

Performance-Based Contractor Prequalification as an Alternative to Performance Bonds

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FOREWORD

The Federal Highway Administration (FHWA) is interested in ensuring that State transportation departments select contractors that can complete projects cost-effectively. One potential method to help select qualified contractors is to use a performance-based contractor prequalification process. FHWA commissioned this study to evaluate the wisdom of expanding the use of this process. This report presents the results of this study, which examined relevant literature, evaluated the benefits and costs of performance bonds and performance-based contractor prequalification, and recommended a model performance-based prequalification approach.

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Research and Development

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16. Abstract State departments of transportation rely on private industry construction contractors to build, rehabilitate, and replace their infrastructure assets. The Federal Highway Administration (FHWA) is interested in providing guidance that State transportation departments can use to select contractors that can complete projects cost-effectively. One potential method to help select qualified contractors is to use a performance-based contractor prequalification process. FHWA commissioned this study to evaluate the wisdom of expanding the use of this process. This report presents the results of this study, which examined relevant literature, evaluated the benefits and costs of performance bonds and performance-based contractor prequalification, and recommended a model performance-based prequalification approach. In the highway industry, one of the main methods to prequalify a contractor is determine whether or not a performance bond can be secured. The current performance bonding system does not differentiate between a high performing and marginally performing contractor, so long as the two companies have the same level of financial assets. This gives both companies the same opportunity to bid on a project, regardless of performance. In a low-bid environment, it creates a situation where a State transportation department subsidizes marginal performance, which, in turn, reduces the incentive for top performers to continue superior performance. This research project analyzes the benefits and costs of performance bonds and performance-based contractor prequalification and creates a performance-based contractor prequalification model. Through a detailed literature review; surveys of contractors, State transportation departments, and sureties; and State transportation department case studies, the research suggests that the default rate for the industry is less than 1 percent, the minimum contract value that requires a performance bond should be raised to between \$1 million and \$10 million, and the cost of performance-based prequalification is low compared to the cost of performance-bonds. Last, a three-tiered performance-based contractor prequalification model is presented.			
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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
LENGTH				
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
AREA				
in ²	square inches	645.2	square millimeters	mm ²
ft ²	square feet	0.093	square meters	m ²
yd ²	square yard	0.836	square meters	m ²
ac	acres	0.405	hectares	ha
mi ²	square miles	2.59	square kilometers	km ²
VOLUME				
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft ³	cubic feet	0.028	cubic meters	m ³
yd ³	cubic yards	0.765	cubic meters	m ³
NOTE: volumes greater than 1000 L shall be shown in m ³				
MASS				
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
TEMPERATURE (exact degrees)				
°F	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	°C
ILLUMINATION				
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	candela/m ²	cd/m ²
FORCE and PRESSURE or STRESS				
lbf	poundforce	4.45	newtons	N
lbf/in ²	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
LENGTH				
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
AREA				
mm ²	square millimeters	0.0016	square inches	in ²
m ²	square meters	10.764	square feet	ft ²
m ²	square meters	1.195	square yards	yd ²
ha	hectares	2.47	acres	ac
km ²	square kilometers	0.386	square miles	mi ²
VOLUME				
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m ³	cubic meters	35.314	cubic feet	ft ³
m ³	cubic meters	1.307	cubic yards	yd ³
MASS				
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
TEMPERATURE (exact degrees)				
°C	Celsius	1.8C+32	Fahrenheit	°F
ILLUMINATION				
lx	lux	0.0929	foot-candles	fc
cd/m ²	candela/m ²	0.2919	foot-Lamberts	fl
FORCE and PRESSURE or STRESS				
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in ²

*SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380.
(Revised March 2003)

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LIST OF ABBREVIATIONS AND SYMBOLS

