

Research Report
KTC -14-02/SPR486-12-1F

Contractor Evaluations in the Contractor Selection Process

Our Mission

We provide services to the transportation community through research, technology transfer and education. We create and participate in partnerships to promote safe and effective transportation systems.

© 2014 University of Kentucky, Kentucky Transportation Center
Information may not be used, reproduced, or republished without our written consent.

Kentucky Transportation Center

176 Oliver H. Raymond Building

Lexington, KY 40506-0281

(859) 257-4513

fax (859) 257-1815

www.ktc.uky.edu

1. Report No. KTC-14-02/SPR486-12-1F	2. Government Accession No.	3. Recipient's Catalog No	
4. Title and Subtitle Contractor Evaluations in the Contractor Selection Process		5. Report Date 04/17/14	
		6. Performing Organization Code	
7. Author(s): T. Taylor, R. Sturgill, M. McDowell, A. Deep, P. Goodrum		8. Performing Organization Report No.	
9. Performing Organization Name and Address Kentucky Transportation Center 176 Raymond Building Lexington, KY 40506		10. Work Unit No. (TRAIS)	
		11. Contract or Grant No.	
12. Sponsoring Agency Name and Address		13. Type of Report and Period Covered	
		14. Sponsoring Agency Code	
15. Supplementary Notes			
16. Abstract The current contractor evaluation system in use within the Kentucky Transportation Cabinet is based on the contractor evaluation system developed as part of SPR 212-00 "Quality Based Prequalification of Contractors." This system relies on average performance ratings from the completion of the Contractor's Performance Report at the conclusion of every project or annually for multi-year projects. The contractor's average performance rating is weighted based on the dollar value of work performed across all projects for the year. The average performance rating is used in the computation of the Contractor's Maximum Eligibility Amount in accordance with 603 KAR 2:015, Section 5. The Maximum Eligibility Amount is determined by multiplying the financial assets of the contractor by the contractor's percentage rating. The financial assets are determined by the summation of the contractor's reported cash surrender value (multiplied by a factor of 12) and the book value of the contractor's equipment (multiplied by a factor of 6). The contractor's percentage rating is determined by the contractor's organization and experience (20%), the contractor's plant and equipment (30%) and the contractor's average performance rating (50%). The intention of including the contractor performance evaluation system in the maximum eligibility amount determination is to encourage high quality work on Cabinet projects and to minimize the number of contractors executing Cabinet contracts with an established history of poor performance. However, there is some question as to whether the current process is effective in limiting contractors with a history of poor performance from Cabinet contracts. For example, a contractor with a large maximum eligibility amount can still continue to bid on a significant number of Cabinet projects despite their documented poor performance. <i>What is the most effective and efficient means for using contractor performance evaluations to encourage the participation of high performing contractors in Cabinet projects while limiting the participation of contractors with a history of poor performance?</i>			
17. Key Words Contractor Evaluation, Construction Procurement,		18. Distribution Statement	
19. Security Classification (report)	20. Security Classification (this page)	21. No. of Pages 96	19. Security Classification (report)

Contractor Evaluations in the Contractor Selection Process

Timothy R.B. Taylor, P.E., Ph.D.

Roy E. Sturgill, P.E.

Maegan McDowell, E.I.T.

Alexa Deep

Paul M. Goodrum, P.E., Ph.D.

Kentucky Transportation Center

College of Engineering

University of Kentucky

Lexington, KY 40506

Table of Contents

1.0 Background and Problem Statement.....	11
1.1 Research Objectives	14
2.0 Contractor Evaluation and Selection at other State Transportation Agencies.....	15
2.1 Indirect Analysis	16
2.1.1 Indiana Department of Transportation Example.....	17
2.1.2 Missouri Department of Transportation Example	18
2.1.3 Other Systems	20
2.2 Direct Analysis.....	20
2.2.1 Maryland Department of Transportation Example	21
2.2.2 Pennsylvania Department of Transportation Example.....	23
2.2.3 Ohio Department of Transportation Example	24
2.2.4 Tennessee Department of Transportation Example.....	25
2.2.5 Virginia Department of Transportation Example.....	25
2.2.6 Kentucky Transportation Cabinet	26
2.3 Conclusions on Impact of Evaluations	26
3.0 Structure of Evaluation Forms	28
3.1 Common Category Analysis	28
3.1.1 Efficiency Rating on Common Categories	28
3.1.2 Percentage of Questions in Common Categories	29
3.1.2.1 Quality of Work Category	29
3.1.2.2 Work Performance Category	30
3.1.2.3 Safety Category	30
3.1.2.4 Schedule Category	31
3.1.2.5 Cost Category.....	32
3.1.2.6 Organization and Management Category.....	32

3.1.2.7 Minority Category	33
3.1.2.8 Environmental Category	33
3.1.2.9 Results from Category Analysis.....	34
3.1.3 Comparison of Direct States Category Analysis.....	35
3.2 Additional Structure Analyses.....	36
3.2.1 Remarks Section.....	36
3.2.2 Contractor Notice	36
3.2.3 Overall Ratings	37
3.2.4 Rating Scales	37
3.2.4.1 Indiana Department of Transportation Rating Scale	38
3.2.4.2 Tennessee Department of Transportation Rating Scale	38
3.2.5 Sub-contractor Evaluation	39
3.3 Conclusions on Structure of Evaluation Forms	39
4.0 Data Collection	42
4.1 Evaluation Form Application	42
4.2 Criterion for Contractor Data	43
4.3 Selected Contractor Data	44
4.3.1 Selected Contractor Descriptions	46
4.3.1.1 Contractor A Description	46
4.3.1.2 Contractor B Description	47
4.3.1.3 Contractor C Description.....	48
4.3.1.4 Contractor D Description	48
4.3.1.5 Contractor E	49
4.3.1.6 Contractor F	49
4.3.1.7 Contractor G.....	50
5.0 Statistical Analysis of Contractor Evaluation Forms	52

5.1 Testing Procedure	53
5.2 Significant Findings	54
5.2.1 Variance in Ratings by Contractors	55
5.2.2 Average Ratings by Question	56
5.2.3 Breakdown Analysis of Questions	57
5.2.4 Variance among Contractors per Question	58
5.3 Conclusion of Statistical Analyses	58
6.0 Solutions for Contractor Evaluation System	60
6.1 SiteManager Utilization	61
6.2 Procedure of SiteManager linked to Contractor Evaluations	63
6.2.1 Daily Work Reports	65
6.2.1.1 Tailoring Daily Work Report to fit Evaluation Needs	68
6.2.2 Diary Section of SiteManager	72
6.3 Cost Analysis on SiteManager	73
6.4 Conclusions Drawn from Possible Solutions	75
7.0 Revised Form	77
7.1 Introduction	77
7.2 Contractor Performance Report Form	77
7.3 Contractor Work Performance	77
7.3.1 Overall Quality of Work of the Contractor	78
7.3.2 Overall Quality of Work of Any Subcontractors	78
8.3.3 Meeting of All Contract Dates, Including Approved Extensions	78
7.3.4 Completion of Job Closeout Activities (Punch List, Cleanup, Paperwork, etc.) in a Timely Manner	79
7.3.5 Cooperation/Coordination with KYTC's Project Staff	79
7.4 Public Safety and Traffic Control	80

7.4.1 Maintenance of Traffic (Proper Signage, Workers Worked During Allowable Hours, Public Notification)	80
7.4.2 Overall Safety of Employees, Including Subcontractors	80
7.5 Environmental Requirements	81
7.5.1 Performance of Environmental Mitigation Methods	81
7.6 Survey.....	81
7.6.1 Survey Results	82
7.7 Finalized Form.....	84
8.0 Results and Conclusions of Research	86
References.....	92
Appendix A: Kentucky Transportation Cabinet Contractor Evaluation Form	A-1
Appendix B: Participating States Contractor Evaluation Forms.....	B-1
Appendix B: Colorado Contractor Evaluation Form	B-1
Appendix B: Connecticut Contractor Evaluation Form.....	B-5
Appendix B: Florida Contractor Evaluation Form.....	B-7
Appendix B: Illinois Contractor Evaluation Form.....	B-15
Appendix B: Indiana Contractor Evaluation Form	B-18
Appendix B: Iowa Contractor Evaluation Form	B-21
Appendix B: Kansas Contractor Evaluation Form	B-24
Appendix B: Maine Contractor Evaluation Form.....	B-26
Appendix B: Maryland Contractor Evaluation Form	B-31
Appendix B: Massachusetts Contractor Evaluation Form	B-35
Appendix B: Minnesota Contractor Evaluation Form.....	B-49
Appendix B: Missouri Contractor Evaluation Form	B-53
Appendix B: Nebraska Contractor Evaluation Form	B-67
Appendix B: New Hampshire Contractor Evaluation Form	B-69

Appendix B: New Jersey Contractor Evaluation Form.....	B-72
Appendix B: North Dakota Contractor Evaluation Form	B-83
Appendix B: Ohio Contractor Evaluation Form	B-87
Appendix B: Oregon Contractor Evaluation Form.....	B-105
Appendix B: Pennsylvania Contractor Evaluation Form.....	B-109
Appendix B: Tennessee Contractor Evaluation Form.....	B-120
Appendix B: Utah Contractor Evaluation Form	B-122
Appendix B: Vermont Contractor Evaluation Form.....	B-125
Appendix B: Virginia Contractor Evaluation Form	B-135
Appendix B: Washington Contractor Evaluation Form	B-143
Appendix B: West Virginia Contractor Evaluation Form	B-155
Appendix B: Wisconsin Contractor Evaluation Form.....	B-157
Appendix B: Wyoming Contractor Evaluation Form	B-162
Appendix C: Efficiency Analysis Data	C-1
Appendix D: Percentage of Questions Analysis	D-1
Appendix E: Contractor Data used in Statistical Analyses	E-1
Appendix F: Full Details of Testing Procedures.....	F-1
Appendix G: South Carolina Department of Transportation Contractor Evaluation System	G-1
Appendix H: KYTC Employee Survey Responses	
Appendix I: Contractor Survey Responses	
Appendix J: Survey Evaluation Rankings	

List of Figures

Figure 1: First Page of Kentucky's Contractor Performance Report.....	13
Figure 2: INDOT Process Chart.....	18
Figure 3: Maryland Department of Transportation Process Diagram	23

Figure 4: National Percentages	34
Figure 5: Direct Method Group Percentages	35
Figure 6: Cost of Projects used in Evaluation Study	45
Figure 7: Scores over Time (Contractor A)	47
Figure 8: Scores over Time (Contractor B)	48
Figure 9: Scores over Time (Contractor D)	49
Figure 10: Scores over Time (Contractor F)	50
Figure 11: Scores over Time (Contractor G)	51
Figure 13: Contractor Evaluation Icon (SiteManager)	64
Figure 14: Diary and Daily Work Report Sections (SiteManager)	65
Figure 15: Inside Daily Work Reports	66
Figure 16: Inside Daily Work Reports	66
Figure 17: Daily Work Reports	67
Figure 18: Daily Work Reports	67
Figure 19: Daily Work Report, Material Quantities	68
Figure 20: Improvements to DWR System	69
Figure 21: Improvements to the DWR System	70
Figure 22: Improvements to DWR System	71
Figure 23: Working Days Charged	72
Figure 24: Breakdown of Respondents	82
Figure 25: Summarized Results	82
Figure 26: Example Survey Rankings	83
Figure 27: Example Ranking, Overall Quality of Work by KYTC Employees	83
Figure 28: Example ranking, Overall Quality of Work by Contractors	84
Figure 29: Finalized Version of Form	85

List of Tables

Table 1: List of Participants	15
Table 2: Difference in Ratings among Contractors	55
Table 3: Contractor Differences among Questions	56
Table 4: Average Ratings by Question	57
Table 5: Daily Work Report Categories	65

Table 6: Cost Comparison Table	74
Appendix C: Table 1: Efficiency Rating Data	C-2
Appendix C: Table 2: Efficiency Rating Data	C-3
Appendix C: Table 3: Efficiency Rating Data	C-4
Appendix D: Table 1: Percentage of Questions Data	D-2
Appendix E: Table 1: Contractor A Raw Data	E-1
Appendix E: Table 2: Contractor C Raw Data	E-2
Appendix E: Table 3: Contractor B Raw Data	E-2
Appendix E: Table 4: Contractor D Raw Data	E-3
Appendix E: Table 5: Contractor E Raw Data	E-4
Appendix E: Table 6: Contractor G Raw Data	E-5
Appendix E: Table 7: Contractor F Raw Data	E-6
Appendix F: Table 1: Average Rating by Contractor Data	F-1
Appendix F: Table 2: Average Rating by Contractor F-Value	F-1
Appendix F: Table 3: Average Rating by Contractor Data (Outlier Excluded)	F-2
Appendix F: Table 4: Average Rating by Contractor F-Value (Outlier Excluded)	F-2
Appendix F: Table 5: Average Rating by Question Data	F-3
Appendix F: Table 6: Average Rating by Question F-Value	F-3
Appendix F: Table 7: Breakdown by Question Data	F-4
Appendix F: Table 8: Breakdown by Question Data (Outlier Excluded)	F-5
Appendix F: Table 9: Breakdown by Question Mean and Standard Deviation	F-5
Appendix F: Table 10: Breakdown by Contractor	F-6
Appendix F: Table 11: Breakdown of Contractor Mean and Standard Deviation	F-6

Executive Summary

This report was prepared in order to describe research findings regarding the Kentucky Transportation Cabinet's current contractor evaluation selection process. There are two main objectives behind the research efforts. One parameter is to determine a method which uses the contractor evaluation forms to provide a greater altering factor in pre-qualification standards. The second area of the project scope is to tailor the current contractor evaluation system and the corresponding form to establish a more objective and simplistic process. The efforts behind research included in this report relate to the second parameter of the project.

The Kentucky Transportation Cabinet (KYTC) has a contractor evaluation system in place which can potentially affect the overall bonding capacity of a contractor in the event their performance reaches an unsatisfactory level. At the completion of a project KYTC project engineers rate the performance of a contractor based on parameters outlined on the associated evaluation form. Ratings are then filed with the pre-qualification division located at the Central Office. On an annual basis, contractors' performance reports are reviewed and a recommendation is made to affect the performance percentage of their overall prequalification bonding capacity. The current system does not sufficiently stand as an effective measure of performance, nor does it impact the overall bonding capacity on a major level.

The main objective in order to develop a system that defines the scope of project quality was to research what other state departments of transportations were currently implementing. During this investigation two major focuses were prevalent: the impact of evaluation forms on contractor selection, and the composition of evaluation forms being used. For the first key factor, the United States Department of Transportation had defined each existing contractor performance monitoring system into two broad categories: states that used the forms for indirect action, and states that directly applied the forms' overall ratings to some degree. Components for the second area in this scope consisted of looking at information that was included in the evaluation form's content. These areas included: the number of questions the evaluator has to complete, the scoring scale, rating criteria, and the overall objectiveness of the content, to name a few. Thirty one states responded to inquiries prompting requests for information regarding contractor performance. Twenty-five states were included in the research and 21 of them applied evaluation forms in an indirect manner. Indiana stood as the flagship state for indirect application.

Indiana uses an evaluation form to rate a contractor's performance at the end of a project and also at interim periods. The rating generated from the contractor evaluation is used in pre-qualification on an as-necessary basis. The majority of the indirect states applied the form in the same situations, where a contractor is reported for negative work, and then evaluations are pulled to provide evidence of such instances. A contractor that has been verified as negatively performing can be suspended, debarred, or reprimanded for their actions.

There are five states that apply the forms directly in the United States. They are Maryland, Pennsylvania, Ohio, Tennessee, Virginia, and Kentucky. With the exception of Maryland all of the direct states use the evaluation forms to generate ratings which are directly inputted into a performance percentage calculation that is used as a part of the contractor's pre-qualification

capacity. Maryland currently has no pre-qualification standards so their ratings are directly applied to retainage reductions.

After a detailed investigation into how states use their evaluation systems, each of the forms were thoroughly analyzed to develop results describing the composition of the evaluation reports. For all twenty-five states that responded to research requests an evaluation form was located. To determine an efficiency level corresponding to each form a Microsoft Excel sheet was formulated to run an analysis. If the evaluation form included a question in one of the specific categories included in the scope (i.e. safety) they were given a point. The total number of pages in a report was subtracted from the sum of points. The resulting number is a measure of how efficient the forms were in regards to covering the most information pertaining to a project in the least amount of space provided. A second analysis was also conducted where percentages were tabulated based on the number of questions on a form that covered a specific category. The categories were defined based on form commonalities and the initial parameters defined in the research scope. Lastly the same comparison was made, except only using the direct states similar to Kentucky's current evaluation system. The results from these analyses showed that Kentucky was trailing in every category except for organization and environment when compared to all of the states, and also fell below average in every category, with the exception of organization and management, compared to the direct states.

The current assumption within KYTC is that the contractor evaluation forms are ineffective because every form's overall rating usually averages around a four. The scale of the evaluation form is 1-5, where five is the best and one is the worst. Any other score recorded other than a four requires written justification. To test this assumption a hypothesis was developed that stated there was little to no variance among the forms collected on projects throughout the state. Data was collected from seven contractors with varying volumes of work, a range of pre-qualification performance percentages (based on evaluations), and differing roles on projects (subcontractor vs. prime contractor). Seventy-three forms were collected and used as the data in testing the hypothesis. To test for variance the ANOVA (Analysis of Variance) model and Kruskal Wallis Test were used. These procedures were run on average ratings per individual contractors, average rating by questions, and a breakdown of question ratings on an individual level within contractors. On all procedures, little to no variance was determined, which verified the assumption that a rating of "four" is given most of the time on evaluations and thus the system is ineffective.

Solutions to update the system were analyzed, but it was determined that there is no easy modification that can be applied to make the evaluations more effective. When investigating other states, several of them have taken on technological assistance in order to ease the burden of contractor evaluations. These computer programs range from Microsoft Excel sheets that simply allow for evaluations to be submitted electronically to systems, such as South Carolina's system, that run based on project data and automatically notify the resident engineer in the event a contractor falls below their desired performance score.

Many states use the same system as Kentucky, SiteManager, to log project information. SiteManager currently acts as a library for project documents and contains information on subjects relating to budget, schedule, safety, and project quality. These areas are coincidentally

found unanimously on contractor evaluation forms throughout the United States. Developing a component in SiteManager that would enable a contractor evaluation report to run off of project data would provide an innovative opportunity to achieve effectiveness and objective ratings.

Regardless of the solution, Kentucky faces a much needed overhaul in regards to their contractor evaluation system. Many states follow the same suit of KYTC's current practices in terms of monitoring contractor performance, and some states do not even monitor performance at all. However, there are also several departments of transportation that have incorporated technology into their evaluation systems, and fully analyzing their procedures would provide beneficial solutions to modify Kentucky's current contractor evaluation system.

1.0 Background and Problem Statement

Procurement of construction services within the Kentucky Transportation Cabinet requires the use of a competitive low bid process. This procurement procedure is required by state (KRS 45A.365) and federal law (Title 23 CFR 635.114(a)) with little to no exceptions. This procurement process is intended to achieve the lowest possible price for construction services by encouraging competition among contractors. It is also designed to minimize corruption in contractor selection by using the price as the sole deciding factor in the contract award decision. Despite these advantages, there are a number of drawbacks to the system. The low bid process does not directly take into account prior contractor performance on highway construction projects, contractor experience in performing this type of project scope or scale, and the ease (or difficulty) of the contractor's working relationship with the Cabinet.

To address these issues the Cabinet has used several contractor prequalification and evaluation processes throughout the years. The system currently used by the Cabinet is based on a prior Kentucky Transportation Center research project (Donn Hancher and William Maloney 2001). This project identified efforts made to provide the Kentucky Transportation Cabinet with an updated contractor evaluation system that addressed project quality and performance on highway construction projects. The evaluation was theorized to be used in the Cabinet's annual prequalification process for contractors. Drs. Maloney and Hancher contacted several other transportation agencies to discover the best practices and limitations. KYTC developed an advisory committee of engineers and also Kentucky contractor representatives.

A performance evaluation process was initiated to evaluate contractors' work on projects. The results from the contractors' sum of projects throughout the year are used in the annual prequalification process. This evaluation process is also to allow contractors to evaluate the performance of the Cabinet's Department of Highways. The system was implemented in December, 2001. (Donn Hancher, 2001)

In the construction industry a major sector of business includes public projects. Within this area, state transportation agencies and corresponding department of highways often account for a large percentage of projects that fall within public works. They employ a hefty amount of contractors

in the construction arena, so much that it is uncommon for a contractor to state that they have never worked on a department of highways project. One area of concern, nationwide, is that contractors' performances on these projects are particularly sensitive due to the source of funding. Public projects rely on tax payers' dollars both on federal and state levels. In the private sector of the construction industry a contractor answers to one specific entity of owners. On transportation agency projects the public is essentially the owner and the agency has been developed to represent them. Thus, the perception of a project is particularly unique, and the transportation agencies must make an effort to mandate good performance of contractors.

Within transportation agencies across the United States there are several contractor evaluation systems that have been established to monitor a contractor's performance on a project. The major goal behind such systems is to encourage contractors to deliver a high quality project and to create a good construction environment throughout the project duration.

The Kentucky Transportation Cabinet uses contractor evaluation forms as a record of performance for every construction project with state funding. These forms are required for prime contractors and sub-contractors. The performance reports are intended to be filled out once the project is completed or every calendar year, whichever occurs first. An overall rating system is the majority of the form's content, and the final score is used in calculating a Contractor's Maximum Eligibility Amount. This can be further described as the total amount to encourage proficient work and to minimize the dollar amount volume of contractors who perform below standards. For example, an evaluation form is filled out at the end of a paving project. The project engineer rates the contractor's performance on a scale of one through five for each question outlined on the report. A typical question would pertain to quality of work and the evaluator would give a five for outstanding quality, or a one for unacceptable work. There are 17 questions on the current evaluation form and they are all answered in the same manner. An overall rating is calculated and the evaluation report is kept on file as a factor in their eligibility amount. Figure 1 shows the first page of Kentucky's contractor evaluation report; for the complete form refer to Appendix A.

KENTUCKY TRANSPORTATION CABINET
Department of Highways
Division of Construction Procurement and Division of Construction

TC 14-19E
Rev. 10/10
Page 1 of 5

CONTRACTOR'S PERFORMANCE REPORT

☐ Prime Contractor ☐ Subcontractor

Name of Contractor _____ CID _____

Contractor Address _____ Phone No. _____

City _____ State _____ ZIP Code _____

Fed/State Proj. No. _____ Completion Date _____

Type of Work _____ Cost _____

Evaluation of Contractor Performance on This Project by the Resident Engineer: Rating Section

Ratings Scale of 1-5.
Categories weighted.

