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Process Review of the Final Acceptance for Federal-Aid Highway Projects in Kentucky

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Executive Summary

Federal funds used to support highway construction projects must comply with federal and state regulations. In Kentucky, the Kentucky Transportation Cabinet (KYTC) with the assistance of the Kentucky Division of the Federal Highway Administration (FHWA) administers the federal-aid highway program. FHWA and KYTC ensure quality of highway projects by inspections of activities conforming to plans and specifications, as well as with the testing of materials used in the project.

During the last five years, an emphasis stemming from OIG and GAO reports related to the financial processes in place to administer the federal-aid highway program has led to a wide review of all processes related to the finance program area. Inactive projects is one of several items that the new FHWA FIRE Order require both FHWA and KYTC to review and improve processes enabling a better and expedited delivery of funds, as well as enhanced documenting techniques of administrative decisions. One of those processes with inactive projects is the final acceptance process, required per federal requirements included in the 23 Code of Federal Regulations and the 2004 Kentucky Standard Specifications for Road and Bridge Construction.

This project intends to address the reasons why highway projects are not being able to be finally accepted by FHWA. A process review was conducted to assess the requirements, steps and stakeholders involved in the final acceptance process. Interviews and descriptive analysis using a historical database of construction projects with both timeframes and funding information were used to achieve this process review. The literature review provided insight of the importance of processes and its relationship with total quality management and performance measures.

Among the findings of this report include the diagramming of the process based on the requirements per federal and state regulations and specifications, as well as the way it is being currently used. Two distinct required documents (*FHWA-47* and *Materials Certificate*) and associated steps to complete them were found to be the major reasons why FHWA has being unable to complete their Final Acceptance Report (*F FAR*). Descriptive analysis showed that there was not much of a difference in the management of the process for interstate and non-interstate projects. A key finding from this analysis was that approximately 30% of all completed projects were being finally paid without having the *F FAR* completed, which consequently means that quality was not being assured by not completing the *Materials Certificate* and *FHWA-47* form.

A series of recommendations were provided to improve the FHWA/KYTC Final Acceptance Process. The following recommendations were proposed: (1) FHWA and KYTC's stakeholders need to engage among themselves to learn and improve the process to their agreement, (2) development of performance goals and measures, (3) definition of roles for stakeholders and users of the process, (4) rollout of guidance provided by the top management, as well as (5) training relating the requirements, steps and accountable parties.

Table of Contents

Problem Statement

Highway projects in Kentucky that use federal funds must comply with both federal and state regulations, which require the State Transportation Agency in Kentucky – the Kentucky Transportation Cabinet ("KYTC") – to perform activities ensuring both quality in the construction of projects and efficient management of authorized federal-aid funds. Federal-aid highway funds are used to reimburse KYTC's eligible programs and projects, and are administered by the Federal Highway Administration ("FHWA"), an agency under the U.S. Department of Transportation.

FHWA and KYTC ensure quality of highway projects by inspections of activities conforming to plans and specifications, as well as with the testing of materials used in the project. Two separate engineering divisions within KYTC lead these two distinct processes: the Division of Construction (inspections) and the Division of Materials (materials testing and acceptance). Work performed and materials used by the contractor in each project are inspected and accounted in a bi-weekly estimate by Resident Engineers, who are assigned to the District Office. The bi-weekly estimate is then reviewed, certified and submitted by construction management personnel at the District office to the Central Office of the Division of Construction (which performs a final review and certification), which then submits it to the Division of Accounts to finally pay the contractor. These payments, called "progress payments", are then sent as requested reimbursement to the FHWA in what is termed as "vouchers".

The average time from awarding the contract to calling the project complete is about 3 years. Based on the Kentucky 2004 Standard Specifications for Road and Bridge Construction, a final inspection by both FHWA and KYTC must be conducted within 90 days of a project being completed. Typically, the results of these final inspections require the Contractor to perform corrective work. At this stage, projects are almost paid-up by both KYTC and FHWA to the Contractor and KYTC, with the exception of a percentage left in an item called "demobilization", which accounts for 1.5% of the total bid of the contract.

When corrective work has been completed, a subsequent inspection, called "formal acceptance" is performed by KYTC. By this time, typically a project is in its fourth year and the contractor is normally released of its contractual obligations and paid all outstanding costs by KYTC, including demobilization. "Demo", as this often is termed, is paid when corrective work is completed and the project has been formally accepted by KYTC. Corrective work includes the completion of the form FHWA-47 (i.e., statement of materials and labor), a requirement specified in both the Kentucky Standard Specifications and the contract.

For KYTC to submit a final voucher to FHWA (effectively closing the project), final acceptance by FHWA is required to ensure and certify that the project conforms to plans and specifications. Final acceptance by FHWA requires both the FHWA-47 form completed by KYTC and its contractor, as well as certification of testing and acceptance of materials used by the contractor to accomplish the work required. The processing and

coordination of these items take considerable time after the project has been finally inspected. Based on a recent project file review of two KYTC districts, it takes between 2 and 4 additional years to get these documents for FHWA to perform its final acceptance. That means that a project could theoretically be authorized federal-aid funds at year 1, but not closed until year 8.

By its minimum amount of 1.5% of the project total cost, “demo” funds remaining in a project may not appear to be a significant amount for KYTC to be concerned. When 10 projects with an average cost of $10 million are completed and formally accepted by KYTC and are not federally closed, funds not yet reimbursed could add up to $1.5 million dollars. If we have similar situation happening for three consecutive fiscal years, it could amount to $4.5 million dollars not being reimbursed and unused by KYTC. This hypothetical situation appears to have been happening in Kentucky. In fact, the sum of authorized funds for interstate projects yet to be reimbursed during fiscal years 2003, 2004 and 2005 is claimed to be approximately $22 million.

Literature Review

Organizations, such as government agencies, have developed systematic approaches to manage their limited resources of time, personnel and costs. This organizational system follows a coordinated methodology based on its strategic planning, from its mission to its impact in the organization's delivery, while keeping focus in quality and efficiency. An understanding of management concepts such as policies, programs, projects and processes is essential in the effective administration of public organizations.

Organizations develop plans of action to guide and administer their decisions. These plans of action, also referred as *policies*, are general principles by which an organization is guided in its management of public affairs (Blakemore, 1998). Policies may not necessarily require a sequential approach of actions; rather, they establish strategies to manage and address a certain subject, such as contract time for highway projects. The Kentucky Transportation Cabinet's Design Memo 08-05 is an example of a policy requiring projects to have established either fixed completion date or maximum working days (KYTC, 2005).

Government agencies deliver their products and services through *programs* designed to achieve their mission and goals (Howard, 1999). A program is essentially a group of projects that are directed toward a common goal, such as improving highway safety. Programs have the distinction to be geographical in nature, by encompassing large jurisdictions such as state, regional, county or city. They also often have certain requirements and/or conditions that set eligibility criteria for these projects. For example,

to be a participant of the federal-aid highway bridge replacement and rehabilitation program, bridge replacement projects must be included in the National Bridge Inventory and National Bridge Inspection Standards database system. This database establishes a ranking of projects based in their sufficiency ratings, which is a composite index in terms of structural stability and durability of its members based on known facts of the materials and maintenance performed by the transportation agency (FHWA, 2004).

Organizations perform work, which generally involves *projects* or *processes*. Although projects and processes are performed by people, constrained by limited resources, and are planned, executed and controlled, they are both differentiated by the fact that projects are temporary and unique while processes are ongoing and repetitive (PMI, 2000). *Projects* are a group of activities to develop a specific product or service, while having specific time periods, such as a beginning and an end. An example of a project is the widening of I-64 between Lexington and Winchester, which would add capacity and minimize traffic congestion to that section of interstate highway.

Different from projects, *processes* are a designed sequence of events, taking up time, space, expertise and/or other resources, to produce an outcome (Wikipedia, 2006). Processes control characteristics and behaviors that create consistency in the delivery of programs and projects. They can detect the need for change and even act as indication for the replacement of unprofitable methodologies or practices (C4DSD, 2004). Processes can be evaluated as part of an assessment of whether necessary changes are warranted to assist organizations in their continuous improvement to achieve and improve their quality

and productivity. An example of a process is the Plans, Specifications and Estimate (PS&E) process required for all projects. Different divisions of the Kentucky Transportation Cabinet's central office and district personnel help assemble the PS&E package, a requirement for projects to be funded with federal-aid funds.

