following year. This leads to a loss of several months during the winter when most of the Districts have indicated they would have more time to devote to a process review.

Process reviews have been conducted in the past with District personnel on the review teams. Generally, this has been the exception rather than the rule. District representation has proven to be very beneficial in past reviews. Not only does it benefit the statewide review team, but it benefits the District through observation of other Districts' practices. All Districts should be given the opportunity to participate on the review teams. Solicitation of District team members should be done by IDOT Central Office management with input and recommendations from the individual IDOT and FHWA team leaders. Although the Districts would like the opportunity to participate, several Districts have indicated that unless there is a strong interest in the topic, they may not want to commit their staff to be on the reviews due to limited staff resources. This should be a consideration when discussing team composition.

Generally, two or three FHWA staff with two or three IDOT Central Office staff should make up a core process review team. District personnel should be considered for inclusion as discussed above. Efforts should be made to ensure that all affected IDOT Bureaus are represented on the team, and additional team members could be included for specific tasks throughout the review if necessary. Each team should have an assigned FHWA and IDOT team leader to lead the review. FHWA management should be responsible for assigning the FHWA process review team leaders and team members, with individual interest taken into account. The IDOT Deputy Directors should be responsible for selecting the IDOT team leaders and team members in consultation with the appropriate Bureau Chiefs.

The FHWA and IDOT process review team leaders should have substantial knowledge in the review area. No individual should be a team leader on more than one review per year. It is the responsibility of the review team leaders to organize the review and keep the review on track and within scope. FHWA management should choose an FHWA advisor if the assigned FHWA review team leader needs additional guidance and expertise in coordinating a particular process review.

The IDOT team leader should be selected as a central point of contact for IDOT and should provide guidance on the direction that the Central Office wants to take with the review. Communication between the IDOT team leader and IDOT management is essential to ensure that all affected Bureaus are informed of the progress and preliminary observations of the review.

A District contact person should be selected by the District Engineer for each of the Districts to be reviewed. This individual will serve as the focal point for all communication concerning the process review at the District level and be responsible for arranging a meeting time and place for the District review and coordinating with all District personnel involved in the review. The District contact person would also be responsible for gathering information on projects to be reviewed.

Purpose and Scope

The development of a purpose and scope is very important in defining a process review. As discussed above (in "Selection of Process Review Topics") a briefing should accompany a topic suggested for review which provides a description of the objective, an example of any specific incidences for correction, and the intension of the suggested review. This briefing will serve as the framework for the development of the purpose and scope.

In addition to the topic briefing, additional discussions held at the annual process review topic selection meeting should provide a substantial basis for the process review team to establish a purpose and scope. Based on the observations of the initial District review (pilot review), the team should reassess the purpose and scope to determine if they are on the

right track to accomplish the goals of the review. If the team believes it is necessary to deviate from the intended purpose and scope identified through the topic briefing and the annual topic selection meeting, the team should meet with management before proceeding.

A review team should develop a finalized "Purpose" which clearly states the objective of the review. If the review includes a specific issue for improvement, the purpose should include background information and desired changes. As a note, it was often repeated through the interview process that the review teams should stay better focused on the review's original purpose throughout the entire review.

The Scope of Review should generally include the number of Districts involved, the number of projects to be reviewed, the specific action items (key steps in the process) to be reviewed in each District, and the review schedule, all as applicable. The "Scope" should also identify which District and/or Central Office Bureaus will be directly involved in the review. The need to re-analyze the scope after the pilot review can be determined by the review team on a case-by-case basis.

The number of Districts reviewed should be three or four; however, this also depends on the topic of the review. The process review teams should consider informally collecting key information from as many other Districts as possible. This can be done through telephone conversations, brief office visits, or by requesting that the Districts complete certain parts of the review guidelines. Districts should be chosen based on the availability of projects or action items related to the review topic. Districts that have limited or no projects available for review or Districts that have only limited involvement in the particular review topic should not be selected, if possible. The IDOT and FHWA process review program coordinators should monitor District selections of the various process review teams. Efforts should be made to ensure that no particular District is overburdened with too many process reviews while other Districts do not get reviewed at all. When scoping a review, consideration should also be given to selecting the Chicago Department of Transportation as a potential review candidate.

The number of projects selected for review in a particular District certainly depends on the topic. However, as a rule of thumb, a minimum of three projects should be selected for review. It is important to note that the more projects reviewed in a District, the more statistically valid the observations and recommendations will be.

Many process reviews will also require an IDOT Central Office review in order to assess the procedures and responsibilities of the Central Office staff. Since IDOT Central Office has the primary responsibility of policy development and project oversight, it is very important that the appropriate Bureaus be reviewed as a part of the overall process. It is suggested, but not necessary, that the Central Office review be conducted prior to any of the District reviews. Generally, an individual Central Office report would not need to be developed; however, the significant observations and recommendations should be included in the statewide close-out report for discussion and resolution.

Guideline Development

The first step in developing guidelines is to perform a search of any existing process review files that may be used or modified. There is no sense in "re-inventing the wheel" if it is not needed. The second step is to check with other State DOTs and FHWA Divisions to see if they have done similar reviews for which guidelines may be available for reference.

When preparing guidelines, every attempt should be made to avoid simple yes/no questions. Questions should be phrased to produce comprehensive feedback and be clear enough for everyone involved in the review to easily understand. The Districts often research answers ahead of time so it is important to be very clear as to what is really wanted from them. Guidelines should generally include the following: Purpose of Review, Scope of Review, Identification of the Review Team, and finally the Review Questions. Upon completion of the draft review guidelines, they should be placed in the common directory of the FHWA LAN system. The FHWA process review team leader should e-mail all appropriate personnel in the Division Office to alert them that the guidelines are available for review and comment. A two-week time frame for comments is adequate. The IDOT process review team leader should be responsible for ensuring that the guidelines are reviewed by proper IDOT personnel.

Upon finalizing the guidelines, the IDOT and FHWA team leaders will co-sign a cover letter to the FHWA Division Administrator and the IDOT Director of Highways with attention to the appropriate Deputy Director(s). The newly developed standard process review letterhead will be used for this transmittal as well as all other process review correspondence (see page C–17 for sample). A copy of this letter should be sent to all affected Bureau Chiefs in the Central Office. The time frame for formal distribution of guidelines should be at least 30 days prior to the first planned District review. The review guidelines should be transmitted to the Districts selected for review as an attachment to a formal cover letter to the District Engineer co-signed by the two team leaders.

The guidelines should also be sent to all of the other Districts not selected for review. This should be done through a formal cover letter to the District Engineer with instruction that it is for informational purposes only. If the review team determines that it is desirable to obtain certain information from Districts not selected for specific review, the cover letter should include a request that the appropriate sections of the guidelines be completed and returned to the team.

After sending guidelines to the Districts selected for review, the process review team should follow up approximately two weeks prior to the District review to remind the District of the upcoming review and to ensure there are no questions concerning the guidelines.

A copy of the final version of the guidelines should be placed in FHWA's electronic process review file. This file should be maintained by the FHWA process review program coordinator.

District Reviews

District reviews are intended to establish a statewide trend for the particular topic under review. A District review should consist of Entrance Meeting, Interviews and Project Reviews (either ongoing projects or archived project files), Close-out Meeting and District Report.

From past experience, too many people conducting a District review can cause a loss in efficiency; therefore, the number of team members participating in a District review should be kept to three or four. It is important that there is an appropriate mix of both IDOT and FHWA team members on the reviews. All process review team members should attend the first (pilot) District review in order for the entire team to be familiar with what is expected in conducting subsequent reviews. The FHWA and IDOT team leaders should attend all the District reviews for continuity purposes.

Entrance Meeting

Entrance meetings are highly recommended in order to alert District management of the team's presence in the District and to explain the purpose and scope of the review. During this entrance meeting, a tentative time should be established for conducting the close-out meeting. Most Districts have indicated they want an entrance meeting with the District Engineer present along with all the affected Bureau Chiefs (or delegated substitutes). If the District Engineer is not available for an entrance meeting, it is important to at least inform him/her of the review team's presence in the District.

District Interviews and Project Reviews

The District interviews should be consistent throughout the course of the review to make sure the same information is obtained from each District. The process review guidelines should provide a good format for the interviews, and the Districts should review the guidelines in advance to be prepared to provide the desired information.

The purpose and scope of the review will define the number of projects to be reviewed in a District. Enough projects should be reviewed in order to get a good sample of the total projects fitting the topic of review. Usually three or more projects will establish a good trend of how the process under investigation is handled in the District. Because Districts spend a lot of time gathering project files for the review, careful project selection is important so as to not cause unnecessary project file search for the Districts.

Upon completion of interviews and project reviews, a preliminary report of observations should be drafted for use at the District close-out meeting.

District Close-out Meeting

If at all possible, the District Engineer should be at the District close-out meeting. The close-out meeting should be held before the team leaves the District and should be at a time when the District Engineer and the affected Bureaus can be represented. This meeting should cover all the observations the team made during the review. However, minor observations can be discussed and resolved informally and do not necessarily need to be included in the District report. During the close-out meeting, the team should discuss which observations are isolated incidences (i.e., occurred on only one project), which observations were found to occur only in that District, and which observations are of statewide concern and will be included in the statewide report. Generally, the observations of statewide concern are issues found in several Districts or issues that involve a Central Office function.

District Report

The purpose of the District report is to summarize the results of the District review and to document the team's observations and recommendations and the comments from the District. All Districts have indicated they want a written report in order to document the District review.

The review team should develop a draft District report within one week of the District review while the observations and discussions of the review are fresh in the minds of the review team as well as the District. The final District report should be completed and sent to the District as soon as possible but within 30 days of the review.

The format of the District report should be standardized as much as possible, similar to the statewide close-out report. Using a newly developed standard reporting form (see page C–16 for sample), the report should include the following in this recommended order:

1. Title of Review
2. Purpose of Review
3. Scope of Review (including projects reviewed)
4. Team Members
5. District Staff involved
6. Executive Summary (optional but recommended)
7. Observations, including "best practices" in order of significance - each observation should have a recommendation (The use of "Observation" is preferred over " Finding")
8. Conclusion (optional)
9. Attachments (supporting documents, project information, etc.)

The FHWA and/or IDOT review team leader should ensure that all team members and the District have a chance to review the draft report before the final copy is released. The final version of the District report should be sent by formal cover letter to the District Engineer with a copy sent to all team members and others (if applicable) who participated in the review. The letter should be co-signed by the FHWA and IDOT team leaders, using the newly developed process review letterhead.

Statewide Close-out Report

The purpose of a statewide close-out report is to summarize the results of the process review, document statewide observations found in the Districts and to document the resolutions discussed at the statewide close-out meeting. Observations in the report can be either positive or negative. The review team should provide recommendations in the report that will resolve or improve the documented observations. The report also serves as an avenue to share "best practices" in Illinois as well as from other states, if applicable.

The newly developed standard reporting form should be used for the statewide close-out report (similar to the District reports). The review team should complete an initial draft of the statewide close-out report within 30 days of the last District review. As a note, this will require finalization of the last District report concurrently with the preparation of the initial draft statewide report. This is necessary in order to complete the entire review by the November 30 target date.

Close-out reports can often get to be fairly lengthy documents. Therefore, there is a need and a clearly expressed desire to provide an executive summary of the process review. The executive summary should be concise and should provide information including purpose, scope, major observations, and recommendations.

Observations in a close-out report should be arranged in order of priority and significance. If the team considers an observation to be significant, it should be reported and addressed. There is no maximum number of observations in a report.

The format of the statewide close-out report should be standardized as much as possible. Using the new standard reporting form, the report should include the following in this recommended order:

1. Title of Review
2. Purpose of Review
3. Scope of Review
4. Identification of Team Members
5. Executive Summary
6. Observations, including "Best Practices," in order of significance—each observation should have a recommendation
7. Conclusion (optional)
8. Attachments (supporting documentation, example specifications, graphs, photos, etc.)

Upon completion of the initial draft statewide close-out report, the FHWA review team leader should ensure that the appropriate FHWA staff are provided an opportunity to review the report and provide comments. This should include all affected specialists, engineering team leaders, and the Assistant Division Administrator. The recommended procedure (internal to FHWA) is to place the initial draft report in the common directory of the FHWA LAN system and e-mail all engineers and affected specialists to inform them of the availability of the draft report for comment. A set time frame for review of the initial draft report of two

weeks should be adequate. The IDOT team leader is expected to coordinate all necessary reviews at the IDOT Central Office.

The final draft version of the statewide close-out report should be sent by formal cover letter to the Director of Highways, with attention to the Deputy Director(s) and to the FHWA Division Administrator. The cover letter should be co-signed by the FHWA and IDOT review team leaders using the newly developed process review letterhead for the official transmittal. A copy of the cover letter and attached statewide close-out report should be sent to all affected Central Office Bureau Chiefs and to the process review team members.

Recommendations to improve the content of process review statewide close-out reports include the following:

- Use statistics whenever possible to justify observations (i.e., "In 7 out of 9 Districts, this procedure was followed...etc.").
- Recommendations should have substance and have specific actions or products ready for recommended implementation. Do not just hand over the issue to IDOT.
- Whenever possible, obtain information from other states on their processes, procedures, etc. These can be shared as "best practices" (sample specifications, procedures, forms, etc.).
- Use the term "Observation" rather than "Finding."
- Material to back up the observations should be included as attachments to the statewide report. Examples include charts, graphs, sample specifications, checklists, etc.
- The District reports do not need to be included as attachments to the statewide report.

Conducting the Statewide Close-out Meeting

Timely scheduling of statewide close-out meetings is critical for the proper dissemination of process review results. For example, it is important to close out all design-related process reviews by the end of August so that the results can be shared and discussed at the annual Program Development Engineers meeting in mid-September. Likewise, for construction-related process reviews, the close-out meeting should be held by the end of November. This will allow for the discussion of process review results at the annual Construction Engineer's meeting and the annual Materials Engineer's meetings scheduled in January and early February.

The IDOT review team leader should contact the appropriate Deputy Director(s) and the affected Bureau Chiefs to identify possible statewide close-out meeting dates. The FHWA team leader should likewise coordinate with the Division Administrator and the Assistant Division Administrator to determine possible meeting dates. One or two days before the statewide close-out meeting, the review team leaders should follow up with appropriate management as a reminder in order to assure attendance.

For those process review recommendations perceived to be highly controversial or considered a tough sell, it is recommended that a preliminary close-out meeting be held. This meeting should be held with IDOT Bureau Chiefs, Section Chiefs, and/or other appropriate IDOT staff, as well as FHWA Team Leaders/Specialists to agree on tentative resolutions. The need for a preliminary close-out meeting should be left to the discretion of the FHWA and IDOT review team leaders.

Close-out meetings should be as brief as possible and should not exceed two hours. Multimedia communication such as slides, photographs, videos, and computer generated presentations should be used whenever possible to increase the effectiveness of focusing attention on the observations and recommendations. Presentations which consist of a stand-alone reading of the observations and recommendations directly from the statewide close-out report are discouraged. In order to stress that these process reviews are joint efforts, presentation of observations should be done by the entire team, including both IDOT and FHWA team members.

At the end of the statewide close-out meeting, the FHWA and IDOT review team leaders should summarize the proposed resolutions made during the meeting. This is necessary to ensure that everyone in attendance has a complete understanding of what was agreed upon. It is also important that the review team leaders ensure that someone is assigned to take meeting minutes for the documentation of agreements. In the past, some close-out meetings were conducted and concluded without proper documentation, and later discussions resulted in confusion and uncertainty of the agreements reached at the meeting.

Within two weeks of the statewide close-out meeting, the IDOT review team leader should ensure that a formal written response is provided to the process review team. The review team should then finalize the statewide report by inserting the resolutions after the appropriate recommendations. Resolutions may include immediate actions, action plans, proposed implementation dates, or other action items. The completed version of the final

statewide report should be sent by formal cover letter (under dual signature) to the IDOT Director of Highways with attention to the Deputy Director(s). Copies should be sent to all affected Central Office Bureau Chiefs, all IDOT District Engineers, and to the FHWA Division Administrator. A copy of the final report should also be sent to the FHWA Resource Center for their information. An electronic copy of the final report should be placed in the FHWA LAN common directory with an e-mail notification of availability to all Division Office engineers and specialists.

Evaluation of Process Review Quality

The overall quality of the process review program is critical in order to gain wide acceptance, favorable recognition, and continued support from IDOT and FHWA upper management. Previous attempts have been made to quantify the "value added" from the process review program, but these efforts have had limited success. Currently, there is no standard format for assessing the quality of process reviews.

The quality assessment of the process review program should be enhanced with the establishment of FHWA and IDOT process review program coordinators. The program coordinators will facilitate in the continual attention on the progress of the process reviews and the follow-up activities from previous reviews. Through constant and direct involvement, the process review program coordinators should be able to easily identify the strengths and weaknesses of the entire program and also individual process reviews. The program coordinators should give guidance to the process review team leaders throughout the year. The program coordinators should conduct an annual program quality assessment as follows:

Approximately one month prior to the annual process review topic selection meeting, the program coordinators should meet with all the FHWA and IDOT team leaders of the ongoing process reviews. The discussions should focus on strengths, weaknesses, and successes of the ongoing process reviews. Many of the ongoing process reviews may not be entirely complete at this time, but the team leaders should have a good handle on the progress and direction of their review. Feedback and discussions between all process review team leaders will provide the benefit of learning from the successes and mistakes for future process reviews. The program coordinators should present to IDOT and FHWA management (at the annual process review topic selection meeting) any significant observations that would result in a major change to the current process review program.

This same meeting should be used to summarize the preliminary issues of the current reviews. The process review program coordinators should use the information gathered to determine if any of the ongoing reviews should be continued on or expanded into the next year's review program. If so, this need should be brought up at the annual topic selection meeting in September.

IDOT and FHWA management should also discuss process review quality at one or more of their regularly scheduled monthly "breakfast meetings." This item should at a minimum be discussed during the November "breakfast meeting" when purpose and scope statements have been developed for the following year's process reviews and when most of the current process reviews are nearing completion. The process review program coordinators should brief management on the status of current process reviews and provide purpose and scope statements for the following year's reviews prior to the meeting. It is essential for IDOT and FHWA management to discuss the purpose and scope of the new process reviews at this time to ensure that the process review teams are proceeding in the right direction.

Followup to Process Review Observations

A high-quality process review requires follow-up on observations to ensure that all resolutions to recommendations are implemented. Many times in the past, the resolutions reached at the statewide close-out meeting were not aggressively pursued and, ultimately, many actions were not implemented because of the lack of follow-up.

A key to ensuring adequate follow-up to review recommendations is the implementation of a comprehensive tracking system. Previously, the Illinois Division used the Management Information Control System (MICS) which was useful to track the status of recommendations, but because of limited capability, restricted access, and not being user friendly, the use of the system has been essentially discontinued. A primary component of a new system should be the tracking of follow-up activities. If and when such a system is implemented, the process review program coordinator and the appropriate FHWA specialists and engineers should use this system to assist in following up on resolutions to ensure implementation.

In order to ensure adequate follow-up, it is necessary to establish clear action items with specified deadlines at the time of the statewide close-out meeting. Upon agreement of resolutions from the close-out meeting, the review team leaders should ensure that all follow-up items are documented and entered into the process review tracking system. The follow-up activities after this point should be assigned to the appropriate Division Office specialist. In

cases where there is no specific specialist (i.e., plan quality, etc.) for the process review topic, the follow-up responsibility should be assigned by the FHWA process review program coordinator in consultation with FHWA management. The assigned individual should, at a minimum, perform follow-up activities at three months, six months, and one year after the statewide close-out meeting. Follow-up after one year should be left to the individual responsible for follow-up of that review. The tracking system should keep a process review status open until all the agreed activities have been addressed and/or accomplished.

Because of continual staff turnover, the FHWA process review program coordinator should monitor the follow-up/tracking system and establish contingency plans if a team leader or assigned specialist in charge of specific follow-up activities leaves the office or is reassigned to a different position. This contingency plan could require another team member from that particular review to be responsible for additional follow-up.

A common problem frequently identified was that many people are not informed of the proposed changes resulting from the process reviews. This is particularly true for District Office personnel. They are familiar with the review conducted in their District, but are often excluded in the distribution of all the final statewide reports. Communication of process review resolutions is extremely critical. The resolutions of process reviews should be discussed at appropriate IDOT annual meetings. This would include the annual Construction Engineer's Meeting, the Materials Engineer's Meeting, and the Program Development Engineer's Meeting. Process review resolutions should also be discussed at District Engineer/Bureau Chiefs Meetings, District Resident Engineers Meetings, Illinois Road Builders Association Meetings, and other management meetings. For those reviews which have major issues and warrant special emphasis, members from the process review team should offer their services in visiting the Districts to discuss the review. For those observations which result in significant changes to specifications, policies, or procedures, the changes should be incorporated into IDOT's specific task training program, if applicable. Another good practice for ensuring that process review resolutions are disseminated is to provide copies of all construction-related process review reports to all Resident Engineers.