EVALUATION ITEMS	Resident Engineer ☐	Chief District Engineer ☐	INPUT POINTS Resident Engineer	INPUT POINTS Chief District Engineer
PART 1 - Contractor Work Performance				
1. Quality of Work (including performance of subcontractor[s])				
2. Quality of Work (excluding performance of subcontractor[s])				
3. Meetings of Contract Dates (including approved extensions)				
4. Job Closeout Activities (punch list, clean-up, paperwork, etc.)				
5. Coordination and Cooperation with DOH and Other Government Agencies				
6. Coordination and Cooperation with Other Contractor(s), Sub(s) and Utilities				
7. Coordination and Cooperation with General Public (motorists and property owners)				
8. Public Safety and Traffic Control				
9. Workforce Safety Practices				
10. Compliance with Environmental Requirements				
PART 2 - Contractor Project Management and Administration				
1. Project Supervisory Personnel				
2. Project Technical Staff				
3. Project Craft Workforce				
4. Project Organization (home office support and organization)				
5. Project Submittals				
6. Equipment				
7. Jobsite Housekeeping				
NOTE: Zero (0) points equals Not Applicable.	Sum of Points			
	Maximum Possible Points			
	Final Rating			

District _____ Crew _____

Project Engineer _____ Date _____

Figure 1: First Page of Kentucky's Contractor Performance Report

A benefit of the evaluation system is that it keeps a record of contractors' performances. The form is tailored to sufficiently describe detailed project information, but lacks objectiveness and authority concerning the overall rating system. For each contractor their maximum eligibility amount is based on several factors in addition to their performance scores. Scores that are derived from evaluation reports are only a fraction of their capacity, and as a result many contractors cannot be affected by poor work performance.

A contractor that has a large amount of assets and other factors that boost eligibility can still continue to bid on cabinet projects despite a reduction in capacity based on poor performance reports. An example of this would be a contractor who typically bid on projects up to \$1,000,000 dollars. If his maximum eligibility amount was reduced to \$987,000 after bad reviews he would still be able to bid on many large projects as most projects let are less than \$800,000. The question is raised ***how can contractor evaluation forms be used effectively to minimize poor work performance and at the same time encourage high quality results on projects?***

1.1 Research Objectives

The primary objectives of the overall project, designed to answer the research question, are to:

- 1) Evaluate the performance of the current Contractor Performance Report in identifying and correcting poor contractor performance,
- 2) Identify the most effective means for evaluating contractor performance in a measurable and unbiased manner, and
- 3) Identify the most effective means of using the Contractor Performance Report to promote high performance on Cabinet projects.
- 4) Disseminate the results of the research to the Cabinet Construction Division

The current work focuses on the first two research objectives. The first objective is investigated using a review of evaluation systems and their use by other state transportation agencies and by collecting and analyzing data from the current Kentucky Contractor Evaluation system (Sections 4.0-5.3). The second objective is accomplished by presenting a preliminary plan to use data collected from SiteManager in the contractor evaluation process (Section 6.0). Based on this work conclusions are drawn and recommendations are offered (Section 6.1 and 7.0).

2.0 Contractor Evaluation and Selection at other State Transportation Agencies

The first objective behind developing a new system that addresses improvements to the current contractor evaluation system was researching other state transportation departments. Review of current contractor performance evaluation practices within the Kentucky Transportation Cabinet as well as other states will provide a large amount of insight for a successful approach. In addition to researching transportation departments, other agencies with similar evaluation objectives were considered including XXX. In regards to state transportation agencies, all 50 states were contacted via phone or internet. Thirty-six states responded to information requests. Out of the 36 responding states, 11 transportation departments reported they did not have any similar process currently in effect. The remaining 25 departments reported that they, at minimum, had a contractor evaluation form that is completed at the end of a project. Thus, they were included in the research analysis conducted and a copy of their current form was obtained. The following states were included in research:

• Colorado	• Florida	• Illinois	• Iowa
• Kansas	• Kentucky	• Maryland	• Massachusetts
• Minnesota	• Missouri	• Nebraska	• New Hampshire
• New Jersey	• North Dakota	• Oregon	• Ohio
• Pennsylvania	• South Carolina	• Tennessee	• Utah
• Virginia	• Vermont	• Wisconsin	• Wyoming

Table 1: List of Participants

When researching each agency, there were two main focuses to be analyzed. First, the impact of evaluation forms on contractor selection was discussed. This can be further described as how the evaluation forms are applied (or if they are) to an additional process. For example, Kentucky's evaluation forms generate an overall score which is directly inputted into an equation that yields a contractor's maximum eligibility amount. Another perspective of using evaluation forms would be an example such as Indiana, which brings the forms as evidence in pre-qualification consultations with contractors. The second focus to the research was the design of the various evaluation forms. These components consist of looking at information such as the number of questions the evaluator has to complete, the scoring scale, rating criteria, and the overall objectiveness of the content, to name a few.

The Federal Highway Administration (FHWA) classified each existing system into two categories: states that use the forms indirectly, and states that use the forms directly (FHWA, Construction, 2011). A contractor evaluation form that has an indirect impact can be described as forms that are implemented but are not used in any organized system. These forms can still generate an overall rating process, but the score is not applied to an equation that generates any factors. A general example of an indirect application would be an evaluation form that is filled out, and used as a reference in a meeting, such as Indiana discussed above. The direct application category consists of states that use forms in an organized process. They have an overall scoring system that is used as a component in another factor, such as maximum eligibility amount. A detailed investigation was conducted on each of the 25 states, which was divided between states using contractor evaluations indirectly and those using the evaluations directly. Next is a discussion of each of the states in terms of their application use. Each of the states' evaluation forms can be found in Appendix B: Contractor Evaluation Reports.

2.1 Indirect Analysis

Twenty-one out of the 25 states with a contractor evaluation process use the forms for indirect means. They are as follows:

- Colorado, (CDOT, 2006)
- Florida, (Ralph Ellis, 2007), (FDOT, September 2005)\
- Illinois, (IDOT, 03)
- Indiana, (Kicinski, 2011), (INDOT, Indiana Department of Transportation) (INDOT, CR-2 Form)
- Iowa, (IOWADOT, 2.38 Contractor Evaluation Report), (IOWADOT, Form 830435)
- Kansas, (KDOT, 2007)
- Massachusetts, (MassDOT, 2010)
- Minnesota, (MnDOT, 2007)
- Missouri, (MoDOT, 2011)
- Nebraska, (NDOR)
- New Hampshire, (NHDOT, 07)
- New Jersey, (NJDOT, 2011)

- North Dakota, (NDDOT, 2009)
- Oregon, (ODOT, Oregon State Archives, 2011), (ODOT, ODOT Construction Manual, 2010)
- South Carolina, (SCDOT, 2010)
- Utah, (UDOT, 2012)
- Vermont, (VTrans, 2009)
- Wisconsin, (WisDOT, 2005)
- Wyoming (Messer, 2011) (WYDOT, 2011)

Indiana's system is presented as an example, because their use of evaluation forms is typical among the other 21 states.

2.1.1 Indiana Department of Transportation Example

The Indiana Department of Transportation has a report of contractor's performance that is used at the completion of every project. In addition to the form being used at project completion they are filled out on an annual and interim basis. This form is commonly known as a "CR-2" and provides a rating system that is used indirectly for pre-qualification. There is not a direct link of the evaluation forms affecting the bonding capacity, ability to bid, or retainage amounts of a contractor. However, the forms are used through the Pre-Qualification Committee exercises (Kicinski, 2011) (INDOT, CR-2 Form) (INDOT, Report on Contractor's Performance, 19896).

The CR-2 forms are on file in the event that there is a need to discuss a contractor's work ethic within the pre-qualification committee. The committee consists of several engineers and an attorney whose only intent is to focus on what are legally viable solutions to any problems that occur. The reason why the CR-2 forms are not directly implicated on bonding capacity is that several contractors with INDOT have unlimited bonding capacity, thus a negative performance would not have any affect.

In the event a contractor is brought before the pre-qualification committee, CR-2 forms are pulled from a statewide database. The database is particularly useful because contractors will do work in several districts and the committee is able to see if the contractor has had bad reports

come out of more than one section or if it is an isolated event. The committee has the authority to reduce the bonding capacity, and/or suspend the contractor from future bidding.

Typically, the pre-qualification committee gives a maximum sentence of two years suspension, and most commonly uses probation as a punishment option for negative performance. The committee views cases that have historically bad CR-2 ratings, and will pull CR-2 ratings when a question of workmanship arises with a low bidder. All committee recommendations for proceedings are ultimately approved by the commissioner. The attorney that serves on the committee is aware of what the state can and cannot do to control bidding procedures (Kicinski, 2011). Figure 2 shows a process chart that graphically describes Indiana's evaluation process:

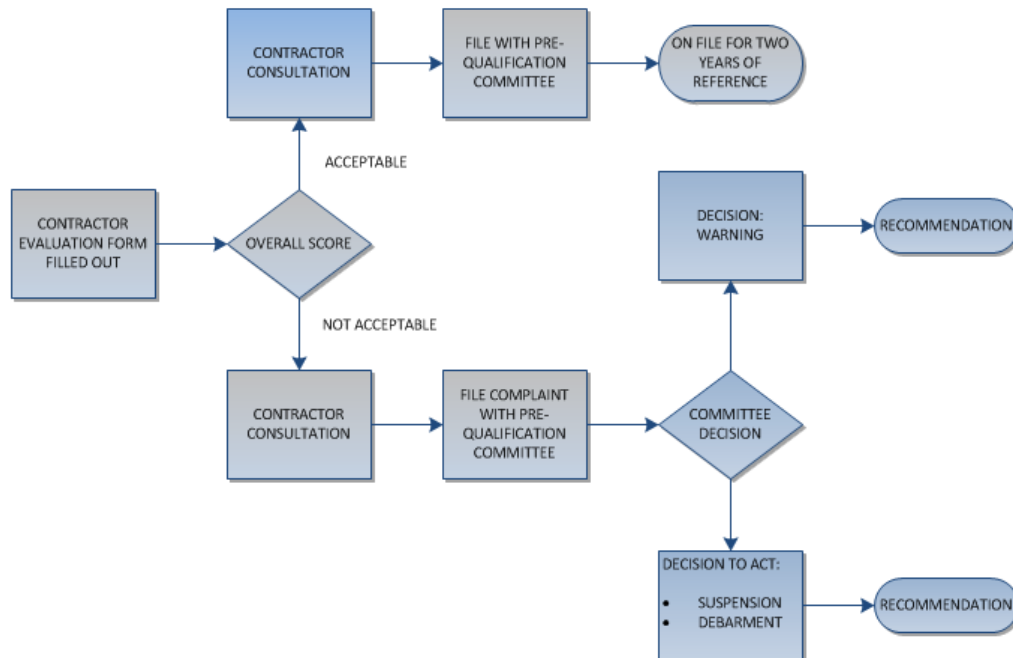


Figure 2: INDOT Process Chart

2.1.2 Missouri Department of Transportation Example

Another state that provided a system similar to Indiana was Missouri. The overall process was synonymous to Indiana in terms of how the evaluation form is used. However, the resulting consequences of poor work performance and incentive based performance were two factors that provided unique information.

Missouri has a form called a contractor performance questionnaire that is filled out at the completion of every project. The contractor performance questionnaires are organized by company, and kept on record. They are analyzed on an annual basis and if the contractor has performed negatively at the point of investigation, or it is brought to attention by the district reviewer then the contractor is called into a meeting. There are no pre-qualification consequences for a negative performance, instead pending on the severity of violation, the contractor can be suspended for six months to two years or debarred from work with the department.

Missouri also has an incentive based system where if the contractor is performing above standards, they are put on a list of top pre-qualified contractors. The contractor is presented with a plaque and the list is published and sent to all companies doing work with the state. The desired effect of the list is to create a top-tier consensus that provides as an elite status that others wish to achieve (Comission, 2007).

Like Missouri and Indiana, the South Carolina Department of Transportation has an indirect use for evaluation forms, but uses a progressive rating system to monitor work performance. The results are the same as the previously discussed systems, in a sense that the evaluations are used to determine an overall score, which can warrant discussion meetings for subpar work. However, South Carolina uses an automated computer monitoring system.

On an interim and project completion basis, the resident construction engineer keeps record of work performance based on the established categories. The contractor performance score is an accumulation of several percentages. The questions are consistent regardless of the project, but an unsatisfactory contractor performance score is agreed upon by the resident construction engineer and the prime contractor in a pre-construction meeting. If the contractor falls below standards, the resident construction engineer can request to stop the project, terminate the contractor from the project, or restrict bidding on future projects to lower amounts, or eliminate the contractor from doing work with the department in extreme events. The South Carolina system is a rendition of their 2008 paper form, which was used to create the questionnaire for the computer program (Construction, 2010).

2.1.3 Other Systems

The remaining states that use the forms indirectly have basic approaches to how the form is applied. For the majority of the departments, the evaluation forms are placed on file in the event there is a need for a contractor consultation. There were no other incentive based programs reported, that were not described similar to Missouri. Every additional state followed the same procedure as Indiana, and most did not have a formal board or established system for contractor work management. They simply had the contractor forms filled out, and put on the shelf in the extremely rare event there was a need to pull the file. There were several departments that stated they have not ever run into problems with contractors due to strict pre-qualification guidelines. For example, California, who does not have a contractor review system in place, explained that their strict permitting and regulatory procedures minimized the amount of contractors who could not manage work sufficiently.

2.2 Direct Analysis

Maryland, Pennsylvania, Ohio, Tennessee, Virginia, and Kentucky are the few states that reported a system with direct applications. Each of the four states has established a system that ties the evaluation form into a direct generation of pre-qualification factors, with the exception of Maryland. The Maryland Department of Transportation uses the forms differently in a unique process. Their contractor evaluation forms are directly used in an incentive based program for retainage reduction. Although the system is primarily focused on rewarding high performance contractors, they also have the ability to use the system for retainage increased on contractors that perform negatively. The following references were used for the direct analysis:

- Maryland, (McClain, 2011), (MDOT),
- Pennsylvania, (PADOT, 2009)
- Ohio, (OhioDOT, 2000)
- Tennessee, (TDOT, 2011)
- Virginia, (VDOT, Rules Governing Prequalification Priviledges, 2008), (Byron Coburn, 2007), (VDOT, CPE Annual Report, 2010)
- Kentucky (Donn Hancher, 2001), (KYTC, 2010), (Legislature, KAR)

2.2.1 Maryland Department of Transportation Example

The Maryland Department of Transportation does not have any standards for prequalifying contractors. Essentially any company is allowed to bid on their projects. Their evaluation forms are sometimes used for interim reports, which the contract has specified will be implemented on that particular project. These contractor evaluation forms are used to positively affect the retainage percentage a company has for that particular project. In addition to analyzing the forms before lowering the retainage amount for a project, the overall project completion status plays a factor in reduction. The contractor evaluation forms have a grading system in which an overall two year average for that specific company is the weighing factor for a retainage reduction. This system is used for both prime contractors and subcontractors.

Every contractor that wins a bid with the state of Maryland is automatically given a five percent retainage regardless of past performance. The retainage amount can only be reduced upon request of the contractor. Usually MDOT does not increase retainage amounts as a result of negative performance, but will do so in the event a contractor with past evaluations resulting in the letter grade 'D' continues to perform at sub-satisfactory standards. If the contractor wishes to have their retainage amount reduced, they file a variable retainage request with the department of transportation. If the contractor is awarded their request, the retainage amount is either reduced to 2.5 or 0 percent. Rarely is any other percentage given, except in special circumstances when the project is nearing completion. There is also another request system classified as the semifinal process request. This is of particular use for newer companies wishing to lower their retainage, and the bond company agrees to decrease along with MDOT when the project is at a specified level of completion (McClain, 2011).

The only two factors that are considered when a request is filed, is what percentage the project is complete at the time and past contractor evaluations. Basically, a contractor is allowed to file for a reduction earlier in the project schedule if his contractor evaluation rating is high. On the opposite side, if a contractor has a mediocre rating then the contractor will not be eligible for reduction to zero percent, and will also have to wait until more of the project is completed. Thus, the contractor evaluation form is the main factor in reduction requests, with the project completion percentage analyzed indirectly. The contractor's surety company must agree to the reduction, and the final approval must be processed through the District Engineer. In the event

that the contractor evaluation scores change, the retainage reduction may be increased back to the original five percent (MDOT).

- 1.) Specification TC-7.05 outlines the specific guidelines for variable retainage requests. The computation is presented below:
- 2.) After 15 percent completion and upon request, contractors with 'A' evaluations for the last two years may be reduced from five percent to zero percent.
- 3.) Project completion percentage is based upon actual work completed (excluding monies paid for stored materials)
- 4.) An interim evaluation of the current project would need to be completed and the overall grading must be an 'A'.
- 5.) At 50 percent completion contractors with 'B' Evaluations or any combination of 'A' and 'B' evaluations for the last two years may be reduced from five percent to 2.5 percent, and remain at that level until released upon final payment. The interim evaluation must reveal an 'A' or 'B' evaluation for the current project.
- 6.) Contractors with 'C' evaluation or any combination of 'C' and 'D' evaluation for the past two years will begin and remain at five percent for project duration.
- 7.) Contractors with a 'D' evaluation for the last two years will begin at five percent, and if a 'D' evaluation is given, their retainage will be raised 10 percent

New Bidders-Contractors who have not been previously rated may be eligible for a reduction, if there is documentation of past work performance with another government agency. If they do not fit this category they are not eligible for a reduction. Other than the retainage amount being raised to 10 percent in the event that the contractor's work is falling below expectations, MDOT does not have a formal procedure in handling the associated contractors. However, if a low bidder has a bad rating consistently with the department an interview is conducted before the project is officially awarded. They are instructed to give a brief explanation as to why they received negative reports, and the board then decides if the project can or cannot be awarded to

the company. Figure 3 shows a process diagram for Maryland’s evaluation system.

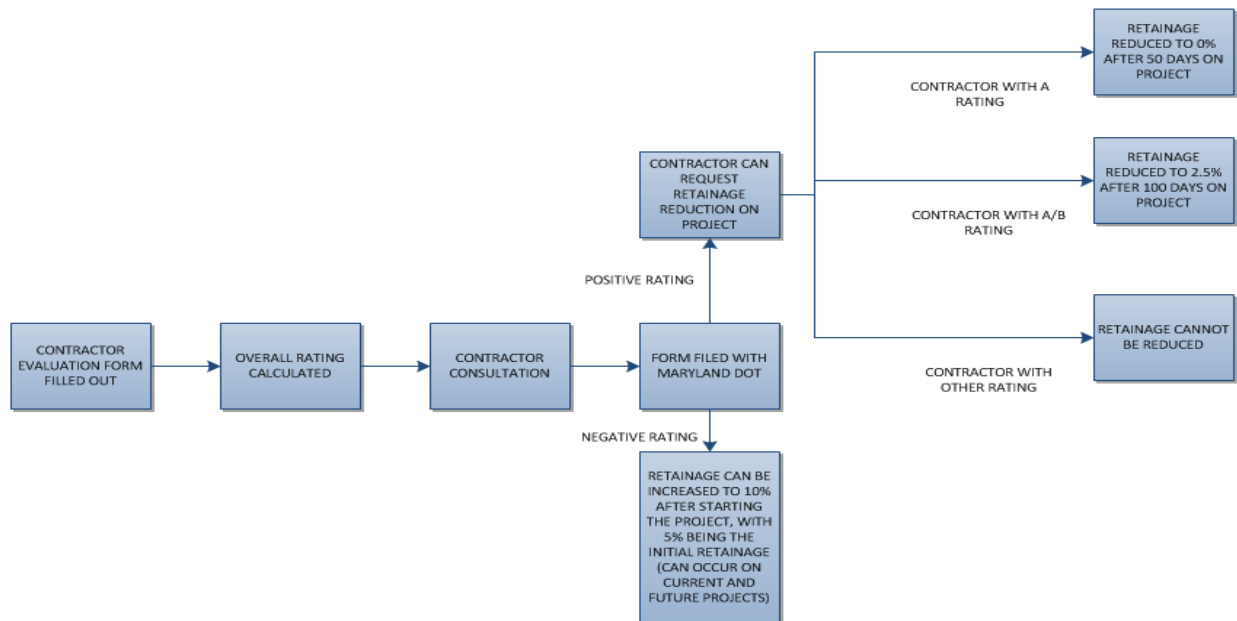


Figure 3: Maryland Department of Transportation Process Diagram

Maryland was a state researched in great detail due to the uniqueness of the system in comparison to Kentucky’s current procedures. The remaining states Pennsylvania, Ohio, and Tennessee all have similar procedures to Kentucky, with minor differences occurring. They all have direct applications linked to pre-qualification factors. For Pennsylvania, the performance ratings generated from evaluation forms determine the contractor’s Ability Factor.

2.2.2 Pennsylvania Department of Transportation Example

The district where work is being done within Pennsylvania establishes a representative to meet with the prime contractor at a pre-construction meeting. Together they determine the weighted percentage of points for the evaluation form based on the project at hand. There are three sections on the Contractor’s Past Performance Report, that are consistent on every form, but their weight remains to be decided based on the agreement. The total of possible points has to equal the default maximums established for the section. This is particularly useful in categories relating to managing sub-contractors, because the representative and the contractor can exclude the section from evaluation and account for the points elsewhere. The representative from the district office is called the “Inspector-in-Charge” and must initial and date the form to show that an agreement has been reached for that particular project.

The points are added for each category, and they are accumulated for the total points on the performance report. If the performance rating is between sub satisfactory (0.5-0.0 scale) then the inspector must provide justification in a comment section. There are no comments needed in the event the contractor scores very high in each section. However, comments must be attached if the total points fall between 95 and 100 or below 70. The total points for the current evaluation form and the last five performance rating determine the contractor's ability factor. This ability factor is reviewed every six months for modification purposes. The ability factor is used as a fraction in the contractor's maximum capacity rating, and regulates the contractor's ability to bid or perform on new projects (PADOT, 2009).

2.2.3 Ohio Department of Transportation Example

For the Ohio Department of Transportation, there is a C95 Evaluation of Contractor Performance form that is filled out on every project. Contractors' scores are averaged over a calendar year, and are used in the calculation of the contractor's bidding capacity. If the project spans over multiple years, an evaluation is done on work performed annually. Affecting the bidding capacity based on the performance report is an incentive based approach that moves the allowance higher if the contractor performs well. The evaluation forms are filled out on a computer system, and it is ODOT's policy that the forms be submitted within 90 days of completion of work.

If the average rating for a contractor is above 85 percent their prequalification factor remains at a 10. The 10 is multiplied by the net assets to determine the bidding capacity of a contractor. The following ratings result in the corresponding pre-qualification factor reductions: an 80-84 percent average rating reduces the prequalification factor to nine, a 70-79 percent results in a prequalification factor of eight, a 60-69 percent corresponds to a seven, 55-59 percent describes a six on the factor scale, 50-54 percent is associated with a five, and below 50 percent results in a one for bidding capacity. A contractor rating five or less for two consecutive years faces debarment from the Ohio Department of Transportation (Proctor, 2000) (OhioDOT, 2000).