The importance of process relies on two key issues: efficiency and scalability (Graham, 1999). Documenting the steps needed to perform activities repeatedly saves time, energy and resources, which ultimately leads to higher efficiencies at the individual and institutional level. As for scalability, the means of documenting the process not only allows it to be improved by current users, but also it could be provided for future users and other stakeholders to learn what is needed to be done in an organization. In that sense, quality is enhanced, as activities are documented and able to be transferred to other parties within and outside the organization.

Process, quality and their relationship with highways

Since 1893, United States involved itself in a dramatic and dynamic era of changes. Gathering agricultural and mineral resources from the rural areas of the country to the cities and ports was becoming more difficult and costly to prospective buyers (Dilger, 2003). Federal, state and local governments used their financing tools to connect and improve existing commercial routes via water and rail. The automobile boom made government agencies focus on capital programs to reconstruct or build new roads. It was during the first part of the 20th century that the federal government took the lead in

helping create the organization of State Departments of Transportation, which consequently formed the American Association of State Highway and Transportation Officials (AASHTO).

During the 1950s, President Eisenhower continued the development of roads and instituted the interstate highway system to primarily serve national defense and to promote interstate commerce. Although quality was accounted through highway design and construction, the focus for all levels of government was to ensure that highways get built to support the economy (FHWA, 2000).

Efforts to incorporate total quality management (TQM) in not only technical but also administrative areas were being pursued within the federal government in the late 1970's, when several large American corporations adopted the techniques that enabled the Japanese to be so successful (Chatfield, 1995). The Federal Quality Institute defines TQM as "a comprehensive customer-focused system…to improve the quality of products and services. It is a way of managing the organization at all levels, top management to front-line to achieve customer satisfaction by involving all employees and continuously improving the work processes of the organization" (Robertson and Gill, 2000). The federal government formally became a participant in TQM with a presidential executive order in February 1986. That order established a government-wide effort to improve the productivity, quality, and timeliness of government products and services.

To transportation officials, quality typically relates to pavement smoothness and durability, adherence to budget and schedules, and improved road safety (Chatfield,

1995). In 1990, FHWA sponsored a quality management workshop under Demonstration Project 89 to develop recommendations for future construction quality management activities. This forum stemmed from the development of the Baldridge National Quality Program, which is the basis for the Federal Highway Administration's Strategic Plan to measure performance (NIST, 2004). The group recommended development of a national initiative on quality, including a national statement of policy, developed jointly by FHWA, AASHTO, industry and academia. The National Quality Initiative was instituted in 1992, evolving to the National Partnership for Highway Quality (NPHQ) in 2000. NPHQ's chief mission is to advocate for the roadway customer's demands -- for practices and programs that ensure our highways operate at peak performance now and into the nation's bright future (NPHQ, 2006). These have been the principles of continuous process improvement that FHWA has pursued since the development of its National Strategic Plan (FHWA, 1998) to manage its programs and processes used in federal-aid projects.

Two other events influenced states to adopt quality management in the 1990s. One was the completion of the interstate highway system in 1990 (Loyselle, 2005). This, coupled with the passage of the federal transportation acts in 1991 and 1998, required FHWA and states to develop a new policy on stewardship and oversight of the federal highway program. Increased knowledge of effective highway management programs and funding levels, while reduction in size of the public sector staff caused a rethinking in the way both federal and state transportation agencies would administer their programs and

projects (FHWA, 2001). Quality assessment tools were developed, such as program and process reviews, to evaluate stewardship and oversight activities.

One of the processes that FHWA and KYTC have been closely monitoring during the last couple of years has been the closing of projects, referred as "final acceptance". Final acceptance processes are required for all federal-aid projects in the United States (CFR, 2002). Kentucky, as many other states such as Alaska, North Carolina and Washington, seems to have difficulties in the administration of this process (AKDOT, 2005; CAGC, 2004; WSDOT, 2006).

Although final acceptance has a technical quality component, it is the efficiency of the management of funds authorized to build the project which has been the factor that has prompted both FHWA and KYTC, as well as other independent agencies such as the General Accounting Office (GAO) and the U.S. Department of Transportation's Office of Inspector General (OIG), to review and investigate whether processes are in place and adequate administration of federal-aid funds is provided (CoP, 2004).

Of a primary concern for both GAO and the OIG are federal funds that are authorized but for some reason they are not spent or billed within a certain period of time, such as within a fiscal year. This situation results in a project becoming financially "inactive", defined as no costs billed to FHWA during the past 12 months. To support its annual certification of internal and financial statements, the FHWA issued the Order 4560.1, establishing the

Financial Integrity Review and Evaluation (FIRE) Program. FIRE is intended to review several financial elements, including inactive projects.

This project intends to provide insight with issues of inactive projects from the construction program perspective.

Research Design

An effective process analysis could yield important insights into features of projects and/or management that lead to withholding of payments. It might lead to process modification, new training, or rule changes. Therefore, a description of the current process ought to be performed, as well as how is it being done to provide a basis for comparison. A review of project data including both FHWA and KYTC reports and dates when those reports are available, ought to be done to assess time between each of these reports and seek for areas of improvement. Descriptive analysis could be performed to assess criticality of data, time and/or other issues. Interviews of officials from both agencies addressing knowledge of process and contract requirements would be helpful to determine whether training is needed and what would be the extent of it.

Hence, the research question is *what are the reasons that lead highway projects not being able to be finally accepted?*

To answer the research question, we must understand the requirements and processes. An implementation analysis of the time it takes both FHWA and KYTC to perform individual final inspections and acceptance must be performed, to observe not only potential similarities and/or differences between the timeline of the two agencies' processes, but to also identify trends that could lead to learn its historical context with the changes in each organization as well as the fiscal conditions per fiscal year.

Therefore, a sample of federal-aid highway projects (with its timelines) during the last 20 years performed in the Commonwealth of Kentucky should provide the information

necessary to perform these analyses. Time will be measured in periods within FHWA and KYTC engineering processes (days and years), as well as overall correlation of both processes in terms of coherence. Money will also be measured from the standpoint of quantities of federal-aid funds authorized, obligated and withheld.

Data of approximately 1,600 federal-aid projects that KYTC has awarded during the last 20 years are available for this project, and this encompasses both interstate and non-interstate projects. To be able to manage the volume of this data, an aggregate analysis will be used to combine project data, such as time and costs, in a yearly basis.

This data will be gathered among the following sources:

- ✓ Administrative data showing federal-aid project identification attributes and dates of its inspections, acceptances and final payments are readily available through KYTC.
- ✓ Fiscal data are also available through FHWA and KYTC, to ascertain both obligational authority and withheld fund levels.
- ✓ Engineering process and its requirements are available through federal regulations (23 CFR), guidance and technical memoranda, as well as through the 2004 Kentucky Standard Specifications for Road and Bridge Construction.
- ✓ Interviews with FHWA and KYTC officials may provide additional information regarding both organizational and procedural analysis.

Data Analysis

Process Diagramming

Through a series of meetings, FHWA and KYTC personnel involved in tasks related to construction management from central and district offices were asked to review the requirements for final acceptance, as specified in the Code of Federal Regulations (23 CFR) as well as the Kentucky Standard Specifications for Road and Bridge Construction. The KYTC final acceptance process was diagrammed and documented with its corresponding requirements based on the two policy documents, as well as current administrative practices.