AF	Ability Factor
ALDOT	Alabama Department of Transportation
APPS	Average Project Performance Score
AR	Available Rating
AS	Ability Score
Caltrans	California Department of Transportation
CCASS	Construction Contractor Appraisal Support System
CMGC	Construction Manager/General Contractor
CMR	Construction Manager-at-Risk
ConnDOT	Connecticut Department of Transportation
CPE	Contractor Performance Evaluation
CPI	Contractor Performance Index
CPR	Contractor Performance Rating
CPS	Contractor Performance Score
CQC	Contractor Quality Control
DB	Design-Build
DBB	Design-Bid-Build
DBE	Disadvantaged Business Enterprise
EEO	Equal Employment Opportunity
FDOT	Florida Department of Transportation
FHWA	Federal Highway Administration
IOWADOT	Iowa Department of Transportation
IDOT	Illinois Department of Transportation
INDOT	Indiana Department of Transportation
KDOH	Kentucky Department of Highways
KDOT	Kansas Department of Transportation
KYTC	Kentucky Transportation Cabinet
MaineDOT	Maine Department of Transportation
MassDOT	Massachusetts Department of Transportation
MCR	Maximum Capacity Rating
MDOT	Michigan Department of Transportation
MDSHA	Maryland State Highway Administration
MoDOT	Missouri Department of Transportation
MSE	Mechanically Stabilized Earth
MTO	Ontario Ministry of Transportation
MWL	Maximum Workload Rating
MWR	Maximum Workload Rating (Different abbreviations are used for this term based on source cited.)
NCHRP	National Cooperative Highway Research Program
NDOR	Nebraska Department of Roads
NJDOT	New Jersey Department of Transportation
NSW	New South Wales, Australia
ODOT-OH*	Ohio Department of Transportation
ODOT-OK*	Oklahoma Department of Transportation
ODOT-OR*	Oregon Department of Transportation

*The Ohio, Oklahoma, and Oregon State transportation departments all use the formal abbreviation ODOT. These abbreviations were modified for purposes of this report by appending the standard State abbreviation.

PennDOT	Pennsylvania Department of Transportation
QA	Quality Assurance
QC	Quality Control
SCDOT	South Carolina Department of Transportation
SFAA	Surety and Fidelity Association of America
TCRP	Transportation Cooperative Research Program
UDOT	Utah Department of Transportation
USDOT	U.S. Department of Transportation
VTrans	Vermont Department of Transportation
WSDOT	Washington State Department of Transportation
WVDOT	West Virginia Department of Transportation
WYDOT	Wyoming Department of Transportation

EXECUTIVE SUMMARY

State transportation departments rely on private industry construction contractors to build, rehabilitate, and replace their infrastructure assets. The Federal Highway Administration (FHWA) is interested in providing guidance that State transportation departments can use to select contractors that can complete projects cost-effectively. One potential method to help select qualified contractors is to use a performance-based contractor prequalification process. FHWA commissioned this study to evaluate the wisdom of expanding the use of this process. This report presents the results of this study, which examined relevant literature, evaluated the benefits and costs of performance bonds and performance-based contractor prequalification, and recommended a model performance-based prequalification approach.

The literature review assessed current performance-based prequalification program components, adjusting bidding and bonding capacity, and barriers to implementation. Several conclusions regarding current prequalification practices emerged from this review:

- Three levels of contract prequalification are currently in use: administrative, performance-based, and project-specific.
- State transportation departments generally use three approaches for performance bonding: they bond the entire contract value, bond a portion of the contract value, or do not require performance bonds.
- Neither State transportation department personnel nor contractors consider the ability to secure a performance bond a reliable indicator of a contractor's qualification to perform high-quality work; rather, they view a contractor's past performance as such an indicator.