A prequalification review board also exists, which hears appeals from contractors that wish to dispute performance evaluations. They are to submit their appeal within 10 days upon receiving the evaluation scores. After an appeal is submitted the contractor may be granted a hearing where

they have a half hour to present their position, with five minutes to rebut evidence presented by the district. The board's decision is issued within 15 days of a hearing.

2.2.4 Tennessee Department of Transportation Example

In 2006, Tennessee decided to use contractor evaluation forms to affect the pre-qualification of companies. The change was a result of rule changes, and each contractor is to be evaluated at the end of each calendar year or at completion of the project. The Project Supervisor is to fill out the report, and the Regional Construction Office along with the Regional Director is to review the performance report. After completion of the report the contractor is provided a copy, and given the opportunity to meet to appeal any rating on a district level. An overall performance rating is determined by the Headquarters Construction Office. The rating is based on a weighted score of current contracts and any contracts completed within two years of the period. The score is calculated by using the original contract amount and the relative score of each report associated with the project. The score in return can affect the pre-qualification of the contractor (TDOT, 2011).

2.2.5 Virginia Department of Transportation Example

Virginia is unique due to the fact they use two separate evaluations for their pre-qualification rating. The total pre-qualification score is found by multiplying the quality score by 0.7, and adding a safety score multiplied by 0.3. The quality score is derived from the contractor's Quality of Performance Evaluation. The safety score is based on the firm's experience modification ratio (EMR). The contractor performance evaluations are filled out on an annual, interim, and project completion basis. The overall score is generated and the department encourages work to be performed on smaller subcontract work before bidding on a large volume of work to increase the scoring. The safety portion is developed on a six year average on the experience modification ratio scores. The EMR is determined by a comparison made between the accident rate of the individual company and the accident rate of all the companies in that industry among the state. If the score falls below a 60 in a 12 month period, or 70 in a 24 month period then the state contract engineer reviews the CPE and will notify the contractor. They will be removed from the prequalification list at this point unless they can justify the low scores (W.

Byron Coburn, 2007) (VDOT, Rules Governing Prequalification Privileges, 2008) (VDOT, CPE Annual Report, 2010).

2.2.6 Kentucky Transportation Cabinet

Kentucky's current evaluation system follows suit with Ohio, although their calculation is different. The Maximum Capacity Factor is determined by the contractor's net assets. The Maximum Capacity Factor is multiplied by the Performance Factor to determine the annual eligibility rating. The performance factor is based on three segments, the experience questionnaire (00-20 percent), plant and equipment (0-30 percent) and results from the contractor evaluation form (0-50 percent). The total possible percentage is 100 percent and can be reduced via negative work performance. Contractors who are starting work with the cabinet have an initial performance factor of 50 percent. Any contractor falling below 50 percent is reduced in the maximum eligibility amount (Legislature, Kentucky Administrative Regulations, 1997).

The contractor evaluation forms are submitted by mail to the central office. The pre-qualification section keeps all evaluation forms on file, and reviews the performance factor on an annual basis. The performance factors are recommended to the pre-qualification board. The contractor must have a recommendation below 50 percent in order to have their maximum eligibility amount reduced. Rarely, does the reduction in maximum eligibility have an effect on the bidding attempts made by the company. Most commonly, the bidding capacities are high enough for the contractors, that even when reduced there is a small dint made in their volume of work. Usually, the contractor does not reach its volume of work capability with the state, making the reduction relatively ineffective. Kentucky's current evaluation form is located in Appendix A of this report.

2.3 Conclusions on Impact of Evaluations

Overall, the research resulted in identifying two separate scopes of information. The first scope was analyzing how the forms are used in various processes. Most evaluation forms are filled out by the resident engineer and kept on file for dispute cases that may arise later. Kentucky uses a direct procedure that ties the form's overall rating into the maximum eligibility amount a contractor may possess. Pennsylvania, Tennessee, Virginia, and Ohio follow the same suit, with

modifications incorporated in the evaluation form structure. Maryland is the sixth state that uses a direct system that applies the overall scores to a retainage reduction procedure. The retainage reduction is an incentive based opportunity that encourages high performance without an authority effect. However, the system can be used to increase the retainage in the rare event a contractor performs negatively on reports over the two year rolling average period. The retainage procedure is particularly effective for Maryland because they do not require pre-qualification of contractors.

Virginia was a unique state because they require several different forms to be filled out based on timing and composition. Safety has its own evaluation form and is used to evaluate the experience modification rating of a company. The EMR accounts for 30 percent of the overall pre-qualification score. They then have a quality performance for annual completion, project end, and interim. These reports are filled out based on the period and combined they account for 70 percent of the performance score.

In every application the procedure is indirect or direct; the state transportation agencies have ultimate authority to recommend a suspension or debarment of a contractor. In most cases, these situations are brought to the attention of the chief engineer both verbally and through the evaluation forms. Out of the 25 states, one recorded debarment was reported; typically a two year suspension or six month probation was used for negative performance of contractors. The punishments were usually given through a post-construction meeting with the departments, and the contractor was given time to appeal the evaluation.

For the direct states, suspension and debarment are rare. The overall ratings are directly applied in the bidding capacity of the contractors, and a reduction occurs when the contractor falls below a pre-established percentage. For Kentucky, the bidding capacity of a contractor will drop if the percentage falls below 50 percent. Every new contractor starts out with a 50 percent in the performance part of the maximum eligibility amount. The performance factor, which is a direct score from evaluation forms, accounts for 50 percent of the overall maximum eligibility of a contractor, while the other 50 percent comes from assets and equipment.

3.0 Structure of Evaluation Forms

The second part of the research involved analyzing the structure of the evaluation forms among the departments. For each of the 25 states reporting, there was an evaluation form found. The forms provided a variety of compositions, with different questions, rating scales, weighting factors, and categories. For example, one form could include content rating environmental and safety questions, while another form would not have any questions presented on these subjects.

Several factors were used to investigate the structure of the evaluation forms. These were objectively determined to provide a clear-cut approach to understanding the efficiency behind the system. The factors included the length of the forms, the number of forms to be filled out for an evaluation process, the report period, and the rating scale. They are limited to tabular data, and the actual content of the form was considered separately. The length of the forms was determined by counting the number of pages that were included in one set to be filled out. Pages that were explanatory inclusions to the form did not count as the evaluation length. The number of forms was a special factor that describes agencies that require more than one form to be filled out for the same project. For example, Colorado has two separate forms to be included in the evaluation procedure. The report period consisted of how many times the report is to be filled out per project. The most common procedure was to have a form filled out annually, at project completion, and at established project milestones (interim report). Lastly, the rating scales of the forms typically were independent of each other, having different scales per agency.

3.1 Common Category Analysis

Common categories represented different content that were included on the questionnaires. The common categories were: quality of work, supervision competence, environment, cooperation with public or other agencies, proper maintenance of traffic, administrative duties, performance of work, equipment, DBE/EEO Utilization, safety, cost overrun, sub-contractor compliance, time-schedule, contract compliance, knowledge of department standards, contractor notice, and remarks option.

3.1.1 Efficiency Rating on Common Categories

A Microsoft Excel sheet was used to run an analysis on the forms. If the evaluation form included questions covering the common category, then they were given a one. The summation

of the total points for the evaluation form minus the total number of pages resulted in a score given to the form which should be associated with the form's efficiency. The efficiency data is presented in Appendix C: Efficiency Analysis. The logic behind the analysis was simply to find the best form that covered the most material, with the least amount of pages. For example, a high scoring form was Ohio, who had a total of 10 combined points. They were allotted one point for every category with the exception of knowledge of department standards, contractor notice, and cost overrun. The total length of the form is five pages, thus it was subtracted from the total points, resulting in a 10. From this analysis the highest scoring forms were Ohio, Tennessee, and Iowa in terms of efficiency. Complete results for each state can be found in Appendix C. A generic equation for the efficiency rating is as follows:

$$\text{Efficiency Factor} = (\text{Total number of points} - \text{Total number of pages})$$

3.1.2 Percentage of Questions in Common Categories

A second analysis ran on the structure was the percentage of questions that each form contained for a certain category. The categories used in analysis one were combined into the following groups: quality of work, work performance, safety, schedule, cost association, organization, minority, and environment. Information regarding this breakdown can be found in Appendix D, Question Percentage Analysis.

3.1.2.1 Quality of Work Category

The quality of work category includes questions that are primarily concerned with the finished product. Some evaluation forms leave the breakdown of these questions up to the engineer due to the uniqueness of the project. Below are example questions extracted from the Illinois Department of Transportation's form. These questions are typical representations. "The contractor assured consistent quality of work performed, eliminating the need to remove defective work. The contractor completed the punch list and cleanup as directed by the PE/PS." Re-working items on the project, as well as completing the punch list, are subjects that occur regularly throughout the contractor evaluation forms. These key objectives provide a general overview of the quality of work category description.

3.1.2.2 Work Performance Category

The work performance category is closely tied with quality of work, however the main difference is that the work performance description includes standard questions that provide an analysis of the overall work during the project as opposed to project completion. Some states rely heavily on the quality of work category for the evaluation, while others tend to have more questions in the work performance category. Specifically, more work performance questions will appear if the contract evaluation is to be filled out at various times throughout the project. An example of a rating criterion for this category, from the Tennessee Department of Transportation, is below: “All work complies with specifications and plans, no price adjustments are needed.” (Price adjustments are related to QC/QA).

In general, work performance includes questions that assess the overall process of the project. This can be specifically described as the progress being made during the construction and the corresponding performance of a contractor. Work performance includes general questions that use the key words “work performance.” Any questions dealing with interim procedural questions (example: timely submittal of costs reports, updated schedules) are placed in their respective categories. Example: A contractor could have a satisfactory end product, but faced several adverse situations that caused work performance to be sub-par.

3.1.2.3 Safety Category

The safety category includes three sub-sections: 1) Maintenance of Traffic, 2) Equipment, and 3) Safety of contractor employees/sub-contractor employees. M.O.T. includes questions that pertain to proper signage, working during allowable hours, and public awareness of construction. Equipment questions pertain to the overall quality and productivity of the machines. The main reason equipment questions are classified as a safety component is that most of the evaluation forms gear these questions towards the safety of the operators. Lastly, the safety of the employees on-site is the largest percentage of questions in this category.

Example of Safety Questions (Virginia Department of Transportation):

“Was the safety of the project personnel and the traveling public for the contractor?”

“Did the contractor plan and execute the work in compliance with the construction safety and health standards of the specifications?”

“Were there any written safety violations issued on the project?”

The main differences amongst contractor evaluations in this section are how they define the scale of a safe project. There are some evaluation forms that consider the EMR rating of the contractors, while others are solely focused on the amount of accidents that occur on the project site and the surrounding areas. These accidents include employee accidents within the project, and also accidents associated with traffic control. Accidents reported by workers would be in category three of safety, while accidents occurring in the public arena would be placed under category one. These categories are not individually defined in the percentages, thus one can assume these accidents are the total number reported throughout the project duration.

3.1.2.4 Schedule Category

The scope of the schedule category is primarily focused on project completion. There are a large amount of contractor evaluation forms that include interim reports on the schedule. These questions are within this section. While this category primarily contains questions geared to completion of the project, there are also questions associated with timely submittal of documents (e.g. construction schedule and MOT plans), change orders, and general personnel tasks that depend on time. Questions pertaining to the timely submittal of payroll, payment of receipts, or other areas of costs are not included in this section. An example of typical questions pertaining to schedule, extracted from the Oregon Department of Transportation, is below:

“Was the contract completed within the adjusted contract time and without liquidated damages?”

Connecticut Department of Transportation requires three different report periods and their schedule questions are as follows: Timely ordering of material; timeliness in addressing punch list; adequate staffing of job; timely notification of possible delays; timely submission of shop drawings.

3.1.2.5 Cost Category

Nearly every contractor evaluation form had several questions dealing with the contractor meeting budget requirements. As with the schedule category, there are separate questions on some evaluations for interim reports that will specifically address cost associations at that time. The cost association category does include questions derived from data based on billing records, sub-contractors payments, or any other items having to do with payments. An example question of cost category (Virginia DOT): “Did the contractor deliver the project on budget within their control?”

3.1.2.6 Organization and Management Category

Organization and Management is a very broad category which basically provides the most subjective part of grouping the questions. In this area, many contractor evaluations have tailored their questions to their state’s permitting requirements as well as their preferences. They may not apply to other states and a frequent amount of personalized questions occurs in this area. However, most of these questions do pertain to certain sub-categories that are sufficiently defined in the questions, including:

Cooperation with public (including public agencies);

Complying with the contract;

Cooperation with the sub-contractor;

Personnel;

Document Control;

Supervision Competence; and

Knowledge of Department Standards.

These sub-categories are combined into one major, lump-sum category, due to the combination of multiple bullet points occurring in one question of the forms. Example questions regarding this category were extracted from the Virginia Department of Transportation: Was project documentation submitted as required? Was there open and effective communication between the

contractor management and project stakeholders? Was there a commitment to conflict resolution at the lowest appropriate level?

3.1.2.7 Minority Category

Minority Category includes utilization of Disadvantage Business Enterprise DBE, Minority Business Enterprise (MBE), and Equal Employment Opportunity (EEO) standards, and any questions pertaining to co-operation with the agencies and abiding by regulations specified for the project. According to the California Department of Transportation a Disadvantaged Business Enterprise company, “is a for-profit small business concern that is at least 51 percent owned by one or more individuals who are both socially and economically disadvantaged. In the case of a corporation, 51 percent of the stock is owned by one or more such individuals; and, whose management and daily business operations are controlled by one or more of the socially and economically disadvantaged individuals who own **it**.” (CALTRANS, March 21st, 2012). A Minority Business Enterprise has 51 percent of owners, operators, or controllers, who are classified as an ethnic minority.

Questions associated with DBE, MBE, and EEO standards are straight forward. The only difference on forms including questions in this category is that they do not always state the utilization of all three agencies. Some forms base their criteria solely on DBE utilization, while others include DBE and EEO utilization. An example from Indiana Department of Transportation: “The contractor complied with EEO and DBE requirements and procedures.”

3.1.2.8 Environmental Category

Environmental questions mostly involve erosion control procedures specific to the project. Aside from questions pertaining to the physical environmental procedures to be in place on the project, many evaluation forms have questions regarding permitting and abiding to the rules set forth by environmental regulations.

An example of the rating standard from Nebraska Department of Transportation: “Environmental Compliance-Contractor met standards for environmental permits, SESC, Water Quality Control”

3.1.2.9 Results from Category Analysis

For each evaluation form, the number of questions that presented content on the specific category divided by the total number of questions was recorded. One major factor excluded from this process was the weight of sections some evaluation forms had in place. For example: Quality of work on Illinois's form was worth 40 percent of the overall rating. This was not considered due to the desire to understand the evaluation forms' bulk composition, as opposed to weighting scale criteria. Individual state percentages were combined with the other states, and compared against Kentucky's current form. Figure 4 is a bar graph showing the national average of questions per category as opposed to Kentucky.

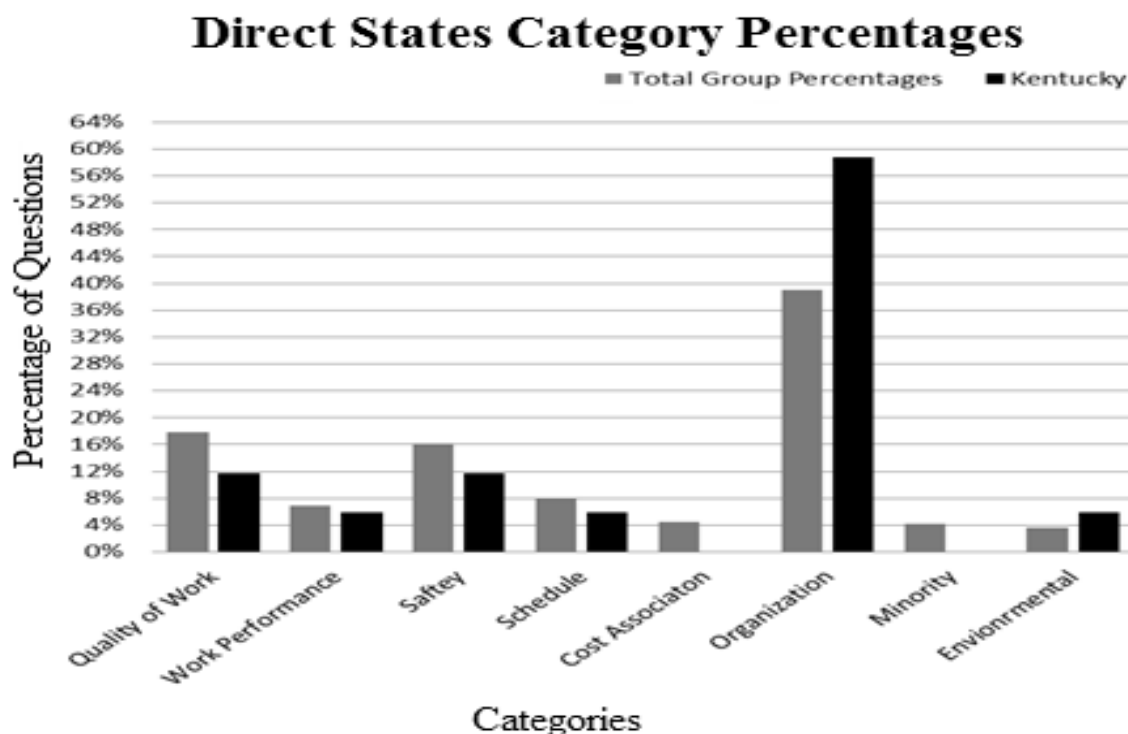


Figure 4: National Percentages

The national percentages for the forms show that Kentucky is trailing in every category with the exception of organization and environment. The largest category for both Kentucky and the other states combined was Management and Organization. The sub-categories included in this section from analysis one were: Cooperation with the public, complying with the contract, cooperation with sub-contractor, document control, supervision competence, and knowledge of department standards.

3.1.3 Comparison of Direct States Category Analysis

The third analysis conducted on the evaluation forms was a comparison between Kentucky and the other states that applied the forms in a direct manner. These states were Tennessee, Pennsylvania, Ohio, Maryland, and Virginia. The same concept was kept, and each of the forms for their representative states was investigated according to the pre-established categories. The graph shown on Figure 5 describes the five direct states. Kentucky falls below in every category regarding content with the exception of organization and management where they have the second highest percentage of questions compared to the others. They present no questions regarding minority utilization or cost over-runs.

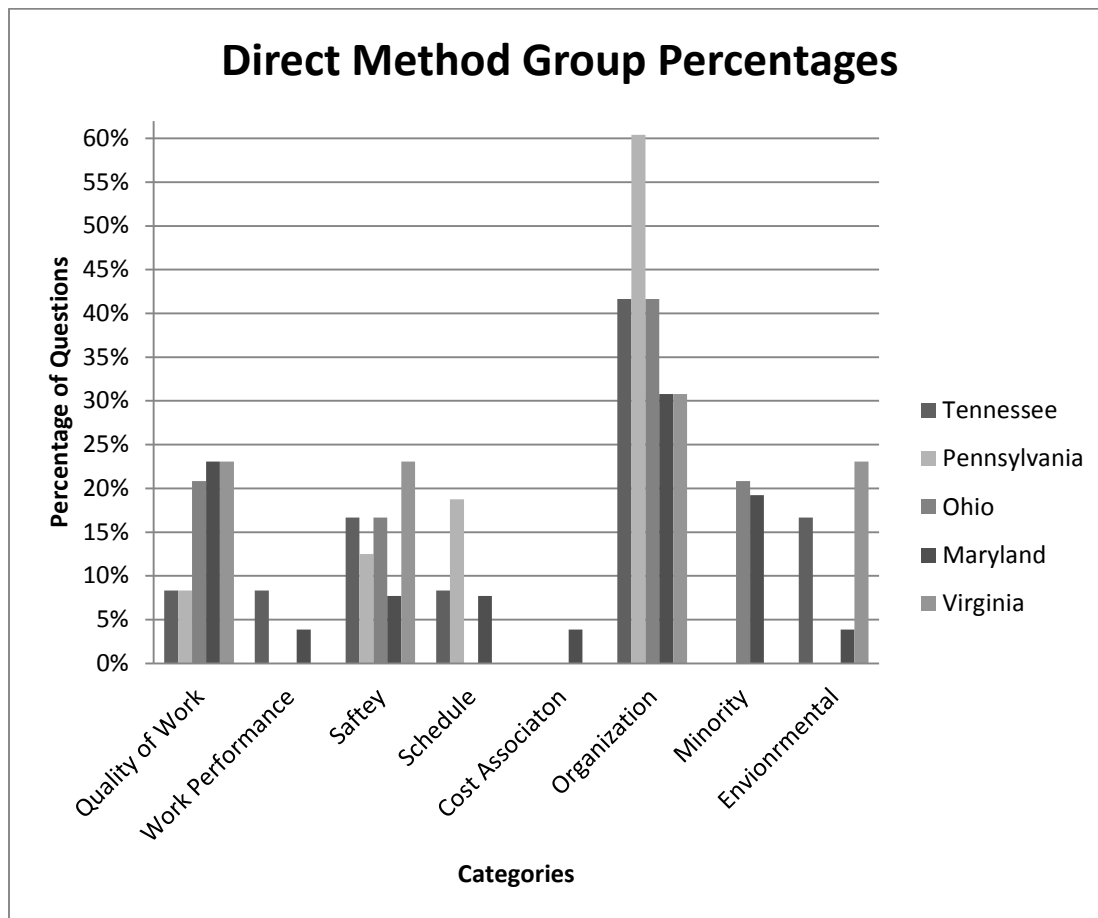


Figure 5: Direct Method Group Percentages

3.2 Additional Structure Analyses

Several key notes were made when looking through the evaluation forms, in addition to the analyses above. Overall, each form presented their own structure, and there was a wide amount of inconsistency among the questionnaires. Remark sections, contractor correspondence, overall ratings, weighting categories, rating scale, and sub-contractor evaluations were the main points of observation.

3.2.1 Remarks Section

Seventeen out of 25 contractor evaluation forms had a remarks section that allowed for the inspector to explain their scores. For all states, if the evaluation form included an area for remarks or comments, they were required to be filled out if a very negative or outstanding score was given. The general relevance to the remarks sections varied across the forms. For example, Kentucky is required and can fill out a comment box for each weighted section of the form. However, in other states, a comment section is only proposed at the end of the form leaving no room for justification on the individual questions. Typically, forms that produced an overall rating allowed or mandated comments to be included per rating section as opposed to the end of an evaluation. Forms that did not have an overall rating were not as dependent on the explanations of the grading.