When changes are made at the Central Office level (i.e., specification changes, new policies, etc.) as a result of a process review, the FHWA Transportation Engineer should follow up at the District level to ensure they are incorporating the recommended changes. If the Districts are reluctant to make changes, reasons should be brought to the attention of the FHWA specialist and the appropriate Central Office staff for discussion.

It is also important to note that follow-up to positive observations is critical. This follow-up is necessary in order to ensure that "best practices" are shared and considered by others for adoption. Follow-up procedures for best practices would be similar to those provided in the discussion above.

A final step in the follow-up process is the development of an annual summary report of all the process reviews. This summary report should be produced by the FHWA and IDOT process review program coordinators and should be limited to two pages or less in length. It should concisely state the purpose and scope of the reviews along with the significant observations, recommendations, and the status of implementation of resolutions. Appropriate IDOT and FHWA staff should be involved in the review of this document. This annual report should be sent to the IDOT Director of Highways and to the FHWA Division Administrator. The report should be targeted for completion by January 15 of each year.

US Department of Transportation
Federal Highway Administration
Illinois Division

IDOT/FHWA Joint Process Review Program

STATEWIDE SUMMARY REPORT
NATIONAL BRIDGE INSPECTION STANDARDS (NBIS)
AND BRIDGE MAINTENANCE REVIEW (1997)

DATE OF REPORT: July 21, 1998

PURPOSE OF REVIEW:

The purpose of this review was to assess the Illinois Department of Transportation's (IDOT's) compliance with the requirements and procedures of 23 CFR 650, Subpart C - NBIS.

SCOPE OF REVIEW:

This review focused on the NBIS programs in IDOT Districts 8 and 9. The District Bridge Maintenance Engineers and staff were interviewed to evaluate whether the District's procedures, policies, inspector's qualifications, and documentation were adequate to satisfy the NBIS requirements....

REVIEW PERSONNEL:

Dan Brydl FHWA Division Bridge Engineer
Tim Souther IDOT Bureau of Bridges and Structures
Nick Sovell IDOT Bureau of Bridges and Structures

EXECUTIVE SUMMARY:

This review consisted of .....

OBSERVATIONS AND RECOMMENDATIONS:

1. Observation:

All of the Districts reviewed had ...

Discussion:

The Code of Federal Regulations (CFR), 23 Highways - PART 650, Subpart C, contains language that ...

Recommendation:

IDOT should revise ....

Resolution:

2. Observation:

In two out of three Districts reviewed .....

Discussion:

Recommendation:

Resolution:

3. CONCLUSION:

Illinois Department of Transportation
2300 South Dirksen Parkway / Springfield, Illinois / 62764

US Department of Transportation
Federal Highway Administration
Illinois Division

Mr. James C. Slifer, P.E.
Director of Highways
Illinois Department of Transportation
2300 South Dirksen Parkway
Springfield, Illinois 62764

Mr. Ronald C. Marshall, P.E.
Division Administrator
Federal Highway Administration
3250 Executive Park Drive
Springfield, Illinois 62703

Attention: Mr. Jay W. Miller, Deputy Director of Highways
Mr. Daniel M. Mathis, Assistant Division Administrator
Dear Messrs. Slifer and Marshall:

Subject: Process Review QIT - Final Report

Enclosed for your information and action is the final report from the Process Review Quality Improvement Team. This report was written to establish clear and uniform guidelines for conducting process reviews in the State of Illinois. We would like to schedule a meeting with you and your staff to discuss this review. Meeting time and location can be established at a later date.

Sincerely yours,

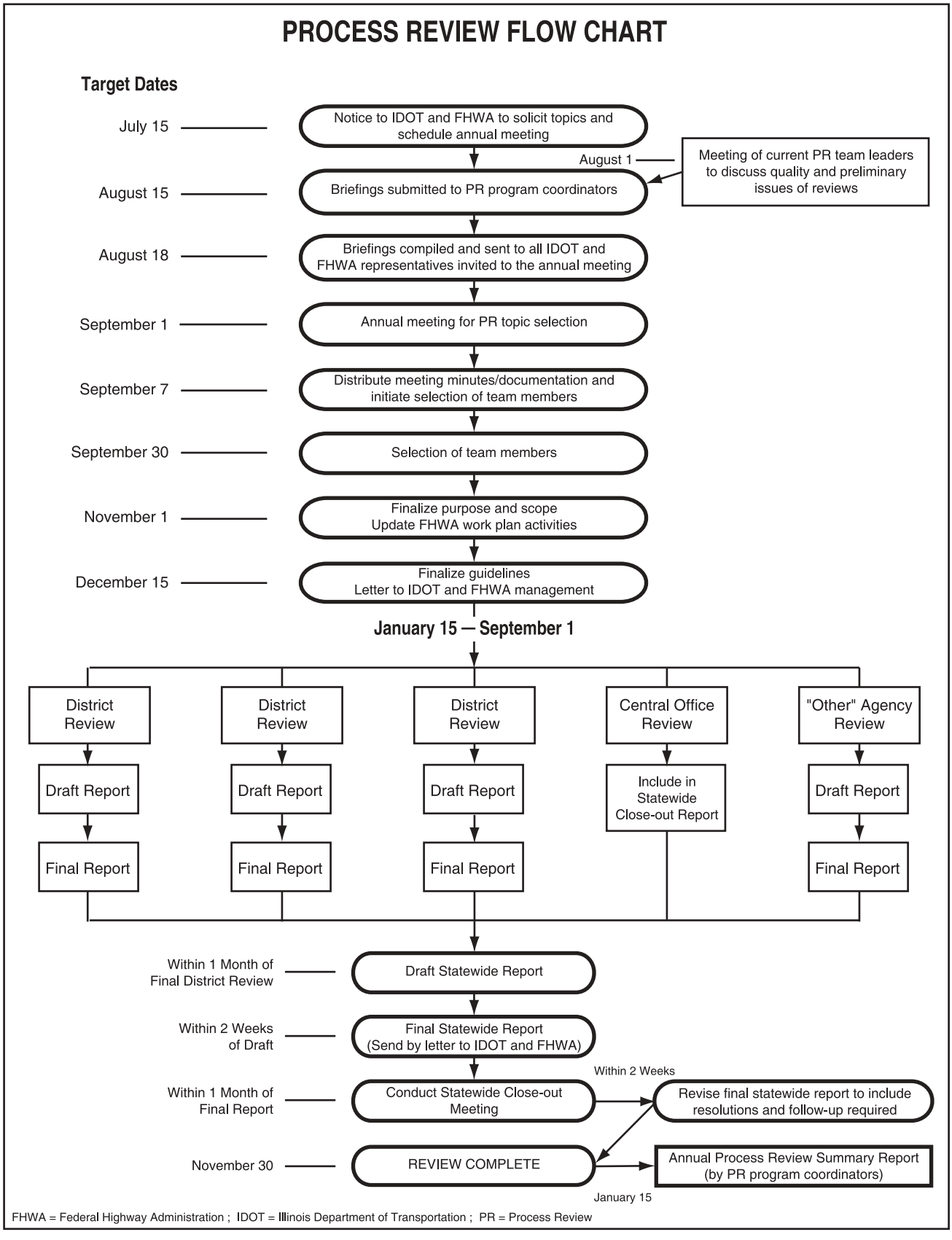
Daniel R. Brydl, FHWA
Process Review Team Leader

Sincerely yours,

Michael J. Ripka, IDOT
Process Review Team Leader

Enclosure

cc: Mr. Ralph Anderson, Chief, Bureau of Bridges and Structures
Mr. Eric Harm, Chief, Bureau of Materials and Physical Research
Mr. Gary Gould, Chief, Bureau of Design and Environment


PROCESS REVIEW FLOW CHART
Target Dates
July 15
Notice to IDOT and FHWA to solicit topics and schedule annual meeting
August 1
Meeting of current PR team leaders to discuss quality and preliminary issues of reviews
August 15
Briefings submitted to PR program coordinators
August 18
Briefings compiled and sent to all IDOT and FHWA representatives invited to the annual meeting
September 1
Annual meeting for PR topic selection
September 7
Distribute meeting minutes/documentation and initiate selection of team members
September 30
Selection of team members
November 1
Finalize purpose and scope
Update FHWA work plan activities
December 15
Finalize guidelines
Letter to IDOT and FHWA management
January 15 — September 1
District Review
Draft Report
Final Report
District Review
Draft Report
Final Report
District Review
Draft Report
Final Report
Central Office Review
Include in Statewide Close-out Report
"Other" Agency Review
Draft Report
Final Report
Within 1 Month of Final District Review
Draft Statewide Report
Within 2 Weeks of Draft
Final Statewide Report (Send by letter to IDOT and FHWA)
Within 1 Month of Final Report
Conduct Statewide Close-out Meeting
Within 2 Weeks
Revise final statewide report to include resolutions and follow-up required
November 30
REVIEW COMPLETE
Annual Process Review Summary Report (by PR program coordinators)
January 15
FHWA = Federal Highway Administration ; IDOT = Illinois Department of Transportation ; PR = Process Review

Summary of Duties

Process Review Program Coordinator

- Responsible for the overall management of the IDOT/FWHA joint process review program
- Sends notice to IDOT and FHWA to begin identifying review topics for upcoming year
- Assembles all proposed process review briefing papers and distribute to IDOT/FHWA management
- Schedules and leads the annual topic selection meeting
- Prepares/Distributes minutes from topic selection meeting
- Drafts letter to IDOT and FHWA outlining the upcoming process review program
- Coordinates selection of team members
- Recommends individual process review coordinators
- Suggests advisors for reviews as necessary
- Oversees development of "Purpose and Scope" statements
- Briefs management on purpose and scope development and preliminary observations and recommendations for "breakfast meeting" discussions
- Reviews and comments on process review guidelines
- Coordinates selection of districts to be reviewed to ensure adequate distribution of reviews among the teams
- Continually monitors timeliness of the steps in the process review program
- Attends reviews occasionally
- Reviews and comments on all process review reports
- Coordinates review activities for programs which cross organizational lines
- Attends statewide close-out meetings
- Conducts meeting with all this year's process review coordinators to discuss successes and problems of the review program. Significant observations should be presented to management at the annual topic selection meeting
- Maintains process review tracking system
- Coordinates and ensures follow-up to process review recommendations
- Prepares end-of-year report to IDOT Director of Highways and FHWA Division Administrator summarizing the major results of all process reviews
- FHWA process review program coordinator should work closely with IDOT process review program coordinator in all these efforts to ensure the intent of "joint process reviews"
- Prepares process review summary presentations for use in IDOT annual meetings, annual District meetings, County Engineer's meetings, and other meetings as appropriate

APPENDIX D

Guide for Making Inspections-in-Depth on Federal-Aid Highway Construction Projects

General

Purpose of Inspections-in-Depth

The need for and purpose of making inspections on Federal-aid highway construction projects can be found in 23 United States Code (USC). Representing the Secretary of Transportation, we are charged with certain responsibilities. 23 USC 114 states:

> The construction of any highways or portions of highways located on the Federal-aid system shall be undertaken by the respective State transportation departments or under their direct supervision.…such construction shall be subject to the inspection and approval of the Secretary.

This responsibility is further clarified in memoranda dated June 22, 2001, Policy on the Stewardship and Oversight of the Federal Highway Programs, and January 8, 2003, Stewardship and Oversight of the FHWA Construction Programs (see Appendix A).

It is recognized that because of staffing and time limitations, it will not be possible to make thorough inspections of all active projects with FHWA oversight. From time to time, however, the division field engineer should designate a number of representative projects upon which comprehensive, thorough, complete, and detailed inspections and analyses of a selected phase or phases of the construction and engineering are to be made. The primary purpose of an inspection-in-depth (IID) and analysis of the findings is to evaluate the accuracy, adequacy, and effectiveness of procedures, methods, controls, and operations used by the contractor and the State to assure high quality construction, accurate determination of quantities, and correct payment in accordance with the contract provisions. Should the findings on these inspections disclose the need for additional controls, supervision, or improvements, a statewide process review/product evaluation (PR/PE) should be conducted.

Intent of Guide

IIDs, like PR/PEs, are a tool to support the State transportation agency's (STA's) construction management program. This guide is intended to provide assistance to field engineers in the performance of IIDs. It is neither practicable nor desirable to specify precisely each step to be taken on an IID because of the many variations encountered on different projects and the specific reasons for making a particular inspection. It is expected that divisions may supplement this guide by adding material applicable to the conditions in their particular jurisdictions.

Scope of Inspection-in-Depth

IIDs may be specific or broad in nature. Steps presented herein are intended to facilitate the inspection of the more common types of work and to obtain a reasonable degree of uniformity. This guide is not a substitute for the exercise of good judgment, especially in determining the scope and depth of the inspection.

Refer to the generic inspection guidelines linked to the FHWA headquarters Construction and Maintenance Web page (www.fhwa.dot.gov/construction/reviews.htm).

Basis of Evaluation

Base the engineering evaluation of construction work on the approved plans, specifications, special provisions, contract provisions and applicable agency standards, instruction manuals, and operating procedures. Ensure that program or project concerns are brought to the attention of the appropriate officials with a recommendation for effecting desirable improvements on present and future work.

Responsibility of Inspecting Engineer

The field engineer is directly responsible for all work in his or her assigned area. *Make the IID as defined in the division's operating procedures.* If specialized knowledge of the construction project work is necessary, ensure that the IID is a team effort with the appropriate technical specialists as team members.

Reach agreement with State personnel on corrective action that will be taken to address findings, and establish a time frame for implementing the action. Elevate the discussion to the STA's resident engineer, district office, or central office if required. Notify the FHWA division office if a condition or deficiency requires immediate attention and resolution cannot be obtained on-site. In situations where immediate attention is not required, the following approaches are available to assure the appropriate action is taken:

a. Transmit the inspection report by letter requesting appropriate corrective action (this should always be the first step when resolution cannot be resolved at the project level).
b. Make the affected item of work nonparticipating.
c. Suspend Federal participation in progress payments (49 CFR 18.43).
d. Make the project nonparticipating.

The goal is for FHWA field engineers and STA field personnel to reach agreement on appropriate action to address findings of concern; in rare situations, more aggressive action is required. Consult with the FHWA division office management when these situations occur.

Selection of Project or Phase of Operations

Select the particular projects and phases of operations for an IID in consultation with your supervisor and construction management program. Base the selection on defined objectives. Schedule the inspection of any individual phase when that particular phase is actively under way on the project. Evaluate new construction techniques whenever possible and prepare a summary report for posting on the FHWA headquarters Construction Web page (www.fhwa.dot.gov/construction/reviews.htm).

Frequency of Inspections-in-Depth

The number and frequency of IIDs will vary according to the need for such reviews and according to the availability of personnel to make them. Inspections-in-depth are preferred to more general contact reviews. Contact reviews typically do not provide adequate knowledge of the substantive operations underway. Contact reviews do provide an opportunity to review project time and cost status, as well as to maintain rapport with the project team. Within each division, there will be certain areas of the State that will warrant more emphasis than others; similarly, there will be certain phases of operations that will require more concentration of effort.

Time Required for Inspection

The time required for each inspection will depend upon the extent of inquiry and investigation considered warranted by the circumstances encountered and the number of construction operations involved. Ensure that sufficient time is available to thoroughly investigate the phases of the operations that are the objective of the inspection. Adequate review of paving operations on a major project, for example, may require about three days at the project site.

Contract Documents

Prior to visiting the site of the project selected for inspection, study the plans and specifications governing the work to assure familiarity with all phases of the project. Place special emphasis on the features that are anticipated to be the focal points of concern during the inspection. In States where the contractor is required to develop a project-specific quality control plan, ensure that the plan is an integral part of any IID that involves material or product acceptance.

State Construction and Materials Manuals

Prior to visiting the site of the project selected for inspection, review the STA's construction and materials manuals for applicability to the work. These documents set forth the basic operating instruction to STA field personnel and generally define inspection and acceptance procedures.

Quality Assurance Requirements

23 CFR 637 sets forth the policies, procedures, and guidelines to assure the quality of materials and construction on Federal-aid highway NHS projects. Become familiar with the requirements within this regulation and ensure that they are being properly administered on the project. Focus specific attention on these processes:

- Random quality control sampling and testing performed by qualified personnel employed by the contractor or vendor.
- Random verification sampling and testing by qualified testing personnel employed by the STA or its designated agent, excluding the contractor or vendor (split samples not acceptable).
- Optional use of contractor's quality control for the acceptance decision when properly verified by the owner.
- Use of qualified laboratories for all testing of materials as a basis of acceptance.
- Independent assurance sampling and testing by qualified personnel employed by the STA or its designated agent, excluding the contractor or vendor.

Evaluation of Project Personnel

Evaluate the STA and contractor personnel assigned to the project for adequacy as to number, knowledge, skills, and abilities. Consider findings made on previous inspections on the same project or other projects that may be reoccurring.

Obtain information by general and technical discussion of the work and by reviewing diaries and project records. Strive for open communication and to develop an atmosphere of trust. Avoid focusing on minor issues of very low risk.

Observe the attentiveness and effectiveness demonstrated by the project personnel at the site. The on-site review quite often provides a better basis for evaluation than the specifics of an individual's education or on-the-job experience as documented in personnel records. Include comments on the attentiveness and effectiveness of the project personnel in the report. Adequate and assertive responses to questions are good indications of proper experience. Comment on education and experience data only when it appears that certain individuals are not adequately performing their duties and their performance is believed to result from lack of training and experience.

Adequacy of Delegated Authority

Evaluate the extent of the authority that has been delegated to project engineering personnel; verify that delegation of authority is adequate to permit conducting the work effectively. Ascertain whether inspectors and other engineering personnel below the level of the project engineer have been given sufficient instruction to have adequate understanding of their authority and responsibilities. Verify that project personnel understand and have an appropriate number of contract documents and other guidance material.

Preconstruction Conference

Determine if a preconstruction conference was held and, if so, who participated, whether an agenda was used, and if minutes were developed. Read the minutes to familiarize yourself with the project. Confirm that issues raised during the preconstruction conference have been properly resolved.

Report Summary, Recommendations, and Followup

Prepare a report of each IID and distribute in accordance with division office procedures. Refer to example forms for inspections as shown in Appendix G and on the FHWA headquarters Construction Web page: www.fhwa.dot.gov/construction/reviews.htm.

Within the report, identify the project, location, contractor, and project engineer; provide a general description of the work and a more detailed description of the particular phases of work involved in the inspection. Use inspection questionnaires based on the specific contract requirements and STA procedures.

Discuss deficiencies, irregularities, and concerns, along with exemplary work, in adequate detail to provide an understanding of the issue. Emphasize recurring concerns by using photographs, charts, and tabulations.

Avoid overemphasizing deviations from desirable procedures that are trivial in character or that do not have significant effect on the value or serviceability of the completed project nor on the effectiveness of the control over the work.

Include a concise summary statement of the important findings and recommendations for corrective actions if any are required. Whenever improvements are necessary or desirable, ensure that there is appropriate followup to verify that corrective action is taken and that the desired results are accomplished. In some instances, conditions and practices found on one project will indicate the need for checking whether similar conditions and practices exist throughout the State or jurisdictional subdivision thereof or on other projects where the same engineers and contractors are involved. Establish reasonable time frames for the resolution of issues.

Document followup in subsequent reports. When the conditions and actions are limited to one project, report further developments in either special followup reports or in subsequent regular intermediate or final inspection reports. When the conditions are found to exist generally or on a number of projects and the corrective actions have corresponding application, report specific followup actions in special reports. Cross-reference the original IID report and provide the same distribution as the original IID report.

Consider withholding further Federal funds from the project or projects as appropriate when the necessary improvements are not accomplished.

Ensure that the original of the report and all significant work papers are made a part of the division's project files.

Project Supervision and Control

Preconstruction Conferences

Most STAs require that a preconstruction conference be held prior to work commencing. All parties involved in the contract—and representatives from other contracts that could affect the project—should attend. Minutes from the conference should have been prepared and should document, as a minimum:

- Railroad or utility adjustments
- Public relations and the interests of abutting property owners
- Contractor's work plan and schedule of operations
- Contractor's backup plan for major stages of construction
- Specific contract requirements
- Safety measures, traffic management, and traffic control considerations
- Environmental commitments
  - Erosion and sedimentation control
  - Dust abatement
  - Noise mitigation
- Rights-of-way available for use by the contractor
- Time limits and performance of operations including materials delivery considerations
- Construction time and cost control
- Emergency response to incidents

Attend these meetings on full involvement projects, if possible, or review the minutes during inspection trips.