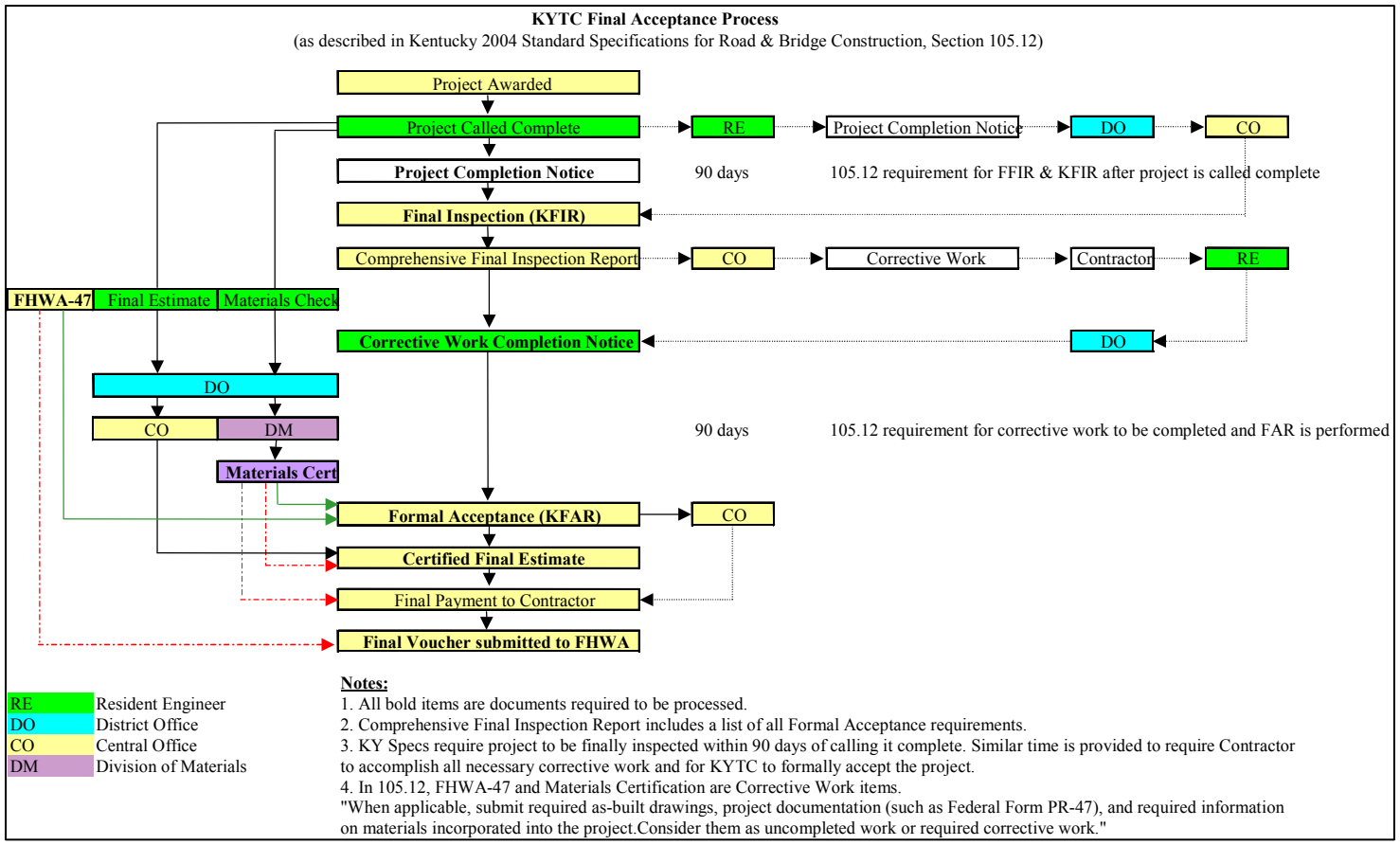

Figure 1. KYTC Final Acceptance Process

The Final Acceptance Process, as shown in Figure 1, consists of several steps led by different groups. The beginning of this process is when a project is awarded by the Division of Construction Procurement, housed in the Central Office (CO) at the Transportation Cabinet Office Building in Frankfort. Depending of the time stipulated in the contract, the project is finished and *called complete* by the Resident Engineer (RE). The RE will complete a *Project Completion Notice* and will submit it to the District Office (DO), which ultimately forwards it to the Division of Construction (CO). This notice will effectively start the process set up in Section 105.12 of the Kentucky Standard Specifications for Road and Bridge Construction, 2004 Edition. This section requires for the CO personnel assigned to conduct final inspections in the items requested within the *Project Completion Notice*, such as structures and traffic control devices, within 90 days after the project is called complete. This 90-day rule is also intended for FHWA to follow on "full-oversight projects" (i.e., interstate and Ohio River bridges), although federal regulations do not establish a limit in the time after a project is called complete.

When the project is called complete, it also initiate the materials sub-process that involves the RE's crew, District Materials personnel and the Division of Materials at the Central Office (DM); as well as the final estimate of the quantities paid to the contractor. The materials sub-process allows for review of the testing and acceptance of materials that has occurred at both the field and at the Central Office, merging it all together for the District Materials Engineer, and subsequently the Director of the Division of Materials in Central Office, to certify the acceptance of the materials used in the project. Although no time limits have been devised for this sub-process to complete these tasks in the federal

regulations nor the Kentucky Standard Specifications, it is intended for the *Materials Certificate* to be submitted to the Division of Construction (CO) just prior to the formal acceptance of the project. A copy of the *Materials Certificate* is also submitted to FHWA on projects with full oversight.

After KYTC performs the *Kentucky Final Inspection Report* (*KFIR*), a *Comprehensive Final Inspection Report* is prepared by the CO personnel and sent to the DO personnel and RE. Typically, corrective work is required to formally accept the project, and this report describes the deficiencies that must be corrected by the contractor. If no corrective work is warranted or needed, a formal acceptance report is then prepared by the Division of Construction (CO), which releases the contractor of their responsibilities with their contract, and will prepare the stage for their final payment.

The *FHWA Final Inspection Report* (*FFIR*) is performed on full-oversight projects normally at the same time or after the *KFIR* is conducted. Among the common observations provided in the *FFIR* is the need for KYTC to provide FHWA the form *FHWA-47*, along with the *Kentucky Formal Acceptance Report* (*KFAR*), the *Materials Certificate* and the *Liquidated Damages Report*, if warranted. The Kentucky Standard Specifications details that "[w]hen applicable, submit required as-built drawings, project documentation (such as Federal Form PR-47), and required information on materials incorporated into the project. Consider them as uncompleted work or required corrective work." Therefore, these documents, including the *FHWA-47* form, should be completed prior to the *KFAR*, which is delineated in Figure 1 as green solid lines.

If corrective work was required, the RE prepares the *Corrective Work Completion Notice* when the contractor finishes warranted corrective work. This form is routed to the DO construction personnel, and then to the Division of Construction (CO). The Kentucky Standard Specifications requires for the contractor to perform corrective work within 90 days when the RE issues the report on or between March 1st and September 30th of the current year, or by June 1st of the later year when the RE issues the comprehensive final inspection report on or between October 1st of one year and February 28th of the next year. Therefore, another 90-day rule is also intended, in this case for the contractor, to perform corrective work.

When all incomplete and required corrective work is finished, the Division of Construction (CO) will prepare the *Kentucky Formal Acceptance Report* (*KFAR*) of the project and take responsibility for the project. This notice is sent to the Final Estimate Branch (CO), Division of Accounts (CO) and to the FHWA (only on full-oversight projects). The Final Estimate Branch will receive the draft Final Estimate from the DO, and their review and certification that quantities and payments are correct (i.e., *Certified Final Payment*) is then sent to the Division of Accounts (CO) to process the *Final Payment to the Contractor*. The Division of Accounts finally prepares and submits the *Final Voucher to FHWA* for its fiscal management section to process payment to KYTC, as originally authorized prior to the project being let.

The *FHWA Final Acceptance Report* (*FFAR*) is prepared on full-oversight projects after the *KFAR* is received. The *FFAR* is then sent to the Division of Construction (CO),

Division of Accounts (CO) and the FHWA fiscal management section to assert federal acceptance of the project and require KYTC to submit their final voucher.

This process is also valid for non-interstate federal-aid projects, per the FHWA/KYTC Stewardship and Oversight Agreement requirements.

Methodology of the Descriptive Analysis

The analysis for this process review was performed based on data obtained from the KYTC CPES (Construction Project Estimate System), which was exported to MS Excel format. CPES data contained 1,682 federal-aid projects awarded between 1981 and 2005, including the following contract and performance data.

Contract Data	Performance Data
District	Project completion date
Project construction number (PCN)	Date of Final Inspection Report performed by KYTC
Federal-aid project number	Date of Final Inspection Report performed by FHWA
Route	Date of Formal Acceptance Report performed by KYTC
Contractor	Date of Final Acceptance Report performed by FHWA
Letting date	Final Payment performed by KYTC
Project beginning date	Date of Final Payment performed by KYTC

To assess effectiveness of the process for both interstate and non-interstate projects, as well as to ensure homogeneity in the data sampling, projects let in 2005 were not included in the analysis. Analysis of the data obtained for the 2005 projects showed that all of these projects did not include data for the performance data column; hence,

showing that the project has not being completed within that year. This resulted in 1,635 federal-aid projects to comply with this criteria (i.e., 97% out of the original 1,682).