The study team conducted three outreach efforts to obtain feedback from the major parties involved in the use of construction contract performance bonds. Representative State transportation departments and their contractors completed surveys tailored to each group, while the Surety and Fidelity Association of America (SFAA) and several surety industry representatives participated in interviews. Following are conclusions on contractor and State transportation department views of the potential benefits and the structure of performance-based contractor prequalification:

- Both contractors and State transportation departments feel that a performance-based contractor prequalification process has the potential to improve overall project performance.
- Contractors and State transportation departments rate the evaluation of "corporate qualifications" (i.e., qualifications that relate to a contractor's experience and qualifications) more highly (in terms of its ability to drive project success) than they rate the evaluation of a contractor's programs, such as quality management or safety.
- Contractors and State transportation departments also believe that past performance, relevant experience, illegal behavior, personnel qualifications, and claims history are the most critical factors to determine a contractor's effectiveness.

Contractors believe that where only performance bonds are used, a marginal contractor has an unfair advantage over a well-qualified contractor. While State transportation departments expressed numerous positive views about the use of performance-based contractor prequalification, they also would be uncomfortable eliminating performance bonds.

The SFAA provided surety information from filings made to State regulators, and several surety companies provided additional anecdotal input. Their conclusions include the following:

- The surety's ongoing role as a creditor enables it to have superior knowledge of the character, capacity, and capital of the contractor.
- The surety has the right to intervene in the contractor's affairs to correct deficiencies and prevent problems.
- The surety will, as a last resort, pay out on a claim for damages, and thus replace the State transportation program's capital, which was lost to the failed contractor.
- The surety can "step into the shoes" of the failed contractor to settle outstanding claims with subcontractors and complete the contract at its original cost.

The study team conducted case studies with five State transportation departments: Iowa, Oklahoma, Utah, Virginia, and Washington. Each of these State transportation departments has varying forms of performance-based prequalification, ranging from simple reference checks to project performance evaluations. None of them indicated any knowledge of a surety becoming involved in a project before a State transportation department requested that involvement. They were not comfortable eliminating performance bonds completely, but several would consider raising the minimum project value that requires a performance bond. Additionally, all case study State transportation departments continue to use performance-based prequalification and a few are even further developing their systems.

A benefit-cost analysis of performance bonds was conducted, based on information from the literature review and data collected from the outreach efforts and the case studies. The financial benefits of performance bonds occur after a default claim is filed and consist of default cost avoidance, schedule delay costs, and re-bid costs. Because the default rate in the highway industry is less than 1 percent, this indicates that default is an infrequent and an unpredictable occurrence. The benefit-cost analysis was to determine, from a strictly financial standpoint, whether performance bonds could be eliminated. Due to the sensitivity of the analysis to the assumptions, multiple iterations of the analysis were conducted. These analyses show that if the default rate is held constant at 0.69 percent (the highest default rate of State transportation departments in the outreach effort), projects over approximately \$10 million have a net benefit from performance bonds; projects between \$100,000 and \$1 million have a net cost for performance bonds; and projects less than \$100,000 and between \$1 million and \$10 million vary between net cost and net benefit. However, when the default rate is lowered to 0.46 percent (the average default rate of the State transportation departments in the outreach effort) there is a net cost for performance bonds on all projects.

As indicated, State transportation departments are not willing to eliminate performance bonds, even though few of them have experienced a default. This is the performance bond paradox—the unwillingness to eliminate performance bonds, even though the risk of default is low. State transportation departments saw value in the detailed financial analysis performed by the sureties and in the agency’s option to contact a surety if a contractor’s performance was unacceptable and did not improve. Rather than eliminate performance bonds, it is recommended that the minimum contract value that requires a performance bond be raised to between \$1 million and \$10 million, based on the benefit-cost analysis. Currently, the minimum contract value that requires a performance bond varies from State to State, between \$0 and \$300,000. The five case study States could have saved between \$1.2 million and \$7.9 million over 5 years if the minimum project size that requires a performance bond had been raised to \$1 million; they could have saved between \$6.5 million and \$26 million over 5 years if the minimum project size that requires a performance bond had been raised to \$10 million.