Project Diary, Inspectors' Daily Reports, and Orders to Contractor

Examine the project diary, inspectors' daily reports, progress charts, and other data compiled in the field office to facilitate job control. Diaries and inspectors' daily reports are very important documents and must be complete yet concise, accurate, and factual to be effective. Ensure that diary entries are signed and dated and have been reviewed by the engineer in charge. Verify that discussions with the contractor are confirmed in writing and are made a part of the official project file. Review and confirm that there is a complete audit trail for work performed, measured, and paid.

Subcontracting

Ensure the STA's subcontracting procedures on NHS projects meet the requirements set forth in 23 CFR 635.116. State procedures should be followed for non-NHS projects. Review and comment on the extent of subcontracted work. Verify that each subcontract has been approved by the State or that an FHWA-approved contractor certification process is being followed. Review copies of the subcontracts to see that they comply with the contract and contain Form FHWA 1273. Assess the prime contractor's general administration of subcontract work. Ensure that Disadvantaged Business Enterprise (DBE) subcontractors are performing a commercially useful function.

Engineering Surveys

Evaluate the adequacy of the project base control and subsequent construction survey procedures. When the staking of part or all of the work is by the contractor or a consultant, it is recommended that there be adequate verification checks by the STA to assure that the work is correct. If there are survey errors that have led to contract change orders, determine if FHWA participation is appropriate.

Examine a sample of survey notes covering slope staking for grading operations or layout for bridges and culvert construction to determine the degree of clarity and orderliness of procedures. Verify that checks have been made to avoid errors in layout.

Examine a sample of survey notes used for measurement of pay quantities, such as cross-sections, to determine accuracy and correctness of procedures used.

Ensure that project control staking is adequately protected during construction operations.

Quality Assurance

Evaluate the project's quality control and acceptance procedures, personnel, and facilities. If required by the contract, the contractor must develop a quality control plan to define sampling, testing, and inspection procedures to be followed. Refer to Appendix B and Appendix E for samples of quality control plan requirements and actual project-specific plans. The contract will also define required acceptance testing, whether by the STA or by the contractor with STA verification. Ensure that adequate quality control and acceptance is being exercised and that materials incorporated in the work are in substantial conformity with the contract.

Project Laboratory

Verify that contractor-furnished laboratories meet contract requirements. Ensure that scales and measuring devices have current certifications for accuracy. Typical equipment requirements for various construction operations are as follows:

(1) Grading: sieves, scales, liquid limit devices, compaction test equipment, field density equipment, hot plates or field stove, oven, sampling equipment, sample containers, and drying pans.

(2) Subbase and base course: sieves, sample splitters, scales, hot plates, devices for determination of moisture content and liquid limit, drying pans, and apparatus for making laboratory compaction tests and for determining in-place densities.

(3) Hot mix asphalt (HMA): thermometers, sieves, sample splitters, scales, hot plates or field stove, burn-off oven, equipment for taking samples from the pavement, and apparatus for determining pavement density and stability of the HMA mixture.

(4) Portland cement concrete: slump cone or other specified equipment for determining consistency of the mix, air meter, concrete cylinder or beam molds, sieves, sample splitters, scales, pans, stove or hot plate, and containers for determining unit weights.

Determine what method is used by the STA to "qualify" the laboratories used for NHS project testing as required by 23 CFR 637. If the IID permits review of the STA's central laboratory, verify that it has been accredited by the Accreditation Program of the American Association of State Highway and Transportation Officials (AASHTO) or a comparable laboratory accreditation program approved by FHWA (23 CFR 637). District laboratories may be accredited by the AASHTO Accreditation Program or a comparable laboratory accreditation program approved by FHWA or reviewed by the STA's central laboratory.

Materials Inspection Personnel

Identify the inspectors assigned to the particular phases of the work and discuss their responsibilities with them. Focus on these responsibilities:

- Inspection duties
- Field diary entries
- Tests required and frequency
- Test results and statistical summaries
- Action on marginal or failing tests
- Records forwarded to the project engineer
- Inspectors' particular sampling and testing qualifications

Appraise the technical ability and effectiveness of the inspector and evaluate the adequacy of the control methods applied on the project. Observe the inspector's sampling and testing techniques to ensure that the specified procedures are being followed.

Test Reports

Check the project files to verify these testing conditions:

- All materials are covered by adequate quality control and acceptance tests, and the frequency of sampling and testing is in accordance with the contract's schedule of test requirements.
- The statistical method used to verify the contractor's test population has been validated by independent random STA tests.
- Third-party independent assurance test results (split samples) compare favorably with project quality control and acceptance tests.

Report minimum and maximum test results and statistical summaries with appropriate remarks regarding the suitability of the material. Evaluate project office procedures for filing test reports, checks made to ensure that all necessary reports have been received, methods to readily identify unsatisfactory or borderline materials, and general house-keeping methods in the handling of the reports.

Ensure that any deviations from the specifications indicated by the test results are explained and that all corrective actions taken are documented. Comment on the disposition of all nonconforming materials received on the project. Verify the process for getting deviations listed in the project's final material certification on NHS projects (23 CFR 637.201).

Verify that certifications, inspections, and test reports on manufactured materials document conformity with the specification and that the test reports on file cover the materials actually delivered to the project. Determine whether certifications for iron and steel products conform to Buy America requirements.

Witness the sampling and testing of quality control and acceptance tests to the extent practical. Take independent measurements of width and depth of bases, surfaces, and other components of the construction, including structures, to validate that the project is being constructed in substantial compliance with the plans and specifications.

Measurement of Quantities

Ensure that the methods used in the measurement of quantities meet contract requirements (23 CFR 635.123).

Determine the frequency of contractor progress payments. Verify that the appropriate quantities of completed work are reported for progress payments. Comment on whether or not a new overall estimate is made for each progress estimate or if computed monthly work quantities are merely added on the estimate of work done during each succeeding period; the latter could result in cumulative errors of consequence. Check the quantity calculations for two or three major items and one or more minor items. Note significant digits. The validity of final estimates cannot be greater than the accuracy exercised in making the field measurements used in the computations. Careless field measurements are difficult to detect, but an examination of the field books will provide some indication as to the extent to which good survey and measurement practices are being followed. Identify in the report what bid items or stockpiled materials were reviewed, if properly identified, dates and personnel making the measurements, proper explanations and initials on corrections, and overall legibility.

At the final estimate stage, review final quantities in considerable detail on a few items. Note assumptions made, significant figures, accuracy observed, and amount of checking done. Indicate the extent of checks and reviews made beyond the project level, such as in the district and central offices. Where appropriate, evaluate the additional checks to assure the sufficiency of the validation.

The following is a summary of recommended inspection techniques:

- Verify that the items reviewed were measured in the units called for in the contract provisions and that the methods of measurement prescribed in the contract and in authorized instructions were followed.
- Examine project records to insure that all materials measured for payment were delivered and incorporated into the project or stockpiled for future incorporation.
- When payment is based on weight or mass, verify the accuracy of the measurements; consider the calibration of scales, checking of truck tare weights, and weighing of haul loads.
- Where payment is based on loads delivered to the project, either on a weight or volume basis, verify the procedures followed for assuring validity in receipt of haul tickets. Discuss the procedures in effect with the project personnel. Focus on practical concepts (falsified haul tickets can be determined by analyzing project records and determining that the number of trips reported was impossible considering time and length of haul involved).
- Where area methods of measurement are specified, make dimensional checks to the extent necessary to verify the actual work performed. Ensure that measurements were made at the proper time and prior to the subsequent placement of other courses of materials.
- Where final quantities are determined by volume computations, verify the method of measurement and documentation of calculations.

Construction Changes and Extra Work

On full oversight projects, be aware of circumstances that required the changes in the plans and specifications. Comment on the need for the construction change and whether the revisions and additions are necessitated by conditions that could not be reasonably anticipated before the project was advertised for bids. Discuss weaknesses in the preparation of plans, specifications, and estimates, and other deficiencies of this nature to assist in funding determinations and in strengthening the State's design procedures and the FHWA's review procedures. Document the steps taken by the Construction Unit to inform Design of plans errors and omissions resulting in change orders.

Verify that proposed changes are consistent with sound design and construction practices and are compatible with the objectives sought in the original design and environmental clearances. Ensure that decisions are in the public interest, are not swayed by the expediency of construction convenience, and are not counter to the intended design concepts.

Support cost-effective changes that improve aesthetics, reduce overall construction costs, and improve the safety of the highway. Verify if project personnel take steps to incorporate these advantages into the project (e.g., an unexpected surplus of excavation becomes available that could be placed within an interchange loop or used to flatten embankment slopes, thus eliminating guardrail and increasing the safety features of the highway).

Become familiar with the Division/STA Stewardship Plan, the definition of major and minor changes, and the approval process on full oversight projects; refer to 23 CFR 635.102 and 23 CFR 635.120. Evaluate the reasonableness of unit prices, labor, overheads (field and unabsorbed home office), and rental rates established for items of work to be performed. Since the cost to process a change order is a direct project expense, consider the following "rules of thumb" when evaluating changes: obtain a better product at no increase in cost or time; obtain an equivalent product at a savings in cost or time; use a change when the product as designed can not be constructed at no fault of the contractor (differing site conditions, "acts of God," etc.).

Ensure that project personnel have evaluated and documented the effect of the contract change to the approved project schedule. Include the appropriate time extension on the change order; refer to 23 CFR 635.121.

Contract Time Charges, Time Extension, Liquidated Damages, and Cost Control

Verify that project personnel are assessing the correct time charges. Compare work completed, as noted in project diaries, to contract time charges. Evaluate the contractor's critical path method schedule to support time charges. Ensure that contractors are provided formal warning when work is behind schedule and that corrective actions are requested.

Ensure that the correct liquidated damages are assessed on projects that exceed the allowable contract time; refer to 23 CFR 635.127.

Review contract expenditures and changes to ensure that the work is constructed in accord within the approved scope, cost, and termini.

Grading and Associated Items

Maintenance of Traffic

Verify that maintenance of traffic and preservation of abutting property owners' interests are in accordance with contract provisions. Observe that the proper barricades, signing, striping, and flagging are in place to ensure the maximum safety to the public and the workers. Examine the project diaries and other project records to verify that revisions to the approved traffic control plans are documented. Drive through the project and verify that a stranger to the area can satisfactorily pass through or reach a destination within the project termini. Ensure that maintenance of traffic is reviewed daily by project personnel, followups on findings are made, and field corrections documented.

Utilities

Observe the coordination of the work between the contractor and railroad or utility companies, the supervision and inspection by the project personnel, and the efficiency and economy with which the work is being performed. Where the work is reimbursable, verify project record documentation:

- Labor used, including classifications, number of personnel, and hours worked.
- Equipment used (including type, capacity, and amount of usage).
- Materials utilized (whether they are used or new).
- Materials retired and their disposition (e.g., salvaged, returned to stock, or junked). Evaluate the procedures and practices used to determine if retired materials should be left in place, salvaged, returned to stock, reused, or junked, and the appropriate credits.
- Special features such as unusual soil conditions, rock, presence of excessive moisture, dewatering required, adequacy of backfilling operations, weather, and unusual conditions that affect the prosecution and cost of the work.
- Contract units constructed if time and material reimbursement is not used.

Removal of Structures and Obstructions

Verify that any structures and other improvements removed were disposed of in compliance with contract provisions. Ensure that any hazardous materials, such as lead-painted girders, were sent to the appropriate disposal site and that the required documentation is in the contract files. Where salvage value is required, verify that the appropriate Federal share is credited to the contract.

Clearing and Grubbing

Prior to work beginning, verify that these conditions are met:

- Clearing limits are clearly marked.
- Trees, shrubs, and other items that are to remain are marked and protected.
- Project survey control is marked and protected.
- Erosion control features are in place.
- Project personnel are familiar with environmental commitments.
- A plan is in place for stockpiling merchantable timber unless it is the property of the contractor.
- Burning plans have been approved by the appropriate jurisdiction.

Observe the adequacy of operations for removal of stumps, organic materials, and other objectionable materials to the specified depth throughout the required limits of construction. Verify procedures for stockpiling topsoil including stockpile erosion control.

Grading and Drainage

Review the soil survey report or soil profile sheets to become familiar with conditions:

- Identification or classification of the soil or rock types expected to be encountered throughout the project (Note: this information is useful should a differing site claim be submitted by the contractor.) Verify if the bidding contractors had access to the soils report.
- Location of areas requiring special treatment and the type of treatment specified.
- Location of borrow materials for embankment and subgrade improvement if specified.
- Requirements for soil selection in placing poorer soils in lower portions of fill sections and better soils in top lifts.

Verify that the quality control and acceptance procedures are being followed to ensure that specification requirements are met.

Ensure that information on the following conditions is included in the project records:

- Depth of lifts compacted.
- General conditions under which embankments are placed.
- Moisture and density tests required.
- Density curves utilized and method for matching the curve to the soil type(s) being compacted.
- Test results obtained.
- Subexcavation required, the quality of replacement material, and the methods used for measuring and paying. Note whether subexcavation was anticipated and properly provided for in the contract or if payment is by contract change order.
- Examine and comment on the uniformity of embankment and cut sections, compliance with contract requirements, and proper slope for drainage. (Assuming the catch points remain as designed, fill slopes constructed with a steeper slope than designed can significantly increase embankment quantities and can result in excessive erosion and safety concerns.)
- Erosion control procedures.
- Control exercised to secure the required finished grade and cross-section including slope rounding.
- Measurement of roadway cross-sections as to conformity with plans.
- Final measurements of borrow areas.
- Borrow area appearance and drainage.
- Roadway and borrow excavation quantity calculations including overhaul.
- Actual versus anticipated (design) shrink or swell and the method used to calculate actual values.
- Watering quantities unless subsidiary to the bid item.
- Culvert material certifications, backfill densities, and alignment.

Pay particular attention to those areas that are difficult to properly control, such as the outside edges of embankments, shallow fills, small work areas, and transitions from cuts to fill.

Review and comment on underdrain installations. Note if underdrain quantities were as anticipated or if major overruns have occurred. Overruns could indicate that additional predesign geotechnical investigation would have been appropriate. Comment on the liaison between the project personnel and the central laboratory in resolving major soil and foundation problems arising during construction.

Review and comment on the waterway, ditches, and drainage structures. Note whether there are abrupt changes in ditch alignment, horizontal or vertical, that could result in future erosion. Verify compliance with the approved Storm Water Pollution Prevention Plan on file in the project office. Verify that appropriate permanent erosion control measures are incorporated at the discharge of culverts and other waterways. Check for sediments leaving the right-of-way.

Match test reports covering the acceptance of corrugated metal culvert pipe and concrete pipe against the actual pipe delivery reports. Verify that the alignment, bedding, and joint construction were examined prior to the backfilling operations and a determination made that the pipe has not been damaged in handling and placing operations. Observe backfilling operations and witness density tests to ensure proper inspection control is being exercised. Evaluate installation procedures and inspection control.

Ensure grade and drain operations are properly supervised and inspected and that the STA has a qualified grade inspector at the point of grading operations during all grading operations.

Structures

Included in this category along with bridges are poured-in-place culverts of any span length.

- Verify that the quality assurance procedures maintain effective inspection at all points of work. Ensure that operations performed away from the actual site of work, such as the production of concrete at a central plant or manufacturer facility, are covered.
- Include the division structural engineer in reviews.

The structures inspection category covers driven piling, drilled shafts, shallow foundations, structural steel, general structural concrete, prestressed concrete members, and temporary structures.

Driven Piling

For more information, see "Design and Construction of Driven Pile Foundations, Volume II," FHWA-HI-97-014.

Evaluate pile driving documentation:

- Equipment and procedures to be followed.
- Inspector responsibility (observational or directional).
- Primary contact if problems are encountered.
- Routing of copies of driving records and daily inspection reports.
- Required data in the pile driving report.
- Material certificates.

Inspect piles and equipment prior to driving:

- Spot check that piles meet specifications for type, size, length, strength, and quantity.
- Confirm driving shoes and splices (if specified) and connection requirements.
- Confirm that piles are not damaged.
- Confirm proper handling and storage.
- Pile driving hammer is the specified type and size.
- Hammer cushion is of approved material type, size, and thickness.
- Helmet properly fits the pile.
- Pile cushion is correct type material and thickness (concrete piles only).
- Predrilling, jetting, or spudding equipment (if specified) meets specifications.
- Lead system meets specifications.

Evaluate inspection of test or indicator pile driving (if required by contract):

- Correct test pile location.
- Test pile driving criteria followed.
- Proper ram weight.
- Hammer in good working order.
- Proper alignment of hammer with pile.
- Helmet remains properly seated on the pile.
- Hammer hoist line is always slack during driving.
- Requirements for dynamic testing met.
- Ground heave noted and recorded.
- Cut-off elevation checked and recorded.
- Visual damage of pile recorded.
- Static testing criteria met.
- Coordination with designer if additional test piles are required.
- Coordination with designer when production pile driving is allowed.

Evaluate inspection during production pile driving:

- Pile driving sequence is proper.
- Pile plumbness is within tolerance.
- Driving shoes and splices meet contract requirements.
- Pile driving logs are properly maintained (see below).
- Dynamic testing indicates capacity and no damage during driving.
- Periodic checks are made on the hammer and pile cushions.
- Ground heave is noted and recorded.
- Visual damage of pile is recorded.
- Hammer is warmed up prior to retap.
- Pipe piles are visually inspected prior to concrete filling.

Ensure that pile driving records contain these items:

- Project identification number.
- Project name and location.
- Structure identification number.
- Date and time of driving (start, stop, interruptions).
- Name of contractor.
- Hammer information.
- Hammer and pile cushions.
- Pile location, type, size, and length.
- Pile number or designation matching pile layout plans.
- Pile ground surface, cut-off, final tip elevation, and embedded length.
- Driving resistance data throughout driving.
- Cut-off length, length in ground, and order length.
- Comments on unusual observations, including reasons for all interruptions.
- Signature and title of the inspector.

Drilled Shafts

For more information see "Drilled Shaft Foundation Inspection" (National Geotechnical Inspector Qualification Program), NHI Course No. 132070A.

Evaluate preconstruction preparation items as applicable:

- Review contract requirements.
- Preconstruction meeting held and minutes documented.
- Drilled shaft installation plan submitted and approved.
- Concrete mix design approved.
- Trial mix designed and concrete slump loss test run.
- Procedure for taking required soil or rock core samples shaft bottom.
- Procedures for protection of existing structures.
- Site preparation completed in accordance with the plans.
- Procedures for coffer dam inspection.
- On-site equipment and tools meet the approved drilled shaft installation plan.
- Correct size(s) casing.
- Correct slurry mixing equipment.
- Desanding equipment.
- Proper tremies.
- Proper drilled shaft inspection forms are utilized.

Review the findings from the trial shaft installation:

- Not a production shaft unless allowed by contract.
- Met contract requirements.
- Problems encountered resulted in positive revisions to installation techniques or equipment.

Verify production drilled shaft excavation and cleaning procedures as applicable:

- Shafts are constructed in the correct location and within horizontal tolerances.
- A benchmark is available and is used to record shaft elevations.
- Required soil or rock core samples of shaft bottoms are obtained.
- Slurry levels, tests, and test reports are conducted according to specifications.
- Soil/rock excavation inspections forms have been completed.
- Permanent/temporary casings meet specifications.
- Belling meets specifications.
- Excavation logs for each shaft are maintained.
- Completed shafts are within vertical alignment tolerances and to the proper depths.
- Shaft excavation time meets the specified time limit.
- Shaft over-reaming is performed in accordance with specifications.
- Shaft bottoms meet cleanliness requirements.
- Shaft inspection forms are completed.

Inspect reinforcing cages to ensure:

- Correct size, configuration, and tying of reinforcing steel.
- Use of proper spacers.
- Correct length of splices.
- A positive method to secure cages from settling or floating during concrete placement.
- Proper elevation of the top of the cage.

During concreting operations, ensure these conditions:

- Slurry is tested prior to concrete placement (if applicable).
- Temporary casings are removed in accordance with specifications.
- The discharge end of the tremie is maintained at least 1.5 m (5 ft) into concrete mass.
- The concrete head in tremie is maintained at least 1.5 m (5 ft) above top of slurry.
- The height of concrete free-fall (dry shaft only) is limited as specified.
- Placement of concrete occurs within the specified time limit.
- Concrete placement and volume forms are completed for each shaft.
- Contaminated concrete overflows shafts until good concrete appears.
- Concrete acceptance tests are performed as required.