3.2.2 Contractor Notice

Kentucky currently does not require contractor notice when submitting a report at the end of project completion. Twelve other states mandate that the contractor be notified of the evaluation they received. All of these states require a signature from the contractor. Several departments require post-construction meetings to be held to warrant discussion over the form before submission. The contractors are made aware of each grading criteria and the justification behind the inspector's scoring. Contractors are left the option to appeal an evaluation if it is not agreed upon. The time to appeal is strictly spelled out in the evaluation specifications either included in state laws, or on the evaluation form itself. On the forms that require a contractor signature, if refusal exists, there is a time limit proposed. If the contractor exceeds the period for signature or appeal, then it is assumed they are in agreement of the evaluation results.

3.2.3 Overall Ratings

Eighteen states have some sort of overall rating procedure incorporated into the evaluation forms. The most ambiguity among the forms lies in this area, because every department has a unique way of rating the questions. For the analyses, weighting of categories was not included. Nearly every system has its own weighting of criteria. For example, one contractor form has safety worth 40 percent of the overall score, while another form only has one question over the subject matter. Also, some evaluation forms are presented in sections with questions pertaining to the sub-categories and in return generate a total score for that section. The total sections add up to the overall rating percentage. Other forms strictly list the questions and each question is worth equal amount of weight. In every form with an overall rating, there is an additional page to the evaluation form explaining the rating criteria. An example state of a system which uses an overall rating score is Oregon.

Oregon is technically classified as an indirect state because they do not use the overall score to affect any other measure. Instead the overall score from the evaluation is divided by the total possible points and multiplied by 100. The scores are kept as a rolling average over a 12 month period. If the rolling average is 100-80, there is no action required. If the evaluation scores fall between an 80 and a 70, then a meeting with SCME is required. A corrective action plan has to be acceptable through Oregon Department of Transportation. For the range of 70-60 a three month suspension of the contractor's prequalification is imposed. For a score of 60 or below the contractor is suspended for six months. If the contractor is suspended again then their time doubles, triples, and quadruples respective to their category.

3.2.4 Rating Scales

The rating scales of each of the forms varied. Typically the ranges were numerical values to some degree. Most of the scales were whole numbers, while a few presented decimal numbers to provide a more accurate score. The grading scales can be directly linked to objectiveness. For example, for Wyoming Department of Transportation, each of their questions should be answered with the following possibilities: Unacceptable, Marginally Acceptable, Needs Improvement, Commendable, and Excellent. For the effectiveness calculated in Excel through

analysis one, they scored a six. They also did not incorporate an overall rating into their form, and the reports are kept on file in the event of consultation.

3.2.4.1 Indiana Department of Transportation Rating Scale

Indiana uses a numerical rating system that is consistent throughout questioning. Indiana's form of contractor evaluation consists of four overall sections. The grading scale is as follows: +2 for outstanding performance, +1 for performance above expectation, 0 for adequate performance, -1 for periodic inadequate performance, -3 for consistently inadequate performance. N/A is an option if there were sufficient opportunities to observe the contractor. A negative three as opposed to a positive two is to place emphasis on the seriousness of sub-satisfactory work being performed (INDOT, CR-2 Form).

Section A provides criteria for Organization Equipment and Personnel. There are eight criteria within the section to be graded and then the total points are calculated. Section B is identical to Section A except it addresses the prosecution of work. Section C has eight criteria as well that assess general relationships and cooperation. Lastly, Section D analyzes the quality of materials and workmanship. At the end of the evaluation each section is listed and the points received in each section are totaled. In the event the overall score is below zero in any section, or a score of three on any question occurs, then there is an immediate referral to the Prequalification Committee.

3.2.4.2 Tennessee Department of Transportation Rating Scale

Looking at Tennessee Department of Transportation, they use a ranging numerical system that generates an overall score. Their evaluation form scored a 12 for effectiveness. The scales range from 0-5, 0-10, 0-15, and 0-20, depending on the question. In the Organization and Management category, which is worth 25 percent, each of the six sub-categories are required to be rated from 0-5, five being best, zero being the worst. For a different section, such as Performance, worth 45 percent, there are three sub categories. For each sub-category a different scale is required. Completion on schedule is scored ranging from 0-20, while compliance of work is scored from 0-10, and quality of finished project is rated 0-15 (TDOT, 2011).

A decimal rating scale was defined by Pennsylvania who is a direct system state. They used 0-1 as the scoring range, and possible allotments were 0, 0.5, 0.7, 0.85, and a 1.0, where a 1.0 is best and a zero is worst. The form scored a two in efficiency due to category content. Ohio's evaluation form scored a ten overall in effectiveness, and the scale for their system is consistent throughout the questions. Their scale ranges from a 10, 8, 5, and 1, and their forms are in a computer program that automatically calculates the score. The points are distributed as such in attempt to veer away from the generic scales such as 1-5 and create accuracy within the evaluators (PADOT, 2009)

3.2.5 Sub-contractor Evaluation

When analyzing the evaluation of sub-contractors, there was a large amount of inconsistency. About half of the 25 participating states viewed sub-contractors essentially the same as prime contractors and they were required to be evaluated in the same manner. Kentucky's evaluation process currently mandates that a sub-contractor be evaluated on the same form as the prime contractor. Some states followed this suit, allowing for Not Applicable to be given for questions that are not necessary for subs. However, other states had a completely separate form for sub-contractors that were uniquely created for questions that would pertain to their business. The third option that some states followed was no evaluation of contractors under the assumption they were under sole control of the prime-contractor and it was not the state's obligation to oversee them. In some cases, the evaluation form questions were left blank and the content was determined in a pre-construction meeting with the contractor. The logic behind this was to create a form specific to the project that both the inspector and the contractor agreed on before the start of construction.

3.3 Conclusions on Structure of Evaluation Forms

Several analyses were used to interpret the structure of the forms. For analysis one, a scoring system was used to establish a relationship among the forms in terms of efficiency. There was a rubric assessed based on categories all of the forms had in common. For each category the form included for a specific state they were given a one. The total amount of ones given was the score of the form, and the total amount of pages was subtracted. The idea behind the efficiency scoring system was to determine the best forms which covered the most material in the least amount of

space. From this analysis, Iowa, Massachusetts, Ohio, and Tennessee scored a 10 or above, resulting in the highest points for evaluation form efficiency.

The second part of researching the structure of the evaluation forms was considering the percentage of questions for each category the forms included. The categories for analysis one were combined into like groups. Each form contained a specific amount of questions for the category, and this sum was divided by the total amount of questions for the entire form. From this a percentage of form content was produced per category. Each percentage was combined for the 25 states. The total percentages were compared to Kentucky's form content shown in Figure Three.

The third analysis ran was to directly research the states that had processes similar to Kentucky. These four states were Pennsylvania, Tennessee, Maryland, and Ohio. The same process was conducted as analysis two, except the states were kept separate, and only these four were considered. The comparison showed the percentage of content in different categories for systems like Kentucky who applied the evaluation forms directly to produce an outcome. Figure Four shows the results where Kentucky had less content in every category with the exception of Organization and Environment.

In addition to the research conducted in the analyses of the evaluation form structure, several other variables were noted. Most every form provided a remark or comment sections at some point on the form. Direct states provide an opportunity for remarks to be made after every scoring section, while some indirect states provide one area at the end of the evaluation. Also, there were discrepancies on requiring the remark sections to be filled out. Typically states with an overall rating system required explanations if the scoring was extremely low or high. States that did not produce an overall score did not stipulate if the comments section was required for a valid form. Kentucky currently requires a comment to be filed if a contractor scores anything other than a four on their 1-5 scale. If a contractor receives a negative evaluation with no comments attached, a note is made on the evaluation, and in some cases deemed invalid for performance factor generation.

Contractor correspondence was another key issue that Kentucky does not require in their most recent system. Most states specify that a contractor has to sign the form or meet with the

evaluator over their results. The contractor is given a certain duration to appeal the decision. If the contractor fails to appeal the form and does not sign, it is assumed that they agree with the outcome. If the contractor appeals the results, then in most cases they are granted a meeting to state any rebuttals, and a final decision on results is made afterward.

Over-all ratings, weighting of categories, and rating scales were three observations that tended to vary across the evaluations. For each form the over-all rating procedure was dependent on the rating scale, and provided to be unique on every form. The weighting of categories varied with some forms placing a large percentage on a certain category, while other forms only addressed the subject through one question. For example, Tennessee places 40 percent of the overall score on performance and has four sub-category questions that are rated within this section. However another form could only ask one question on performance, worth five percent of the form. There were several forms that had a lateral weight, which means that each question was worth the same percentage.

Rating scales of the forms can be directly linked to objectiveness. Forms that do not have an over-all numerical rating typically scored lower points on the efficiency analysis. Forms that had an established rating system could either use the same scale throughout the questionnaire (i.e. 1-5) or use different scales (i.e. 1-5, 0-20, 0-15) based on the question at hand. The use of different scales was for ease of calculating over-all rating scores at the end of the questionnaire.

Sub-contractor evaluations were also another factor that varied throughout the forms. There were three options that the different evaluation forms presented. The first process noted was to evaluate the sub-contractors exactly the same as the prime contractors. The same form was used, and questions that do not pertain to a sub-contractor were marked “Not Applicable” or left blank. Questions with these answers were thrown out of the overall rating if one was present. Another process was having a different sub-contractor evaluation form. These forms were tailored to questions that specifically addressed the work of subs rather than primes, and were used to calculate the overall rating for a sub in a separate process than the prime contractor evaluations. Lastly, the third approach consisted of not evaluating sub-contractors. Under this approach the prime-contractor is evaluated based on the sub-contractor’s performance. Since the prime contractor has authority over the sub-contractor, the states that used this system choose not to evaluate the subs.

4.0 Data Collection

To analyze the effectiveness of the current system in evaluating Kentucky contractors, data was collected from the Kentucky Transportation Cabinet on contractor performance. This data consisted of a collection of contractor evaluation forms pulled from random contractors throughout recent years. The objective behind the data collection was to run statistical analyses that provided a measure of effectiveness for the current contractor evaluation system. The statistical analyses were generated to provide information on different levels. The processes were conducted to rate the effectiveness of the individual questions, the effectiveness associated with an individual contractor, and the measure of effectiveness on the evaluations as a whole group.

The analyses were conducted using the latest contractor evaluation form provided by the Kentucky Transportation Cabinet (KYTC). This form can be found in Appendix A. The form, defined by KYTC as TC 14-19 E, consists of two parts. The first part contains questions which describe contractor work performance; there are 10 questions to be rated by the evaluator on a scale of one through five. Part two includes questions that pertain to the contractor project management and administration. There are seven questions within this section which are rated the same as part one. These questions have weights assigned to them and the sum of points compared to the maximum points available provides the final rating. Questions are given a zero if the description does not apply to the project. The form is specified for a sub-contractor or a prime contractor.

4.1 Evaluation Form Application

The Kentucky Transportation Cabinet currently uses the contractor evaluation forms as a key factor in bonding capacity. A resident engineer is specified for each project funded by the cabinet. At the end of substantial completion the resident engineer fills the form out and submits the final copy to the pre-qualifications department at the central office in Frankfort, KY. The form then goes into a folder, and awaits review. The pre-qualification department pulls each folder annually. Using the forms that have been stacked for that annual period, they calculate the average of final ratings from each form submitted during the period. The pre-qualification engineer recommends an average percentage rating to the pre-qualification board based upon the ratings. However, if an evaluator turns in a form scoring below a four on a question, and no

comments are noted, then the engineer does not use that evaluation against the contractor. The prequalification engineer depends heavily on the comments to justify their recommendation, which is why some contractors have been reduced below 100 percent and others have not, even though their averages may indicate that a decrease should have occurred.

The average must fall below 50 percent for a reduction in bonding capacity to occur. Most often, the averages are in the 80-100 percent range, thus no reduction is recommended. Once the annual rating period has been completed, the evaluation forms are stored with their recommendations attached. The average percentage is dependent upon the volume of work for the contractor. The higher volume of work the lesser impact the evaluation form has on the overall rating. If a contractor only does one project for the state during the annual time frame, that percentage is recommended to the board. If a contractor does 30 smaller jobs during that period, then the average is calculated over all 30 evaluation forms.

4.2 Criterion for Contractor Data

To analyze the current system it was necessary to collect forms for data. The volume of forms was accumulated using seven different contractors. The contractors used in the analyses were pulled at random, pending that they met the specified criterion desired. There were several parameters used to define the criterion for the contractors to be used. Information for all of the contractors' volume of data can be found in Appendix E: Contractor Data used in Statistical Analyses.

The forms used in the data collection were only from the most recent rating period. The oldest evaluation form pulled was submitted in 2005, the newest forms were submitted in 2011. The form submitted in 2005, basically indicates that the contractor has not done work for the state since that annual period. The range for the evaluations varies for an annual report period. Also, if the contractor has not done any projects for the state in several annual periods, their latest one is still considered the most recent information. Thus, the final ratings are not consistently from the same annual report.

Ideally, the contractors selected were to be spread evenly throughout the state. However, with the majority of work occurring in the central Kentucky area, there was a struggle to find

contractors working in multiple districts defined by the cabinet. A contractor was pulled from the Western Kentucky, District One area and several were pulled from the Central Kentucky, Districts Five, Six, and Seven, areas. An attempt was made to use contractors with varying average percentages. Out of the seven contractors, six of them had an average percentage for the rating period of a minimum 75 percent and one of them had achieved a 100 percent recommendation. One contractor did see a reduction in bonding capacity when they were recommended to the board as a 45 percent, which is below the defined 50 percent.

Contractors with varying volumes of work were pulled. Two contractors had over 20 forms included in their annual report period. One contractor had nine forms included while others only had one contractor evaluation form included. The last criteria considered were if the contractor was a sub or prime on the project. Some contractors presented evaluations in both categories. Most of the forms used in the research were prime contractor evaluations however a portion of them do pertain to sub-contractor descriptions. These four parameters were used to collect the data, they are summarized as: Location of contractor, annual percentage rating, volume of work, and prime contractor or sub-contractor forms. Plots were made to record the scores over time. Below are the contractors' data and the associated information. The form type is describing if they have used the old or new form. The cabinet has updated the format of the form, with the same questions and rating procedure. In regards to research, there is no difference between the two, but a note was made in case the situation occurred where there was a discrepancy between the two forms.

4.3 Selected Contractor Data

There were a total of 73 evaluation forms collected among seven contractors. The data collected for each contractor can be found in Appendix C. The average cost of the projects used in the study was 2.2 million dollars. The bar graph located on Figure 6 shows the number of forms that fall in a certain price range. According to the graph, about 50 of the forms covered smaller projects over 500,000 dollars.

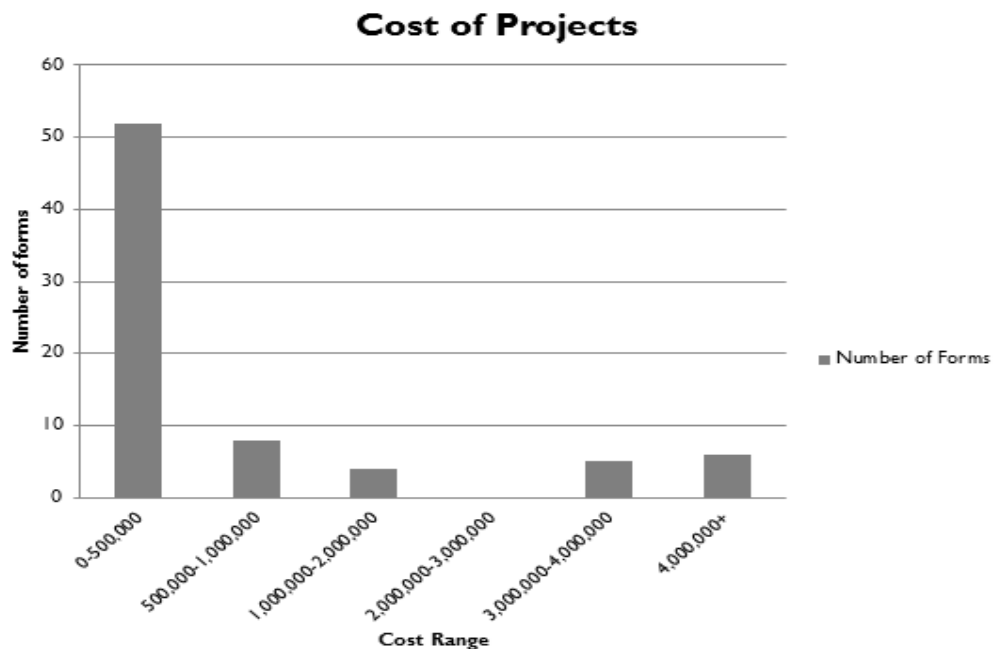


Figure 6: Cost of Projects used in Evaluation Study

For clarification purposes the question key which can also be found in Appendix A on Kentucky's evaluation form is provided below. Each evaluation form included in the study used these question parameters.

Question Key:

- 1.) Quality of Work (including performance of subcontractor(s))
- 2.) Quality of Work (excluding performance of subcontractor(s))
- 3.) Meetings of Contract Dates (including approved extensions)
- 4.) Job Closeout Activities (punch list, clean-up, paperwork, etc.)
- 5.) Coordination and Cooperation with DOH and Other Government Agencies
- 6.) Coordination and Cooperation with Other Contractor(s), Sub(s) and Utilities
- 7.) Coordination and Cooperation with General Public (motorists and property owners)
- 8.) Public Safety and Traffic Control
- 9.) Workforce Safety Practice
- 10.) Compliance with Environmental Requirements
- 11.) Project Supervisory Personnel
- 12.) Project Technical Staff
- 13.) Project Craft Workforce
- 14.) Project Organization (home office support and organization)
- 15.) Project Submittals
- 16.) Equipment
- 17.) Jobsite Housekeeping

* Zero indicates question unanswered

If a zero was given for a question, then the question was not applicable for the project. Otherwise a rating of one through five was given for a question. If the contractor performance was given below a 4.0 rating it is required that the form contain comments for justification. Associated comments are presented below the data for each contractor in the appendix. The standard deviation is listed in the raw data to show the change between questions and evaluators.

4.3.1 Selected Contractor Descriptions

The exact contractor information is sensitive material and cannot be disclosed. Thus each contractor has been assigned an alphabetical letter: A, B, C, D, E, F, and G. They are referred to in this report by their associated abbreviation. An average rating was recorded for each evaluation by taking the mean of each score for the seventeen questions. For each contractor, their position was recorded (prime or sub-contractor), also the dates of the form submission are listed. Using this information plots were made to show the completion date versus the overall average. These plots are particularly beneficial because they show the trend of the evaluation scores over the duration of the forms. Performance levels can be interpreted from these graphs, showing sharp decreases or increases associated with a specific evaluation.

4.3.1.1 Contractor A Description

Contractor A is a sub-contractor and for the annual report period used in this research, the date of the evaluations ranged from 2005 to 2011. They had 31 evaluations total included in the most recent annual percentage rating. The highest final rating they received was a five, which is the maximum possible rating a contractor can receive. The lowest final rating included in their overall score was a 3.8125 average.

The recommended annual percentage to the prequalification board was a 100 percent. Figure 7 shows the scores from their oldest form dating back to 2005 to the most recent form considered. The graph indicates that the overall average for the evaluation forms remained a four until 2007 when fluctuation of scores began to occur. This can directly correlate to the contractor's inconsistent performance on jobs, or multiple jobs could have been evaluated in the same period causing a discrepancy to occur due to difference in evaluators' opinions. The fluctuation did not produce a net reduction on their final percentage.

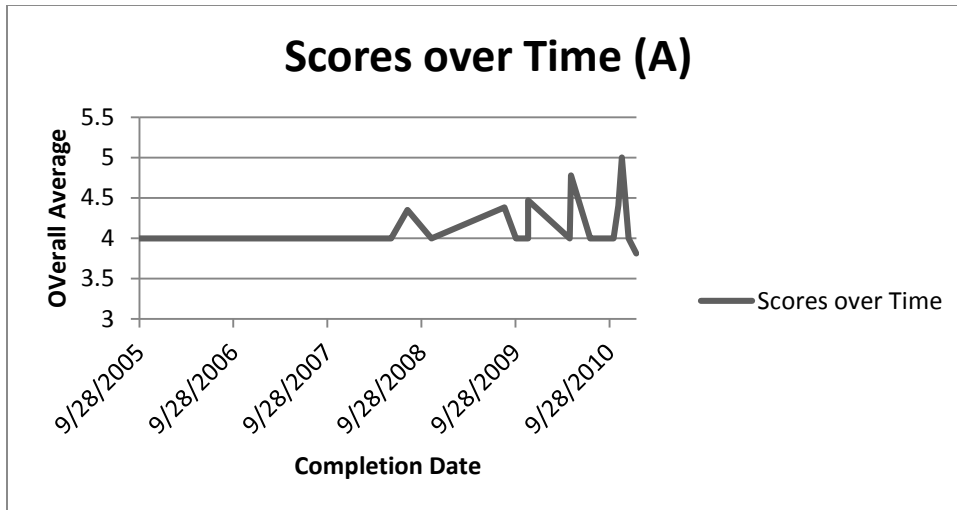


Figure 7: Scores over Time (Contractor A)

4.3.1.2 Contractor B Description

Contractor B has nine evaluations included in their annual percentage calculation, and they were the prime contractor for all of the projects. The evaluations range from April 2010 to December 2010, showing a fairly small time window compared to contractor A. Likewise their highest score was a five, received on the first project included in the calculation. The lowest score was on the second evaluation included in their volume of work, which was a 4.128.

Figure 8 shows the contractor evaluation scores plotted against the time frame considered in the annual score recorded. They show an immediate drop off from a five to a 4.18 in the beginning, and then a consistent score from June 30th to August 31st. During this time period there were three evaluations turned in on their company. This most likely indicates that the same evaluator was filing the forms because all three presented the exact same average of 4.308. The final overall rating the contractor received for the annual report period observed, was a 100 percent.