Under the current FHWA/KYTC Stewardship and Oversight Agreement (FHWA/KYTC, 1999), some project approval and oversight activities were delegated to the KYTC. Primarily, all non-interstate project final design and construction activities were delegated, while FHWA kept "full oversight" (i.e., planning, design, utilities, right-of way and construction) of interstate projects and Ohio River bridges. Therefore, as projects were distributed in two separate sample groups (i.e., interstate and non-interstate), further data review and reduction were required to achieve simplicity in the analysis. Data review included the identifying and coding data cells, which originally did not have any data incorporated in them. These data cells were further excluded from the reduction analysis.

Individual project data from 287 interstate (18% out of 1,635) and 1,348 non-interstate (82% out of 1,635) projects was then reduced to the following data attributes:

Reduced Contract Data	Reduced Performance Data
District	Date of Final Inspection Report performed by KYTC (KYTC FIR)
Project construction number (PCN)	Date of Final Inspection Report performed by FHWA (FHWA FIR)
Federal-aid project number (Fed Proj No.)	Date of Formal Acceptance Report performed by KYTC (KYTC FAR)
Letting date (Letting)	Date of Final Acceptance Report performed by FHWA (FHWA FAR)
Project beginning date (Proj Began)	Date of Final Payment performed by KYTC (Fin Pay)
Project completion date (Proj Compl)	

Analysis of selected attributes of the data led to an even more simplified approach of managing the entire individual data and allowed it to be aggregated into annual averages for each of the two sample groups. Quantity of projects that completed required administrative construction tasks and the average times it took for either KYTC and FHWA to complete such tasks were assessed. The following are analytical attributes obtained through this process:

KFIR	Number of projects with KYTC Final Inspection Report completed
KFIR %	Percentage of projects with K FIR completed
KFIR Avg T	Average time between Project Completion and K FIR (days)
KFAR	Number of projects with KYTC Final Acceptance Report completed
KFAR %	Percentage of projects with K FAR completed
KFAR Avg T	Average time between K FIR and K FAR (days)
FFIR	Number of projects with FHWA Final Inspection Report completed
FFIR %	Percentage of projects with F FIR completed
FFIR Avg T	Average time between Project Completion and F FIR (days)
FFAR	Number of projects with FHWA Final Acceptance Report completed
FFAR %	Percentage of projects with F FAR completed
FFAR Avg T	Average time between F FIR and F FAR (days)
K Pay T	Average time between KYTC Final Pay and K FAR
F Pay T	Average time between KYTC Final Pay and F FAR
Paid in Adv	Number of projects that have been finally paid without a FFAR
% Paid in Adv	Percentage of projects that have been finally paid without a FFAR
Compl to Pay	Average time between Project Completion & Fin Pay (days)
T KFAR (years)	Average time between KFAR & Fin Pay (years)
T FFAR (years)	Average time between FFAR & Fin Pay (years)

To focus in the entire process, two additional analytical data attributes were obtained:

T KFAR (years)	Average time between Proj Compl & KYTC FAR (days, years)
T FFAR (years)	Average time between Proj Compl & FHWA FAR (days, years)

Differences between the Established Process and Practiced Process

In 2002, after KYTC's annual requests for FHWA to conduct *FFAR* on completed interstate projects, FHWA management directed an internal review to know the reasons why the *FFAR* were not being conducted. During a desk review of interstate construction project files in 2 of the 12 KYTC districts, it was found that FHWA was unable to conduct final acceptance due to the lack of supporting documentation, specifically *Materials Certificates* and *FHWA-47* completed forms. In 2005, FHWA management directed a more encompassing review to know whether this situation was isolated in these 2 districts or was a statewide problem. FHWA management directed both FHWA and KYTC to evaluate the current final acceptance process and find recommendations in how to improve it.

Current practices managing these two required documents are shown in dashed-red lines in Figure 1. While the *Materials Certificate* is often finished and submitted after the *KFAR* is completed (i.e., either by the time the *Certified Final Estimate* or the *Final Payment to the Contractor* is performed), the *FHWA-47* form is usually sent to the FHWA by the time the Final Voucher is submitted to the FHWA fiscal management section. Informal interviews conducted among FHWA Transportation Engineers covering all 12 KYTC districts, as well as KYTC construction personnel at both CO and DO, confirms that this is occurring statewide. Reasons for this practice ranged from lack of knowledge of the process and its requirements, staffing, personnel accountability

requirements, to management decisions in focusing in processing the final payments rather than following the established process.

Although both FHWA and KYTC primary users (i.e., construction personnel at KYTC; project delivery personnel at FHWA) are familiar with the documentation requirements for each agency, in practice each agency's portion of the process is kept separate from the other agency. Federal requirements are included in the Kentucky Standard Specifications; however, they are often overlooked. For instance, the majority of the interviewed KYTC personnel acknowledged not knowing the value or importance of the *FHWA-47* form. *FHWA-47* form results are compiled for every federal-aid project with costs over $1 million and it is a key input to develop price trend and usage indexes for highway construction. This form, which would only detail a statement of materials and labor used in the project, is for the contractor to complete with the assistance of the State Department of Transportation, in this case the KYTC.

Another way this process is kept separate between agencies is when the *Materials Certificate* is made available by the Division of Materials either after certifying the final estimate (performed by the Division of Construction) or when the Final Payment to the Contractor is being performed (by the Division of Accounts). In this case, a necessary document by both KYTC construction and FHWA project delivery personnel is not being produced at the time the Kentucky Standard Specifications requires it to be available.

The priority of Resident Engineers, which is to complete the project within the contract time and assure it was performed per plans and specifications, makes the unfamiliarity and confusion with requirements and the steps in the process even larger. As the number of projects under their management increases while their crew of inspectors diminishes due to regular turnover year after year, makes final acceptance a tedious administrative exercise. Not only they are dealing with more projects and less supporting staff, but also additional requirements have been placed on them during recent years. Examples include the oversight of documentation from subcontractors who are DBE (Disadvantage Business Enterprises), and further contractor payments to the DBE subcontractors, training and management of contracted inspection personnel, while dealing with typical daily situations such as traffic control and requests for additional quantities of a needed material, makes Resident Engineers to focus their time and expertise in managing projects that are still active.

Another thing that takes the Resident Engineer's mind away from their goal of completing projects as detailed per plans is their direct involvement with contractors, which would demand response to them for their payments due to work already performed, as they are the most visible KYTC personnel to them in the field. Therefore, for completed projects that the contractors believe they have provided the necessary documentation for them to receive their final payments, the Resident Engineers priority would be to make certain that the Final Estimate has been reviewed and processed. As they are not directly involved in the development of the Materials Certificate and FHWA-47, Resident Engineers do not see this as within their authority to complete.

Technology has helped KYTC to improve or maintain the completion rate of documentation needed to finish the process, while reducing its workforce. The rollout of SiteManager to administer all construction data, including notice to proceed, change orders, and necessary contract documentation, would certainly help the state to meet internal goals while improving their administration of the process.

Finally, each of the previous steps is not held accountable by a specific team or individual within the KYTC. For instance, the Standard Specifications or guidance memoranda does not specify who is responsible within the KYTC to process these documents, with the exception of the often used term "the Engineer".

Descriptive Analysis

During the twenty-four year study period, KYTC has increased its annual production of federal-aid projects being let from 2 in 1981 to 69 in 2004 (see Figure 2). It was also observed that the number of federal-aid projects let in Kentucky peaked during the latter years of the 1990s (i.e., 1997 and 1998). This coincides with two major historic factors: the last fiscal year of the 6-year federal transportation act at the time (Intermodal Surface Transportation Efficiency Act, ISTEA, from 1991-1998); and the development of the new FHWA/KYTC Stewardship Agreement, signed on March 17, 1999.

ISTEA allowed flexibility in use and combination of program funding for states to be able to finance their highway programs. Also, federal transportation acts typically

authorize the highest level of funding during its last fiscal year of the enacted law. Finally, ISTEA required FHWA to develop new oversight mechanisms to allow states to manage FHWA functions, primarily on projects that were not interstate and in the National Highway System (NHS). The new FHWA/KYTC Stewardship Agreement, although becoming official in the first part of 1999, most of it was already employed by both agencies since 1998.