Verify the following postinstallation steps:

- In open water, shafts are protected 7 days or until concrete reaches specified strength.
- Permanent casing is cut off at proper elevation.
- Nondestructive evaluations are completed (if required).
- Shafts meet all applicable construction tolerances.
- Drilled shaft logs have been completed.
- All pay items have been documented.

Shallow Foundations

For more information, see "Shallow Foundations," FHWA-NHI-01-023.

Evaluate foundation preparation:

- All unsuitable materials are removed to the approved subgrade.
- A shoring system is used for excavations greater than 1.5 m (5 ft) deep, or appropriate slopes are constructed.
- If blasting is required, the blasting program is designed to limit overblasting.
- Bearing soils exposed overnight or to rain are protected from degradation.
- Compacted subgrade fill meets material and compaction specifications.

Evaluate groundwater control:

- The contractor has a site drainage plan to prevent surface water intrusion.
- Bearing soils softened by intrusion of water are removed prior to footing placement.
- The contractor has a groundwater control plan when groundwater table is near bottom of excavation.
- Sump pumps are an option for controlling ground water intrusion in cohesive soils.
- The contractor's groundwater control plan includes method(s) to control perched water tables in cohesionless soils without causing piping (well points are an option to control ground water intrusion in cohesionless soils).

Verify:

- Foundation-bearing stratum in the field is the same as that considered in design.
- All unsuitable material is removed from below the footing.
- Required fill material is placed in accordance with specifications.
- Reinforcing steel and concrete are placed in accordance with contract plans and specifications.
- Limits of pay for structural excavation.

Structural Steel

Review these items:

- Procedures for fabrication shop inspection. Verify compliance on current project.
- Erection sequence and equipment requirements for lifting. Verify compliance with the approved erection plan.
- Field connecting and splicing. Focus on field splicing, specifically the inspection procedures employed for field welds and high-strength bolting; welder certifications; required and field-applied torque; method for calibrating torque wrenches.
- Bearing seats at correct elevation and alignment.
- Expansion devices properly set.
- Field cleaning, priming, and painting.

General Structural Concrete

Review:

- Minutes from the prepour meeting (attend if possible).
- Forms for support, tightness, form release agent, defects in the lumber, and removal of debris.
- Approvals of the formwork and falsework and means of checking deflections during concrete placement operations.
- Approved mix design and source of materials; verify proper sequence for adding admixtures.
- Condition, tying, and support of the reinforcing steel and other imbedded items such as conduits, void spaces, bolts for railings, etc.; ensure damage to coatings is repaired.
- Inspection and record procedures used for documenting that reinforcing steel and other imbedded items are placed in accordance with the plans and that the number, sizes, and splice lengths of bars are verified and correctly summarized for pay purposes.
- Record heat numbers of reinforcement delivered and installed; verify correlation to test reports or certifications.
- Methods used in placing and finishing the concrete.
- Air content and strength testing.
- Time between batching and placement of each load of concrete.
- Procedures for assuring that the riding surface, curbs, and walks, etc., conform to the proper grades and cross-section.
- Final finishing and curing procedures.
- Fabrication, erection, alignment, and quality of workmanship in the railings.

Examine those physical features of completed work that are visible:

- Apparent workmanship and degree of care given by the quality control and acceptance process.
- Visual lines and grades.
- Straightness of overhangs, curb chamfers, railings.
- Uniformity of the surface texture.
- Surface drainage and outfalls.
- Uniformity of position of roller-bearing devices.
- Conformance of expansion plates to the grades of the deck and required gap.
- Final cleanup; the removal of temporary supports, detour facilities, and debris.

Review field office documentation:

- Test reports.
- Pay quantities. Verify that calculations meet standard specification requirements.
- Delivery records (invoices, delivery tickets, reports, etc.) on incorporated materials.
- Verify that test and inspection reports covering materials incorporated in the minor structures document compliance with the contract.

Prestressed Concrete Members

Review during construction:

- Procedures for prestress plant inspection; verify compliance on current project.
- Erection sequence and equipment requirements for lifting; verify compliance with the approved erection plan.
- Bearing seats at correct elevation and alignment.
- Inspect beams for correct camber, length, alignment, and damage.

Temporary Structures

Ensure:

- Shop drawings or plans are signed by a registered professional engineer.
- Structure meets plan requirements for minimum roadway width, vertical clearance, and minimum opening size.

Subbase and Base

- Verify if this should include subgrade.
- Verify that the quality control and acceptance procedures maintain effective inspection at all points of work.

Subgrade

- Verify procedures used to document subgrade preparation for grade, cross-section, surface uniformity, moisture content, density, and correction of soft spots prior to placing subsequent pavement structure.
- Verify subbase and base as-constructed and material properties.

On projects where the final thickness of the pavement structure is established from test results obtained from the constructed subgrade, verify the frequency and adequacy of the on-site sampling and testing; check that the recommended thickness is in conformity with the State's design criteria for thickness of flexible pavements.

Aggregate Material Sources

- Examine material sources (pits or quarries) for uniformity of materials, presence of pockets or lenses of deleterious material, pit operations, supervision, and other production procedures.
- Check on any materials source testing and approvals.
- Comment on the uniformity of product.
- Document whether the source has been designated by the STA or selected by the contractor and approved by the STA.
- Verify that appropriate environmental clearances were obtained.
- Inspect processing equipment for compliance with specifications. If more than one material is proportioned and mixed into a combined subbase or base material in order to comply with the specifications, either in a central plant or by road mixing operations, determine the types, quality, and proportions of the materials used and the tests performed to ensure that the specified proportions are followed and that the end product complies with the specified requirements.

On-site Production

- Review quality control and acceptance moisture, density, aggregate quality, and gradation tests.
- Verify subbase and base width and compacted thickness.
- Ensure that soft or failing subgrade areas were replaced prior to placement of subbase or base.
- Verify method used for documenting pay quantities.

Paving

Verify that the quality control/quality acceptance procedures maintain effective inspection at all points of work.

Conventional Seals

Evaluate:

- Contractor's equipment and procedures.
- Condition (properly cleaned, patched, and graded) of the surface to receive the prime or surface treatment asphalt.
- Control of heating and means for the verification of the quantity and temperatures of the asphalt.
- Quality and quantity of aggregate.
- Weather conditions at the time of application.
- Technique for application of cover stone and the attention given to the obtainment of uniformity and completeness of coverage.
- Rolling and subsequent maintenance of the cover stone during the curing or setting period.
- Requirements for opening to traffic.

Hot-Mix Asphalt Pavements

Prior to observing work, examine the prepave meeting minutes. Use these notes to become familiar with work processes to be observed. Discuss procedures established to maintain continuous and effective inspection at all points of work and proper liaison between quarry, plant, and paving operations. Verify that plant production has been designed to meet delivery, laydown, and compaction rates (i.e., continuous production with minimal stops and starts).

Evaluate:

- Equipment, to determine whether its type, size, and operation comply with the contract requirements, if applicable.
- Backup equipment in case of breakdowns.
- Procedures for checking and maintaining payment records for asphalt and the asphalt mix, and for documenting that all items paid for are actually incorporated into the pavement; pay particular attention to criteria established to define acceptance.
- Diaries, plant and road reports, and other day-to-day records of the operations.
- Use of control charts to control operations.
- Operation of cold-feed proportioning, the dryer, screening, and batching equipment.
- Mixing time.
- Substrata condition ahead of the placement of the hot-mix asphalt (i.e., tack or prime coat, cleaning, patching, absence of raveling, etc.).
- Adequacy and effectiveness of the contractor's operations and the STA's inspection of the laying operations.
- Continuity in the delivery, laydown, and compaction (minimal stops and starts).
- Temperature of the mix versus required range (plant and laydown).
- Thickness and calculated spread rate.
- Slope pavement (eliminate edge dropoffs for errant vehicles).
- Density results.
- Finished section smoothness, cross-section, and transitions.
- Grade match into manholes, curb and gutter, and water valves.
- Work zone safety and control.
- Uniformity of gradation, asphalt content, and other mix properties.
- Applicable contract warranties.

Observe field inspector and laboratory personnel as they perform their normal duties. Comment on inspections of the batching operations, weighing of trucks (both empty and full), collection of samples at all points and where they are taken, performance of the various tests, adequacy of the facilities and equipment, etc. Comment on how soon test results are available and necessary adjustments or corrections are made based on this information.

Portland Cement Concrete Pavement

Verify that the QA procedures maintain effective inspection at all points of work.

Prior to observing the work:

- Examine the prepave meeting minutes.
- Become familiar with work processes to be observed.
- Discuss procedures established to maintain continuous and effective inspection at all points of work and proper liaison between quarry, plant, and paving operations.
- Verify that the mix design and material sources have been approved.

Forms

Examine completed forms in advance of concrete placing operations:

- Take sufficient measurements to ensure compliance with applicable specifications; identify the location of measurements by station.
- Quality of foundations material under forms.
- Line and grade.
- Method of securing forms to substrata.

Joints

Verify:

- Alignment of the dowel bars meets contract requirements (generally bars should be parallel to the centerline of the slab—not necessarily at right angles with joint, i.e., skewed joints—and parallel to surface pavement). Document the frequency and results of checks made after paving operations have been completed; this is particularly important when dowel bar inserters are used in the paving train.
- Dowel baskets are securely fastened to the substrata.
- Dowel bars are lubricated, free of deformities, and properly capped.
- Preformed expansion joints are properly secured; comment if they are tilted or displaced by strike-off or finishing equipment.

Paving Operations

Allow sufficient time to become reasonably familiar with all the operations involved; this should include the beginning and ending of the day's operations.

Verify:

- Type of equipment used and if in compliance with contract requirements.
- Mixing and delivery time is in compliance with contract requirements.
- Adequacy of batch design and batch control.
- Tests for slump, or consistency, and air content.
- Methods of making, transporting, and curing concrete test specimens; when possible, witness flexural or compressive tests.
- Frequency and adequacy of control tests.
- Theoretical yield against actual yield to ensure conformity with the specified mix proportions.
- Method of placing concrete.
- Finishing operations including micro and macro texture.
- Curing operations.
- Joint forming, sawing, depth of cut, uncontrolled cracking before or during sawing operations, cleaning, and sealing operations.
- Surface smoothness.
- Pavement thickness as determined from core measurements.
- Applicable contract warranties.

Environmental Commitments

Verify:

- Environmentally sensitive areas fenced off as appropriate.
- Certified biologist and archeologist available as needed.
- Mitigation features (temporary and permanent) constructed as defined within environmental (NEPA) clearance documents such as noise, erosion, dust, and sediment control, etc.

Signs

Review:

- Procedures for shop inspection; verify compliance on current project requirements.
- Shop drawings or plans; ensure they are signed by a registered professional engineer if applicable.
- Material certifications.
- Sign placement relative to field conditions and safety requirements.
- Tightening procedures for bolts.
- Structural members for cracking or defects in coatings.
- Proper retroreflectiveness.
- Proper coverage of signs when not in use.
- Proper breakaway features.

Guardrail and End Treatments

Strong Post W-Beam Guardrail

Verify:

Height

- Roadside installations: 706 mm (27-28 in) to top of w-beam rail.
- Median installations: 550 mm (22 in) to center of rail with no rubrail, or 610 mm (24 in) to center of rail and 300 mm (12 in) to center of rubrail.

Blockout

- Wood blockouts with wood posts toenailed to prevent rotation of blockout.
- Wood blockouts with steel posts routed and fit around edge of steel post.
- Steel blockouts only if speeds are 72 km (45 mph) or less.
- Recycled or composite blockouts connected in a manner that prevents rotation.

Rail

- Splices lapped to prevent snagging for the direction of traffic nearest the rail.

Location

- Slope in front of w-beam guardrail no steeper than 1:10.
- Preferred minimum offset from shoulder is 0.6 m (2 ft).
- No rigid objects within 0.9 m (3 ft) of the back of the line of posts unless measures have been taken to further stiffen the system.

Terminals

- Strut on ground or partially buried.
- Wood post holes near ground (see manufacturer's drawing for height and number of drilled posts as well as need for soil tubes).
- Steel posts hinged for breakaway design.
- Slope approaching and around terminal no steeper than 1:10.

Concrete Barrier

Verify:

Height

- Basic: 810 mm (32 in) minimum to top of w-beam barrier.
- Heavy truck traffic: 1070 mm (42 in) to top of barrier.

General

- Ensure that all concrete barriers are terminated in a backslope with an approved crash cushion or with an approved transition to guardrail design.

NOTE: Substantiate the above dimensions with the approved plans and details or manufacturers recommendations prior to the review. For further information on these issues or other types of roadside hardware, see the AASHTO Roadside Design Guide (see Appendix E).

Miscellaneous

Landscaping and Planting

Ensure the contract-specified landscaping and planting items meet design concepts of aesthetics and erosion control.

Fertilizing, seeding, and mulching

- Evaluate both quality and rate of application of the materials used.
- Record information from tags on seed bags and compare to contract requirements.
- Examine project test reports on the materials used and the rates of application.
- Verify that the time or season of planting is appropriate.
- Where sufficient time has elapsed since planting, examine and document apparent growth as a percentage of the surrounding undisturbed area (70 percent growth is generally required by the National Pollutant Discharge Elimination System [NPDES] permit).

Shrubs, trees, and other plantings

- Check to assure that the quantity, size, and quality meet specifications.
- Visit the source nursery or other source of supply if possible.
- Document methods and procedures used in planting, watering, and caring for trees and shrubs.
- Discuss applicable warranty provisions and procedures for administering.

Other Items

There are many items that may be included in projects that are not specifically mentioned in this Guide. Some are incidental to other bid items, and some are bid separately. Become familiar with the specific contract requirements and inspect in a similar manner.

There are other items of work that consist principally of the assembly and erection of components of manufactured products that are delivered to the project site. Examples of these items are signs, signals, lighting, and pump station equipment. Confirm the method of acceptance of these types of work. Generally, a manufacturer's certification that verifies the material characteristics of the product is required for acceptance. Ensure that these certifications are on file in the project records.

Project Cleanup

Evaluate the overall effectiveness of the contractor's operations in successfully completing all items of work. Field review the entire project and note:

- Surplus materials including stumps and brush have been disposed of in accordance with the contract.
- The project presents a pleasing appearance.
- Encroachments exist upon the right-of-way; pay particular attention to signs that overhang the right-of-way in urban areas.
- Borrow pits and ditches drainage are as required.
- Borrow areas, both on the right-of-way and on private property, have been regraded and seeded, and pit releases have been obtained from the owners.
- Haul roads have been restored and abandoned roadbeds obliterated.

Labor Compliance

Become familiar with the U.S. Department of Labor (USDOL) labor compliance provisions contained in Form FHWA 1273. Evaluate the effectiveness of the contractor and the contracting agency in administering these requirements:

- Weekly payrolls are submitted from the prime contractor and all subcontractors.
- Statements of compliance are signed and attached to payrolls.
- Seven-day pay periods are established and constant.
- Wages and fringe benefits are at rates not less than those predetermined by the Secretary of Labor as contained in the contract provisions.
- Work performed by any specific class of employees, including helpers and apprentices, conforms to the classifications set forth in the contract provisions.
- Employee classifications are correct for the work performed.
- Payroll forms reflect number of hours worked per day and per week.
- Gross and net wages are shown.
- When hours worked exceeds 40 in any work week, 1.5 base rate is paid.
- All weeks to date are accounted for.
- There is no evidence of any disproportionate employment of laborers, helpers, or apprentices that would indicate avoidance of the appropriate journeyman wage rate provisions.
- Trainee/apprentice documentation on file.
- Spot check interviews with employees of the contractor and subcontractors; comment on how these interviews are documented in project records. Make several spot interviews with employees and document findings.
- The contract wage rates are posted and available to the contractor's and subcontractor's employees.
- Unresolved violations are properly dealt with in accordance with STA, FHWA, and USDOL procedures.
- FHWA representatives are kept aware of labor discrepancies.
- The STA is preparing and submitting the Semi-Annual Labor Compliance Enforcement Report, Form FHWA 1494.

Bulletin Board

Verify that the prime contractor maintains a bulletin board in a prominent location where employees congregate. Refer to the appendix of FHWA's Contract Administration Core Curriculum Manual for a listing of job site posters and Federal forms to be displayed (www.FHWA.dot.gov/programadmin/contracts/poster.htm).

Construction Safety

Become familiar with the USDOL Occupational Safety and Health Administration (OSHA) provisions contained in 29 CFR 1926 (see the OSHA Web site: www.osha.gov).

- Evaluate the effectiveness of the contractor and the contracting agency in administering safety and health requirements.
- Document STA guidance provided to field engineers and inspectors on their role and responsibility.
- Inspect the project to identify potential safety and health hazards; photograph concerns for discussion with the STA and the contractor.
- Document how many contractor personnel workdays have been lost to project injury.
- Obtain a copy of OSHA Document 2202 for a quick reference.

APPENDIX E

Technical References and Resources

Technical References and Resources

The following list contains sources used in preparing this guide and related information. The list is not intended to be a comprehensive resource on construction program management and inspection. Web and e-mail addresses are current as of April 1, 2004. See page E-4 for a list of the training courses included in this section that are related to construction program management and inspections. For more information, contact your local division office and visit the FHWA home page: www.fhwa.dot.gov.

Bridge Inspection

Bridge Construction Inspection for Area Engineers. Federal Highway Administration, Region 10, 1985.

Safety Inspection of In-Service Bridges (training course). Federal Highway Administration, National Highway Institute Course No. 130055A. Course Scheduling: www.nhi.fhwa.dot.gov/coursedesc.asp?coursenum=22. Course Manual: www.nhi.fhwa.dot.gov/crsmaterial.asp?courseno= 130055.

Construction Reviews

Conducting Reviews That Get Results. Federal Highway Administration, National Highway Institute Course No. 310111. Available: www.nhi.fhwa.dot.gov/coursedesc.asp?coursenum= 1146.

Generic Construction Related Review Guidelines. Federal Highway Administration, Office of Asset Management. Available (online): www.fhwa.dot.gov/construction/reviews.htm.

Contract Administration

Contract Administration Core Curriculum Manual, Participant's Manual and Reference Guide. Federal Highway Administration, 2001. Available (online): www.fhwa.dot.gov/programadmin/contracts/coretoc.htm.

Critical Path Method

Critical Path Method (CPM) Guidance for FHWA Area Engineers. Federal Highway Administration, March 1985.

Use of Critical Path Method (CPM) for Estimating, Scheduling, and Timely Completion (training course). Federal Highway Administration, National Highway Institute Course No. 134049A. Available (online): www.nhi.fhwa.dot.gov/coursedesc.asp?coursenum=1001.

Experimental Construction Features

FHWA Program Administration Web site: www.fhwa.dot.gov/programadmin/contracts/expermnt.htm.

Freedom of Information Act

FHWA Freedom of Information Act Web site: www.fhwa.dot.gov/foia/index.htm.

Geotechnical

Checklist and Guideline for Review of Geotechnical Reports and Preliminary Plans and Specifications. Federal Highway Administration, October 1985, Publication No. FHWA ED-88-053.

Design and Construction of Driven Pile Foundations, Volumes I and II. Federal Highway Administration, November 1998, Publication Nos. FHWA HI-97-013 and FHWA HI-97-014 (NTIS Nos. PB97-134407 and PB97-141311). Available (online): www.fhwa.dot.gov/bridge/geopub.htm#pilefoundations. Available (print): www.ntis.gov.

Drilled Shaft Foundation Inspection (training course). Federal Highway Administration, National Highway Institute Course No. 132070A. Available (online): www.nhi.fhwa.dot.gov/coursedesc.asp?coursenum=1062.

Driven Pile Foundation Inspection (training course). Federal Highway Administration, National Highway Institute Course No. 132069A. Available (online): www.nhi.fhwa.dot.gov/coursedesc.asp?coursenum=1070.

Performance of Pile Driving Systems: Inspection Manual. Federal Highway Administration, Pub. No. FHWA RD-86-160, December 1986. Available (online): www.fhwa.dot.gov/bridge/geopuba.htm#pilefoundations.

Shallow Foundations (training course). Federal Highway Administration, National Highway Institute Course No. 132037A. Available (online): www.nhi.fhwa.dot.gov/coursedesc.asp?coursenum=75. Reference Manual (FHWA-NHI-01-023).

Tiebacks. Federal Highway Administration, Pub. No. FHWA RD-82-047 (Report) and FHWA RD-82-046 (Executive Summary), July 1982. Available (print): e-mail reportcenter@fhwa.dot.gov or at www.ntis.gov, report code PB83-178368; Executive Summary code PB83-178350. Available (online): www.fhwa.dot.gov/bridge/geopuba.htm#permanentgroundanchors.