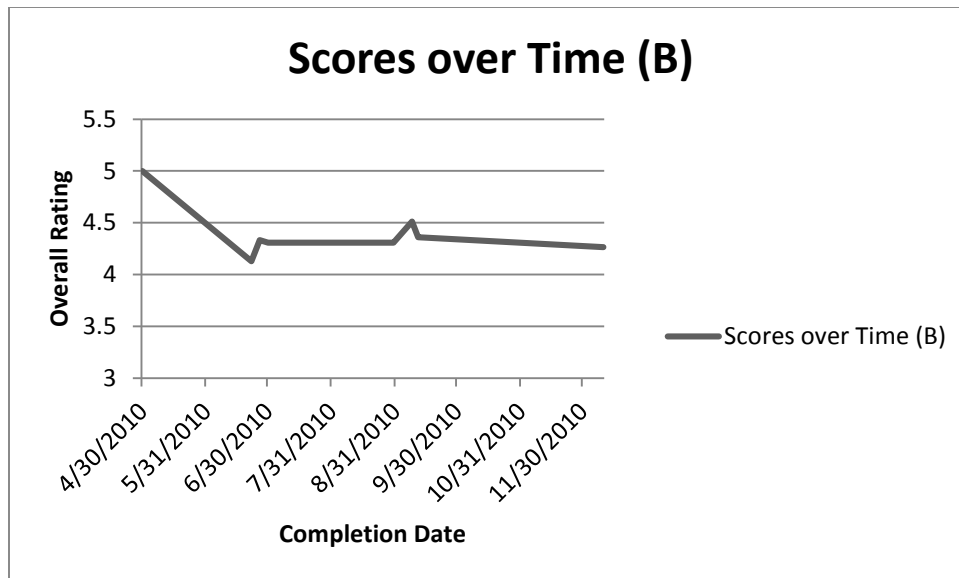


Figure 8: Scores over Time (Contractor B)

4.3.1.3 Contractor C Description

Contractor C was included in the data selection because of the size of the project. They only had one evaluation included in the report period, but the total costs amounted to approximately 32.5 million dollars. The evaluation dated back to 2007, and the contractor was the prime on the project. The average rating for the evaluation was a 3.973. However, their score for the annual report period was dropped to an 80 percent. No reduction in bonding capacity occurred due to the fact a contractor must score below 50 percent for the reduction to take place.

4.3.1.4 Contractor D Description

There were four evaluation forms included for contractor D. The contractor acted as prime on all projects except one where they were the sub. The dates of the evaluations run from June of 2010 to December of 2010. The maximum score received was a 4.462, while the lowest was 3.588. The overall annual report percentage for the contractor was a 100 percent.

The score versus time graph, located on Figure 9, shows a steady decline in scores followed by a sharp decline towards the end. This would indicate that the contractor's performance is declining

as they do more projects. They took a sharp decline when they were listed as a prime on a 6.6 million dollar project. Most likely, this could have been an isolated event because the other three evaluations range within tenths of each other.

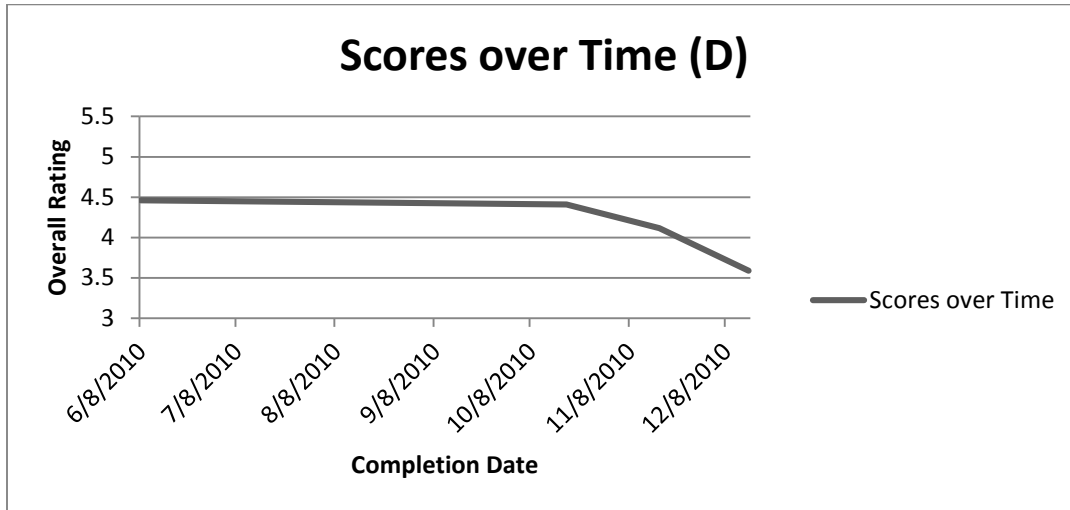


Figure 9: Scores over Time (Contractor D)

4.3.1.5 Contractor E

Contractor E was included in the data because of the size of the project its evaluation form was associated with. The cost of the project was 7.9 million dollars, which was representative of a medium size project. They were listed as the sub, and reported an average score of 3.737.

Following this evaluation their annual report percentage was decreased five percent to a 95. No actual reduction occurred in bonding capacity.

4.3.1.6 Contractor F

There were three evaluations within the volume of work for contractor F. They were an interesting find due to the severity of reduction that occurred on their annual percentage rating. For the three evaluations, the dates ranged from January of 2010 to November of 2010. On each evaluation the average scores were 3.513, four, and 1.974. The contractor acted as a prime on all three projects. They are a particularly good example of evaluation inconsistency, because on one project they scored what the state considers above average and then on the last evaluation they scored extremely low. The level of comments provided on the last evaluation enabled the pre-qualification engineer to recommend a substantially large reduction in their annual report

percentage. The contractor was reduced to 45 percent and an actual decrease in bonding capacity occurred. After a conversation with the pre-qualification engineer, it was imperative that this contractor would no longer be doing business with the state. Thus, the actions of the contractor warranted not only a reduction but suspension as well.

Figure 10 reflects the relative increase in average scores from their first evaluation to their second. Then the contractor took a sharp decrease after their last evaluation occurred.

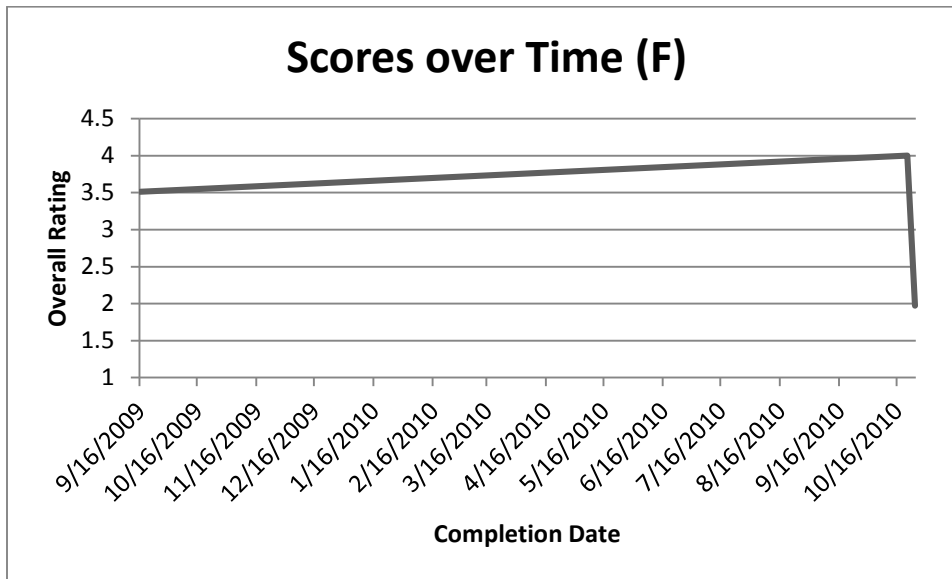


Figure 10: Scores over Time (Contractor F)

4.3.1.7 Contractor G

Contractor G was used in the study because like contractor A, they had a large volume of work included in their most recent annual report percentage calculation. There were 24 evaluations included ranging from August 2010 to September 2011. This relatively short time frame for the large volume of work indicates that there were multiple projects going at once, which makes this contractor unique to the study. On all projects they were the prime contractor, and they received several maximum averages of five on evaluations. The lowest evaluation average reported was a 3.941.

For the annual report percentage this contractor was awarded a 100 percent. The score versus time graph (Figure 11) shows fluctuation among scores, but all within what the state currently considers as satisfactory.

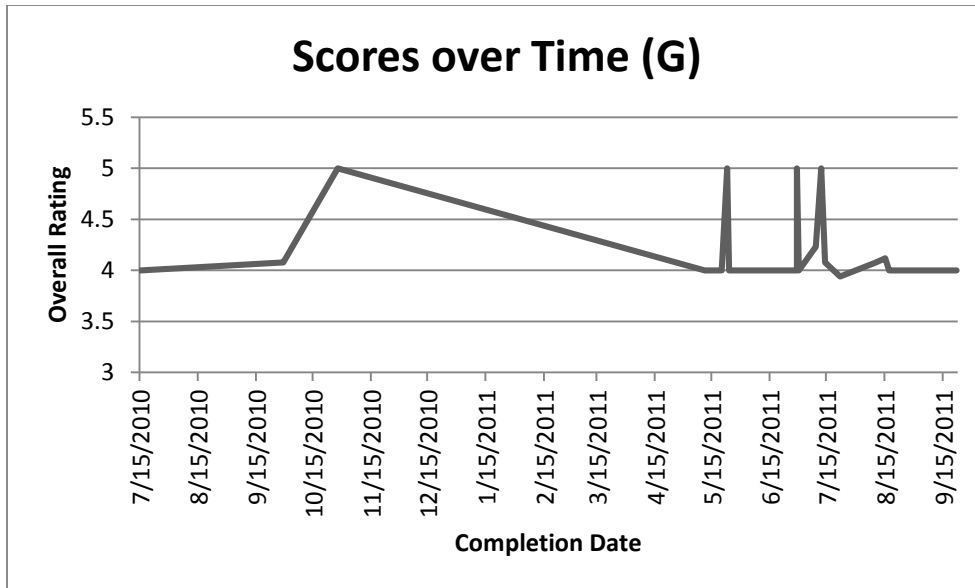


Figure 11: Scores over Time (Contractor G)

5.0 Statistical Analysis of Contractor Evaluation Forms

After the evaluation forms were collected the main objective was to prove that the contractor evaluation process was not effective. The common belief is that the system is currently not providing a fair estimate of the actual contractor performance, partly due to the fact that if an evaluator chooses to score anything other than a four they must provide explanation. Thus, the statistical analyses were run to verify the assumption that the rating of four is common, and independent of the person evaluating or the contractor being scored.

One component to the statistical tests was determining which questions are answered more accurately. The relation to accuracy was made by finding the variance in the question scores. For example, question three, regardless of contractor or evaluator, most commonly was rated as a four. There would be little variance among the question, and this would show that the question is not objectively answered. On the contrary, if a question had a high variance, then this would directly correlate to different ratings on various evaluation forms. Thus, the assumption is made that the question is a good measure of performance. To do this analysis, all evaluation forms were grouped together and questions one through 17 were analyzed individually. Looking at the data provided in Appendix C, a visual way of understanding such an analysis is that the variances were tested in vertical lines on the tables provided, from one question top to bottom, and then ran again from the second question top to bottom.

The second component was considering the average rating variance among contractor. For this portion of the analysis, contractors were looked at on an individual level to see if there was variance in their ratings from project to project regardless of the questions. This can be viewed on the tables by reading left to right to pick up variances in the data. Understanding consistency among contractor's individual evaluations is to determine if an evaluator simply filled out four for the entire evaluation or if there was significance in their scores. For example, for one project an evaluation received an average score of four. This would indicate that an evaluator filled out four for every single question instead of providing true answers.

These testing parameters were developed to find possible patterns on the evaluation forms. Also, they were used to find which questions showed differences among the contractors. To locate full information regarding the statistical analyses conducted refer to Appendix F: Full Details on Testing Procedures.

5.1 Testing Procedure

The procedure used on the data set was to develop a hypothesis test. Hypothesis testing is a statistical method used for verifying assumptions. For example, there is a desire to know whether a certain medicine (i.e. insulin) has a positive effect. Experiments are designed to test this medicine. The procedure can be giving the medicine to a group of test subjects (experiment group) and giving a placebo to another group of subjects (control group). Then there is the ability to measure the variable of interest (say blood sugar) for each subject and calculate the mean values of the two groups.

For the next step of the testing, a statistical model must be chosen. There are several models that could be used for a hypothesis test. The most common procedure used on this data is a one-way ANOVA (Analysis of Variance) model because the data set contains more than two groups, and the variable of interest has a normal distribution. After setting up the one-way model, a null hypothesis has to be selected for testing. The null hypothesis usually assumes no difference among groups. Thus, the null hypothesis tested for this data is that there is no significant variation among the group averages.

Lastly the “test statistic” is determined based on the data. For one-way ANOVA it’s the “F Value”. There is a formula to calculate the test statistic for each statistic model. Any statistic software would have the built-in function for calculating test statistics. The SAS software is used to run the analysis. The software finds the probability distribution for the test statistic and finds the corresponding P-Value for the calculated F-Value. The F-Value is calculated with degrees of freedom varying for each test.

For example, one of the tests reveals that a P-value is 0.1006. This indicates that the null hypothesis, since there is no significant variation, is true. The chances of the data collection getting a set F-Value (calculated using the data) of 1.86 is 0.1006. Thus, if a small P-value is generated from a hypothesis test it means that the null hypothesis is unlikely to be true. Once the test is generated a decision must be made to reject or accept the null hypothesis. The typical threshold is a 0.05 value. In conclusion, if the P-value is smaller than 0.05 then the null hypothesis is unlikely to be correct and is rejected.

The second testing procedure used on this data set was the Kruskal Wallis Test. This test was used when the scores did not have a normal distribution. For the data set the scores do not have a normal distribution, they have an interval distribution. The Kruskal Wallis Test mimics this type of situation. The test still generates a resulting P-value that is interpreted using the same threshold as above.¹

For the statistical analyses conducted, several possible situations were run to pick up significant variances among the contractors. The two most common tests used were the F-Test Values and the Kruskal Wallis P-Value test.

The F-Value test, according to Dr. James at Richland Community College, is used when two population variances are equal. In other words, it tests the ratio of variances and if two of them are equal the result will be one. There are two degrees of freedom, one in the numerator and the other is located in the denominator (Jones, 2012).

Each statistical analysis was run including all seven contractors' evaluations. They were also run a second time excluding contractor F's third evaluation, which had an average rating of approximately 1.9. This was an outlier to the data, thus it was left out during statistical tests.

5.2 Significant Findings

The tests resulted in findings that were true to the hypothesis that there is little variance occurring among the forms. The first analysis was used to find variance in ratings by contractor. The analysis was implemented twice, one time with the outlier in the test and the other time the outlier was excluded. The second section of results tests the variance by question. The purpose behind this analysis was to find significant differences on each of the questions presented on the evaluation forms. Following the two major tests, analyses were run to determine the objective ratings behind each question on an individual level. The areas of variance found through the statistical analysis resulted in specific questions that directly correlate to areas that are well documented during the project.

¹ Information for 5.1 Testing Procedures was provided by Ying Li.

5.2.1 Variance in Ratings by Contractors

The average ratings per individual contractor showed no significant difference in overall scores among the seven contractors. This means that each of the seven contractors had similar ratings. The only exception occurred when Contractor F's third evaluation was included in the analysis. Table 2 shows the average rating among the contractors with their standard deviation among questions recorded. All three of contractor F's evaluations were included in this analysis.

Level of Contractor	N	Final	
		Mean	Std Dev
A	31	4.08122581	0.30704340
B	9	4.39133333	0.24896385
C	1	3.97300000	.
D	4	4.14450000	0.40070396
E	1	3.73700000	.
F	3	3.16233333	1.05754165
G	24	4.23004167	0.40745728

Table 2: Difference in Ratings among Contractors

Using the data in this table the analysis showed an F-Value of 4.37, thus there was a significant difference among contractors. More detail on the findings can be located in Appendix D.

Including the outlier in the data set generates a P-value of 0.0009 which is less than the minimum value of 0.05, this means that the null hypothesis, if there is no significant difference, is rejected.

Table 3 shows the mean and standard deviation with the exemption of the outlier.

Level of Contractor	N	Final	
		Mean	Std Dev
A	31	4.08122581	0.30704340
B	9	4.39133333	0.24896385
C	1	3.97300000	.
D	4	4.14450000	0.40070396
E	1	3.73700000	.
F	2	3.75650000	0.34436100
G	24	4.23004167	0.40745728

Table 3: Contractor Differences among Questions

The F Value generated from this data, excluding the outlier was a 1.86, thus the findings show that there is no significant difference among questions considering contractors. This further verifies the assumption that the contractor evaluation forms are all scored similar regardless of circumstances projects, making the system ineffective. For more detail on the findings see Appendix D. The resulting P-value for this data was 0.1006 which is greater than the threshold of 0.05, thus the null hypothesis that there is no significant difference is accepted.

5.2.2 Average Ratings by Question

The average rating by questions was an analysis that tested the same question among all 73 evaluations to find variance. On all seventeen questions an average of around four was determined, showing that no question had significance compared to the others. Also, the average of four indicates that most commonly that is the value assigned for the rating, which correlates to the assumption that fours are often given because no comment is necessary by doing so. Table 4 shows the results found for all 17 questions pulled from all of the forms combined. Using this table The F-Value resulted as 1.37, which verifies that no significance was found from question to question. More details can be found in Appendix D. On this test the P-value was found to be 0.1484 which is greater than 0.05, so the null hypothesis is accepted and the assumption is made that there is no significant difference.

Variable	N	Mean	Std Dev	Minimum	Maximum
Q1	59	4.0677966	0.5528736	1.0000000	5.0000000
Q2	72	4.1111111	0.5705336	1.0000000	5.0000000
Q3	70	4.2857143	0.7448929	1.0000000	5.0000000
Q4	65	4.2769231	0.6251923	1.0000000	5.0000000
Q5	73	4.1232877	0.6443172	1.0000000	5.0000000
Q6	72	4.0972222	0.3812405	3.0000000	5.0000000
Q7	72	4.0694444	0.3873488	2.0000000	5.0000000
Q8	72	4.2222222	0.4510464	3.0000000	5.0000000
Q9	73	4.2191781	0.4786142	3.0000000	5.0000000
Q10	72	4.1250000	0.4089664	3.0000000	5.0000000
Q11	73	4.0821918	0.5205079	1.0000000	5.0000000
Q12	73	4.0684932	0.4192840	2.0000000	5.0000000
Q13	73	4.0684932	0.4192840	2.0000000	5.0000000
Q14	73	4.1232877	0.5513923	1.0000000	5.0000000
Q15	73	4.1369863	0.5086766	2.0000000	5.0000000
Q16	73	4.1232877	0.5256003	1.0000000	5.0000000
Q17	73	4.0821918	0.3997716	2.0000000	5.0000000
Final	73	4.1278904	0.4374557	1.9740000	5.0000000

Table 4: Average Ratings by Question

5.2.3 Breakdown Analysis of Questions

The breakdown analysis tests if there is significance in the questions on an individual level within the contractors. Including the outlier, the F-Value test found that almost every question had variance; through the other tests this finding was odd. Using the Kruskal Wallis P Test on the same data six out of 17 questions showed significant difference. The tables corresponding to these findings can be found in Appendix D. This test indicates that some questions could be more objective than others based on the significance.

The same analysis was performed excluding the outlier and for both the F-Test P-Value and the Kruskal Wallis P Value test, five out of 17 questions showed an indication of objectiveness. The six questions that could be defined as objective according to this analysis are:

- Question 1 (Quality of Work)
- Question 3 (Contract Dates)
- Question 4 (Job Closeout Activities)
- Question 8 (Public Safety)

- Question 9 (Workplace Safety)
- Question 10 (Environmental)

The variation in questions may indicate that the evaluations, in regards to these categories, are somewhat effective and the engineers are not automatically assigning a four to these questions. This is most likely due to the fact that the questions cover recorded items. For example, question one regarding contract dates, the engineer has to keep on file a record of all dates met and exceeded. Accidents have to be recorded separate from evaluation forms so this would be another area that is easy to obtain a rating on. Thus these categories are indicative of areas that are heavily emphasized on current projects.

5.2.4 Variance among Contractors per Question

For this analysis, five contractors were considered for the tests due to the fact two others only had one evaluation form in their data set. Both F-Value tests, which assume normal distribution, and the Kruskal-Wallis test, which assumes interval distribution, were used. The results showed that one out of five contractors differ significantly among their ratings per question. The only contractor that had a P-value less than 0.05 for both the Kruskal-Wallis and F-Value tests was contractor B. This indicates that contractor B had evaluations that differed among the questions within their own volume of data. The other contractors had no significant findings, meaning that they have no differences occurring within their own collection of evaluations.

5.3 Conclusion of Statistical Analyses

From the statistical analysis it can be concluded that there is little statistical variance among the contractors and questions. This ensures the assumption that the current evaluation system is ineffective. The reasons behind the shortfalls in the system are not easy to determine. The current system requires that the contract evaluator explains any other rating given besides a four. Since this is the case, it is not surprising that many evaluators give a four in efforts to save time when completing the form. As of present, the forms are filled out on an annual basis for most projects. This minimizes the opportunity for the evaluator to accurately fill out a form, because there is a need to recall information throughout the entire project duration for ratings. For example, if there was a contractor who completed a task early on in the project which required a lot of rework, and

the engineer starts to complete the evaluation at the end of the duration, there is a high chance that they have forgotten about the magnitude of problems the rework warranted. Whereas if there was rework that occurred at the same point in time the evaluation was to be submitted, the engineer would be a lot more likely to comment on the form.

The other major problem behind the evaluation form that the analyses revealed, is that most questions are subjective and do not have a clear answer. Thus, they are given a four, which essentially describes a “no comment” situation. Many of the questions do not link to actual documentation that occurs on a project, leaving it solely up to the engineer’s discretion to determine the outcome of the evaluation.

There were overall six questions which proved to have some objectiveness. These questions covered quality of work, contract dates, job closeout activities, public safety, workplace safety, and environmental measures. These questions all concerned areas of the project that are heavily analyzed and documented throughout the project duration. Regarding these subjects, the engineer can often refer to the records that are kept on the project. They can also more easily recall detailed information in these areas because they have most likely, already submitted a report over the same subject matter.

6.0 Solutions for Contractor Evaluation System

The tests generated from the analyses undoubtedly proved that the evaluation system is subjective, and that there is little to no variance among questions and contractors as far as ratings are concerned. For a system of this magnitude there is no one, simple solution that can be implemented that will accurately generate reports. There are multiple levels of steps that can be taken in hopes of improving the contractor evaluation process.

One small scope change that should occur is the redevelopment of the rating system. As mentioned previously, evaluators must include a comment for any other rating besides a four. This deters the engineers from giving another number, because they know that elaboration on their rating will need to occur in order for the form to be valid. The 1-5 scale, consistent on every question, can arguably be ineffective due to the repetition in numbers. Many systems change the rating scale from question to question so that an evaluator cannot simply write the number five on all of the ratings. They must read the question as the scale varies, in order to determine which number is appropriate for the subject. See Appendix B, where other states' contractor evaluations are included for further detail on various rating systems.