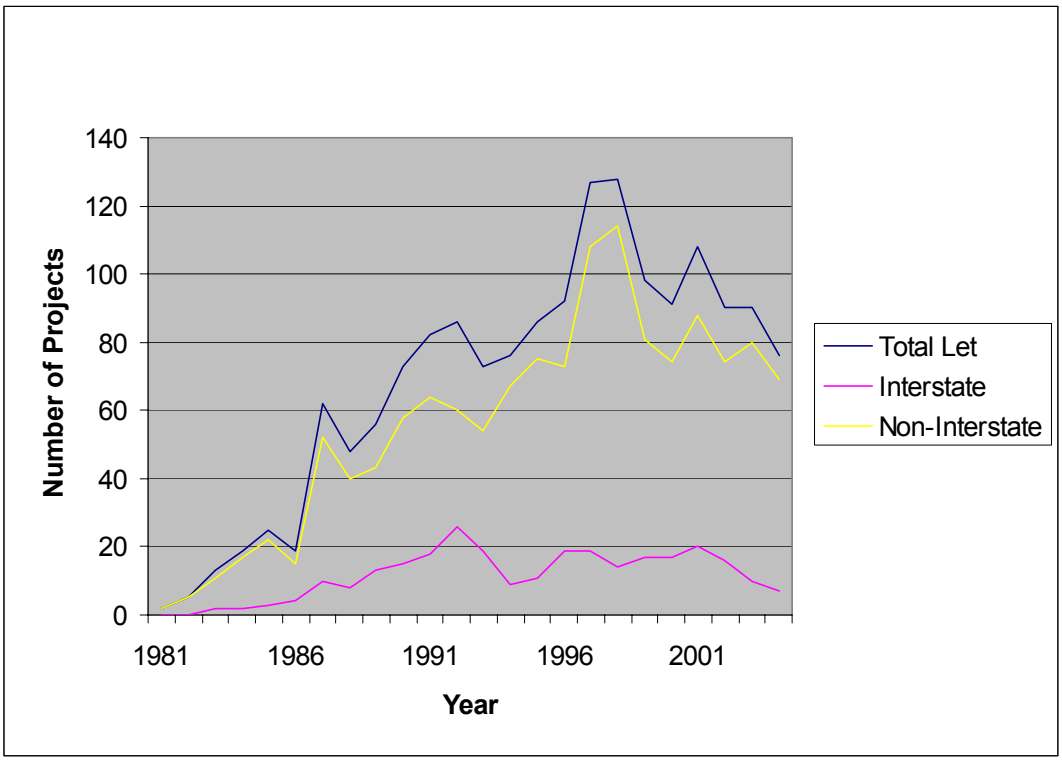

Figure 2. KYTC Let Projects (1981-2004)

The size of the construction program in Kentucky, as shown in Figure 2, contrasts with the number of employees at KYTC during this period, shown in Table 1 (Hancock, 2002 and 2005). This demonstrates that the size of the construction program has increased throughout the last three decades, while the workforce to administer it has continuously decreased.

Year	Employees	Difference	Construction Awards	Per employee
1980	8,013	****	****	****
1990	6,185	-1,828	$ 424,000,000.00	$ 68,552.95
2000	5,972	-213	$ 736,000,000.00	$ 123,241.80

Table 1. Comparison of KYTC Personnel with Construction Program

Quantity often is not reflected in quality, and consequently, in the effective management of the construction program. Table 2 shows the number of completed projects with proper documentation.

Total I	I KFIR	I FFIR	I KFAR	I FFAR
279	235	79	261	105
	84%	28%	94%	38%

Total N	N KFIR	N FFIR	N KFAR	N FFAR
1346	1106	163	1214	558
	82%	12%	90%	41%

Note: I = Interstate projects; N = Non-Interstate projects

All FHWA FAR	41%
All KYTC FAR	91%
All FHWA FIR	15%
All KYTC FIR	83%

Note: FAR = Final Acceptance Report; FIR = Final Inspection Report)

Table 2. Number of completed projects with proper documentation

During the twenty-four year study period, an average of 15% and 41% of all federal-aid projects were finally inspected and formally accepted by FHWA, respectively. It could also be observed similar trend among interstate and non-interstate projects, such as an average of 83% and 91% of all federal-aid projects were finally inspected and formally accepted by KYTC, respectively. Based on these facts, it could be concluded that more

projects were formally accepted without being finally inspected by both agencies, as the Acceptance Process requires. This appears to be happening primarily due to the lack of oversight and accountability from FHWA and KYTC Division of Construction to the KYTC District Office and its Resident Engineers.

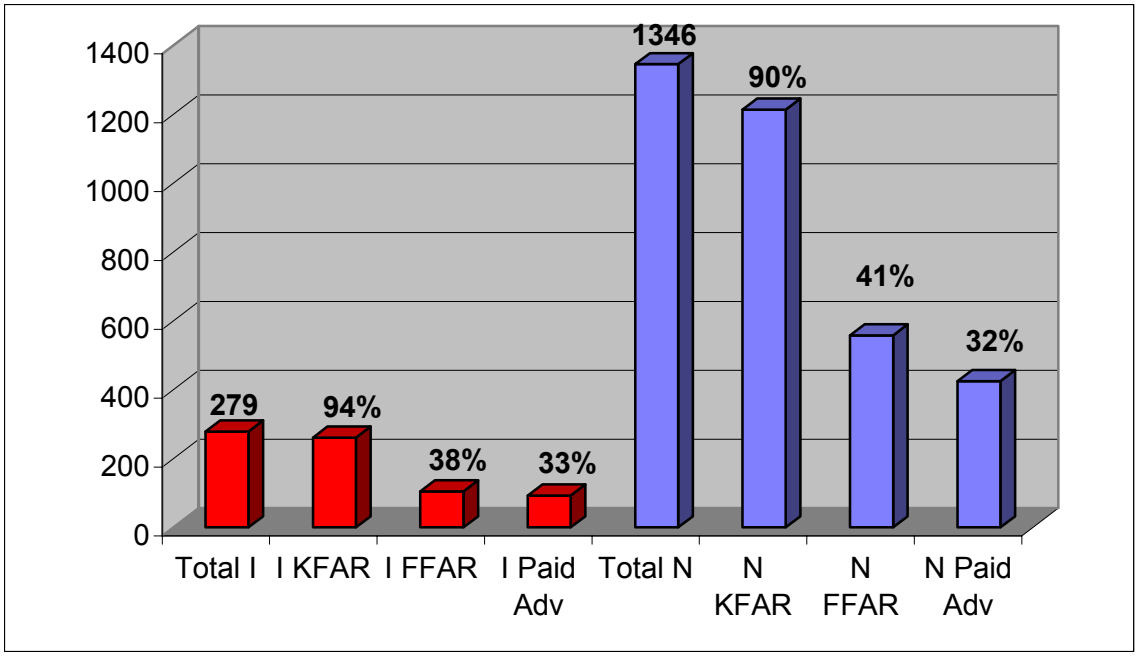

Figure 3. Projects that have been finally paid prior to FHWA Final Acceptance (1981-2004) (Note: I = Interstate projects; N = Non-Interstate projects)

Further review of individual project data allowed for accounting the situation previously described. Figure 3 shows the number and percentage of projects that have been finally paid, prior to FHWA Final Acceptance. During the twenty-four year study period, about 30% of all federal-aid projects were finally paid by KYTC prior to FHWA Final Acceptance. Averages of time paid by KYTC in advance of FHWA Final Acceptance were 109 and 151 days for non-interstate and interstate projects, respectively. Individual

project data led to also conclude that the KYTC Formal Acceptance Report (*K FAR*) was conducted in about 90% of all projects, comparing with just about 40% of all projects having the FHWA Final Acceptance Report (*F FAR*) completed. When advised of these facts, KYTC personnel interviewed seemed surprised of the magnitude of the problem regarding the lack of administrative oversight to support quality in construction projects.

There was consensus among interviewed KYTC personnel that the two 90-day rules stated in the Kentucky Standard Specifications were intended as a goal for KYTC to perform and complete the final acceptance process. To understand how effective KYTC has been able to achieve this process and meet this goal, a comparison of average time periods for the eighteen-year study period (1981-1999) and the five-year period between years 2000 and 2004 was done. The reason for this analysis is to assess KYTC's performance after the FHWA/KYTC Stewardship and Oversight Agreement became effective. Table 3 and Figure 4 show average time (days) that took required KYTC and FHWA documentation to be completed, as well as the average time (days) it took for project completion being finally paid (i.e., *Compl to Pay*).