Inspections (general)

Construction Inspection Techniques for Base Course Construction. Federal Highway Administration, May 1986. Available by e-mail: construction@fhwa.dot.gov.

Design and Control of Concrete Mixtures, 14th ed. S. Kosmatka, B. Kerkhoff, W. Panarese, 2002. Skokie, IL: Portland Cement Association (www.portcement.org).

Federal-Aid Policy Guide. FHWA Web site: www.fhwa.dot.gov/legsregs/directives/fapg/ cfr0470a.htm.

FHWA Construction Web site: www.fhwa.dot.gov/construction/reviews.htm.

Major Types of Transportation Construction Specifications: A Guideline to Understanding Their Evolution and Application. AASHTO Highway Subcommittee on Construction, Quality Construction Task Force, August 2003. Available (online): www.fhwa.dot.gov/construction.

Public Works Inspector's Manual. S. B. Birch, Jr., E. B. Wetherill. BNI Publications, February 2001. www.buildersbook.com, code 1557013942.

Pavements

Construction Inspection Techniques for Flexible Pavements. Federal Highway Administration, May 1986. Available by e-mail: construction@fhwa.dot.gov.

Hot-Mix Asphalt Paving Handbook 2000. Transportation Research Board. Print and CD formats available from AASHTO Publications (aashto@aashto.org), FHWA Report Center (reports.center@fhwa.dot.gov), or National Asphalt Pavement Association (napa@hotmix.org).

Principles of Construction of Hot-Mix Asphalt Pavements, 2nd ed. Asphalt Institute. Available: www.buildersbook.com, code MS22.

Quality Assurance

Implementation Manual for Quality Assurance. American Association of State Highway and Transportation Officials, February 1996. www.transportation.org/publications/bookstore.nsf, code IMQA-1.

Optimal Procedures for Quality Assurance Specifications. Federal Highway Administration, April 2003, Publication No. FHWA-RD-02-095. Available (print): www.ntis.gov. Available (online): www.tfhrc.gov/pavement/pccp/pubs/02095/index.htm.

Quality Assurance Guide Specification. American Association of State Highway and Transportation Officials, February 1996. www.transportation.org/publications/bookstore.nsf, code QA-1.

Quality Assurance Software for the Personal Computer. FHWA Demonstration Project 89, Publication No. FHWA-SA-96-026, May 1996. Available (print): construction@fhwa.dot.gov. Available (software): www.ntis.gov, NTIS number PB96-502729.

Records

Office of Management and Budget Web site: www.whitehouse.gov/omb/circulars/a130/print/a130trans4.html#1.

FHWA Web site: www.fhwa.dot.gov/legsregs/directives/orders/m13241.htm.

Risk Assessment

Risk Assessment Guide. FHWA Intranet: intra.fhwa.dot.gov/programadmin/risktoc.htm

National Highway Institute Training Courses

National Highway Institute (NHI) training courses are readily available at little or no cost in hard copy or CD format. The NHI course catalog is available at www.nhi.fhwa.dot.gov/coursec.asp. Following are courses related to topics in this Guide.

Conducting Reviews That Get Results. Course No. 310111.

Drilled Shaft Foundation Inspection. Course No. 132070A.

Driven Pile Foundations Inspection. Course No. 132069A.

Safety Inspection of In-Service Bridges. Course No. 130055A.

Shallow Foundations. Course No. 132037A.

Use of Critical Path Method (CPM) for Estimating, Scheduling, and Timely Completion. Course No. 134049A.

APPENDIX F

Examples of Reporting Practices

Examples of Reporting Practices

The following items were extracted from actual construction inspection reports. Included with them are comments regarding the appropriateness and significance of each of these items. The included items represent a variety of topics that could be covered in construction inspection reports. Although they relate to specific items, the treatment of these items could be applicable to other items as well.

Inspection Coverage

Report Item	Comments
The primary purpose of this stage inspection was to determine the adequacy of the State's construction inspection processes for bituminous pavement.	This statement covers the type of inspection, phase of work, and how the review will be focused. It gives the reader an idea of what to expect.
Scope of inspection: review traffic control and placement of asphalt concrete pavement.	This is a brief way of covering the purpose statement. The type of review phase (e.g., initial, inspection-in-depth (IID), etc.) should be identified.
The purpose of this inspection was to get information for the bridge deck quality construction. At the same time, a joint inspection of concrete bridge deck placement was conducted with the State's contract administration staff.	In addition to providing the type of information in the above statements, this example demonstrates conservation of resources by performing a dual-purpose review. It also clarifies the State's role in the review.
With the best intentions, a major phase (IID) of concrete paving operations was scheduled to be performed on this project on July 20, 2002. Just prior to reaching the plant site, a power outage at the plant and a major rain downpour on the grade resulted in the operations being shut down for the day. However, we were provided with a detailed briefing of the plant's operation. (This item was followed with over a full page of text on the review and six pages of photographs.)	This is a good explanation of why an intended inspection could not be carried out. It explains what was done in lieu of the originally planned review. The field engineer could have also considered a review of materials test reports, stockpiling operations, materials payment records, or other required project documentation as an alternative. Another aspect that could have been reviewed would have been on the contractor's quality test control results and charts.
This is an experimental project that consists of installing a "Tensar" polymer grid fabric wall. The project was inspected to observe the forming system and the overall appearance of the wall.	This report contains an up-front identification of a special feature of the project as well as the purpose of the inspection.

Progress and Quality of Work

Report Item	Comments
Time Elapsed: 121 percent Progress of Work: Unsatisfactory	It is undesirable to get report heading data such as this without an explanation and a projection of future progress or actions to be taken. Expansion of statistical data is encouraged.
At the time of this inspection, the asphalt concrete leveling work was substantially completed and the contractor was just beginning the paving of the base lift, starting at the westerly end of the project.	This example of project status presents a meaningful picture of the ongoing major work on the project at the time of inspection.
The contractor hopes to start paving operations the first week in August.	Future scheduling is appropriate for reporting. Is this ahead of or behind schedule?
Currently the contractor is behind schedule but he has developed an accelerated schedule that shows he may complete the work on time.	Information on revised scheduling is also of interest.
It was clear that the contractor on this project has done everything he could to maintain his construction schedule. However, the nature of the somewhat abnormal rains this summer combined with the volcanic silt in this area has slowed his progress. It is important to note that the contractor did work every time that soil conditions allowed.	This comment is not as speculative as the last one. It is apparent that some support for the conclusion probably exists in addition to the general statements here. The level of support here is fully acceptable. It is helpful if the information source can be identified (e.g., project engineer, diaries, etc.).
The contract time was extended 42 days to completion time of 252 days. The contractor used 253 days and is being charged one day of liquidated damages.	This is a factual report of contract time charges, but it really adds very little value to the report without further explanation. Also, it does not discuss justification for the 42-day extension or whether it was agreed to by FHWA.
For a project of this magnitude, it appeared that very little construction activity was occurring at the time of the inspection. Construction weather and soil conditions were ideal. (Note: time = 15 percent, work = 3 percent)	The inspecting engineer should add sufficient information to clarify the reasons why no construction has taken place, his/her reaction to these reasons, and a remark resolving the issue of lack of progress.
Although the percentage of work completed (16 percent) lags the percentage of time elapsed (50 percent), it is anticipated that the contractor will complete this project on time. Once the paving operations commence, the percentage of work completed will accelerate.	A logical explanation has been included for the slow progress to avoid creating alarm on the part of the reader.

Continued on next page

Progress and Quality of Work *(continued from previous page)*

The completed work was found satisfactory except that several runs of guardrail needed better line and grade and three turnouts did not have terminal end sections installed on the guardrail. The State's traffic section was requested to review this situation.	The use of exception statements permits a general statement of acceptability to be made without glossing over minor items that are not fully satisfactory.
A brief windshield review was made of the completed work and it appeared satisfactory.	The FHWA engineer properly described a brief inspection. These type of cursory reviews are discouraged in lieu of more detailed inspections.
The project has been built in general conformance with the plans and specifications and is considered satisfactory for acceptance.	There may be some differences in opinion as to what is substantial conformance or reasonably close conformance. However, "general conformance" seems much more nebulous and leaves considerable doubt as to the quality of the work. An effort should be made to stick to commonly accepted terms. When this is not possible, a more detailed explanation is in order.

Materials and Quality Control

Report Item	Comments
The specified quality has been obtained on all materials incorporated into the project to date.	This statement is all-inclusive and does not reflect any particular effort by the field engineer to verify it. It would be appropriate to include the source and basis for this statement.
The compaction testing was accomplished with a nuclear gauge, and all testing for the day's laydown was found to have passed the required 92 percent density. The density ranged from 92.2 percent to 94.0 percent.	The reporting of specific data is helpful in supporting quality evaluations. This comment should include the type of nuclear gauge and test method followed.
The stockpiling of materials was situated such that contamination or segregation was minimized.	Comments such as this reinforce the validity of test results.
M. Gardner indicated that the burner was not functioning properly for about 3 hours in the afternoon and that mix was being delivered to the street at approximately 115–118 ºC (240–245 ºF). The plant was run at approximately 146 ºC (295º F) thereafter.	Comments received verbally without confirmation should be identified as such.
A quality level (QL) analysis was performed on the aphalt concrete pavement Class B material, particularly the #10 and #200 sieves and asphalt content. The QLs were 82, 100, and 100 respectively. The QL for the #10 sieve was less than the desirable 90. The material tests showed a wide variability and one test to be out of specifications, but within tolerance limits.	It is meaningful to note that QL analysis is being made. Specific findings are stated together with a further explanation of the reason for the low quality level. It further indicates specification compliance.
The traffic has been moved to the new lane, and the old pavement has been milled and stockpiled for future recycling into the asphalt-treated base. The recycled asphalt appears uniformly graded and has no noticeable contamination.	Observations of visual acceptability add to the value of the inspection report.
Approximately 457 m (1,500 ft) of the base lift were rejected, removed by the contractor, and replaced at his expense. I inspected the material before it was removed from the road and concur with the State's action. The asphalt did not coat the aggregates well. It is felt that possibly the wrong asphalt had been delivered to the project.	Here the field engineer recorded a problem and corrective action. In addition, the engineer chose to document FHWA support of the State's action and speculate on the cause of the problem.
Aggregate moisture samples had not been taken for approximately 5 days; moisture content was being estimated for water/cement ratio calculation.	Adverse findings should be supported with specifics. Action that FHWA will be taking as a result of improper testing procedures should be noted and documented.

Workmanship

Report Item	Comments
The pavement looks and rides good. The emulsion asphalt seal, using a slow setting emulsion, is being placed at between approximately 0.45–0.57 l per 0.84 m^2 (0.12–0.15 gal per yd^2) The uphill lanes were shot slightly lighter. The emulsion appears to penetrate into the pavement well and should not affect the skid qualities of the pavement. It appears this pavement could absorb more emulsion if that were necessary.	Opinions by the field engineer are particularly appropriate in discussing workmanship. Details of materials design can be of value in making future post-construction evaluations of the quality of work.
Representatives from the city were present at the final inspection and indicated their pleasure with the way the project turned out.	When possible, it is desirable to include the opinions of others as well.
Curbing exists along some of the northerly part of the project. The typical section calls for the pavement to be tapered at these locations to match the existing curbing. Very little tapering was done, and consequently abrupt edges exist along the curb-pavement match joint. The abrupt edges should be corrected.	This comment explains why the work is unsatisfactory. The fact that the work is being redone is also of value in the report.
It was found that many of the compartmentalized neoprene joint installations were at the surface of the pavement slab rather than embedded 3.175 mm (1/8 in) according to the plan. This is not acceptable because of the tire wear on the joint and possible removal of the compartmentalized joint by the traffic.	Where possible, it is also desirable to include reasons other than specifications for making unsatisfactory findings. Providing this information to the inspector and contractor may also be helpful in getting future compliance.

Construction Operations and Features

Report Item	Comments
The project engineer stated that there were no problems with the contractor's construction methods.	We value the observations of the project engineer to help us report the things we have not seen, but when a statement such as this is included without expansion it raises doubt as to whether or not the area engineer ever got out of the project office. The area engineer needs to address specific operations. It is possible that the area engineer visited the project after the construction activity was completed. In those cases he should look at project documents such as diaries for corroboration of the project engineer's statements.
The latex-modified deck overlay was placed on the northbound lanes of Fords Bridge on July 20, 2002, with excellent results. The project manager indicated that the work went very smoothly.	This comment combines personal evaluation with the project engineer's report of what could not be observed personally. See above.
Present plans are to place concrete on Thursday and Friday of this week. The pours are scheduled to begin during the early hours of the morning (3 a.m. to 4 a.m.) and be completed before the hotter weather of the day.	Comments on future operations may be useful in scheduling additional reviews or in gaining assurance of the probable acceptability of the operations.
The contractor demonstrated a device called a scabbler that is a lightweight mechanical hammer that turns when it hits the concrete surface. The impact of the hammer can be regulated from light to heavy within the operating range of the equipment. This device leaves a very nice surface on which to place the overlay and does not appear to damage the deck.	Reports on unusual features are of particular interest. The description of activities as well as the results of using the unusual feature is of additional value.
The contractor's rolling equipment consisted of one pneumatic breakdown roller immediately behind the paver followed by a vibratory steel wheel roller. The inspectors were continually maintaining temperature checks on the material, and found it to fluctuate between 121 and 135 ºC (250 and 275 ºF), which is well above the minimum 82 ºC (180 ºF) for compaction. Generally there were three passes of the pneumatic and two passes of the steel-wheel roller, which brought the densities into the 92.2 percent to 94.4 percent compaction area, which is within specifications.	The reporting of State as well as contractor activities provides assurance of adequate State supervision. Specification citations are of particular value to readers who encounter projects in more than one State.
There was some evidence of erosion control used. Items noted were seeded slopes, straw bales, settlement areas, and silt screens.	An observant inspection engineer may be able to report on compliance with contract provisions even when the operation is not in progress during the inspection and will not be evident in the completed work.

Project Records

Report Items	Comments
Compaction of this project has not been a problem in the past, and therefore the compaction tests were not reviewed during this inspection.	Risk management frequently means that not all items can be checked. Support for these judgment calls is desirable. However, the privilege of not looking should not be abused.
Project records indicate that all materials incorporated into the work are in reasonably close conformance with the specification requirements.	It is highly improbable that an area engineer examined all project records. The basis for making broad-brush statements should be reported.
Material test reports were not reviewed. However, the project supervisor indicated that specification materials were being incorporated into the work and good densities were being obtained.	Here, verbal reporting is accurately reported. This is acceptable provided that occasional checks are made.
A review of the project records indicates compaction testing frequencies well above the specification requirements. Less than 10 percent of the tests indicated failing results. All failing areas were reworked and retested until specified levels were attained.	In this example, the acceptability of test results is quantified along with a notation of corrective action.
Compaction and gradation tests were examined and found to be adequate in frequency and within specifications.	This report identified the records reviewed and type of checks made. However, it does not indicate what tests were spot-checked or if all tests were reviewed.
Project diaries were reviewed and found to be current.	This comment shows that a specific check of diaries was made.
The asphalt plant, rollers, and paver inspection forms were reviewed and found in order.	This comment indicates the specific inspection forms that were reviewed.
Bid Item No. 8, Class E Hot Mix, was reviewed for documentation of pay quantities. The estimate paid for 8,196 tonnes (9,035 tons) of material. The quantity summary had a similar figure posted that was documented by weigh tickets. The weigh tickets were properly signed and receipted.	The field engineer has identified the specific item and the type of quantity check made.
Negotiated unit prices were used for all three items. Based on the conversation with the project engineer, the basis for the unit prices was the average bid prices for other projects. However, the project files should be documented as to how the price was selected.	Information received verbally should be properly identified. The request for documentation is also properly recorded.
There have been 10 change orders (COs) processed to date on this project. CO numbers 2, 3, and 7 were reviewed in detail. The project files contain adequate justification for making changes on this project.	Accuracy in recording what was reviewed avoids creating mistaken impressions that all records were reviewed.

Subcontracting

Report Item	Comments
Names of six subcontractors have been submitted for approval to date with an additional three pending. Of these, four are Disadvantaged Business Enterprises (DBEs). The DBE contract goal was $40,000. The subcontractor approvals submitted far exceed these contract goals.	It is important to keep track of subcontracting and compliance with DBE subcontracting goals.

Labor Compliance and Disadvantaged Business Enterprises Performance

Report Items	Comments
A check on labor compliance (payroll data) showed compliance with contract provisions.	While most labor compliance responsibilities have been turned over to the State, occasional checks are appropriate.
It was found that in some cases the "Project Site Labor and EEO Standards Interview Forms" were not completely filled out or contained information that did not correlate with the payrolls. In some cases the dates, the contractor's name, or the interviewer's name was not included on the form. In other cases the employee's job title or pay rate did not match that listed on the payrolls. It is recommended that training or guidance on conducting the job site interviews be issued to the field personnel responsible for the interviews.	It is important to keep track of labor interviews as they are a critical portion of labor compliance verification.
It was reported that DBE participation on this project has been satisfactory.	We need to know if there is appropriate DBE participation on projects. Where direct observation is not possible, we need to rely on feedback from project personnel.
Contract DBE goal was 8 percent of the total contract amount. This goal has been met as follows: (A list followed of firm name, bid item, amount, and percentage of total contract.)	Specifics on how goals are being met should be reported. Desirably, the inspecting engineer should report DBEs actually on the job, performing a commercially useful function, and supervising the work being done.
This inspection included reviewing various DBE project records. During this review it was found that some of the DBE's employees were on the prime contractor's payroll. A meeting has been set up at State headquarters to discuss this matter with civil rights personnel.	The inspecting engineer should not only report on goals and attainment but also from time to time review office records regarding DBE operations. In this case, when determining whether a DBE is an independent business, records documenting personnel actions, ownership of equipment, etc., should be scrutinized. A finding such as this one is significant and may affect a firm's eligibility. A followup meeting with appropriate STA staff is a "good call."

Safety and Handling of Traffic

Report Item	Comments
It was reported that the approved traffic control plans (TCPs) had been working in a satisfactory manner on this project.	Reports from project personnel are of value, but it was surprising that this comment was not reinforced by personal observation.
Some deficiencies in construction signing (mainly drums and barricades) were noted.	The citation of deficiencies should be as specific as possible. Was the problem in reflectivity, placement, or some other aspect?
The construction traffic control was observed carefully throughout the length of the project and found to be exceptionally good.	This comment reflects a detailed review of the situations.
There have been several reviews on the traffic control by the State's traffic section during the life of the project. From these reports, the traffic control used appeared to have improved since our previous inspection.	Commenting on the State's management as well as observed conditions is of value.
The detour was well marked for two-directional traffic. Striping was very visible, and the numerous reflector buttons indicate that visibility at night is probably very good also. Barrels and candle delineators were up, as appropriate, through the entire length of the project and appeared to be in very good condition.	The inspecting engineer has provided information to support the conclusion that the use, location, and maintenance of traffic control devices are all being adequately handled.
All flag persons were properly equipped with hard hats and orange vests, and appeared to understand proper flagging procedures.	In this instance, it is apparent that all aspects of the flagging operation had been evaluated; however, if the flag person's operations were observed, the area engineer should report that the flag person demonstrated an understanding and use of proper techniques.
During a field review, it was noted that a piece of heavy equipment was parked in the median area. This hazard was brought to the attention of the inspectors, and steps were taken immediately to have the contractor move the equipment	The comment made here reflects an awareness of unsafe conditions and shows a product of the inspection effort.
The detour appears to be operating in a satisfactory manner. The project engineer indicated he had made a night inspection of the detour to insure that nighttime operation was satisfactory. Several minor adjustments were made as a result of this nighttime inspection.	Good coverage of the item being reviewed is provided by combining firsthand observation with reports of those items that could not be reviewed during the inspection.