While there is the ability to achieve considerable premium savings by raising the performance bond threshold, there remains a risk, albeit small, that a State transportation department will still experience a default. A State transportation department can further reduce the likelihood of default through the implementation of performance-based prequalification because it will help screen out poorer performing contractors. If a default does occur, the State transportation department still can recover funds from the contractor to offset the cost of default. Any unrecovered costs would be borne by the State transportation department, but as the above analysis indicates, large savings in bond premiums can significantly offset these costs.

A performance-based prequalification system provides many benefits, but quantitative data about these benefits does not exist because the benefits are simply qualitative, such as improved contractor relationships, or the State transportation department simply does not collect the data to measure the benefits. Consequently, it is not possible to calculate a benefit-cost ratio. However, based on the outreach efforts and the case study, the overall areas that benefit from performance-based prequalification are the following: project quality, project timeliness, number of claims, and contractor and State transportation department relationships. The costs associated with operating a performance-based prequalification system range between \$104,000 and \$416,000 per year. This is negligible, compared to the costs of performance bonds.

Based on the project research and analysis, the study developed a performance-based prequalification model. The model combines elements of the processes used by the Florida Department of Transportation (FDOT), Ohio Department of Transportation (ODOT, presented as ODOT-OH for the purposes of this report), and the Ontario Ministry of Transportation (MTO), and it borrows concepts and terminology from each. The model accounts for a contractor’s financial capacity, rewards good performance, and encourages the improvement for marginal performance by prequalifying a contractor, based on a bidding capacity that is determined by rating prior performance. It consists of a two-tier process that is applicable to design-bid-build projects and an optional third tier for alternative project delivery methods, such as design-build (DB), construction manager/general contractor (CMGC), and public-private partnerships. It also can be used for design-bid-build (DBB) projects, where a State transportation department wishes to do a performance evaluation. A summary of the tiers follows:

- Tier one consists of administrative prequalification, which is composed of financial analysis conducted by the agency, a records check, and the assembly of optional external documented information.
- Tier two focuses on contractor performance and encompasses two primary areas: the determination of the contractor's management ability and a post-project evaluation of the contractor performance on each contract. These factors are used in conjunction with tier one's financial analysis output to determine the amount of work upon which a contractor can bid.
- Tier three is a project-specific prequalification tier, designed to closely evaluate the contractor's qualifications and experience in terms of the specific needs of a given project. This final tier is an optional portion of the prequalification process and is intended for use on projects that are delivered by methods other than traditional design-bid-build and/or on a project that has requirements beyond the standard boilerplate requirements.

CHAPTER 1—INTRODUCTION

State transportation departments rely on private industry construction contractors to build, rehabilitate, and replace their infrastructure assets. The FHWA is interested in ensuring that State transportation departments select contractors that can complete projects cost-effectively. One potential method to help select qualified contractors is to use a performance-based contractor prequalification process. FHWA commissioned this study to evaluate the wisdom of expanding the use of this process. This report presents the results of this study, which examined relevant literature, evaluated the benefits and costs of performance bonds and performance-based contractor prequalification, and recommended a model performance-based prequalification approach. Data regarding performance bonds and performance-based contractor prequalification was gathered through a thorough literature review; outreach to the State transportation departments, contractors and sureties; and case studies of five State transportation departments. This report investigates both methods of performance bonds and performance-based contractor prequalification and presents a performance-based contractor prequalification program that can be adapted to State transportation departments across the Nation.

The purpose of this study was to investigate the cost and benefit of performance bonding versus replacing performance bonding, to various degrees, with performance-based contractor prequalification. This final report includes recommendations on the cost effectiveness of performance bonds; guidance for State transportation departments that wish to develop and transition to a performance-based contractor prequalification system; and recommendations for how such systems can best be implemented. The specific objectives are as follows:

1. Document the benefits and costs of the current system of performance bonding in highway construction.
2. Quantify the benefits of replacing currently required performance bonds on some highway construction projects with a rigorous performance-based contractor prequalification system.
3. Provide State transportation departments with guidance on the development and implementation of the prequalification system.