Project Documentation	Average Time Period in days (1981-1999)	Average Time Period in days (2000-2004)
I KFIR	45	68
N KFIR	54	37
I FFIR	61	94
N FFIR	72	n/a
I KFAR	298	230
N KFAR	348	112
I FFAR	1573	n/a
N FFAR	2063	n/a
I Compl to Pay	1276	539
N Compl to Pay	1776	407

Table 3. Average time period (days) between Project Completion, KFIR, FFIR, KFAR, FFAR and Finally Paid
(Note: I = Interstate projects; N = Non-Interstate projects)

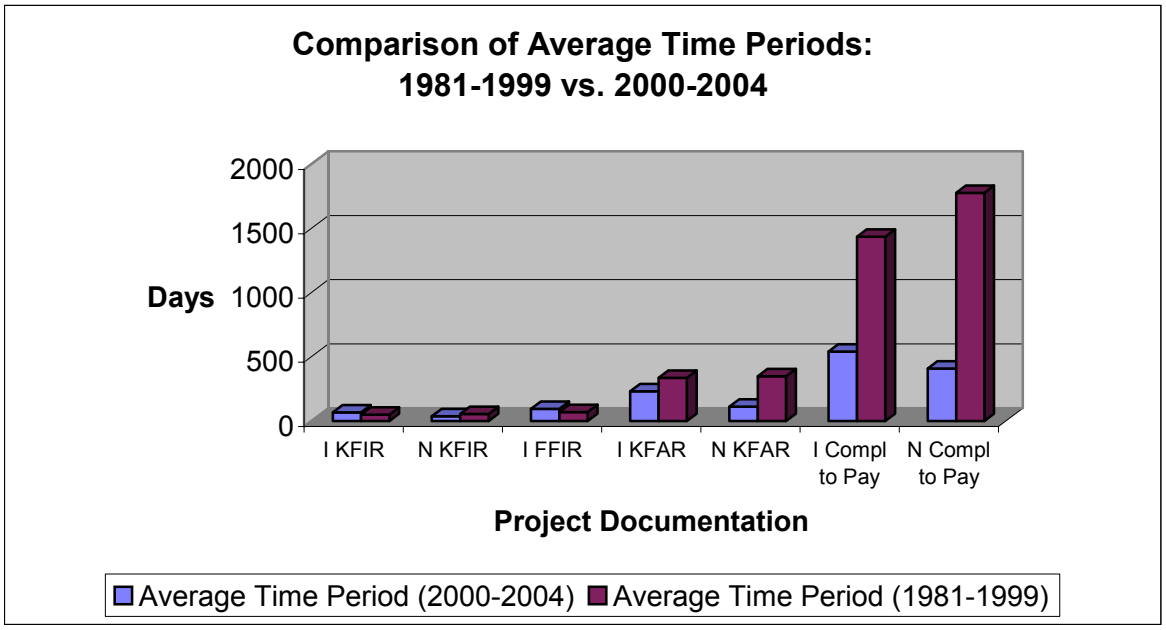

Figure 4. Comparison of Average Time Periods related to the Completion of Project Documentation (Note: I = Interstate projects; N = Non-Interstate projects)

A t-test was performed to determine whether there was a difference of means between the two periods prior and after 1999. Using paired data that was available (i.e., N FFIR, I FFAR and N FFAR data were unavailable in the latter 5-year period) and 95% as the level of significance, t-test results are shown in Table 4.

	1981-1999	*2000-2004*
Mean	551.14	212.43
Variance	479,102.14	36,760.29
Observations	7	7
Pearson Correlation	0.8909	
Hypothesized Mean Difference	0	
df	6	
t Stat	**1.6954**	

P(T<=t) one-tail	0.0705
t Critical one-tail	1.9432
P(T<=t) two-tail	0.1409
t Critical two-tail	**2.4469**

Table 4. Results of statistical test of difference of means (t-test)

The null hypothesis for the t-test was based whether the means of the two groups differed. Based on the Pearson correlation factor, there appears to be correlation among the average time periods recorded before and after 1999, while the t-test results show that there is no significant difference at the 95% level between the before and after measures. The t statistic (1.69) is less than the p-value at the 95% level of significance (2.45).

Further analysis of Figure and Table 4 results led to the following findings related to the required documentation:

- ✓ *KYTC Final Inspection Reports on Interstate Projects (I KFIR)* – In 2004, KYTC performed project final inspections within an average of 121 days after interstate project completion. This is the first time since 1992 that *I KFIR* average time went beyond the 100-day mark. Based on the historical data, these over 100-day periods occur approximately once every 10 years (i.e., 1983, 1992, 2004). Only 2 years (1991, 1995) had projects with *I KFIR* being performed prior project completion. This could either mean that final inspections were actually performed prior to calling the project complete while Central Office personnel takes advantage of a trip near the project and decides to conduct such inspection, or a

typographical error. During the 2000-2004 period, an average time period of 68 days was achieved, 20 days more than the 24-year average.

- ✓ *KYTC Final Inspection Reports on Non-Interstate Projects (N KFIR)* – In contrast, the average period of time between project completion and final inspection of non-interstate projects stayed below 50 days for the 4th consecutive year. However, projects with *N KFIR* being performed prior to project completion during 2004 were noted, only the first time since 1989. An average of 37 days was achieved during the 2000-2004 period, 9 days less than the 24-year average.

- ✓ *FHWA Final Inspection Reports on Interstate Projects (I FFIR)* – The 24-year average time period of 55 days between project completion and FHWA final inspection of interstate projects must be compared with the most recent (and available) average time period (from 2000-2002), which was almost double (94 days) than the historical average. During the years of 2003 and 2004, insufficient data neglected the time analysis. This in itself could increase the average time period from years 2000-2005 to more than 100 days.

- ✓ *FHWA Final Inspection Reports on Non-Interstate Projects (N FFIR)* – Since 1998, the availability of this data is negligible, as the FHWA/KYTC Stewardship and Oversight Agreement allow KYTC to perform this activity for FHWA. The average time period based in the 24-year data is 48 days.

- ✓ *KYTC Formal Acceptance Reports on Interstate Projects (I KFAR)* – In 2003, KYTC performed project final acceptances within an average of 143 days after completing the I KFIR; the first time since 1997 that I KFAR average time went below the 200-day mark. During the 2000-2003 period, I KFAR's were performed within an average 230 days from the I KFIR, compared to 262 days based in the 24-year data. 2004 data was unavailable.

- ✓ *KYTC Formal Acceptance Reports on Non-Interstate Projects (N KFAR)* – For the sixth consecutive year, KYTC performed its KFAR on non-interstate projects with an average of less than 200 days per project (i.e., 112 days). In fact, 2004 was the second consecutive year that KYTC achieve average times below 100 days. The trend has been decreasing since 1992. This favorably contrast with 285 days based in the 24-year historical data.

- ✓ *FHWA Final Acceptance Reports on Interstate Projects (I FFAR)* – Although the trend has been declining since 1983 (with 1994 being the first year with less than 1,000 days), data has not been reliable since 1995. Therefore, the latter 5-year period cannot be compared with the 24-year historical data (721 days).

- ✓ *FHWA Final Acceptance Reports on Interstate Projects (N FFAR)* – Since 1996, the availability of this data is negligible, as KYTC is required to perform this activity for FHWA. The average time period based in the 24-year data is 1,117

days, which compares favorably with *N FFIR* and the implementation of the FHWA/KYTC Stewardship and Oversight Agreement.

- ✓ *Time between Project Completion and Final Payments on Interstate projects (I Compl to Pay*) – As the 24-year average time period between calling an interstate project complete and finally paid is 1,047 days, it is then logical not to have available 2004 data. But data from 2000-2003 shows an average of 539 days, almost half of the historical average time.

- ✓ *Time between Project Completion and Final Payments on Non-Interstate projects (N Compl to Pay*) – For its fifth consecutive year, KYTC managed to decrease the time it takes to call a non-interstate complete and finally pay it, to an average of 270 days in 2004. The 24-year historical data shows 1,417 days, while during the 2000-2004 period it was achieved in only an average of 407 days.

These findings lead to the conclusion that reduction in the time it takes to complete required tasks for KYTC and FHWA is being achieved. As observed in Figures 5 and 6, trends for completion timeframes of the KYTC and FHWA acceptance reports for interstate and non-interstate projects show an average of approximately 1 year after the project is called complete for a project to be formally accepted by the KYTC, while between 4 and 4.5 years to be finally accepted by FHWA.