Changes, Extra Work, and Time Extensions

Report Items	Comments
The final contract cost is expected to exceed the contract bid amount by 26 percent.	Since early notice of the overrun will probably not be used for fiscal control, this comment is of little value without more explanation.
The final project cost will be approximately $700,000—an overrun of about 10 percent. Major items making up the overrun are: (list followed)	Specific comments such as this are more of value than the general comment noted above. If possible at this time, the FHWA position regarding the overruns should be reported.
The final project cost overran the original authorization by approximately 22 percent. The majority of this overrun was due to encountering a very wet subgrade that required a considerable amount of subexcavation and importing of embankment materials. Overruns also occurred in temporary striping, stripe removal, cement-treated base and asphalt paving.	This comment goes a step further and identifies the reason for the major overrun as well as the items involved. This level of detail is desirable.
Several change order documents were discussed and found satisfactory.	This discussion may have been of value at the time, but the failure to be specific makes the comment meaningless to anyone other than the principals involved.
There have been three COs to date on this project. CO No. 1 was reviewed in detail. The file contained adequate justification for making changes on the project as directed by CO No. 1.	This specific comment is much more appropriate than the one above.
The slide area mentioned in a previous report has moved enough to cause displacement of the new pavement surface. If movement continues, stabilization work may be required. Any corrective work could best be handled separately from this contract.	An anticipated future problem has been identified. This note, which serves to alert readers of the possible need for action, also contains FHWA's suggestion for contracting the work.
The material had to be removed from the deck surface. This requirement had not been specifically noted in the plans or special provisions. The contractor may request extra compensation for this work.	The possible need for change orders or claims on work, which has already been accomplished, should also be noted.
The contractor has submitted a request for a time extension, which is currently being reviewed.	This comment concerning a time extension is of little value without additional information. Since the discussion is appropriate, it should have been expanded.

Environmental Commitments

Report Items	Comments
Material source cleanup will be coordinated with the Fish and Game Commission, as a small stream passes through the source area.	Environmental sensitivity and mitigation efforts have been properly noted without being limited to items included in the applicable environmental document.
There was one location at Sta 13+90 on the north side of the new roadway near Kincaid Lake with an excessive amount of silt accumulation. It is recommended that a floating boom be installed on the south side of the roadway to keep any silt from entering the lake. There was also quite a bit of silt in the pond area on the north side of the roadway at Sta 51+55. A large amount of silt was exiting the side slope and entering the pond. It is recommended that a large rock dam/sediment basin be constructed along with a rock ditch at the toe of the slope to prevent this situation from reoccurring.	The inspecting engineer should make sure that bodies of water receiving direct runoff be adequately protected. Structural controls are often used as a second or third line of defense to capture sediment as it leaves the site. A continuing effort is needed to address environmental concerns. Construction inspection reports should acknowledge these efforts.
During this final inspection, wetland plantings were visually observed to be healthy and well maintained. The types of plants and spacing matched the requirements committed to in the project's environmental assessment.	It is important that the inspecting engineer know about all prior environmental commitments and document that all measures were carried out.

Staffing and Project Control

Report Items	Comments
I found the project adequately staffed with experienced personnel to adequately inspect the testing and construction procedures on the project.	Project staffing and qualifications are appropriate items for evaluation and reporting.
The project is presently being staffed with adequately trained and experienced personnel (10 employees).	This comment provides additional information by quantifying the staff size.
The engineer crew was considered adequate but minimal. If the contractor elects to double-shift, it will not be possible to cover all operations with the existing staff.	Evaluations should also anticipate future needs.
The city's project manager advised that the city electrician had inspected the electrical wiring at all signals.	Notes regarding outside inspections are desirable.
During the inspection, I noted several major work items being accomplished on this bridge rehabilitation project without the required STA project inspector on the project. Resteel appeared high, and the stripped forms showed pockets of honeycomb. A review of the project diary showed that all available inspectors were assigned elsewhere. The State felt the test results and periodic spot inspection for this work were reasonable. I have asked that each major work item receive at least the "minimum" level of inspection required by specifications and the State construction manual. I have also arranged a meeting with the district engineer before I recommend further action.	This series of comments on staffing findings is not unusual. It could probably occur on most projects today. The area engineer noted a problem, observed the process, and discussed observations with STA project and district construction personnel. FHWA's position was set for that project, and when the resolution or future corrective action was beyond the project level, the field engineer stated the next course of action.
Overall, the contract administration and sampling and testing were found satisfactory. The minor discrepancies found during the inspection were immediately taken care of to the satisfaction of FHWA. The project staff needs to be commended for a job well done.	Appropriate compliments to the project staff are appreciated.
The project engineer and crew are complimented for keeping the engineering costs to a minimum, especially when considering the isolated location of the project.	Performance under unusual circumstances is worthy of recognition.
This was a difficult project to construct in that it had constant heavy traffic and was in a rather tight work area. The completed work looked very good. This is a reflection of the good job done by both the contractor and the State's project manager.	Contractors should also be complimented for quality performance.

Claims and Potential Claims

Report Items	Comments
The contractor has submitted seven claims totaling $379,221.41. Following is a brief discussion of each including the current status: (amounts, facts, alleged claims, and initial State analysis of each has been omitted here for brevity).	The recording of claims and potential claims permits FHWA to begin evaluation of their merits at an early date. Specifics are of value here.
Longitudinal bracing was required for the detour by the railroad and State. There has been a minor dispute over this item.	In this case, a dispute has been identified, but the value of the comment is limited since neither the nature of the dispute nor parties involved, i.e., contractor, railroad, State, etc. were included.
While excavating on June 9, the contractor broke a water line. A repair joint was installed by the contractor. Since there was less than 38 cm (1ft) of cover over the pipe, the contractor will be filing a claim. The water line was there before the existing roadway was built.	In this instance, the facts upon which the claim is based have been appropriately noted.
The contractor has filed a notice of intent to file a claim for additional excavation quantity at Pier 5. Contract plans provide for pay limits for riprap excavation at a 1:1 slope. Based on observations at this inspection, it appears that the contractor is accomplishing an excavation slope of 2.5:1 or 3:1. The project manager is taking appropriate action to resist such a claim.	Contractor actions affecting claims should be recorded as was done here. The State's position on the claim is also of value.

Evaluation of Design and Potential Maintenance Problems

Report Item	Comments
The project engineer noted that the major problems with the plans were related to the fact that the utility locations, which were based on information obtained from the utilities, were not verified in the field.	The circumstances responsible for the preparation of inaccurate plans have been appropriately recorded here. In this instance, additional reconnaissance should have been made.
The project manager advised that a small concrete retaining wall was added adjacent to the railroad tracks. It was required by the railroad agreement but was somehow overlooked in the plans.	Design oversights occur for a variety of reasons. Identification of the source of oversight may help to prevent future occurrences.
A free right turning movement is not presently operating as was expected. During our observation, approximately 50 percent of the time, the lead vehicle stopped and waited for a short time before realizing that they were in a free movement lane. It appears that the location of the signal heads for the through movement is causing the confusion. These signal heads will be relocated over the appropriate lanes and additional signing and radius work will be provided on the right turn.	Where facilities do not function as designed, changes may be required. The feedback of this information to design may be of use in improving future designs.
One shaded area just westerly from the Beaver Creek crossing did not take the cover aggregates very well. This area may require minor work next year.	The identification of potential maintenance items serves to point out areas that should be monitored for performance. This identification may also be of benefit in achieving future design and construction improvement.

APPENDIX G

Project Implementation and Reporting Forms

Contents

Related Project Information - Field Inspection Reports/Checklists/Forms

Forms may be modified as appropriate for Division use.

* Forms shown are division office forms that have been modified to suit a division's needs.

OMB NO. 2125-0010

BID PRICE DATA

NOTE: *Transmit only original to the Washington Headquarters, Office of Infrastructure*
ATTN.: HIPA-10

STATE

COUNTY	FEDERAL PROJECT NO.	URBAN ( ) RURAL ( )	DATE OF AWARD

ROADWAY Contract Amount	$	Code Types	ROADWAY AND BRIDGE
BRIDGE Contract Amount	$		
TOTAL CONTRACT AMOUNT	$		

NUMBER OF UNITS	UNIT	ITEM	UNIT PRICE Dollars	UNIT PRICE Cents	TOTAL COST (Dollars)
	C.Y.	111 Common Roadway Excavation			
	C.Y.	131 Unclassified Roadway Excavation [1]			
	LB.	421 Structural Reinforcement			
	LB.	431 Structural steel			
	TON	775 Bituminous concrete surfaces [2]			
	S.Y.	781 Port. cem. conc. surfaces *Inches* [3]			
	C.Y.	900 Structural concrete [3]			

PRICE ADJUSTMENTS PCC PAVEMENTS AND STRUCTURAL CONCRETE	UNIT PRICE *Per Square Yard* 781	781	781	*Per Cubic Yard* 900	900
Unit bid price					
Steel, not bid separately *(Subtract)*					
Longitudinal joints *(Subtract)*					
Transverse joints *(Subtract)*					
Fine finishing of subgrade *(Add)*					
Cement or aggregates bid separately *(Add)*					
3 ADJUSTED PRICE					

Prepared by:

Title:

Date:

REMARKS *(Use reverse side if more space is needed.)*

[1] *Unclassified Roadway Excavation (Item 131) when reported:*

Percent Rock

Estimated Price of Rock _____ per cubic yard

[2] When aggregate and bituminous material are bid separately, combine quantities and total costs. In converting gallons to tons, 235 gallons per ton may be used. When bituminous material is bid in addition to the bid for mix, report weight of mix only, and the combined total costs.

Form FHWA-45 (Rev. 7-98) (INF 4.2, 7/29/98) PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE

This form was electronically produced by Elite Federal Forms, Inc.

DISCARD BEFORE SUBMISSION

DEPARTMENT OF TRANSPORTATION
Federal Highway Administration

SUPPLEMENTAL INFORMATION

Agency Display of Estimated Burden
for
BID PRICE DATA

According to the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this form is 2125-0010. The average completion time for this form is 0.75 hours. If you wish to make suggestions, please fax them to 202-366-3988, or mail to:

Federal Highway Administration
Office of Program Administration, HIPA-10
400 7th Street, SW
Washington, D.C. 20590

OMB NO. 2125-0010

BID PRICE DATA

NOTE: *Transmit only original to the Washington Headquarters, Office of Infrastructure, ATTN.: HIPA-10*

STATE

COUNTY	FEDERAL PROJECT NO.	URBAN ( ) RURAL ( )	DATE OF AWARD

ROADWAY Contract Amount	$	Code Types	ROADWAY AND BRIDGE
BRIDGE Contract Amount	$		
TOTAL CONTRACT AMOUNT	$		

NUMBER OF UNITS	UNIT	ITEM	UNIT PRICE Dollars	UNIT PRICE Cents	TOTAL COST (Dollars)
	M^3	111 Common Roadway Excavation			
	M^3	131 Unclassified Roadway Excavation [1]			
	KG.	421 Structural Reinforcement			
	KG.	431 Structural steel			
	t	775 Bituminous concrete surfaces [2]			
	M^2	781 Port. cem. conc. surfaces CM [3]			
	M^3	900 Structural concrete [3]			

PRICE ADJUSTMENTS PCC PAVEMENTS AND STRUCTURAL CONCRETE	UNIT PRICE Per Square Meter			Per Cubic Meter	
	781	781	781	900	900
Unit bid price					
Steel, not bid separately *(Subtract)*					
Longitudinal joints *(Subtract)*					
Transverse joints *(Subtract)*					
Fine finishing of subgrade *(Add)*					
Cement or aggregates bid separately *(Add)*					
3 ADJUSTED PRICE					

Prepared by:

Title:

Date:

REMARKS *(Use reverse side if more space is needed.)*

[1] *Unclassified Roadway Excavation (Item 131) when reported:*

Percent Rock

Estimated Price of Rock per cubic meter

[2] When aggregate and bituminous material are bid separately, combine quantities and total costs. In converting liters to metric tons, 982 liters per metric ton may be used. When bituminous material is bid in addition to the bid for mix, report weight of mix only, and the combined total costs.

Form FHWA-45M (Rev. 7-98) (INF 4.2, 7/29/98) PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE

This form was electronically produced by Elite Federal Forms, Inc.

DISCARD BEFORE SUBMISSION

DEPARTMENT OF TRANSPORTATION
Federal Highway Administration

SUPPLEMENTAL INFORMATION

Agency Display of Estimated Burden
for
BID PRICE DATA

According to the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this form is 2125-0010. The average completion time for this form is 0.75 hours. If you wish to make suggestions, please fax them to 202-366-3888; or mail to:

Federal Highway Administration
Office of Program Administration, HIPA-10
400 7th Street, SW
Washington, D.C. 20590

U.S. Department of Transportation
Federal Highway Administration

DIVISION OFFICE

BID REVIEW CHECKLIST

Competition is one of the best indicators of a "good" bid. Other factors, however, play an important role in analyzing a bid. The analysis and subsequent award of a project should be thorough even when the low bid is below or at a reasonable percentage above the engineer's estimate. It is reasonable to expect that larger projects will undergo a more thorough review than smaller projects. Reference Technical Advisories T5080.4 and T5080.6 for additional information on the bid review process.

This document serves as a checklist for what should, at a minimum, be included in a bid review for a Full Oversight Project. The completed checklist and any accompanying information should be filed in the project-specific file.

—— NOTE ——

The State transportation agency's bid information contains agency Engineer's Estimate, which is CONFIDENTIAL! The responsible FHWA transportation engineer will not discuss the details of the estimate with anyone other than the FHWA Team Leader or the State contact. Upon Concurrence in Award, the Summary of Contractor Bids will be shredded/destroyed.

1. How many bids were submitted?
2. Is there good competition?
3. How does the bid compare with the engineer's estimate?
4. What is the distribution or range of bids received?
5. Which unit bid prices differ significantly from the estimate?
6. Is there justification for the difference?
7. What is the identity and geographic location of the bidders?
8. What is the potential for savings, if any, if the project is re-advertised?
9. How doe the bid prices for the project under review compare to bid prices for similar projects in the same letting?
10. Is there any urgency in letting the project?
11. What are the current market conditions and workload?
12. Are there any unbalanced bids?
13. Would deferral be contrary to public interest?
14. Are there any errors in the engineer's estimate?

10/93

U.S. Department of Transportation
Federal Highway Administration

CONSTRUCTION INSPECTION REPORT

DIVISION	REPORT NO.	DATE OF INSPECTION	DATE OF REPORT	PROJECT NO.

INSPECTION MADE BY	QUALITY OF WORK	PROGRESS OF WORK	TIME ELAPSED	WORK COMPLETED
	☐ Unsatisfactory ☐ Satisfactory	☐ Unsatisfactory ☐ Satisfactory	%	%

IN COMPANY WITH

(check appropriate box)

☐ Process Review/Product Evaluation ☐ Inspection-In-Depth ☐ Project ☐ Final

Form FHWA 1446A (Rev. 10–89)

U.S. Department of Transportation
Federal Highway Administration

CONSTRUCTION INSPECTION REPORT

DIVISION	REPORT NO.	DATE OF INSPECTION	DATE OF LAST INSPECTION	DATE OF REPORT	PROJECT NO.
California	[X]	[M/D/YY]	[M/D/YY]	[M/D/YY]	[XXXXX-XXX-X[XXX]XN]

INSPECTION MADE BY	QUALITY OF WORK	PROGRESS OF WORK	TIME ELAPSED	WORK COMPLETED
[Name, Title]	☐ UNSATISFACTORY ☐ SATISFACTORY	☐ UNSATISFACTORY ☐ SATISFACTORY	%	%

IN COMPANY WITH
[Name, Title]

☐ INITIAL ☐ PROJECT ☐ INTERMEDIATE ☐ PHASE (INSPECTION-IN-DEPTH) ☐ FINAL INSPECTION

LOCATION: [fill in the blank]

PROJECT DESCRIPTION/WORK TYPE: [fill in the blank]

PROJECT INFORMATION: [Acquire a copy of the Contract Award Summary once, at the beginning of the project]

CONTRACTOR: [Name]
[Address]
[City]
[Phone]

CONTRACT AMOUNT: [$XXXX]

STATE CONTRACT OR EA NO.: [XX-XXXXXX]

RESIDENT ENGINEER: [Name]
[Address]
[City]
[Phone]
[Fax]
[E-mail]

CONTRACT TIME SUMMARY: [Acquire a copy of the Weekly Statement of Working Days and Progress Payment Voucher after each construction inspection]

STATUS OF CONTRACT TIME AS OF	[M/D/YY]	TIME EXTENSIONS	[XX]*
CONTRACT AWARDED	[M/D/YY]	NON-WORKING DAYS	[XX]
FIRST WORKDAY	[M/D/YY]	REVISED WORKING DAYS	[XX]
ESTIMATED COMPLETION DATE	[M/D/YY]	TOTAL WORKING DAYS TO DATE	[XX]
WORKING DAYS IN CONTRACT	[XX]	REMAINING WORKING DAYS	[XX]

* Note: If a Contract Change Order is non-participating, days are non-participating.

PURPOSE OF INSPECTION: The purpose of this inspection was to review and discuss the completed work, work in progress, and to evaluate the performance and effectiveness of the contract administration performed by the Department.

Continued

PROJECT STATUS:

- **WORK COMPLETED:** [Comments]

- **CONTROLLING ITEM:** [Comments]

- **WORK IN PROGRESS:** [Comments]

- **CONSTRUCTION ACTIVITIES OBSERVED:** [Comments]

[PHOTOS of the project and any current work that may be taking place]

WORK ZONE SAFETY [note any of the following]

- Cones, drums, tabular delineators, barricades [type I, II, III]
- Detours
- Concrete barriers
- Signs
- Pavement markings
- Workers, equipment, material
- Clear zone
- Use of intelligent transportation systems

- **UPCOMING WORK:** [report]

- **RECORDS REVIEW:**
  - Is the uniform filing system being used?

The following records were reviewed at the construction field office:

CONTRACT CHANGE ORDERS [list of approved and pending]

- To date, a total of **[##]** CCOs have been issued for this project and are considered minor change orders. Since the last inspection of [M/D/YY], the following minor CCOs have been updated or issued for this project:
- FHWA has reviewed and issued prior approvals for CCO# **[##]**.
- Were any CCOs requiring prior approval executed without receiving prior approval or prior to making a contact with FHWA?
- If so, what steps are being taken to assure that FHWA sees these major CCOs in the future?
- Were there any CCOs that might cause an environmental issue?
- How is contingency balance on the contract being tracked?

NOTICE OF POTENTIAL CLAIM [NOPC]

- Up to now, how many NOPCs have you received from the Contractor for your job?
- What are the related issues?
- How many NOPCs were found to have no merit?
- How many NOPCs did the Contractor drop?
- How many NOPCs were considered incomplete (i.e., missing costs, reference to correct plan or specification, reason for submittal)?
- How many NOPCs were resolved to the satisfaction of both parties?
- Are all NOPCs on file?

Continued

MATERIAL TESTING – Test reports [were or were not] reviewed.

- Were forms TL-29 and HC-30 on file?
- Are Certifications of Compliance being filed?
- If so, do they contain the required information?
- Are "Buy America" requirements included on invoices and certifications for all iron and steel products?
- Are Acceptance Sampling and Testing Reports in the files?
- Is there a "Summary Log" of tests?
- What types of material have been tested for this project? Are they on file?
- Were the materials sampling and testing conducted at the required frequencies shown in the Construction Manual?
- Is the frequency of tests being monitored?
- Are failed tests documented in the files with the cross-references to re-tests?
- Does the Resident Engineer see the test reports?
- Have any disputes resulted from failing tests? If yes, what were the resolutions?
- Are there any signed material certifications on file?
- Are there any approved mix designs for asphalt cement and Portland cement concrete?
- Are trial batch test results properly identified and acceptable?
- Review the construction area and the Contractor on-site yard; check to make sure foreign iron and steel is not being incorporated into the project.

INDEPENDENT ASSURANCE RECORDS – Forms TL-0100, TL-0108T, TL-0108L, etc.

- Are copies of the material tester's certification in the project files? If not, where?
- Has a consultant been hired to do the materials testing for this project? If so, is there a copy of the consultant material tester's certifications in the project files?

DISADVANTAGED BUSINESS ENTERPRISE (DBE) – A review of the DBE records indicated the following:

- Is a copy of the contract Bidder DBE Information Form in the project files?
- What was the contract DBE goal?
- What is the Contractor's DBE goal?
- If the Contractor's goal is less than the contract goal, is there a "good faith" statement in the project files?
- How are you checking for DBE goal compliance and that the DBEs listed are performing a commercial useful function? By payrolls, interviews, diaries, or material invoices? Any changes made?

RESIDENT ENGINEER'S DAILY DIARIES

- Records reviewed and [were or were not] current, thorough, well organized, neat, and up to date.

LABOR COMPLIANCE

- [Were / Were not] any withholdings made by the Department?
- Are diaries spot-checked against certified payrolls?
- What is the established method?

EQUAL EMPLOYMENT OPPORTUNITY/WAGE RATE POSTERS

- Are the Federal posters posted for every worker to see at or near the Contractor's office at the construction site or at the Contractor's workers' central gathering point?

EMPLOYEE INTERVIEWS

- Are employee interviews being conducted? Findings? Frequency?

FEDERAL TRAINING REQUIREMENTS

- Are training requirements included in the contract?
- Is there documentation to show that the Contractor and all subcontractors are meeting the apprenticeship (training) goal?