On the broadest level mimicking a system such as the one South Carolina's department of transportation is currently using would be a beneficial measure. SCDOT implemented a computer program in 2010, which monitors the contractors during the project and submits reports on an annual, interim, and completion basis. The evaluations are composed from a progressive rating system and cover five categories where points are automatically determined based on inputs. These categories are Safety, On-Budget, On-Time, Quality Management, and Claims Denied. Each category has a default percentage assigned and adjusts as the project moves forward. The assessment by the residential construction engineer makes up a portion of the overall grade, where they answer questions based on these categories. The system automatically alerts the Resident Construction Engineer if the contractor falls below the pre-determined Contractor Performance Score. The Contractor Performance Score is set at a default for new contractors and uses the Experience Modification Ratio as part of its determination. Once the system notifies the RCE of a CPS score dropping below a desired value they must take an action and record that they have done so. These actions can include stoppage of project, termination of contract, or

future restrictive bidding. To see the entire report prepared by SCDOT on their recent system upgrade, see Appendix G: SCDOT Contractor Evaluation System. (SCDOT, 2010)

In order to create a more objective evaluation system for the Kentucky Transportation Cabinet, attention has to be focused on using technological means that cut down on the time it takes to complete an evaluation. If the system is going to be simplified then there must be an increase in frequency of evaluation reports. The more regularly evaluations occur, the less the resident engineer has to recall to complete a form accurately. Questions on the evaluation need to be tailored to address areas that significant information is required to be submitted.

To implement a system similar to South Carolina, a complete overhaul of the current system would have to occur. Kentucky Transportation Cabinet currently runs a similar program to monitor projects already and this system could potentially be used in contractor evaluations. Site Manager is a program that is currently used in multiple departments of transportations. The program has the capability to log every detail of the project if used correctly, and the cabinet has begun to place a major emphasis on optimizing the program's abilities.

6.1 SiteManager Utilization

SiteManager is a recent development in the cabinet, and can be considered as a statewide database that stores information for every project that is currently being funded by the state. It also includes past projects that have been completed. All projects, no matter the amount of funding that is required, are incorporated into this program. The current system allows for records to be kept in every area of a project. Project estimates are currently ran through SiteManager, and material quantities are also recorded. The program can be used to issue change orders, where a reason code is used to describe the nature of the requests. Contracts are kept on file, and any documentation that occurs on the project is submitted through this program. The project schedule, duration, and working days charged can also be found in this database. Lastly, and most applicable to contractor evaluations, daily work reports are generated and issued using SiteManager.

The optimal solution to creating a more effective contractor evaluation system would be to utilize information that is already being inputted into SiteManager for other documentation.

Using these various inputs that are already mandated, they can serve as a conglomerate of data that will ultimately rate the contractor. At the end of the day on the project a technical assistant is required to file a daily work report. This daily work report covers any events that occurred on the project, as well as weather conditions or other unique circumstances which describe a picture of the daily activities that have occurred. An estimate for the project is typically run every two weeks at the end of a pay period. Before an estimate can be initialized all daily work reports for the project must be authorized by the office manager.

There are three levels of authorization in the program. On each level more access is granted into SiteManager Files. The highest level of access is the supervisor, which is typically controlled by the project engineer or section supervisor. The next level, which has medium access, is the office manager. The office manager role can be assigned to anyone necessary. The smallest level of access is usually given to the technical assistants to file the daily work reports.

The idea behind utilizing SiteManager as a key component to the contractor evaluation process is to have the forms connected to the daily work reports, working days charged, and budget information. Since most of this data is numerically inputted, having an evaluation that automatically references these areas would generate a solid report based on the entire project duration. SiteManager would ultimately generate the ratings based on the data given, and the engineer's only responsibility is to make sure they agree with the final output. This method would add more emphasis on an already mandated daily work report, and eliminate any subjectivity that occurs from an evaluator having to decide ratings one time, at the end of a project.

The next part of this report, describes the possible utilization of SiteManager on contractor evaluation forms. Ideally, the contractor evaluations could be added as one of the many components the program exhibits. If this occurs, then theoretically, the evaluator could simply request to run the evaluation based on program data. The procedure of implementing contractor evaluations into the system is an overall suggestion, and has several possibilities of modification should SiteManager be deemed as a feasible connection.

6.2 Procedure of SiteManager linked to Contractor Evaluations

Figure 12 shows the general procedure for SiteManager to run a contractor evaluation form in the event that it is added as a component to the program. There are five overall steps outlined which describe the general process. In theory, the contractor evaluation would reference two components throughout the project duration to compile a report. These areas are daily work reports, and working days charged. Estimates could also be referenced if the contractor evaluation form needed detailed data on project costs.

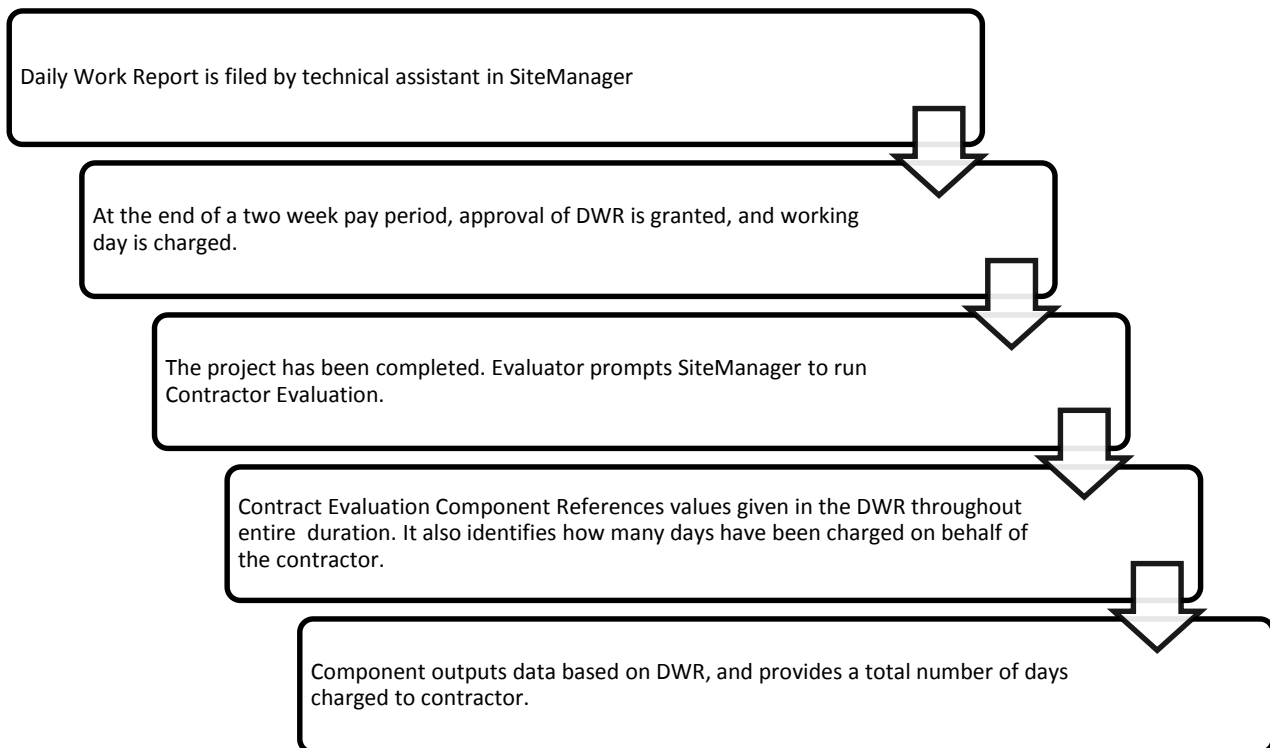


Figure 12: Process Chart of SiteManager

The first question at hand is who would have access to managing the report? The resident supervisor would be granted the authority to submit the evaluation, while the office manager role would have their current authority in finalizing daily work reports and they would also take on access to generate a contractor evaluation report.

Every day technical assistants file mandatory daily work reports, on which the cabinet currently places a major emphasis. The contractor evaluation system could reference the daily work reports that are submitted to combine daily information that would describe objective project parameters used in contractor evaluations. This would essentially create less work for the resident engineer when evaluations are due. They would click on the evaluation icon, and information from the project days would already be a part of the evaluation form or easily available for ratings.

Figure 13 shows the area where the contractor evaluation icon could be placed. The daily work report icon breaks down into more components in the office manager and supervisor screen. Technical assistants do not have this access; however they would not need access to the evaluation section either. Thus their role is to essentially fill out the daily work report tabs in an effective manner for the evaluation to be accurate. Hierarchal referencing should not be a concern since the daily work report component breaks down to further sections.

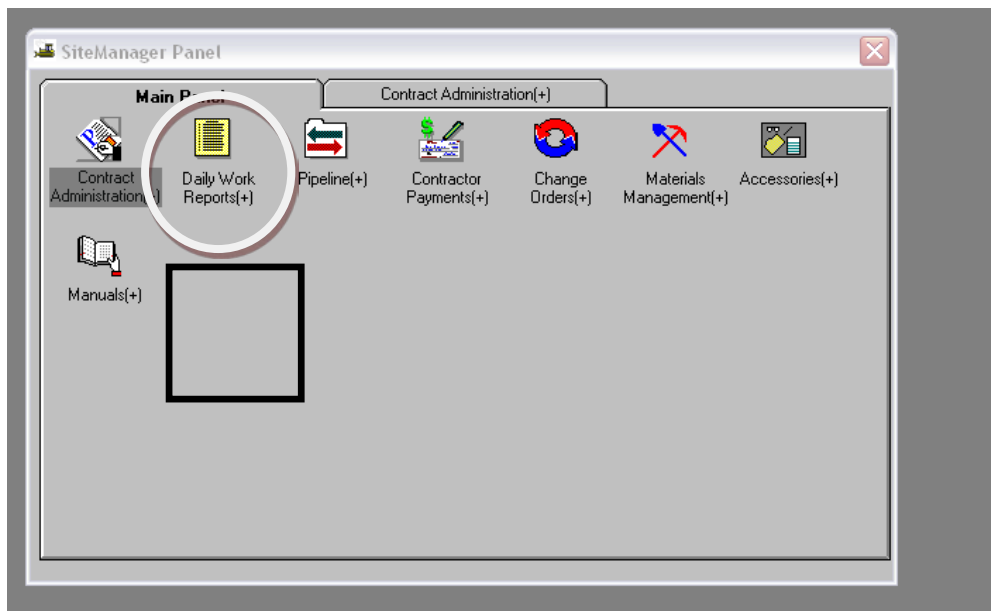


Figure 13: Contractor Evaluation Icon (SiteManager)

The evaluation form would need to reference the daily work report tab and also the diary tab which is only accessed by the resident office manager or the supervisor. The DWR tab has the bulk of information used on contractor evaluation forms, while the diary tab will tell information about the schedule and material quantities in the event these items are determined feasible on the

new contractor evaluation forms. Figure 14 is a screenshot of the diary and daily work report sections where the evaluation would extract data.

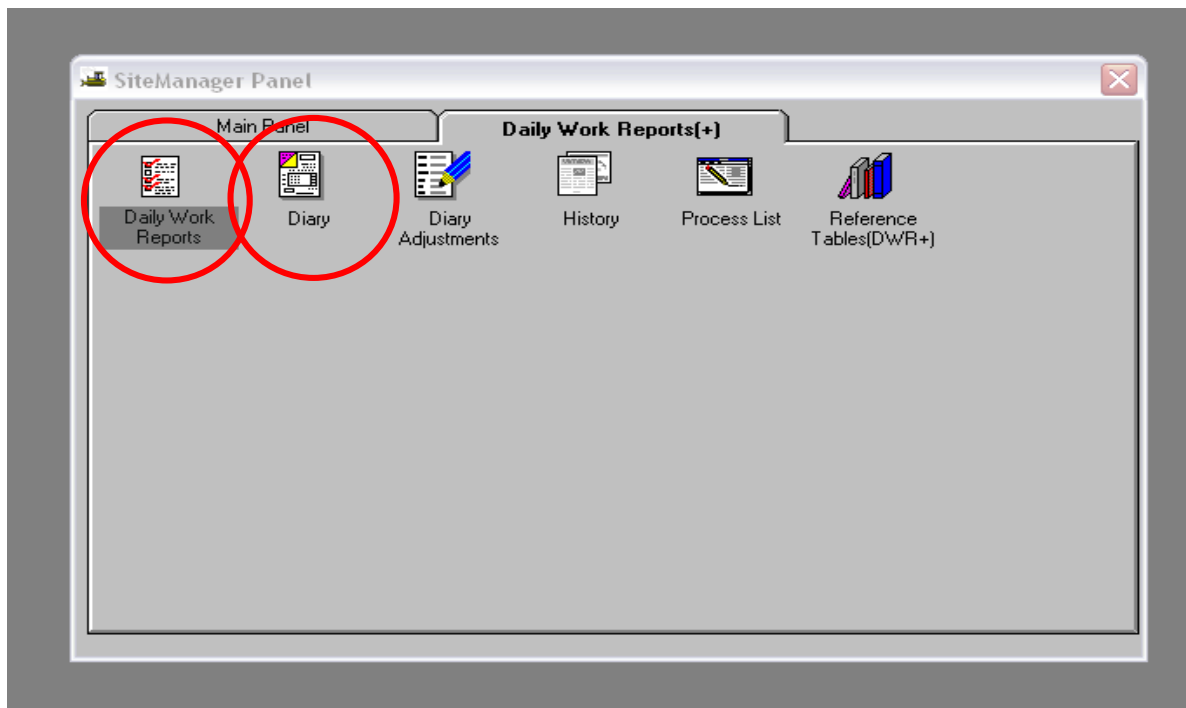


Figure 14: Diary and Daily Work Report Sections (SiteManager)

6.2.1 Daily Work Reports

The daily work report covers several areas of the project. The report consists of fourteen different parameters that information has to be inputted for every time there is a submission. A technical assistant inputs statements for each of the following categories:

• Weather Conditions	• No work items installed
• No contractors on site	• No daily staff on site
• Work suspended (time)	• Accident reports
• Begin and end time	• Controlling Operation
• Delay	• EEO
• Erosion Control	• General
• Material Deficiency	• Other

Table 5: Daily Work Report Categories

Figures 15 through 18 serve as a walk through in the daily work report process. On the left hand, bottom side, each of the categories is listed. The technical assistant goes through each category and makes remarks for that particular section, or inputs the required data (i.e. start and end time). They enter the weather conditions in the upper right hand side, and they also provide a check mark in the event no work items are installed, no contractors are on site, and/or there is no daily staff on site. All of this information is found under the first tab of the daily work report section.

Figure 15: Inside Daily Work Reports

Figure 16: Inside Daily Work Reports

Daily Work Reports

DWR Info. Contractors Contractor Equip. Daily Staff Work Items Force Accounts

Contract ID: 051057 Inspector: Guess, Jonathan D.

DWR Date: 10/21/10

Locked: No
Authorized: Yes
Authorized Date: 10/23/10

Temperature
High: 75
Low: 42

Weather Conditions
A.M.: Partly Cloudy
P.M.: Partly Cloudy

No Work Items Installed: ☐
No Contractors On Site: ☐
No Daily Staff On Site: ☒

Work Suspended: ☐
Suspended Time: 00:00
Resumed Time: 00:00

Remarks:
General ☒
Material Deficiency ☐
Other ☐

Paying 25% Demobilization.

Figure 17: Daily Work Reports

Daily Work Reports

DWR Info. Contractors Contractor Equip. Daily Staff Work Items Force Accounts

Contract ID: 051057 Inspector: Guess, Jonathan D.

DWR Date: 10/21/10

Locked: No
Authorized: Yes
Authorized Date: 10/23/10

Temperature
High: 75
Low: 42

Weather Conditions
A.M.: Partly Cloudy
P.M.: Partly Cloudy

No Work Items Installed: ☐
No Contractors On Site: ☐
No Daily Staff On Site: ☒

Work Suspended: ☐
Suspended Time: 00:00
Resumed Time: 00:00

Remarks:
Traffic Control ☒
Visitor ☐
Working Day Statement ☒

No Working Day Charged: Project Complete.

Figure 18: Daily Work Reports

The key factor from existing daily work reports is that technical assistants are already filling out what contractor evaluation forms tend to cover both on the existing KYTC form, and other states' evaluation systems. Thus, it would be efficient to determine a way to use these to cut the time down in completing an evaluation form. For example, in Figure 18 the technical system inputs a working day statement identifying if a working day was charged, and the reason for the

charge. This data is used by the office manager when they approve the DWR and permanently log that day against the contractor.

Also, a major increase in objectiveness would occur due to data being pulled from daily reports throughout the project duration. Similar to California, the system would monitor the project as it progresses instead of at project milestones. An evaluation form could still be generated and submitted at project milestones, but they would access data from daily reports instead of a project overview created by the project engineer.

Under the work items tab material quantities are listed for the project. In addition to the DWR information provided, these numbers could be referenced in the contractor evaluations. Material quantities or lack thereof, can often times limit the contractor's performance. This is a common area that can be directly related to an evaluation that is already being implemented in the daily work report section. Figure 19 shows an image of the work items tab.

Daily Work Reports

Contract ID: 051057 Inspector: Guess, Jonathan D. Date: 10/21/10

Project Nbr: DE07300600504 Line Item Nbr: 0010 Item Code: 00020 Category Nbr: 0001

Item Desc: TRAFFIC BOUND BASE Unit Price: \$72.08000

Supp Desc 1: Supp Desc 2:

Qty Reported to Date: 0.000 Qty Authorized to Date: 0.000 Units Type: TON

Qty Installed to Date: .000 Bid Qty: 50.000 Pay To Plan Qty: ☐

Status: Final Qty Paid to Date: .000 Current Contract Qty: 0.000

Loc Seq Nbr	Location Installed	Placed Qty.	Plan Page Number	Templ Used

Material Component	Material Inspection Detail		Reprt Matr Qty	Matr Unit
	Cont Est Matr Qty	Satisf Repr Matr Qty		
AGG - #57	0.000	0.000	0.000	TONS
BASE AGG - DGA	0.000	0.000	0.000	TONS
AGG - #710	0.000	0.000	0.000	TONS
AGG - #610	0.000	0.000	0.000	TONS

Figure 19: Daily Work Report, Material Quantities

6.2.1.1 Tailoring Daily Work Report to fit Evaluation Needs

The current daily work report system provides substantial information that can be directly inputted into an evaluation as it stands. However modification to the section could further optimize the data collection efforts in the evaluations. The work items tab currently has numerical values already in place in regards to material quantities. An evaluation report could

reference these values to generate an estimate on material shortages. Also, adding a numerical system to the daily work report information tab, filled out by the technical assistants, will greatly enhance the evaluation data. Implementing a numerical gage on how the day went on the project in regards to a certain category will not only allow for data to be generated, but it will also simplify the daily work report information that a technical assistant has to input. As of present they have to type a statement for every category even if there were no conditions for that area.

Figure 20 is an idea that would require an installation of a numerical system to be attached to the daily work report information. Instead of repeatedly entering in the same remarks every day if for example, no accident occurs; the tech would simply click “4.” If an accident occurs, remarks can be made at that time and a different rating can be applied.

The screenshot displays a web-based form titled "DWR Info." with several tabs: "Contractors", "Contractor Equip.", "Daily Staff", "Work Items", and "Force Accounts". The "DWR Info." tab is active, showing the following fields:

- Contract ID:** 051057
- Inspector:** Guess, Jonathan D.
- DWR Date:** 10/21/10
- Locked:** No
- Authorized:** Yes
- Authorized Date:** 10/23/10
- Temperature:** High: 75, Low: 42
- Weather Conditions:** A.M.: Partly Cloudy, P.M.: Partly Cloudy
- No Work Items Installed:** ☐
- No Contractors On Site:** ☐
- No Daily Staff On Site:** ☒
- Work Suspended:** ☐
- Suspended Time:** 00:00
- Resumed Time:** 00:00
- Remarks:**
 - Traffic Control:** ☒
 - Visitor:** ☐
 - Working Day Statement:** ☒
 - None Needed.** ☐
 - 4-No Accidents.** ☒
 - 3-Minor Accident.** ☐
 - 2-Major Accident.** ☐

A text box with the placeholder "Provide comments if accident has occurred in existing text area." is visible next to the accident rating options.

Figure 20: Improvements to DWR System

This creates more efficiency among the technical assistants, because they would no longer have to type the same sentences, instead they could click a number. The evaluation reports could directly reference these numbers and tabulate an overall rating based on daily values that are submitted throughout the entire project duration. Taking this step to implement such a parameter could be difficult, but the payoffs are tremendous. The DWRs become more simplified for the technical assistants, and the contractor evaluations become sufficiently objective due to the

amount of data on hand to imply a rating in a certain category. Figure 21 is another example demonstrated on the erosion control section.

The screenshot shows the 'Daily Work Reports' application window. At the top, there are tabs for 'DWR Info.', 'Contractors', 'Contractor Equip.', 'Daily Staff', 'Work Items', and 'Force Accounts'. The 'DWR Info.' tab is active, displaying fields for 'Contract ID: 051057', 'Inspector: Guess, Jonathan D.', and 'DWR Date: 10/21/10'. Below these, there are sections for 'Locked: No', 'Authorized: Yes', 'Authorized Date: 10/23/10', 'Temperature' (High: 75, Low: 42), 'Weather Conditions' (A.M.: Partly Cloudy, P.M.: Partly Cloudy), 'No Work Items Installed: [checkbox]', 'No Contractors On Site: [checkbox]', 'No Daily Staff On Site: [checked]', 'Work Suspended: [checkbox]', 'Suspended Time: 00:00', and 'Resumed Time: 00:00'. At the bottom, there is a 'Remarks:' section with a text area containing 'Comments here'. To the left of the text area is a list box with 'EEO', 'Erosion Control', and 'General'. The 'Erosion Control' item is selected and has a green checkmark next to it. To the right of the text area is a 'Spell Check' button. A tooltip is visible over the 'Erosion Control' item, displaying a rating system: '4-Erosion control in place', '3-Needs minor work', and '2-Major Work'.

Figure 21: Improvements to the DWR System

The rating system could be implemented in all fourteen categories covered under the daily work report information tab. It could also be carried over to the other tabs to provide data in areas not covered in this section. In most contractor evaluation forms the condition of equipment used on the job site is rated. The condition of equipment can be a safety concern, and the contractor's productivity can be indicative of how well the equipment runs on the project. Safety standards currently implement that equipment has to meet minimum guidelines in order to be used on site.

The daily work report section has a special tab for contractor equipment, where each item used on the project is recorded. The same rating system could be implemented in this section to describe the current conditions. Contractor evaluations could then reference this as a safety rating mechanism or an equipment rating that stands in its own category.