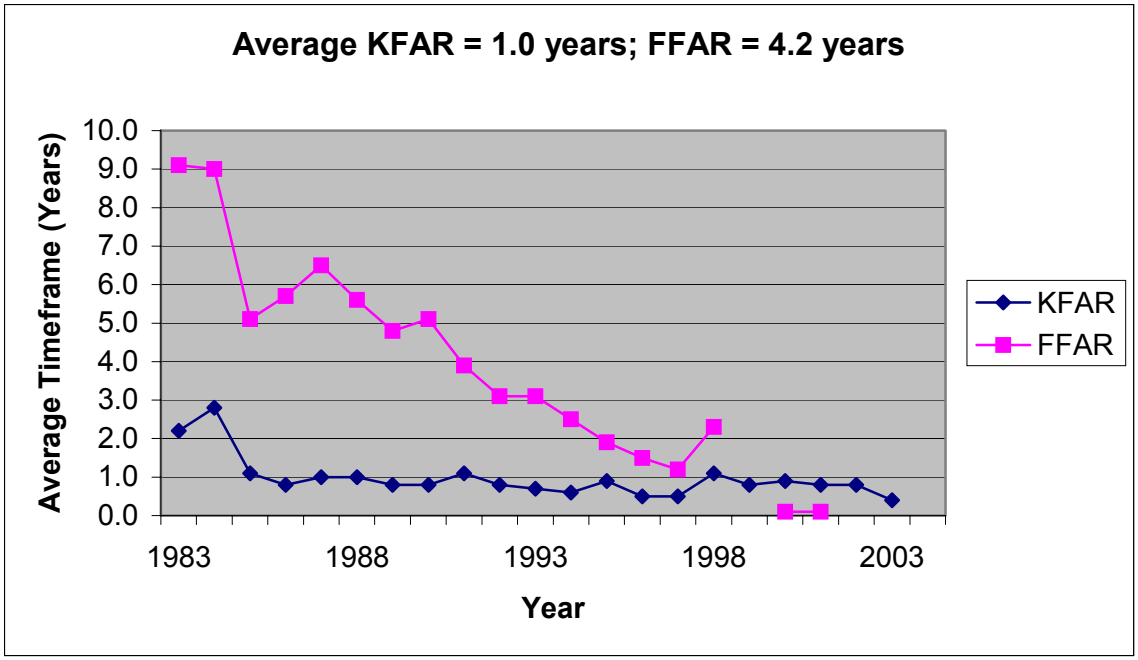

Figure 5. Interstate Projects Completed and FAR Timeframe (Sample of 270 completed projects).

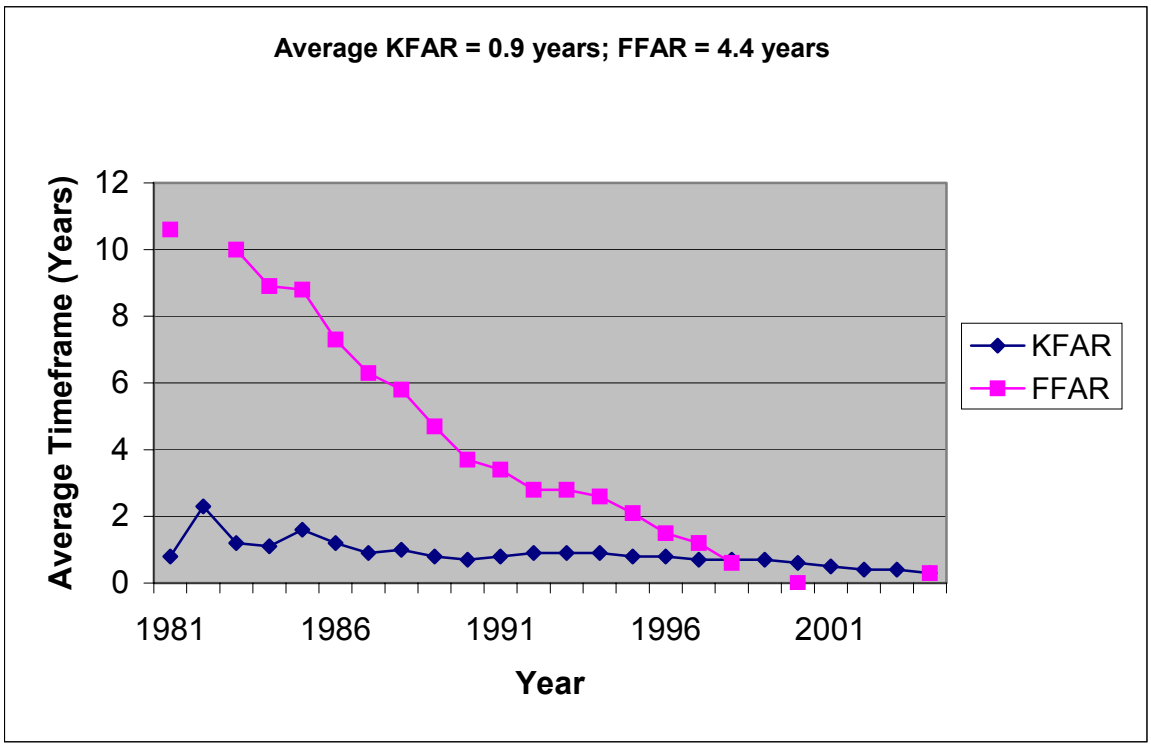

Figure 6. Non-Interstate Projects Completed and FAR Timeframe (Sample of 1,212 completed projects)

Another analysis, shown in Figure 7, was conducted to assess the amount of projects that completed the acceptance reports (*FAR*) within a certain amount of time. In the sample of interstate projects (270 projects), 98% of the projects had *KYTC FAR* completed within the first 3 years (73% the 1st year, 19% the 2nd year, 5% the 3rd year). This compares favorably with the sample of non-interstate projects (1,212 projects), which had 99% of their *KYTC FAR* completed within the first 3 years (76% the 1st year, 20% the 2nd year, 3% the 3rd year).

In the sample of interstate projects, 89% of the projects had *FHWA FAR* completed between 2 and more than 5 years (28% more than 5 years, 21% the 5th year, 16% the 2nd year, 15% the 3rd year). This compares favorably with the sample of non-interstate projects, which had 93% of their *FHWA FAR* completed between 2 and more than 5 years (25% the 2nd year, 22% the 3rd year, 20% more than 5 years, 14% the 5th year, 13% the 4th year).

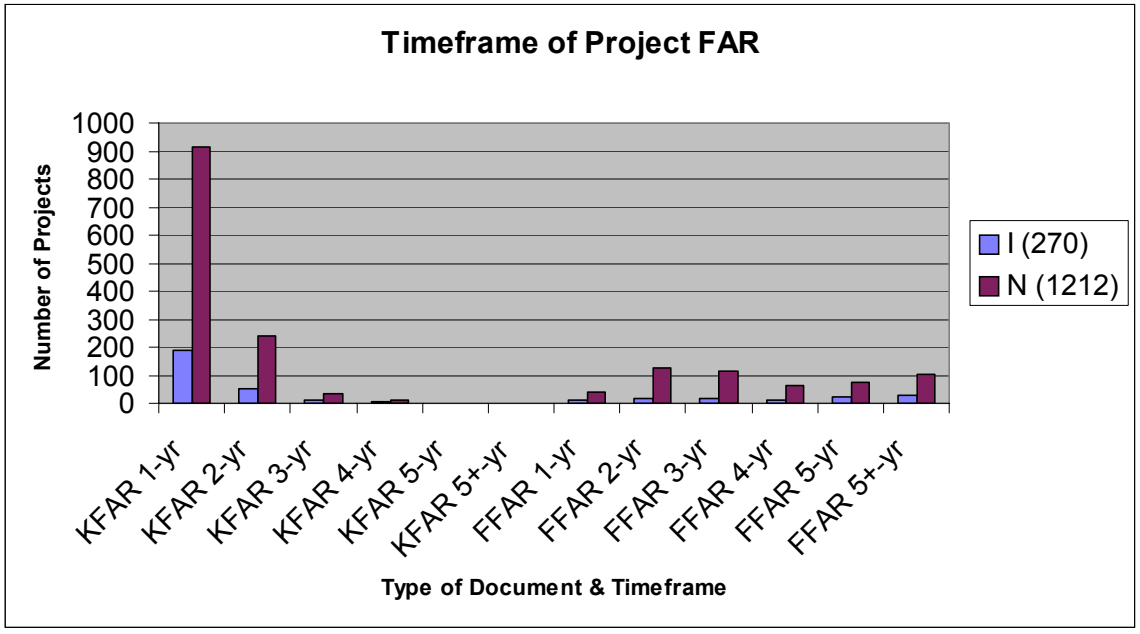

Figure 7. Timeframe of Project Final Acceptance Reports

A final analysis was performed to compare the number of projects awarded during the last three state fiscal years and the number of projects closed out, including amounts of unpaid funds that FHWA has not been able to reimburse. That analysis is summarized in Tables 5 and 6 below.