PROMPT PAYMENT

- Are the subcontractor prompt payment requirements in the contract [CM 3-807]? Are they being followed?

Continued

ENVIRONMENTAL COMMITMENTS

- Is the environmental document or Project Report for this project in the Resident Engineer's files?
- Are you aware of any environmental commitments on your project? If there are environmental commitments on your project, what is your action plan to work with the Contractor to commit these requirements?
- Is the construction project adhering to the mitigation requirements in the environmental document? How?

PROGRESS PAYMENT

- Are there on file any Contractor-submitted monthly lists of items and quantities for payment?
- Review the estimate for accuracy prior to its being approved for payment.
- What do you do to prevent double payment of contract items?

TRAFFIC CONTROL

- Has the State approved a traffic contingency plan from the Contractor for the job?
- What does the contingency plan include?
- Were the Contractor's traffic control plans adequate?
- Were they approved by the Resident Engineer and when? [before or after construction began]
- Were any substantial changes made to the traffic control plans? If so, would these changes result in any additional costs or delays or in any savings?
- A drive through the project [day and/or night] for traffic control was made. Project's traffic control measures appeared to be [adequate / not adequate] (e.g., signs clean, reflective, distance, etc.)

SAFETY

- Records were reviewed and there [were XX / were not] injury/fatal/non-fatal accidents reported within the construction zone.
- Meeting scheduled every [XX] weeks.

CRITICAL PATH METHOD SCHEDULE

- [XX] revisions have been made and [were / were not] available for our review.

PRE-CONSTRUCTION MEETING

- Records were reviewed, and the attendee list [was / was not] found.

STORM WATER POLLUTION PREVENTION PLAN [SWPPP]

- Approved by the Resident Engineer? Date? Before construction started? [yes / no]
- Has the project's SWPPP been updated to reflect the recent changes required by State Water Resource Board?
- Is the updated SWPPP on file?
- Any problems?

UTILITY/RIGHT-OF-WAY (ROW) DELAYS

- There [were / were not] any utility/ROW delays at this review.

PUBLIC NOTIFICATION

- News release notices [were / were not] sent notifying the public of construction activities taking place.

FINDINGS AND RECOMMENDATIONS:

Special attention is being given to environmental permits with the resource agencies. Overall, the project seemed to be going well and appeared to be in accordance with plans and specifications.

Other findings:

[Note]

CONCLUSION:

To date, the overall progress of the contract and the quality of work are [satisfactory / unsatisfactory].

* * *

cc: [e-mail] [Name], HTA-CA

cc: [mail] [Name], Caltrans District X [Deputy Director for Construction]
[Resident Engineer's name], Caltrans District X [Construction]

U.S. Department of Transportation
Federal Highway Administration

DIVISION OFFICE

DESIGN PROJECT CHECKLIST

Federal-Aid Project No. _____

District, County, Route _____

PRE - PS&E	DATE	COMMENTS
Field Safety Walk with Minutes		
Environmental – NEPA Documents		
Public Hearing		
T S & L Plans		
Hydraulic Report (Major Structures)		
Justification for Additional Access (Interstates)		
Geotechnical Report (Major Structures)		
Horizontal &Vertical Alignment/ Clearance		
Design Report Approval		
Design Exceptions (Mainline by ADA)		
Lighting Plan		
Value Engineering Study (if applicable)		
Signing Plan		
Traffic Control Plan		
Pavement Design		
Air/Highway Clearance		
Utilities		
Erosion and Sedimentation Control Plan		

10/03

U.S. Department of Transportation
Federal Highway Administration

DIVISION OFFICE
ENGINEER'S ESTIMATE CHECKLIST FOR FULL OVERSIGHT PROJECTS

This document serves as a checklist for what should, at a minimum, be reviewed on an Engineer's Estimate for a Full Oversight Project. This checklist and any accompanying information should be filed in the project-specific file.

For additional information on Engineer's Estimates refer to Technical Advisory TA 5080.4 Preparing Engineer's Estimates and Reviewing Bids December 29, 1980.

—— NOTE ——

The State Transportation agency's Engineer's Estimate is CONFIDENTIAL! The responsible FHWA transportation engineer will not discuss the details of the estimate with anyone other than the FHWA Team Leader or State contact. After the Engineer's Estimate approval, all hard copies will be shredded/destroyed.

1. Check approximately 15–20 percent (more if possible) of the bid items against the plan quantities for accuracy.

   a. Do the items checked correspond with the plans and plan quantities?

2. Do the Pay Items correspond to the type of work proposed?

3. Are the Units of Measure appropriate for the Pay Item?

4. Is the quantity for the Pay Item reasonable for the project?

5. Does the Unit Price seem reasonable for the type, size, and location of the project?

U.S. Department of Transportation
Federal Highway Administration

DIVISION OFFICE
FINAL ACCEPTANCE CHECKLIST
FOR FEDERAL-AID "N" PROJECTS

PROJECT INFORMATION

EA No. _____ Federal-aid No. _____

Project Description _____

District/County/Route/KP _____

Date Awarded _____ Approval Date _____

Time Started _____ Work Started _____

Contract Days _____ Final No. Working Day: _____

Original Completion Date _____ State Acceptance Date _____

Liquidated Damages (no. of days and total $ amount) _____

SUBMITTALS	SUBMITTED?			DATE
Material Certification (CM 6-1.1)	Yes	No	N/A	_____
Form FHWA-47M	Yes	No	N/A	_____
Proposed Final Estimate	Yes	No	N/A	_____
Last Statement of Working Days	Yes	No	N/A	_____
Contractor's Written Statement				
of Claims (Submitted Separately)	Yes	No	N/A	_____
List of CCOs	Yes	No	N/A	_____
(Approved and Pending)	Yes	No	N/A	_____
(Participating/Non-Participating)	Yes	No	N/A	_____
List of Time Extensions	Yes	No	N/A	_____
(FHWA Approved/Not Approved)	Yes	No	N/A	_____
Form CEM-2402 (F) Final Report	Yes	No	N/A	_____
Utilization of DBE	Yes	No	N/A	_____
Environmental Commitments Completed	Yes	No	N/A	_____

ADDITIONAL INFORMATION

Labor Compliance Problems _____

_____

_____

_____

Any Other Changes _____

_____

_____

(ORIGINAL: PROJECT FILE; CC: FHWA, WITH PROPOSED FINAL ESTIMATE)

U.S. Department of Transportation
Federal Highway Administration

FINAL ACCEPTANCE REPORT

DIVISION	REPORT NO.	DATE OF FINAL INSPECTION REPORT	PROJECT NO.

DATE CONTRACT STARTED	DATE WORK COMPLETED	ACCEPTANCE BY CONTRACT AGENCY	TIME ELAPSED
			%

LOCATION

SCOPE OF PROJECT

NOTE: FHWA-47 ☐ Submitted ☐ Not Required

Materials Certification ☐ Submitted ☐ Not Required

There is compliance with section 1.23 of the Regulations pertaining to encroachments on the right-of-way.

REMARKS: ☐ SHA procedures and controls were sufficient to assure that this project completed in reasonable close conformance with the approved plans and specifications including authorized changes and extra work.

ACCEPTANCE OF PROJECT IS RECOMMENDED		ACCEPTED BY FEDERAL HIGHWAY ADMINISTRATION	
Signature		Signature	
Title	Date	Title	Date

Form FHWA 1446B (Rev. 3-90)

Save Data Only | Clear Form | Save Data & Form

U.S. Department of Transportation
Federal Highway Administration

DIVISION OFFICE
NATIONAL ITS ARCHITECTURE AND STANDARDS CONFORMITY DOCUMENTATION CHECKLIST

FEDERAL PROJECT NUMBER: _____

MUST SELECT ONE (CASE A OR CASE B)

☐ **CASE A—A regional ITS architecture exists, or is under development for the region.**

☐ This is a project to study and/or design an ITS implementation that:
- ☐ Will accommodate interface requirements and information exchanges specified in the ITS regional architecture.
- ☐ Will use a systems engineering analysis commensurate with the project scope.

☐ This project is an ITS deployment project that:
- ☐ Has been designed based on a systems engineering analysis commensurate with the project scope.
- ☐ Will deploy ITS elements (check if applicable).
- ☐ Will integrate ITS elements or systems (check if applicable).
- ☐ Will deploy communication infrastructure that will allow integration to occur (check if applicable).

☐ This project will use the ITS standards and interoperability tests that have been adopted by USDOT. *(Currently, no ITS standards have been adopted by USDOT.)*

Projects using discretionary ITS funds designated by Congress must agree to consider using/testing appropriate emerging Standards that have been approved by the Standards Development Organizations (see Web site: http://www.its-standards.net/).

☐ **CASE B—A regional ITS architecture does <u>not</u> exist.**

☐ This is the first ITS project for this region. A commitment needs to made to develop an ITS architecture for this region within the next four years.

☐ This is a *major* ITS project to study and/or design an ITS implementation that:
- ☐ Will use a systems engineering approach to arrive at the final design.
- ☐ Will develop a project level ITS architecture to guide the development of this project and serve as a baseline for the development of a regional ITS architecture for the area.

☐ This project is an ITS deployment project that:
- ☐ Has been designed based on a systems engineering analysis commensurate with the project scope
- ☐ Will deploy ITS elements (check if applicable).
- ☐ Will integrate ITS elements or systems (check if applicable).
- ☐ Will deploy communication infrastructure that will allow integration to occur (check if applicable).

☐ This project will use the ITS standards and interoperability tests that have been adopted by USDOT. *(Currently, no ITS standards have been adopted by USDOT.)*

Projects using discretionary ITS funds designated by Congress must agree to consider using/testing appropriate emerging Standards that have been approved by the Standards Development Organizations (see Web site: http://www.its-standards.net/).

U.S. Department of Transportation
Federal Highway Administration

DIVISION OFFICE
PLANS, SPECIFICATIONS, AND ESTIMATES CHECKLIST

FEDERAL-AID PROJECT NO.: _____ STATE ID _____

ROUTE _____ COUNTY _____ DISTRICT _____

I. GENERAL

1. Is the project non-exempt (full oversight) as per our current oversight agreement?
2. Is the project included in the current Statewide Transportation Improvement Program (STIP/TIP)? (23 CFR 450.216 and .220)
   a. Is the project within a Non-Attainment Area?
      (1) Is it conformed properly? (Air Quality) (23 CFR 322(d))
3. a. Does the project description agree with the authorization request?
   b. Are there any unresolved items/issues?
4. a. Is the funding ratio correct?
   b. Are funds available? (Get stamped by fiscal clerk.)
5. Is the project an Advanced Construction project? Assure eligibility.
6. What are the environmental requirements?
   a. A Class I project (EIS)? (23 CFR 771.123)
      (1) Have we made a Record of Decision?
      (2) Is re-assessment or re-evaluation needed? (Three-year limit)
   b. A Class II project (Categorical Exclusion)? (23CFR 771.117)
      (1) CE I or CE II ?
      (2) ECAD?
   c. A Class III project (Environmental Assessment)? (23CFR 771.119)
      (1) Have we made a Finding of No Significant Impact (FONSI)?
   d. Have all commitments outlined in the environmental document been addressed in the PS& E (23 CFR 635.309(j)) and have we received a copy of environmental commitment listing and approved it for the project?
   e. Are noise walls included in the project? (23 CFR 772.5)

7. Are 4(f) properties involved? (23 CFR 771.135)
   a. If so, has approval been given either in the EIS or as a separate document?
8. Civil Rights
   a. Are DBE Requirements met?
      (1) Notice of DBE Participation.
   b. Is there a DBE Contract Goal?
9. Was a public hearing required? (23 CFR 635.309(d))
   a. Were hearing comments considered in the project development?
10. Is a 404 permit required? (23 CFR 777)
    a. Are mitigation or enhancement requirements of permit incorporated into the PS&E?
    b. Is the permit date valid?
11. Is a U. S. Coast Guard permit required? (40 CFR 1500-1508)
    a. Is the permit date valid?
12. If the project contains structures, has the Division Office Structural Engineer reviewed the plans?
13. If the project is a safety improvement project, has the project been coordinated with the Division Office Safety Coordinator?
14. Has the Right-of-Way been cleared? (23 CFR 635.309(b)(c) and per our ROW agreement)
    a. If the ROW is not clear prior to authorization do the special provisions contain:
       (1) Restrictions on the contractor?
       (2) An estimate as to when the ROW will be clear?
       (3) A statement that a time extension may be granted if the property is not available as indicated in the proposal? (23 CFR 635.309(b) and 23 CFR 635.107)
15. Is the project located within two miles of an airport?
    a. If so, has FAA/FHWA coordination been completed? (23 CFR 620.103)
16. Will utilities be affected by this project? (23 CFR 645.113)
    a. Is the utility clearance statement on authorization request?

17. Does the project require use of or adjustment to railroad facilities? If so:
    a. Is there a signed agreement between the railroad/SHA? (For projects that include actual adjustments, this agreement must also be approved by FHWA.) (23 CFR 646.216(d))
    b. Does the proposal include liability insurance requirements? (23 CFR 646.107)
18. If force account work is included, have we approved the cost effectiveness determination? (23 CFR 635.309(e))
19. If appropriate, has SHA stated on the Authorization Request that they have an executed City/County Agreement or will be in possession of one prior to bid opening?
20. Are any materials to be supplied by the State or local agency?
    a. If so, has FHWA approval been given? (23 CFR 635.407)
21. Is this an Intelligent Transportation Systems (ITS) project?
    a. Complete National ITS Architecture and Standards Conformity Documentation Checklist.
22. Is this a Mass Transit or Special Use Highway Project? 23 CFR 810)

II. PLANS

1. Has the design Checklist been completed?
2. Do the plans include items required by 23 CFR 630.205.

   Suggested Items:
   a. Title sheet including: title, scale, location sketch, index, length, conventional symbols, design data (ADT, DHV, % trucks), project number and reference to applicable standard specifications and plans?
   b. Typical section?
   c. Summary of quantities?
2. Are Traffic control plan consistent with the MUTCD? (23 CFR 630.1010(a)(2))
3. Are signing and pavement markings consistent with the MUTCD?
4. For split-fund projects, are funding limits shown on plans?
5. Have pay items been checked against construction plans to identify questionable items?
   a. Have they been cross-checked against summary of quantities, and engineer's estimate?

6. The Date of the Field Safety Walk (FSW)?
   a. Has the report been reviewed?
   b. Have all items in FSW report, if applicable, been incorporated into the plans?
7. Does the design conform to SHA's current Design and Environment Manuals?
8. If there are design exceptions, have they been approved? (Review Delegation of Authority)
9. Has adequate right-of-way been acquired for construction?
10. Do all safety appurtenances meet NCHRP 350 criteria and are they placed in accordance with the current "Roadside Design Guide?"
11. Are ADA requirements met?

III. SPECIFICATIONS

1. Does the proposal include:
   a. Form FHWA-1273 Required Contract Provisions ? (23 CFR 633)
   b. The Buy America Act provisions? (23 CFR 635.410)
   c. The current Department of Labor Minimum Wage Rates?
   d. Standard contract clauses on:
      (1) Differing Site Conditions
      (2) Suspensions of Work
      (3) Significant changes in the character of work
   e. Any proprietary items? Explain.
   f. An incentive/disincentive clause? (Must have both.)
      (1) Has the incentive/disincentive been specifically calculated for this project?
      (2) Have the calculations been previously submitted for our review and approval?
   g. Any guarantee or warranty clauses? (23 CFR 635.413)
   h. Are there training requirements?
      (1) If so, are the training special provisions included?

i. Are the DBE provisions included?

(1) DBE Special Provisions.

(2) Non-discrimination Clause.

(3) Complete Equal Opportunity Employment (EEO) Check sheet.

j. A general description of the work to be performed?

k. Latest applicable standard special provisions?

(1) Are the special provisions satisfactory?

l. For Interstate asphalt paving projects does the proposal contain the asphalt concrete pavement smoothness specification?

m. Are ADA, environment mitigation, and safety requirements included?

2. Is the contract time realistic?

3. Are any experimental features included in the project?

a. If so, do you concur in their incorporation into the project and have you coordinated with the Division's Technology Transfer Engineer?

b. Does the feature have an approved work plan approved by the T2 Engineer?

IV. ENGINEER'S ESTIMATE

1. Does the estimate include a pay item for all work included in the plans?

2. Does the estimate appropriately represent the scope and requirements of the PS&E? Has a labor, materials, equipment estimate been made or is the estimate based only on historic costs?

3. Are there Federal-aid nonparticipating items included in the project?

a. If so, are they listed separately in the estimate and plans?

4. Is an estimate for railroad work included if needed?

5. Has the engineer's estimate check sheet been completed/placed in the appropriate project file?

V. ITEMS Included with P S & E

1. R/W Clearance (On authorization Request)
2. Utility Clearance (On authorization Request)
3. Experimental Features Work Plan
4. EEO Trainees
5. Inclusion on the STIP/TIP
6. Environmental Re-evaluation if applicable. (Three years)
7. Compliance with Environmental Mitigation Commitments
8. Project Transportation Management Plan

Checklist completed by: _____ Date: _____
Transportation Engineer

US Department of Transportation

Federal Highway Administration

RECORD OF AUTHORIZATION TO PROCEED WITH MAJOR CONTRACT REVISION

PROJECT NO.	COUNTY	STATE

TYPE OF REVISION

☐ CHANGE ORDER ☐ SUPPLEMENTAL AGREEMENT ☐ TIME EXTENSION ☐ SPECIFICATION CHANGE

☐ WORK ORDER ☐ OTHER:

REQUESTED BY	DATE

NATURE OF AND REASON FOR PROPOSED REVISION (If additional space is required, use reverse side)

ESTIMATED ☐ INCREASE ☐ DECREASE IN COST: $ _____

METHOD OF PAYMENT

☐ FORCE ACCOUNT ☐ NEGOTIATED PRICE ☐ LUMP SUM

☐ UNIT BID PRICES ☐ OTHER:

THE WORK COVERED BY THE PROPOSED REVISION AS DESCRIBED ABOVE IS HEREBY AUTHORIZED SUBJECT TO THE CONDITIONS MARKED BELOW:

☐ EVALUATION OF COST DATA

☐ LIMITATIONS OF EXTENT OF FEDERAL PARTICIPATION

☐ DETERMINATION OF SATISFACTORY ADJUSTMENT IN TIME

☐ ADEQUATE SUBMITTAL OF WRITTEN SUPPORTING DATA

☐ PROPOSED REVISION AUTHORIZED WITHOUT FEDERAL PARTICIPATION

☐ OTHER (Explain)

☐ NONE

RECOMMENDED BY AREA ENGINEER		DIVISION OFFICE APPROVAL	
SIGNATURE	DATE	SIGNATURE	DATE

Form FHWA-1365 (Use Reverse for Comments, if Required)
(Rev. 3-86) PREVIOUS EDITIONS MAY BE USED

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
CALIFORNIA DIVISION

RECORD OF PRIOR APPROVAL FOR CONTRACT ADDENDUM

PROJECT NO.	ADDENDUM NO.	CONTRACT NO.	DIST-CO-RTE-PM

REQUESTED BY:	☐ CALTRANS HQ ☐ RE / DISTRICT	DATE:

PROPOSED CHANGE:

REASON FOR CHANGE:

RECOMMENDATION FOR APPROVAL

Transportation Engineer

APPROVAL

Team Leader
Program Delivery Team

D-21

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION CALIFORNIA DIVISION OFFICE

RECORD OF PRIOR APPROVAL FOR MAJOR CONTRACT CHANGE ORDER

PROJECT NO.	CCO NO.	CONTRACT NO.	DIST-CO-RTE-KP/PM

REQUESTED BY: ☐ CALTRANS HQ ☐ RE / DISTRICT — DATE:

PROPOSED CHANGE:

REASON FOR CHANGE:

AS DISCUSSED IN FIELD (REPORT NO. _____)

TIME EXTENSIONS

☐ NONE _____ DAYS ☐ DEFERRED

ACTIVITY ON CRITICAL PATH AFFECTED BY CCO (IF TIME EXTENSION INVOLVED)

ESTIMATE OF COST:

$ _____ ☐ INCREASE ☐ DECREASE

CCO: METHOD OF PAYMENT

☐ CONTRACT ITEMS ☐ ADJUSTMENT OF COMPENSATION

☐ AGREED PRICE ☐ EXTRA WORK AT FORCE ACCOUNT

THE WORK COVERED BY THE PROPOSED REVISION AS DESCRIBED ABOVE IS APPROVED SUBJECT TO SUBMISSION OF SUPPORTING DOCUMENTATION INCLUDING COST EVALUATION AND JUSTIFICATION OF TIME EXTENSIONS.