The report includes the following:

- Chapter 1—Introduction: This chapter includes a discussion of the motivation for this investigation, a performance bond background, and an overview of the industry outreach efforts. It provides the necessary background for the remainder of the report.
- Chapter 2—Literature Review: This chapter presents an overall summary of the literature review, as well as the detailed review for each of the four focus areas of the literature review.
- Chapter 3—Overview of Industry Outreach Efforts: In order to inform the research, outreach efforts were conducted with State transportation departments, contractors, and

the SFAA. These efforts were conducted through surveys, interviews, and case studies. This chapter discusses all of these efforts.

- Chapter 4—Benefit-Cost Analysis of Performance Bonds: The costs and benefits of performance bonds are identified and analyzed in this chapter. Additionally, this chapter further clarifies the definition of a performance bond, the roles of the surety, and determines a default rate for the industry.
- Chapter 5—Performance Bond Paradox: This chapter discusses State transportation department views on performance bonds and compares those to the experience with default rates. This chapter also contains a recommendation for raising the minimum project size that requires a performance bond.
- Chapter 6—Performance Bonds versus Performance-Based Contractor Prequalification: Building upon the benefit-cost analyses of the previous two chapters, a comparison of performance bonds and performance-based contractor prequalification is presented in this chapter. Additionally, an argument is made for increasing the minimum project size that requires a performance bond.
- Chapter 7—Proposed Performance-Based Contractor Prequalification Program: This chapter presents a performance-based contractor prequalification program. The program includes a quantitative method for modifying the contractor bidding capacity, based on the results of performance ratings.
- Chapter 8—Conclusions: This chapter presents the overall findings and conclusions of the entire research project.

We note that this research project was funded and administered by FHWA. While FHWA has a stewardship role in funding and administering Federal-aid highway program, the primary responsibilities for administering highway construction programs lies with the individual State transportation departments and local public agencies. The Federal-aid highway program is a federally funded/state-administered program. State transportation departments are responsible for virtually all aspects of highway planning, design, construction, maintenance and operations. Congress defined this relationship with implementation of the statutory provisions in Title 23 United States Code Section 145(a)—“Protection of State Sovereignty.”

In light of this guiding principle, FHWA’s regulatory requirements for performance bonds in Title 23 Code of Federal Regulations Section 635.110 are relatively brief. These provisions ensure that State licensing, prequalification, insurance or bonding requirements be administered in a manner that does not restrict competition. Furthermore, in section 635.107 the participation by disadvantaged business enterprises (DBE), the State transportation department shall schedule contract lettings in a balanced program providing contracts of such size and character as to assure an opportunity for all sizes of contracting organizations to compete.

Unlike the Federal Miller Act that applies to direct Federal contracting, FHWA’s bonding policy does not specify the amount of a performance bond or when or how bonds must be used. This is a matter of state and local policy. So while this research provides important information for

public agencies to consider in implementing their surety requirements, FHWA will not require the states to implement the research recommendations, but will consider the recommendations to be good practices that should be considered.

PERFORMANCE BONDS

A performance bond is a promise from a surety that monetary compensation or contract completion services will be provided to the owner if the contractor fails to complete all the services required under the construction contract, which thereby insulates the State transportation department from potential damages due to contractor default. Sureties' performance bonds hold State transportation departments harmless in the event that a contractor (1) fails to complete a bridge or highway construction contract and then (2) is unable to provide a remedy for the failure, which typically arises from the contractor's deteriorated financial condition. State transportation departments generally use one of three approaches for performance bonding: they bond the entire contract value, bond a portion of the contract value, or do not require performance bonds.

The Miller Act of 1935 made performance bonds a requirement for Federal construction work, and thus required any states that accepted federal funds for construction work to create their own legal requirements for performance bonds. Each individual State created its own specific Miller Act, known as "Little Miller Acts," which define the requirements for performance bonds, including the percent of the contract value to be bonded and the minimum contract value that requires a bond. The amount of bond required varies across the nation, from 25 percent to 100 percent of the contract value. The vast majority of the States require a performance bond for 100 percent of the value of the contract. The minimum contract size that requires a performance bond also varies from State to State, and ranges from \$0 to \$300,000.