Daily Work Reports

DWR Info. Contractors **Contractor Equip.** Daily Staff Work Items Force Accounts

Contract ID: 051057 Inspector: Guess, Jonathan D. Date: 10/21/10

Contractor	Nbr of Supervisors	Nbr of Workers	Contractor Hrs Worked
02843 C J MAHAN CONSTRUCTION COMPANY LLC *** PRIME **			.000

Equipment ID - Description	Nbr. of Pieces	Nbr Used	Hours Used
Contractor equipment is typically reported here. Numerical system could be implemented to rate the condition of equipment on site using the same approach			

Figure 22: Improvements to DWR System

In summary, the daily work report is very similar to the contractor evaluation, and with a few small changes the system could be used to collect data that can in return be directly copied in to the evaluation form. The main idea behind this is to have the program automatically use the data provided to calculate the scores. It would be the responsibility of the engineer to approve the scores based on their discretion, and add comments that are necessary to comply with the evaluation.

For example, when the supervisor chooses to run the evaluation, rolling averages of daily scores are automatically shown. They have the option to veto, or include a comment due to the unique score. Eliminating typing on the technical assistant's behalf would allow them easier daily work report tasks. The data would be more objective because the scores are calculated by daily occurrences rather than the project overview.

6.2.2 Diary Section of SiteManager

The daily work report section covers the vast majority of information that is utilized on most contractor evaluation forms. There is one area that it fails to calculate, and it would not be easy to apply a rating system. However, the diary section, which is available to the office manager and the supervisor, covers this information. No current changes would need to be made in this area; the contractor evaluation form could simply reference the values.

When a person authorizes a DWR (Usually RE or SUP) they charge the working day. The charge tab, after authorization will show how many diary charge days have been accrued over the project duration. It also shows the number of no charge days and adjusted totals based on specific circumstances. The number of days charged on a project can be directly linked to the project schedule's health. Evaluations could reference this number and compare it to a pre-established ideal number of days on the project. If the project is falling behind or ahead then the evaluation can rate accordingly. Or the number of days charged can be totaled at the end of a project (the system already totals every time a day is charged) and the evaluator can determine if the project ran behind schedule at the expense of the contractor.

Figure 23 is a screen shot of the charge tab in the diary section. The working days charged also comes with a credit reason that must be stated in order for the authorization of a complete daily work report occurs. For example, a no charge day can occur if it is raining, the site is too wet, holiday, weekend, etc.

Mlstr Nbr	Milestone Description	Charge Amount	Credit Reason
-----------	-----------------------	---------------	---------------

Figure 23: Working Days Charged

Using the daily work reports to generate most of the information behind the contractor evaluation form eliminates time on the engineer and technical staff, while creating more objective results. The daily work report can be used in nearly every category the evaluation form wishes to cover, while the DWR approvals (diary tab) would be used to report the working days. This would be an indication on how the schedule is running, and the data analyses conducted verified that schedule health is an objective category for evaluation.

6.3 Cost Analysis on SiteManager

The solution to produce evaluations through a system such as SiteManager will be worrisome due to the expenses associated. The overhaul to the current evaluation process, and the modifications needed on the program will come at a costly price tag. However, there must be consideration given to the fact that the current system has been updated on a ten year basis, and none of the solutions have been as desirable as first conceived. This is largely due in part that when a contractor evaluation system is implemented, the task is unrelated to other housekeeping activities that an engineer already has in place. Adopting an entirely new process can be much more cumbersome and the time needed for the system to become a custom could take a while. Using SiteManager would modify a current activity already in place, and not only make that process easier for the technical assistants, but allow for objective and feasible evaluations to be generated with less efforts by all associated. Just how feasible the SiteManager would be can be considered with the following questions:

- How long does it take the resident engineer to complete the evaluation form?
- How much is this person's time worth?
- Will this objectify the evaluations?

The time spent on an evaluation form can vary for an engineer. Ideally, the evaluations would take a substantial period of time, where the evaluator takes time to thoroughly rate a contractor and provide proper justification. If the contractor evaluation report is filled out adequately, then the time taken to complete the process can take a couple of days, to allow the engineer time to research the project's documentation and milestones. The research shown in this report reveals that this is hardly ever the case, and 4.0 ratings are given. Most likely, it can be assumed that an evaluation form typically turned in by an evaluator takes less than 30 minutes to complete.

Ideally, a middle ground could be achieved with this timing. It is not feasible to have an evaluation form tie up an engineer for multiple work periods; however it is justified to ask that they assert a degree of concern when completing the form. Allowing the contractor evaluation system to be implemented into SiteManager achieves the optimal experience. An engineer can generate the report, based on objective data, with one click. It is then left up to them to verify that the data used to generate the evaluation form has appropriately addressed the contractor's performance. Only in extreme situations would an engineer feel obligated to override the system's evaluation. Overall, a substantial time decrease can occur on the evaluations, and a more objective report can be formulated as a result. Table 6 shows a surface level cost analysis on the savings that can occur if SiteManager were to be implemented.

Cost Comparison	Eval Time (hr)	Number of Evals (month)	Engineer Wage (hourly dollars)	Money Spent on Evaluations	Number of Engineers Evaluating	Cost per Month per District	Cost per Year Per District	Total for KYTC Annually
Traditional Method	0.5	5	\$ 21.33	\$ 53.33	20	\$ 1,066.67	\$ 12,800.00	\$ 115,200.00
	0.5	10	\$ 21.33	\$ 106.67	20	\$ 2,133.30	\$ 25,599.60	\$ 230,396.40
SiteManager Method	0.33	5	\$ 21.33	\$ 35.56	20	\$ 711.10	\$ 8,533.20	\$ 76,798.80
	0.33	10	\$ 21.33	\$ 71.11	20	\$ 1,422.20	\$ 17,066.40	\$ 153,597.60
Savings	Based on 5 Evaluations a Month			\$ 38,401.20				
	Based on 10 Evaluations a Month			\$ 76,798.80				
Assumptions	Engineer Salary	\$4000 per Month						
	Engineer Hours	187.5 Hours per Month						

Table 6: Cost Comparison Table

An emphasis must be placed on the simplicity behind merging the evaluation system daily tasks within SiteManager. In some districts, templates are already made to provide descriptions in daily work reports because technical assistants are not equipped to work efficiently with computers. The idea of training the staff to become more functional is a possibility, but this would cost in terms of time and money as well. The evaluator's time is worth a lot to the state because of the fact that the savings in SiteManager could almost pay for the upgrade by itself in one year. Clearly, a lot of time is needed to turn in an accurate evaluation form, and the engineers that are required to complete the reports are getting paid a substantial salary. Cutting their time on housekeeping documentation creates room for them to allocate their duties elsewhere in areas of high importance. The ratings that are generated from a collection of numerical data that occur from daily work reports will create the possibility to have the evaluation forms weigh more heavily in contractor pre-qualification. There is a concern that not

a large amount of attention should be given in the performance area, because the criterion for a successful project range from evaluator to evaluator. The SiteManager solution would allow for a set of parameters to be consistent from project to project, and the mass accumulation of data would minimize inconsistency in reviews that can occur depending on the evaluator. Overall, a savings of roughly 30,000 to 75,000 dollars a year on evaluations alone is a number that justifies an investment in SiteManager. These numbers are based on conservative figures, where an engineer at the cabinet often makes more than 4,000 dollars a month, and the district often employs more than 20 engineers that are required to fill out evaluation forms.

6.4 Conclusions Drawn from Possible Solutions

The contractor evaluation system that the Kentucky Transportation Cabinet currently uses can be classified as ineffective when looking at the process's entirety. To develop a solution that addresses the issues the system faces, a large emphasis has to be placed on the importance of evaluations. Several states have turned to an electronic means of contractor evaluations, and to do so there was sufficient time and money placed in efforts to revamp their systems. The answers to the problem are big and small. Starting with the current rating system, the evaluator is going to most likely give a four due to the requirement of providing justification otherwise. Also, the rating scale never changes throughout the entire evaluation and this can be indicative of pattern ratings shown in the statistical analyses.

A more holistic solution can also be utilized, by developing a technical program that monitors the project on a more invasive level. South Carolina currently implements a rating system that collects data throughout the entire project and automatically notifies personnel in the event a contractor performs below satisfactory. A system of this nature would be a complete overhaul compared to the current system where evaluations are processed on paper and filed. However, a system of this magnitude is not completely out of reach because Kentucky is one of the states that use SiteManager as a library for project information.

Creating a contractor evaluation system within SiteManager would be the most efficient alternative to providing an objective, simple, rating process. Although a lot of upfront costs would accrue due to the modifications necessary in SiteManager, there is a lot of simplification in current SiteManager practices and a new contractor evaluation system that would be possible.

Adding a rating system to daily work report information categories would allow for technical assistants to veer away from typing repetitive sentences on a daily basis. A lot of technical assistants face challenges in computer technology, and this would greatly reduce the stress that daily work reports currently enact. They would simply rate the fourteen categories on a daily basis, and only provide statements if the rating must fall below standards according to the scale definitions. Simultaneously, these values can be linked to the contractor evaluations, and when a project engineer has to generate a report all of these values will be available. This limits the effort an engineer has to make to recall project mishaps or circumstances that should be applied to evaluation ratings. The evaluation can run a calculation and even generate the rating for the engineer to simply verify as accurate.

In addition to the daily work reports, the diary section keeps the number of working days charged on a project and the reasoning behind each charge or no charge. If the evaluation has this total available when a report is generated, the evaluator can easily determine if the project has abided by the intended schedule or if major delays have occurred.

Overall, a substantial amount of energy has to be used when developing a solution to the current evaluation system. To generate more objective and accurate results it is necessary to turn to technology to serve as an aid in the evaluations. Using SiteManager as the technology will essentially make the two systems better for everyone involved, and the subjectivity behind evaluations would be eliminated if the ratings were being calculated independently.

7.0 Revised Form

7.1 Introduction

The purpose of the previously discussed research was to identify the most important areas in evaluating contractor performance in order to improve upon Kentucky's own contractor evaluation forms. While the old form has to be printed off and filled out, the new form can be done electronically, as it was made using Excel with Macros, thus making it easier to work with and distribute to the relevant parties that must complete the evaluation. The proposed new form combines elements of the old form with those that were found to occur most frequently in other states' evaluation processes in order to create one in which the evaluations are more reflective of the actual work that has been completed by the contractor. In examining the research, it was determined that some questions should be weighted differently than others with regard to importance, and thus a survey was created and distributed to Kentucky Transportation Cabinet employees as well as contractors to gather input on what they believe to be the most important elements of the construction project process. The results of this survey will be used to finalize the form through the weighting of various categories.

7.2 Contractor Performance Report Form

After analyzing the results from different states, three main areas were identified as the most frequently occurring and least subjective in nature. These categories include contractor work performance, safety and traffic control, and environmental regulations. From these areas, a total of eight questions were created, where contractors will be evaluated on a scale from one to five, with three typically being the average acceptable standard and five signifying that the contractor exceeded expectations in this section. Because the significance of the ratings vary by section, a detailed explanation of what each number means is provided in a comment box. The following sections will explain more thoroughly the ratings chosen for each category.

7.3 Contractor Work Performance

The first category on the form, contractor work performance, is comprised of a total of five sections: overall quality of work of the contractor, overall quality of work of any subcontractors,

meeting of contract dates (including approved extensions), completion of job closeout activities in a timely manner, and cooperation/coordination with KYTC's Project Staff.

7.3.1 Overall Quality of Work of the Contractor

Based on the analysis, the overall quality of work of the contractor was found to be a necessary component to any evaluation forms. A rating of one in this section signifies that there were removals or replacements or that there were deductions in greater than 10 percent monetarily of the work, with the project being completed without addressing the structural engineer's punch list. A two for this section means that the removal or replacements or deductions were no more than five percent monetarily of the work, with the project being completed without addressing the SE's punch list. A three means that the work was acceptable and that all corrective work or deficiencies were addressed in a timely manner. A four signifies that there was no major corrective work, but perhaps some for the contractors. A five means that the work was formally accepted at the final inspection, with no corrective work or material deficiencies.

7.3.2 Overall Quality of Work of Any Subcontractors

For this component, the same rating scale as discussed above was used to evaluate the work of any subcontractors.

8.3.3 Meeting of All Contract Dates, Including Approved Extensions

For this section, contractors are evaluated with regard to how well they stick to the time table for completing the project. A one means that the project was completed after the proposed completion date or working days by 10 percent of the bid/change order amount, while a two means that it was completed by no more than five percent of the bid/change order amount. A three signifies that the project was completed on time within the project's completion date or working dates. A four for this section means that it was completed ahead of the completion date or working days by five percent of the bid/change order amount, and a five means that It was completed ahead of time by 10 percent of the bid/change order amount.

7.3.4 Completion of Job Closeout Activities (Punch List, Cleanup, Paperwork, etc.) in a Timely Manner

For this section, the ratings correspond to how well the contractor completed any job closeout activities, including the punch list, cleanup, and paperwork with regard to the schedule of the project. A one means that the contractor failed to complete any corrective work within 100 days of the Comprehensive Final Inspection Report, with the exception of seeding and landscaping, while a two means that they failed to complete the work within 90 days. A three signifies that all corrective work was completed within 90 days of the Comprehensive Final Inspection Report, while a four means that it was completed within 30 days. A five means that there was no corrective work, and the project was formally accepted at the final inspection.

7.3.5 Cooperation/Coordination with KYTC's Project Staff

In this section, the ratings reflect whether or not the contractor was able to successfully work with the Kentucky Transportation Cabinet to complete the project. A rating of one means that the contractor did not work using a schedule nor did he or she keep KYTC informed of any changes or problems. Also, any requests for information, submittals, or records were routinely ignored and numerous complaints from private citizens were not addressed. A two signifies that the contractor used a schedule but did not keep KYTC routine informed, nor were requests for information timely and comprehensive. A three represents acceptable work on the part of the contractor. A four signifies that the contractor made efforts to schedule work and met contract requirements even though there may have been difficulties with utilities, right-of-way, flooding, and other issues. The contractor was able to minimize the impact of any delays for the Cabinet. A five for this section means that the contractor was actively engaged as a project partner by coordinating progress meetings, scheduling work around events and delays, and using forces and engineering to meet contract requirements even though there may have been difficulties. The contractor not only minimized the impact of delays, but also put forth valuable engineering suggestions in order to enhance the project.

7.4 Public Safety and Traffic Control

The second section on the form, Public Safety and Traffic Control, is divided into two categories: maintenance of traffic including proper signage, working during allowable hours, and public notification, and overall safety of employees including subcontractors.

7.4.1 Maintenance of Traffic (Proper Signage, Workers Worked During Allowable Hours, Public Notification)

For the first category in this section, the ratings pertain to how well the contractor maintained traffic during the construction process, through the use of proper signage, working during allowable hours, and public notification. A one for this category means that the contractor installed traffic control devices, such as lane closures and double fines, but they were not to standard, and they did not address the issues without KYTC directive. A two means that the contractor worked beyond or outside of the allowable hours and/or may have neglected sign removal, such as flagman ahead or double fines. A three signifies acceptable work. A four represents that there was an incident free work zone, and the contractor worked well with law enforcement as well as the public. A five means that the contractor was completely involved in the project, actively engaging advance warning techniques, oversize vehicle considerations, media disinformation, LEO's and on-site traffic technicians.

7.4.2 Overall Safety of Employees, Including Subcontractors

The ratings for this category represent whether or not the contractor kept in mind the safety of all employees throughout the completion of the project. Because safety of employees should be a priority, an extra rating of zero was included in order to signify that the contractor had multiple OSHA citations leveled against the project and safety issues were not being communicated with the project partners. A one means that the contractor received OSHA citations, or other serious hazards were noted by the SE and not immediately corrected. Safety issues were again not communicated with the project partners. A two represents that there were minor hazards noted by the SE, but there was minimal communication regarding any safety issues. A three signifies that the work was acceptable and that no hazards were noted. A four means that there were safety meetings held that were verified, and that all safety concerns were communicated. A five represents the total safety project involvement by all project partners, who were involved with

safety meetings and the communication of potential safety problems being distributed to all parties, including the SE and state personnel.

7.5 Environmental Requirements

The final section, environmental requirements is comprised of one category, performance of environmental mitigation methods. While environmental impact is of concern to most projects, there were exceptions found with a few minor ones, such as the implementation of road fencing. A method for scoring these types of projects will be discussed in a later section.

7.5.1 Performance of Environmental Mitigation Methods

For this category, the ratings represent whether or not the contractor adhered to various environmental mitigation methods throughout the construction process. A one represents that EPA fines were leveled against the project. A two means that progressive seeding was not completed per permit or 14 days of the final dressing of one acre or more. Measures such as silt fencing and checks were not maintained or installed to the point that the SE wrote a five day letter. The reseeding of the project occurred more than once in order to establish vegetation. A three signifies that these measures were not maintained or installed to the point that the SE wrote a five day later, and reseeding of the project occurred more than once in order to establish vegetation. A four means that seeding was established with no corrective work at the completion of the project. A five represents that seeding was established, in larger part, before the project was completed, and that no corrective work had to be done at the completion of the project.

7.6 Survey

While the new form was created in hopes to improve upon the old one, discussions are still being conducted with regard to how the finalized version will be weighted and used in the evaluation of contractors. In order to determine what elements of the form that KYTC employees and contractors felt were the most important aspects to be evaluated, a survey was created and distributed to gather input using an online program called SurveyMonkey. The survey was comprised of four questions that gathered information regarding the types of employees being surveyed, how they would rank the nine categories from the form, why they chose to rank them the way they did, and any additional feedback they had regarding the new contractor evaluation

form. The results from this survey will be used to weight the different categories on the form in order to provide an evaluation that is reflective of the expectations of contractors on construction projects.

7.6.1 Survey Results

After the survey was sent out, the results were analyzed to determine how to weight the different categories on the form. Out of the 39 respondents, 32 were Kentucky Transportation Cabinet employees, and seven were contractors working for the state. The following shows the breakdown of respondents:

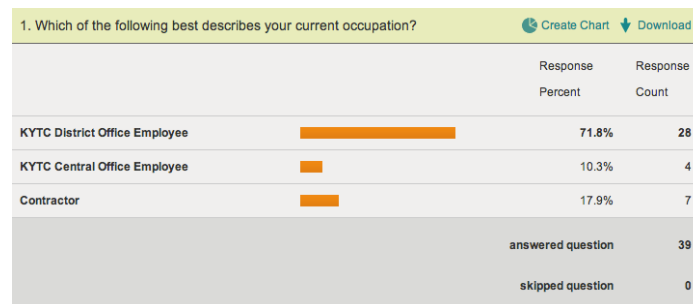


Figure 24: Breakdown of Respondents

The overall results for question 2 are summarized in the following image:

2. Please rank the following in order of importance, with 1 being the most important and 9 being the least important when evaluating contractor performance on a job. Once you select a ranking, the choices will automatically rearrange to that order.											 Create Chart	 Download
	1	2	3	4	5	6	7	8	9	Rating Average	Rating Count	
Overall quality of work of the contractor	61.5% (24)	17.9% (7)	15.4% (6)	5.1% (2)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	1.64	39	
Quality of work of any subcontractors	0.0% (0)	41.0% (16)	15.4% (6)	25.6% (10)	12.8% (5)	5.1% (2)	0.0% (0)	0.0% (0)	0.0% (0)	3.26	39	
Meeting of all contract dates (including approved extensions)	2.6% (1)	2.6% (1)	17.9% (7)	25.6% (10)	25.6% (10)	7.7% (3)	12.8% (5)	2.6% (1)	2.6% (1)	4.72	39	
Completion of job closeout activities (punch list, clean-up, paperwork, etc.) in a timely manner	2.6% (1)	2.6% (1)	7.7% (3)	5.1% (2)	30.8% (12)	38.5% (15)	7.7% (3)	2.6% (1)	2.6% (1)	5.33	39	
Maintenance of traffic (proper signage, workers during allowable hours, public notification)	5.1% (2)	15.4% (6)	23.1% (9)	20.5% (8)	12.8% (5)	12.8% (5)	10.3% (4)	0.0% (0)	0.0% (0)	4.00	39	
Quality of equipment used	0.0% (0)	2.6% (1)	2.6% (1)	2.6% (1)	2.6% (1)	2.6% (1)	25.6% (10)	30.8% (12)	30.8% (12)	7.54	39	
Productivity of equipment Used	0.0% (0)	0.0% (0)	0.0% (0)	2.6% (1)	2.6% (1)	2.6% (1)	12.8% (5)	48.7% (19)	30.8% (12)	7.95	39	
Overall safety of employees (including subcontractors)	28.2% (11)	15.4% (6)	15.4% (6)	10.3% (4)	10.3% (4)	12.8% (5)	2.6% (1)	2.6% (1)	2.6% (1)	3.36	39	
Performance of environmental mitigation methods	0.0% (0)	2.6% (1)	2.6% (1)	2.6% (1)	2.6% (1)	17.9% (7)	28.2% (11)	12.8% (5)	30.8% (12)	7.21	39	

Figure 25: Summarized Results

The individual results were then analyzed and totaled for comparison. These appeared as follows:

	1	2	3	4	5	6	7	8	9
Overall quality of work of the contractor		X							
Quality of work of any subcontractors				X					
Meeting of all contract dates (including approved extensions)			X						
Completion of job closeout activities (punch list, clean-up, paperwork, etc.) in a timely manner					X				
Maintenance of traffic (proper signage, workers during allowable hours, public notification)				X					
Quality of equipment used									X
Productivity of equipment Used							X		
Overall safety of employees (including subcontractors)		X							
Performance of environmental mitigation methods								X	
Comments:									

Figure 26: Example Survey Rankings

The individual rankings for KYTC employees can be found in Appendix F, while those for the contractors can be found in Appendix G.