OTHER CONDITIONS: _____

PRIOR APPROAL TO PROCEED GRANTED BY:	DATE OF AUTHORIZATION:

Form FHWA CA-358 © Converted to Word 1/01 **(Copy to CT)**

OMB NO. 2125-0033

U.S. Department of Transportation
Federal Highway Administration

STATEMENT OF MATERIALS AND LABOR USED BY CONTRACTORS ON HIGHWAY CONSTRUCTION INVOLVING FEDERAL FUNDS

PART A *To be completed by FHWA or State Highway Personnel (See instructions on reverse)*

STATE*	COUNTY	FEDERAL PROJECT NO.*	URBAN ( ) RURAL ( )*

ITEM	DESCRIPTION		ROADWAY	BRIDGE *(Over 20 ft)*	DATE STARTED*
	CONSTRUCTION TYPE CODES				
1	LENGTH OF PROJECT	MILES			DATE COMPLETED*
2	FINAL* CONSTRUCTION COST	dollar			TOTAL NO. BRIDGES

PART B *To be completed by; contractor - see instructions on reverse (REMARKS Attach a plain sheet of paper)*

3	**LABOR*** TOTAL PROJECT		TOTAL LABOR-HOURS	GROSS EARNINGS	

ITEM	DESCRIPTION	UNIT	PROJECT QUANTITY
4	TOTAL COST OF ALL MATERIALS AND SUPPLIES*	dollar	
5	PETROLEUM PRODUCTS*	GAL.	
6	CEMENT	BBL.	
7		LB.	
8		TON.	
9	AGGREGATES PURCHASED	TON.	
10		CU. YD.	
11	BITUMINOUS MATERIAL	GAL.	
12	LUMBER	THSD. BD. FT.	
13	REINFORCING STEEL	LB.	
14	STRUCTURAL STEEL	LB.	
15	READY-MIXED CONCRETE	CU. YD.	
16	PREMIXED BITUMINOUS PAVING MATERIALS	TON.	
17	AGGREGATES PRODUCED	TON	
18		CU. YD.	
19	MISCELLANEOUS STEEL	LB.	
20	NOISE BARRIERS	LIN. FT.	
21	GUARDRAIL	LIN. FT.	
22	BRIDGE RAIL	LIN. FT.	
23	FINAL CONTRACT AMOUNT FOR SIGNS	dollar	
24	FINAL CONTRACT AMT. FOR LIGHTING	dollar	
25	FINAL CONTRACT AMT. FOR TRAFFIC SIGNALS	dollar	

CULVERT ITEMS

26 CORR. STEEL CULVERT — SIZE (In.) / LGTH (Lin ft)

27 CONCRETE PIPE

28 CLAY PIPE — SIZE (In.) / LGTH (Lin ft)

29 CORR. ALUMINUM CULVERT

30 PLASTIC PIPE

REVIEWED BY

DATE

*MUST BE REPORTED ON ALL REPORTS

FORM FHWA-47 (Rev. 7-98) (INF4.2, 7/29/98) PREVIOUS EDITIONS ARE OBSOLETE This form was electronically produced by Elite Federal Forms, Inc.

DISCARD BEFORE SUBMISSION

DEPARTMENT OF TRANSPORTATION
Federal Highway Administration

SUPPLEMENTAL INFORMATION

STATEMENT OF MATERIALS AND LABOR USED BY CONTRACTORS ON HIGHWAY CONSTRUCTION INVOLVING FEDERAL FUNDS

According to the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this form is 2125-0033. The average completion time for this form is 5 hours. If you wish to make suggestions, please fax them to 202-366-3988; or mail to:

Federal Highway Administration
Office of Program Administration, HIPA-10
400 7th Street, SW
Washington, D.C. 20590

INSTRUCTIONS FOR PREPARING AND TRANSMITTING FORM FHWA-47

GENERAL REQUIREMENTS

Form FHWA-47 should be transmitted for each Federal-aid project involving construction performed under contract awarded by competitive bidding that is located on the National Highway System (NHS), except projects for which the total final construction cost of the roadway and bridge is less than $1,000,000 or projects consisting primarily of (1) the installation of protective devices at railroad grade crossings, or (2) highway beautification.

Form FHWA-47 should be transmitted with or, if data is already available, in advance of the Final Report required by Federal-aid Policy Guide Chapter 6 G 6011.11

A separate form should be transmitted for each contract except that data for two or more contracts on the same project may be combined when such contracts are completed at approximately the same time. In case of a combination, the earliest starting date and the latest completion date should be reported. Where a single contract covers more than one project, one form may be prepared for each project or for the entire contract, provided none of the data are duplicated. A Form FHWA-47 should not be prepared for a contract covering only the purchase of material but the quantity of material should be reported when subsequently included in a construction project. In all cases, only the original of Form FHWA-47, typed or clearly lettered, and no carbon or photocopies, should be transmitted to the Washington Office.

If nonparticipating work is included in the contract, all data should be combined with the Federal-aid data in preparing the form. Data for any subcontract must be combined by the State or the division office with the prime contract if not so combined by the prime contractor. It will be the State's responsibility to see that all prime contract and subcontract costs, material, and labor-hours have been reported for each contract, and no duplication of data are involved. Quantities of State-furnished materials should be included with contract quantities, and costs of STATE-furnished materials should be added to Item 2 "Final Construction Cost" and also to Item 4 "Total Cost of All Materials and Supplies." All quantities should be reported to the nearest whole unit and only in the units specified. All costs should be reported to the nearest dollar.

Check urban or rural to indicate whether the major cost is for work within an urban area or in a rural location.

All figures should be verified for reasonableness by State highway department and Federal Highway Administration division office engineers. The total material cost and the total labor-hours and gross earnings should bear reasonable relationships to the final construction cost. Also the quantity of each material reported should be reasonable with respect to the quantities of other materials. For example, if a large quantity of reinforcing steel is reported with no cement or ready-mixed concrete, an error of omission in reporting would be indicated.

Generally, the total cost of materials, supplies, and labor should be substantially less than the final construction cost, as the latter also includes costs of equipment ownership, overhead, and profit which are not required to be reported. If the final construction cost is less or only a few percent more than the total cost of materials, supplies and labor, the indication is that the contractor suffered a loss on the project or that there is an error in reporting. In such case, if it is determined that the figures reported are correct, a statement should be made on a plain sheet of paper marked "Remarks" to the effect that the contractor actually did suffer a loss, (verify with contractor).

Part A- INFORMATION TO BE SUPPLIED BY FEDERAL HIGHWAY ADMINISTRATION OR STATE HIGHWAY PERSONNEL (FEDERAL-AID POLICY GUIDE CH. 6 G 6011.11)

Item 1- "Length of Project." - Report official roadway mileage and official bridge mileage.

Item 2 - "Final Construction Cost" - Show best estimate of Federal and State costs incurred to date for contract items, extra work performed by contractor, and State-furnished materials.

PART B - INFORMATION TO BE SUPPLIED BY CONTRACTOR IMMEDIATELY UPON COMPLETION OF CONTRACT OR PROJECT

Specific Instructions for the Following Numbered Items:

Item 3 - Report total labor-hours worked and earnings of all contractor's employees on the project, including those on operation and maintenance of equipment.

Item 4 - This should be the total cost, at the jobsite of all construction materials and supplies purchased for and used on the project, including the cost of materials for signing and lighting and the cost of any materials and supplies not specifically listed hereon. Costs of equipment or equipment rental and the cost of operating the equipment, except the costs of fuel and lubricants, should not be included in this item. Small items of equipment such as jackhammers, handtools, repair parts, tires, etc., are not considered to be supplies. Costs of such items and also overhead costs should not be included. The amount included here for aggregates produced should be only the cost paid by the contractor for the aggregates and should not include the costs of excavating, processing, loading and hauling. Wages and labor-hours for aggregates produced should, of course, be included with Item 3.

Item 5 - Report total number of gallons of all gasoline, diesel oil, lubricating oil, and grease for equipment and trucks. For conversion purposes use factor of 8 pounds of grease per gallon.

Items 6, 7, and 8 - Report quantity of cement used on project. Do not report here the cement included in Item 15.

Items 9 and 10 - Report quantity of aggregates purchased from commercial producers, such as sand, gravel, crushed stone, etc. Do not report here aggregates included in Items 15 and 16. Aggregates produced by the contractor shall be reported as Items 17 and 18.

Item 11 - Report number of gallons of bitumens such as asphalt and tar. Do not report here bituminous materials included in Item 16.

Item 12 - Report all lumber products purchased for and use on the project, including plywood and pressed wood, but excluding timber piling, lumber in fencing, guardrail, and signs, and lumber purchased for or used on previous projects and previously reported. The quantity of lumber should be reported as the number of thousand board feet and not as the number of board feet.

Item 13 - Report total number of pounds of reinforcement (plain or coated) for both structures and pavement. Include estimated quantities of reinforcing and prestressing steel in purchased precast units, except concrete pipe reinforcement.

Item 14 - Report total number of pounds of structural steel, steel H-piling, and sheet piling.

Item 15 - Report total number of cubic yards of ready-mixed concrete plus estimated quantity of concrete in purchased precast units, excluding Item 26.

Item 16 - Report total number of tons of bituminous paving mixtures that are purchased in a prepared condition ready for placement as they reach the job.

Items 17 and 18 - Report total quantity of aggregates such as sand, gravel, crushed stone, etc., produced by the contractor.

Item 19 - Report estimated total weight of steel products not appropriate for Items 13, 14 and 26, such as joint devices, tubular piling, etc.

Items 20, 21, and 22 - Report total lengths, in linear feet, of all types of noise barriers, guardrail and bridge rail.*

Item 23 - Report final contract amount for all types of signs including foundations, posts, structural supports, etc. Do not include traffic signals.*

Item 24 - Report final contract amount for highway and bridge lighting including foundations, conduits, standards, wiring, switches, luminaires, etc. Do not include traffic signals.*

Item 25 - Report final contract amount for traffic signals.*

Item 26 - Report, by size, regardless of class, type, gauge or coating, total number of linear feet of corrugated steel pipe, structural plate pipe, pipe-arches and arches.

Item 27 - Report, by size, regardless of class, type, gauge or coating, total number of linear feet of plain and reinforced concrete drain and culvert pipe.

Item 28 - Report, by size, total number of linear feet of clay pipe.

Item 29 - Report, by size, total number of linear feet of corrugated aluminum culvert.

Item 30 - Report, by size, total number of linear feet of plastic pipe.

*Quantities of steel, concrete and lumber used in connection with Items 20, 21, 22, 23, 24, and 25 should not be reported unless difficulties are encountered in segregating such quantities from total quantities.

FORM FHWA-47 (Rev. 7-86)

OMB NO. 2125-0033

U.S. Department of Transportation
Federal Highway Administration

STATEMENT OF MATERIALS AND LABOR USED BY CONTRACTORS ON HIGHWAY CONSTRUCTION INVOLVING FEDERAL FUNDS

PART A *To be completed by FHWA or State Highway Personnel (See instructions on reverse)*

STATE*	COUNTY	FEDERAL PROJECT NO.*	URBAN ( ) RURAL ( )*

ITEM	DESCRIPTION		ROADWAY	BRIDGE *(Over 6 meters)*	DATE STARTED*
	CONSTRUCTION TYPE CODES				
1	LENGTH OF PROJECT	KILO-METERS			DATE COMPLETED*
2	FINAL* CONSTRUCTION COST	DOL			TOTAL NO. BRIDGES

PART B *To be completed by: contractor - see instructions on reverse (REMARKS Attach a plain sheet of paper)*

		TOTAL LABOR-HOURS	GROSS EARNINGS
3	**LABOR*** TOTAL PROJECT		

ITEM	DESCRIPTION	UNIT	PROJECT QUANTITY
4	TOTAL COST OF ALL MATERIALS AND SUPPLIES*	DOL.	
5	PETROLEUM PRODUCTS*	LIT.	
6		t.	
7	CEMENT	KG.	
8		t.	
9	AGGREGATES PURCHASED	t.	
10		M^3	
11	BITUMINOUS MATERIAL	LIT.	
12	LUMBER	THSD BD. M.	
13	REINFORCING STEEL	KG.	
14	STRUCTURAL STEEL	KG.	
15	READY-MIXED CONCRETE	M^3	
16	PREMIXED BITUMINOUS PAVING MATERIALS	t.	
17	AGGREGATES PRODUCED	t.	
18		M^3	
19	MISCELLANEOUS STEEL	KG.	
20	NOISE BARRIERS	LIN. M.	
21	GUARDRAIL	LIN. M.	
22	BRIDGE RAIL	LIN. M.	
23	FINAL CONTRACT AMOUNT FOR SIGNS	DOL.	
24	FINAL CONTRACT AMT. FOR LIGHTING	DOL.	
25	FINAL CONTRACT AMT. FOR TRAFFIC SIGNALS	DOL.	

CULVERT ITEMS

	SIZE (cm.)	LGTH (Lin M.)
26 CORR. STEEL CULVERT		
27 CONCRETE PIPE		

28 CLAY PIPE	SIZE (cm.)	LGTH (Lin M.)
29 CORR. ALUMINUM CULVERT		
30 PLASTIC PIPE		

REVIEWED BY

DATE

*MUST BE REPORTED ON ALL REPORTS

FORM FHWA-47M (Rev. 7-98) (INF4.2, 7/29/98) PREVIOUS EDITIONS ARE OBSOLETE

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DEPARTMENT OF TRANSPORTATION
Federal Highway Administration

SUPPLEMENTAL INFORMATION

STATEMENT OF MATERIALS AND LABOR USED BY CONTRACTORS ON HIGHWAY CONSTRUCTION INVOLVING FEDERAL FUNDS

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Federal Highway Administration
Office of Program Administration, HIPA-10
400 7th Street, SW
Washington, D.C. 20590

INSTRUCTIONS FOR PREPARING AND TRANSMITTING FORM FHWA-47M

GENERAL REQUIREMENTS

Form FHWA-47 should be transmitted for each Federal-aid project involving construction performed under contract awarded by competitive bidding that is located on the National Highway System (NHS), except projects for which the total final construction cost of the roadway and bridge is less than $1,000,000 or projects consisting primarily of (1) the installation of protective devices at railroad grade crossings, or (2) highway beautification.

Form FHWA-47 should be transmitted with or, if data is already available, in advance of the Final Report required by Federal-aid Policy Guide Chapter 6 G 6011.11

A separate form should be transmitted for each contract except that data for two or more contracts on the same project may be combined when such contracts are completed at approximately the same time. In case of a combination, the earliest starting date and the latest completion date should be reported. Where a single contract covers more than one project, one form may be prepared for each project or for the entire contract, provided none of the data are duplicated. A Form FHWA-47 should not be prepared for a contract covering only the purchase of material but the quantity of material should be reported when subsequently included in a construction project. In all cases, only the original of Form FHWA-47, typed or clearly lettered, and no carbon or photocopies, should be transmitted to the Washington Office.

If nonparticipating work is included in the contract, all data should be combined with the Federal-aid data in preparing the form. Data for any subcontract must be combined by the State or the division office with the prime contract if not so combined by the prime contractor. It will be the State's responsibility to see that all prime contract and subcontract costs, material, and labor-hours have been reported for each contract, and no duplication of data are involved. Quantities of State-furnished materials should be included with contract quantities, and costs of STATE-furnished materials should be added to Item 2 "Final Construction Cost" and also to Item 4 "Total Cost of All Materials and Supplies." All quantities should be reported to the nearest whole unit and only in the units specified. All costs should be reported to the nearest dollar.

Check urban or rural to indicate whether the major cost is for work within an urban area or in a rural location.

All figures should be verified for reasonableness by State highway department and Federal Highway Administration division office engineers. The total material cost and the total labor-hours and gross earnings should bear reasonable relationships to the final construction cost. Also the quantity of each material reported should be reasonable with respect to the quantities of other materials. For example, if a large quantity of reinforcing steel is reported with no cement or ready-mixed concrete, an error of omission in reporting would be indicated.

Generally, the total cost of materials, supplies, and labor should be substantially less than the final construction cost, as the latter also includes costs of equipment ownership, overhead, and profit which are not required to be reported. If the final construction cost is less or only a few percent more than the total cost of materials, supplies and labor, the indication is that the contractor suffered a loss on the project or that there is an error in reporting. In such case, if it is determined that the figures reported are correct, a statement should be made on a plain sheet of paper marked "Remarks" to the effect that the contractor actually did suffer a loss, (verify with contractor).

Part A- INFORMATION TO BE SUPPLIED BY FEDERAL HIGHWAY ADMINISTRATION OR STATE HIGHWAY PERSONNEL (FEDERAL-AID POLICY GUIDE CH. 6 G 6011.11)

Item 1- "Length of Project." - Report official roadway mileage and official bridge mileage.

Item 2 - "Final Construction Cost" - Show best estimate of Federal and State costs incurred to date for contract items, extra work performed by contractor, and State-furnished materials.

PART B - INFORMATION TO BE SUPPLIED BY CONTRACTOR IMMEDIATELY UPON COMPLETION OF CONTRACT OR PROJECT

Specific Instructions for the Following Numbered Items:

Item 3 - Report total labor-hours worked and earnings of all contractor's employees on the project, including those on operation and maintenance of equipment.

Item 4 - This should be the total cost, at the jobsite of all construction materials and supplies purchased for and used on the project, including the cost of materials for signing and lighting and the cost of any materials and supplies not specifically listed hereon. Costs of equipment or equipment rental and the cost of operating the equipment, except the costs of fuel and lubricants, should not be included in this item. Small items of equipment such as jackhammers, handtools, repair parts, tires, etc., are not considered to be supplies. Costs of such items and also overhead costs should not be included. The amount included here for aggregates produced should be only the cost paid by the contractor for the aggregates and should not include the costs of excavating, processing, loading and hauling. Wages and labor-hours for aggregates produced should, of course, be included with Item 3.

Item 5 - Report total number of liters of all gasoline, diesel oil, lubricating oil, and grease for equipment and trucks. For conversion purposes use factor of 3.6 kilograms of grease per 3.8 liters.

Items 6, 7, and 8 - Report quantity of cement used on project. Do not report here the cement included in Item 15.

Items 9 and 10 - Report quantity of aggregates purchased from commercial producers, such as sand, gravel, crushed stone, etc. Do not report here aggregates included in Items 15 and 16. Aggregates produced by the contractor shall be reported as Items 17 and 18.

Item 11 - Report number of liters of bitumens such as asphalt and tar. Do not report here bituminous materials included in Item 16.

Item 12 - Report all lumber products purchased for and use on the project, including plywood and pressed wood, but excluding timber piling, lumber in fencing, guardrail, and signs, and lumber purchased for or used on previous projects and previously reported. The quantity of lumber should be reported as the number of thousand board meters and not as the number of board meters.

Item 13 - Report total number of kilograms of reinforcement (plain or coated) for both structures and pavement. Include estimated quantities of reinforcing and prestressing steel in purchased precast units, except concrete pipe reinforcement.

Item 14 - Report total number of kilograms of structural steel, steel H-piling, and sheet piling.

Item 15 - Report total number of meters of ready-mixed concrete plus estimated quantity of concrete in purchased precast units, excluding Item 27.

Item 16 - Report total number of metric tons of bituminous paving mixtures that are purchased in a prepared condition ready for placement as they reach the job.

Items 17 and 18 - Report total quantity of aggregates such as sand, gravel, crushed stone, etc., produced by the contractor.

Item 19 - Report estimated total weight of steel products not appropriate for Items 13, 14 and 26, such as joint devices, tubular piling, etc.

Items 20, 21, and 22 - Report total lengths, in linear meters, of all types of noise barriers, guardrail and bridge rail.*

Item 23 - Report final contract amount for all types of signs including foundations, posts, structural supports, etc. Do not include traffic signals.*

Item 24 - Report final contract amount for highway and bridge lighting including foundations, conduits, standards, wiring, switches, luminaires, etc. Do not include traffic signals.*

Item 25 - Report final contract amount for traffic signals.*

Item 26 - Report, by size, regardless of class, type, gauge or coating, total number of linear meters of corrugated steel pipe, structural plate pipe, pipe-arches and arches.

Item 27 - Report, by size, regardless of class, type, gauge or coating, total number of linear meters of plain and reinforced concrete drain and culvert pipe.

Item 28 - Report, by size, total number of linear meters of clay pipe.

Item 29 - Report, by size, total number of linear meters of corrugated aluminum culvert.

Item 30 - Report, by size, total number of linear meters of plastic pipe.

*Quantities of steel, concrete and lumber used in connection with Items 20, 21, 22, 23, 24, and 25 should not be reported unless difficulties are encountered in segregating such quantities from total quantities.

FORM FHWA-47M (Rev. 7-98)

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Federal Highway Administration

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