Year	Awarded	Completed	Corrective Work
S FY03	19	18	4
S FY04	5	4	2
S FY05 *	5	3	3
Total	29	25	9

Year	KFAR	Finally Paid	% Finally Paid Proj
S FY03	13	7	36.84%
S FY04	2	1	20.00%
S FY05 *	0	0	0.00%
Total	15	8	27.59%

Year	Total $$	Amt Unpaid	% Unpaid Amt
S FY03	$200,406,895	$4,183,924	2.09%
S FY04	$25,904,232	$1,432,932	5.53%
S FY05 *	$53,566,424	$16,973,872	31.69%
Total	$279,877,551	$22,590,728	8.07%

Table 5. Number of interstate projects awarded, formally accepted, and finally paid; including authorized and unpaid amounts during the State Fiscal Years 2003-2005

Approximately 28% of the 29 interstate projects awarded during the state fiscal years 2003 through 2005 have been finally paid. Total amount of funds that accounts for these projects is approximately $280 million, which about $22 million are still unpaid. This accounts for 8% of the total authorized funds. Projects awarded during year 2005 bear the majority of these unpaid funds with almost 32% ($16 million). 60% of the completed

projects (15 out of 25) have been formally accepted by the KYTC. Using the same reasoning, 60% of the total amount unpaid for years 2003 and 2004 could be reimbursed if FHWA proceeds with conducting their final acceptance report. This could lead to about $3.3 million that could be reimbursed.

Year	Awarded	Completed	Corrective Work
S FY03	86	73	11
S FY04	65	46	19
S FY05 *	25	12	11
Total	176	131	41

Year	KFAR	Finally Paid	% Finally Paid Proj
S FY03	62	53	61.63%
S FY04	27	12	18.46%
S FY05 *	1	0	0.00%
Total	90	65	36.93%

Year	Total $$	Amt Unpaid	% Unpaid Amt
S FY03	$238,073,805	$25,008,909	10.50%
S FY04	$214,640,303	$73,768,542	34.37%
S FY05 *	$168,869,105	$101,680,591	60.21%
Total	$621,583,213	$200,458,042	32.25%

Table 6. Number of non-interstate projects awarded, formally accepted, and finally paid; including authorized and unpaid amounts during the State Fiscal Years 2003-2005

Almost 37% of the 86 non-interstate projects awarded during the State fiscal years 2003 through 2005 have been finally paid. Total amount of authorized funds that accounts for these projects is approximately $622 million, which about $200 million are still unpaid. This accounts for 32% of the total authorized funds. Projects awarded during year 2005 bear the majority of these unpaid funds with almost 50% ($101.7 million). Almost 70%

of the completed projects (90 out of 131) have been formally accepted by the KYTC. Using the same reasoning, 70% of the total amount unpaid for years 2003 and 2004 could be reimbursed if FHWA proceeds with conducting their final acceptance report. This could lead to about $123 million that could be reimbursed.

Conclusions and Recommendations

This project addressed a variety of issues regarding the final acceptance process for federal-aid projects. The question of whether the process was followed or not (as per both federal and state regulations) was assessed. After laying out the process for both KYTC and FHWA, it could be concluded that many different groups within each of these agencies need to interact among each other to know where each federal-aid project might be in terms of the final acceptance process. Stakeholders from KYTC include construction personnel at the Central, District and field (i.e., Resident Engineer's crew) offices; materials personnel at the Central, District and field (i.e., Resident Engineer's crew) offices; and the Divisions of Construction Procurement and Accounts at the Central Office. Within FHWA, the project delivery team (with its Transportation Engineers) and the fiscal management team will certainly be involved in the FHWA portion of the final acceptance process.

The research question – *what are the reasons that lead highway projects not being able to be finally accepted?* – was answered. Lack of required documentation, such as *FHWA-47* and *Materials Certificate*, are the two primary reasons that highway projects cannot be finally accepted by FHWA. A variety of causes were gathered through interviews with KYTC and FHWA personnel, including their unfamiliarity with the requirements and steps of the process, Resident Engineer's priorities and lack of supporting staff, personnel accountability requirements and the focus in processing the final payments rather than following the established process.

One recommendation to address the separation within the process between FHWA and KYTC is for both primary users of the process – KYTC Division of Construction liaisons and FHWA Transportation Engineers – to conduct joint final inspections and exchange notes prior to KYTC preparing its Formal Acceptance Report (*FAR*). This exchange must lead to clarifications from both agencies, in particular FHWA, to assure that KYTC will be having the Materials Certificate and *FHWA-47* along with its *FAR*, for FHWA to then review these documents and prepare its *FAR* in a reasonable timeframe.

Another recommendation is for the FHWA project delivery team and fiscal management team to devise a mechanism to allow for both administrative and construction requirements (i.e., fund management and construction management) to be a single process instead of two disjointed sub-processes. FHWA fiscal management must have in hand a FHWA Final Acceptance Report prior to process final voucher in any federal-aid project that is under FHWA full-oversight. The KYTC Division of Accounts could assist, as they have been in the recent years, gathering all the information and submitting it to both FHWA project delivery and fiscal management teams for them to become aware of the need for final acceptance and further processing of final vouchers.

Also, if required documents such as *FHWA-47* or Materials Certificate are unavailable, the Division of Construction ought not to prepare a Formal Acceptance Report. By doing so, it may force contractors to prepare the *FHWA-47* and materials personnel to finish their checks for the *Materials Certificate*, but it is obviously against the Standard Specifications. The thought behind this argument is that, for the contractor to receive

their final payment, they ought to comply with necessary requirements; unfortunately, the Division of Accounts would not likely enforce construction specifications, but their financial requirements, which allows them to pay the contractors when final estimates are certified and received. Efforts to find the information to complete the *FHWA-47* gets more difficult after the Kentucky Administrative Regulations that requires KYTC to retain documents for a maximum of 3 years after final payment for audit purposes.

Each of these steps needs to be held accountable by a specific team or individual within the KYTC. For instance, the practice and stakeholders previously mentioned are not disclosed in similar fashion in the Standard Specifications or guidance memoranda. The FHWA-47 is loosely mentioned as a requirement, but no accountability as to whom it needs to be completing it. Therefore, a memo or clarifying the specifications to assert responsibility of each of the required documents is recommended. These memos may allow the FHWA and KYTC top management to reassert the importance of effectively managing this process together.

Training would likely be needed among all the process stakeholders, as KYTC may be losing up to 40% of their personnel due to retirements in the year 2008, as well as with FHWA's likelihood of personnel retirements and/or turnover due to 'baby boom' generation effects. This training must explain each of the steps and 'gatekeepers' involved in the process.

The data analysis demonstrated two trends: final payment of projects without FHWA Final Acceptance (about 30% of all completed projects) and the improvement of the process performance by FHWA and KYTC throughout the years, in terms of time it takes each agency to proceed their process. Although there might not be a goal specified by either FHWA nor KYTC regarding the number (or percentage) of projects who gets formally and finally accepted, along with reasonable timeframes for the completion of this process in a program basis, the opportunity for the top management of both agencies to express the significance of this process should be complemented with a set of performance measures. These performance measures could be developed around the two 90-day rules specified in Section 105.12 of the Kentucky Standard Specifications, similar to the way Alaska DOT currently has it incorporated within the State Government's "Mission and Measures".

KYTC has implemented an internal memo related to inactive projects, in light of the financial integrity review stemmed from OIG and GAO investigations, as well as the FIRE order. This would certainly help in the development of performance measures in the monetary amounts withheld and unpaid by FHWA, as well as enough accountability for the "gatekeepers" of required documents that are not completed within a certain timeframe.

A process will work efficiently and effectively if the stakeholders engage among themselves to learn and improve it to their satisfaction. Performance goals and measures, definition of roles for stakeholders and users of the process, guidance provided by the top

management and training are some of the techniques that could be used to improve the FHWA/KYTC Final Acceptance Process.

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