These totals were then entered into Excel in order to create histograms for the comparison of distributions for each category. For example, the distributions for the rankings of the overall quality of work of the contractor are as follows:

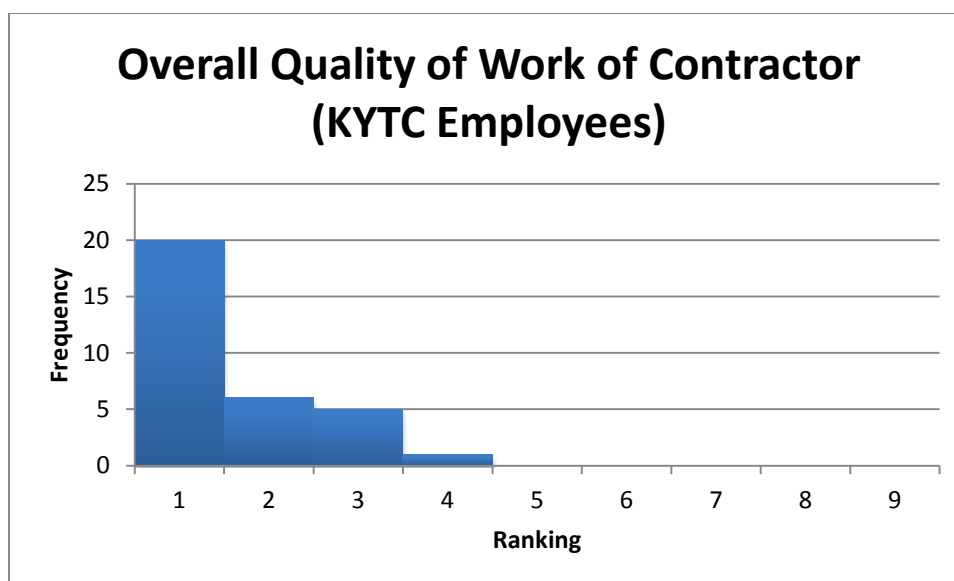


Figure 27: Example Ranking, Overall Quality of Work by KYTC Employees

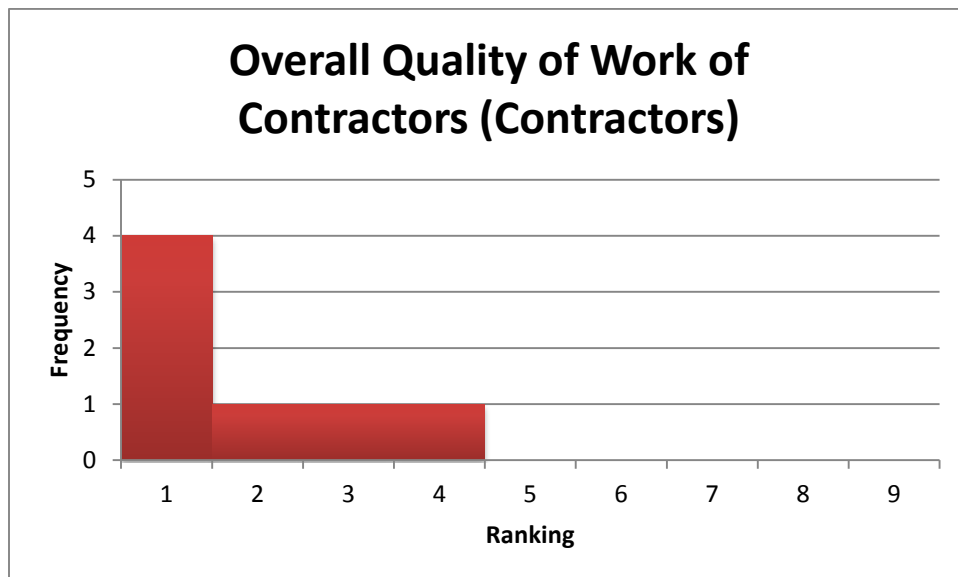


Figure 28: Example ranking, Overall Quality of Work by Contractors

For the full set of results, please see Appendix H.

Based on an analysis of these results, two of the criteria were determined to be most significant, both for employees of the Kentucky Transportation Cabinet as well as the contractors that participated in the survey. These criteria were the overall quality of work of the contractor, which includes any subcontractors whose work is valued at less than \$50,000, and the overall safety of employees, including any subcontractors. Thus, it was determined that these two criteria would be weighted more significantly than the others. Additionally, questions regarding the quality and productivity of the equipment used were removed, as suggested by many of the respondents who felt that these were encompassed by other criteria.

7.7 Finalized Form

With regard to the new evaluation form, the next step was to take the results of the survey and come up with a weighting system that emphasizes different aspects of the evaluation process, as well as address any initial concerns that KYTC employees and contractors had with the new form. For the weighting system, criteria A1, overall quality of work of the contractor (including

any subcontractors <\$50,000), and criteria B2, overall safety of employees (including any subcontractors), were given a level five weighting, while the rest were made to be a level three. This means that with regard to these sections, the points carry more significance toward the overall contractor score for the project.

Another concern that was addressed with the rating system was with regard to criteria C1, performance of environmental mitigation methods such as proper signage, maintaining of silt fencing, and erosion control. For projects where these do not apply, a score of zero can be entered and this section of the form will be removed from the overall total score.

The form itself is out of a maximum score of 125 points, or 110 if environmental mitigation methods do not apply to the project. Category A contributes a total of 70 points to the overall score, while Category B makes up 40 points and Category C can add an additional 15 points. For contractors meeting the minimum satisfactory performance, receiving a rating of three for each of the criteria, they would score 75 points, or 66 without section C1.

Name of Contractor _____		CID _____	
Contractor Address _____		Phone No. _____	
City _____		Zip Code _____	
Contractor Performance Report			
CATEGORY			
Element	Level	Rating	Max Score
A. Contractor Work Performance (Max=70)			
A1. Overall quality of work of the contractor (including subcontractors <\$50,000)	5	3	15
A2. Meeting of contract dates (including approved extensions)	3	3	9
A3. Completion of job closeout activities (punch list, clean-up, paperwork, etc) in a timely manner	3	3	9
A4. Cooperation/Coordination with KYTC's Project Staff	3	3	9
CATEGORY A TOTAL			70
B. Public Safety and Traffic Control (Max=40)			
B1. Maintenance of Traffic (proper signage, workers worked during allowable hours, public notification)	3	3	9
B2. Overall Safety of Employees (including subcontractors)	5	3	15
CATEGORY B TOTAL			40
C. Environmental Requirements (Max=15)			
C1. Performance of environmental mitigation methods (e.g. maintaining silt fencing, erosion control)	3	3	9
CATEGORY C TOTAL			15
Section I Maximum Score			125
Comments:			
print _____		date _____	District 12
sign _____			

Figure 29: Finalized Version of Form

8.0 Results and Conclusions of Research

There were 25 states used in this research to establish a means of comparison for the Kentucky Transportation Cabinet's current contractor evaluation system. Two major divisions occurred between the states. Twenty-one states use contractor evaluations in an indirect manner, which implies that there is no direct relationship between pre-qualification capacity and contractor performance. These systems require that a form be filed during various intervals of the project, but then they are simply kept on file in the event a necessary action needs to occur against a contractor. Kentucky follows suit with three of the 25 states, where evaluation forms are linked to a calculation that affects pre-qualification standards. The one other direct state, Maryland, applies the forms into calculations pertaining to retainage reduction because they currently do not pre-qualify contractors.

One of the main considerations when looking at the structure of the evaluation forms was developing a measure of efficiency for each form. To find a good measure, each form was given a point for the every question that covered a different area of a project. A total number of points were added, and then the number of pages that the evaluation form included was then subtracted. The form scoring the highest was termed as the most effective form because they covered the widest range of a project in the least amount of questions. Kentucky scored around average using this procedure.

In order to investigate the structure of Kentucky's current evaluation form, a break-down of each form on file for the research occurred. Categories were determined by comparing each form and finding commonalities among them as a whole. The common areas established were: quality of work, work performance, safety, schedule, cost association, organization, minority, and environment. Each of the 25 forms was divided into percentages regarding these categories. Kentucky's form was treated the same, and the percentages within categories were compared to the other states as a whole group, and also specifically the states that mimicked Kentucky's direct application. The national percentages for the forms show that Kentucky is trailing in every category with the exception of organization and environment. The largest category for both Kentucky and the other states combined was Management and Organization. Compared to the

direct states, Kentucky falls below in every category regarding content with the exception of organization and management where they have the second highest percentage of questions compared to the others.

These results imply that Kentucky's current evaluation form structure is lacking in many areas that are pertinent to ensure accuracy. The current impact of the form on pre-qualification standards is relatively minimal, leaving little threat for contractors that perform below average on a repetitive basis. The analyses on the evaluation forms content reveals that not only are the forms having no impact, but their overall composition compared to other states is relatively below average in clarity and coverage on project matters. However, the information revealed by the structural analyses only compares Kentucky to other states, thus it was necessary to find just how accurate the current evaluation form was within the transportation cabinet.

One of the major observances that several staff members appointed to this research project discussed is that evaluators often give an average rating of four on every question on the form. This further relates to the assumption that a four is being given due to the fact that if any other rating is given proper justification is required. On an annual basis, the pre-qualification committee uses evaluation forms to justify the performance percentage of a contractor which is tied into their overall bonding capacity. When the pre-qualification engineer pulls the evaluations most commonly he finds them useless because every question on every form is rated a four. Thus the evaluation forms do little to justify a contractor's actual performance record.

The assumptions established by the transportation cabinet were used to generate a hypothesis that there is little variation among the forms. If this hypothesis were proven to be true, then there is sufficient evidence that shows that the current evaluation system is ineffective. To test the proposition past contractor evaluation forms were pulled. Seven contractors were used, and an attempt was made to include a diverse set of contractors for the study. Out of the contractors selected, 73 forms were found. The contractors varied from sub-contractor to contractor, had different pre-qualification ratings based on their performance, and acquired projects of different funding levels.

Multiple analyses were run on the ratings given on each of the forms. There was only trace amounts of variance found when considering ratings grouped by contractors, and ratings grouped

by questions. A breakdown analysis of questions was used to determine if any of the areas covered on the evaluation did show variance, which would theoretically show where the form had objective points. Using this analysis, some questions did show variance in areas that related to quality of work, contract dates, job closeout activities, public and workplace safety, and environmental parameters. The reason that these areas had more variance can be attributed to requirements of documentation that are mandated by the cabinet. Overall the results showed that the assumption, that contractor evaluation forms are ineffective, was verified through the testing procedures implemented.

The areas researched in this report show that Kentucky's current contractor evaluation form and system are in need of improvement. The transportation cabinet needs to consider new alternatives to the system as opposed to updating the current process. Many of the 25 states have turned to technical tools in order to make their contractor evaluation processes more objective and efficient. A flagship example of this action is South Carolina's recently modified system where the contractor is modified at all times of the project and in the event their contractor performance score drops below a pre-determined rating, then it is required for specific action to be taken.

Based on this conducted research, a new electronic version of the form was developed using Microsoft Excel using the criteria that was found to be objective from each state. The form is divided into three categories that include Contractor Work Performance, Public Safety and Traffic Control, and Environmental Requirements, with each of these having their own subcategories. Subcategories of Contractor Work Performance include (1) the overall quality of work of the contractor, including subcontractors that complete work values at less than \$50,000, (2) the meeting of all contract dates, including approved extensions, (3) the completion of all job closeout activities (punch-list, cleanup, paperwork, etc.) in a timely manner, and (4) the cooperation/coordination with KYTC's Project Staff. Subcategories for Public Safety and Traffic Control include (5) maintenance of traffic (proper signage, workers worked during allowable hours, etc.) and (6) overall safety of employees, including subcontractors. Finally, the subcategory for Environmental Requirements is (7) the performance of environmental mitigation methods, such as maintaining silt fencing and erosion control. These subcategories total to seven criteria upon which a contractor's performance is evaluated.

Each subcategory was then weighted based on the results of a survey sent to members of the Kentucky Transportation Cabinet as well as contractors employed by the Kentucky Transportation Category. The results of the survey showed that quality of work and safety stood out when it comes to evaluating contractors, while the other subcategories received a mixed level of importance. Thus, the overall quality of work of the contractor and the overall safety of employees were weighted as level five criteria, while the rest of the subcategories were weighted as level three.

The form is programmed to find the maximum possible points for the contractor passed on the selection of certain criteria. If the project necessitates environmental mitigation methods, the total possible points are 125. However, if environmental mitigation methods are not a concern for the project, then the total possible points reduces to 110.

The future goal for this project is to determine how these forms and their scores will be used in order to signify the eligibility of contractors for work, as well as determine what will happen should a contractor fail to meet the minimum standards with a rating of three for each of the criteria. This is a step that will involve collaboration with the Kentucky Transportation Cabinet and an analysis of previous projects using the new form.

Another important factor to consider is the report submission requirements. The cabinet currently requires that an evaluation form be submitted at the end of each project. Most other states require that reports be filed on an interim, project completion, and annual basis. Creating more than one period for evaluation on a project would allow for more accuracy to occur on the ratings. The pre-qualification would also have more data to use when recommending the percentages based on a contractor's performance. If Kentucky were to follow this suggestion, then it is necessary that a technical program be implemented to assist in contractor evaluation form production. This implies that KYTC should adopt a computer program where evaluation reports can be submitted electronically instead of on paper. The designated area for evaluation forms to be kept on file is already limited with one report being turned in per project. As the amount of projects continues to increase, and if more than one form was required for a project, there is essentially no means in storing all of the data without the aid of technology.

On a national level, every state needs to consider the alternative of creating a technical evaluation system. Computers can now calculate ratings and manage progress efficiently, and this eliminates a lot of the responsibility an evaluator faces. Also, it creates a more blind approach to contractor performance ratings, because regardless of the evaluator, a computer system will not have a relationship where they feel pressured to rate based on reputations or connections. Developing systems where the evaluator simply inputs project information minimizes the impact they have on a rating, and creates a more objective and consistent evaluation. Many of the states with evaluation systems currently in place use Microsoft Excel sheets or programs of similar features to create the reports. Even if the funding is not available to create a system that generates a report or monitors a contractor for the department, using Microsoft Excel creates a paperless submission and a faster approach.

In summary, a system needs to be developed using technology, and the questions need to cover objective parameters that are easy to recall on a project. A lot of paperwork and documentation occurs on a project and the analysis showed that areas that require documentation provide more variation in ratings. This is because an evaluator has already spent time discussing that area of a project so it is easy for them to apply a rating. Contractor performance reports should be tailored in such a manner that questions are “black and white” and the justification can easily be applied.

When sentiments are taken from this report on the research behind the current contractor evaluation system’s status, consideration must be included due to some limitations that existed in various aspects. Phase one of the project consisted of contacting each state via phone, e-mail, or website. The results included in the report were given by a credible employee of the corresponding department of transportation for a given state. Most of the assistance was derived from administrators specifically in chief construction engineering positions. Thus, their opinions on the system were used to develop an idea of the associated process. They also often times provided a detailed overview of how their system was implemented whether it be by indirect or direct means. Every effort possible was made to find a source or credible employee to include in the research findings.

Some restraints occurred during the process of collecting contractor evaluation forms. The original intent was to use contractors who worked in separate areas of the state. However, due to the volume of contractors for districts five, six, and seven as opposed to the other areas, an

exemption was made to include more contractors from the central Kentucky area. This method was justifiable because when considering the volume of work across the state, most of the projects lie within this region. Also, the amount of forms associated with a contractor varied because of the attempt to find contractors whom different percentages had recommended to the pre-qualification board based on their performance records. Thus one contractor was pulled because they had a performance rating of 45 percent, and an actual reduction in bonding capacity occurred. The data, even with the associated limitations, verified the hypothesis that there was no variance in scoring. It was concluded that the results were relevant and the data accumulated was acceptable.

The research conducted in this report showed that Kentucky's current contractor evaluation system needed improvement on a structural level and emphasis needed to be placed on how the form is being applied to the current system. Adapting to new technology to help assist contractor evaluation reports will tremendously improve the system, and create a sense of ease for the project engineer when submission is required. Several other states currently lead the efforts in generating systems on this level; Kentucky should adopt such techniques that will serve as major incentives in the future.

References

Byron Coburn, J. P. (2007, July 24). *Construction Directive Memorandum*. Retrieved 2011, from Number: CD-200704

CALTRANS. (March 21st, 2012). *Frequently Asked Questions: Disadvantaged Business Enterprise Program*. California Department of Transportation.

CDOT. (2006). *Rules for Prequalification, Debarment, Bidding and Work on Colorado Department of Transportation Road, Highway and Bridge Public Projects*. Retrieved April 25, 2012, from Colorado Department of Transportation:
<http://www.coloradodot.info/business/bidding/Bid%20Rules/view>

Comission, M. H. (2007). Code of State Regulations. In *Contractor Performance Rating to Determine Responsibility: 7 CSR 10-10.010-10.120* (pp. 3-8). Missouri Department of Transportation.

Construction, O. o. (2010). *Contractor Performance Evaluation Policies and Procedures*. SCDOT.

Donn Hancher, S. L. (2001). *Quality Based Prequalification of Contractors*. Lexington, KY: Kentucky Transportation Center.

FDOT. (September 2005). Contractor's Performance Report: 700-010-25. In S. o. Transportation, *Notes and Contractor Past Performance Rating* (pp. 2-7). FDOT.

FHWA. (2006). *Contract Administartaion Core Curriculum Participant's Manual and reference Guide 2006*. Retrieved April 25, 2012, from State Procedures:
<http://www.fhwa.dot.gov/programadmin/contracts/core03.cfm#s3A14>

FHWA. (2011, April 7). *Construction*. Retrieved April 3, 2012, from Questionnaire Regarding State DOT Approaches for Dealing with Unsatisfactor Contractor Performance:
<http://www.fhwa.dot.gov/programadmin/contracts/perflong.cfm>

IDOT. (03, April). *Contractor Performance Report*. Retrieved from BC 1777

INDOT. (19896). Retrieved April 25, 2012, from Report on Contractor's Performance:
<http://www.in.gov/indot/files/CR2Report.pdf>

INDOT. (n.d.). *CR-2 Form*. Retrieved 4 25, 2012, from <http://www.in.gov/indot/files/CR2Report.pdf>

INDOT. (n.d.). *Indiana Department of Transportation*. Retrieved April 25, 2012, from Report on Contractor's Performance of Contract: <http://www.in.gov/indot/files/CR2Instructions.pdf>

IOWADOT. (n.d.). *2.38 Contractor Evaluation Report*.

IOWADOT. (n.d.). *Form 830435*.

Jones, J. (2012, Spring). *Stats: F-Test*. Retrieved 4 4, 2012, from Richland Community College:
<http://people.richland.edu/james/lecture/m170/ch13-f.html>

KDOT. (2007). *Special Provisions to the Standard Specifications*. Retrieved April 25, 2012, from 07-01019-R02: <http://www.ksdot.org:9080/burConsMain/specprov/2007/pdf/07-01019-r02.pdf>- 92.4KB -
Special Provisions

Kicinski, G. (2011, September). Pre-Qualifications Chairman. (M. McDowell, Interviewer)

KYTC. (2010, October). *Contractor's Performance Report*. Retrieved April 25, 2012, from
<http://transportation.ky.gov/Organizational-Resources/Forms/TC%2014-19.pdf>

Legislature, K. (1997). *Kentucky Administrative Regulations*. Retrieved August 31, 2011, from 603 KAR 2:015 Prequalification for Construction: <http://www.lrc.ky.gov/kar/603/002/015.htm>

Legislature, K. (2010, July 5). *Kentucky Revised Statutes* . Retrieved April 25, 2012, from KRS 45A.365:
<http://www.lrc.ky.gov/krs/045a00/365.pdf>

Legislature, K. (n.d.). *KAR*. Retrieved August 31, 2011, from Identification: 603 KAR 2:015

MassDOT. (2010, April 20). Retrieved April 25, 2012, from Form: E-10-002.

McClain, S. (2011, September). Chief Construction Engineer. (M. McDowell, Interviewer)

MDOT. (n.d.). *Terms and Conditions: TC-7.05*.

Messer, J. (2011). WYDOT. (M. McDowell, Interviewer)

MnDOT. (2007, September 16). *Minnesota Department of Transportation*. Retrieved April 25, 2012, from Consultant/Contractor Performance Evaluation:
<http://www.dot.state.mn.us/i35wbridgedata/groupwise2/September16-30-2007/attachments/PerformanceEvaluationForm.doc>- 43.5KB - State of Minnesota

MoDOT. (2011, April 21). *Missouri Department of Transportation*. Retrieved April 25, 2012, from 2011 CPR: www.modot.mo.gov/business/materials/2011CPRQuestionnaire%20.pdf - 2011-04-21

NDDOT. (2009, October). *Consultant Evaluation-Construction Services*. Retrieved from Form: SFN 51242

NDOR. (n.d.). *Nebraska Department of Transportation*. Retrieved April 25, 2012, from RFP's for Acquisition Consultants: <http://www.dor.state.ne.us/roway/rfps.htm>

NHDOT. (07, March). *Contractor's Confidential Past Performance Report*. Retrieved April 4, 2012

NJDOT. (2011, June 21). *New Jersey Department of Transportation: Contractor Evaluation Report*. Retrieved April 25, 2012, from Form: DC-8 Section 6, Subsection M

ODOT. (2010, October). *ODOT Construction Manual*. Retrieved April 24, 2012, from Chapter 34- Contractor Performance Report:
<http://www.oregon.gov/ODOT/HWY/CONSTRUCTION/ConstructionManual/cm34.pdf?ga=t>

ODOT. (2011, August 15). *Oregon State Archives*. Retrieved April 25, 2012, from Pre-Qualification For Bidding and Highway Bridge Construction:
http://arcweb.sos.state.or.us/pages/rules/oars_700/oar_734/734_010.html

OhioDOT. (2000, April 5). *Evaluation of Contractor Performance*. Retrieved April 25, 2012, from <http://www.dot.state.oh.us/policy/PoliciesandSOPs/Policies/411-001%28P%29.pdf>

PADOT. (2009, November). *Contractor's Past Performance Report*. Retrieved 25 April, 2012, from <ftp://ftp.dot.state.pa.us/public/PubsForms/Forms/CS-4307.pdf>

Proctor, G. (2000). *Evaluation of Contractor Performance (C95)*. Ohio Department of Transportation.

- Ralph Ellis, J.-H. P. (2007, July). *Evaluation of Alternative Contracting Techniques on FDOT Construction Projects*. Retrieved April 25, 2012, from Florida Department of Transportation:
http://www.dot.state.fl.us/research-center/Completed_Proj/Summary_CN/FDOT_BDC51_rpt.pdf
- SCDOT. (2010, July 1). *Contractor Performance Evaluation Policies and Procedures*. Retrieved April 25, 2012, from http://www.scdot.org/doing/pdfs/CPE_Policies_&_Procedures_Apr_2012.pdf
- TDOT. (2011). *Construction Circular Letters*. Tennessee Department of Transportation.
- UDOT. (2012, March 3). *Consultant Project Evaluation Form*. Retrieved April 25, 2012, from www.udot.utah.gov/main/uconowner.gf?n=200504040819341
- VDOT. (2008, November 14). *Rules Governing Prequalification Priviledges*. Retrieved April 25, 2012, from http://www.virginiadot.org/business/resources/prequal_app_new.pdf
- VDOT. (2010, July). *CPE Annual Report*. Retrieved April 25, 2012, from http://www.virginiadot.org/business/resources/const/Blank_CPE_ANNUAL_rpt_0710.pdf
- VTrans. (2009). *State of Vermont Agency of Transportation Construction Section*. Retrieved April 25, 2012, from <http://www.aot.state.vt.us/progdev/publications/2010ConstructionManual/Section8Evaluations.pdf>
- W. Byron Coburn, J. P. (2007). *Constructive Directive Memorandum*. Commonwealth of Virginia Department of Transportation.
- WisDOT. (2005, December). *Construction Consultant Performance Evaluation Report*. Retrieved April 25, 2012, from Form: DT1087 Ch.84
- WYDOT. (2011, February). *Contractor Performance Evaluation Form*. Retrieved April 25, 2012, from Form: PQ-1