The performance bond underwriting process conducted by the surety is a process of prequalification, similar to the prequalification processes of State transportation departments. During the underwriting process, a given contractor is evaluated on three sets of criteria:

Character: The contractor's reputation among subcontractors, suppliers, owners, and lenders, as shown by (a) administrative evidence, such as letters of reference; (b) the presence of certain systems and procedures, such as quality management systems and alternative dispute resolution methods; and (c) past performance, measured in terms of outcomes of past contracts.

Capacity: The contractor's management practices, personnel, and equipment, as shown by (a) administrative evidence, such as resumes of key employees; (b) the presence of the systems and procedures that make up good management practices; and (c) past performance, measured in terms of outcomes of past contracts and whether or not they were completed without default, claims, etc.

Capital: The contractor's funding capacity as shown by (a) administrative evidence of the net assets and net income reported in its financial statements and those of its owners, along with the assessments of other creditors; (b) the presence of certain operations' systems and procedures,

such as sound treasury management business practices; and (c) past performance, as reflected in the contractor's credit score.¹

A contractor with a marginal track record for quality and timely completion, but the same level of financial assets as another contractor with a record of exemplary performance, will be able to furnish performance bonds, and hence will have the same opportunity to bid.⁽¹⁾ This method, if used alone, turns prequalification into merely an inventory of contractor assets and past experiences, without regard to the quality of the given contractor's performance. A contractor with sufficient financial assets and marginal experience and/or performance would be found fully qualified. When a surety concludes that a particular contractor presents too high a financial risk, the surety will decline the opportunity to underwrite a bond for the contractor. The contractor is then forced to seek out another surety whose underwriting process or appetite for risk is more accommodating.

PERFORMANCE BONDS ARE NOT INSURANCE

A performance bond is like credit in that the surety provides a bond with the expectation of no loss. That is, the surety provides a bond only to those contractors that it has determined are capable and qualified to perform the obligation that is bonded. In addition, the contractor ultimately remains liable for a default. If the contractor defaults and the surety incurs a loss in remedying the default, the surety may seek reimbursement from the contractor. Insurance is fundamentally different in that losses are expected and the losses are ultimately borne by the insurer, who does not seek to recoup its loss from the insured entity. Car insurance companies, for example, do not prequalify the insured's ability to prevent its car from being stolen; rather, the insurer can lower the premium on cars through the use of anti-theft devices. When a car is stolen, insurance pays out the value of the car, regardless of whether its owner has sufficient wealth or income to replace the car. The insurance premium reflects the insurer's expectation that it will incur losses on a portion of the policies written.

This difference explains why insurance policies and surety bonds are priced differently. A significant portion of the insurance policy premium is a loss-paying component that, when coupled with the premium from all insurance policies, is used to pay claims. Because a surety does not expect a loss when writing a bond, the loss-paying component in the surety bond premium is relatively small. The premium is largely an underwriting fee for the surety's prequalification review. While risk under an insurance policy is addressed largely by the amount of premium charged, risk under a surety bond is addressed by imposing additional credit requirements on the contractor or, ultimately, by not writing the bond.

Guaranteeing the Lesser of Contract Completion or Compensation

When a contractor fails to complete a construction contract or damages have been assessed against the contractor and it is determined that the contractor cannot pay those damages, the surety is required to make good on the damages (i.e., to either complete the contract or pay the owner the bonded amount).

¹ Credit bureaus assign scores to companies and individual consumers based on their payment history, the diversity of the types of credit already available to them, and their use of those types of credit.

The surety has the right to exercise options other than simply paying the amount of the bond. The surety is entitled to all the rights and equities of the owner, the contractor, or both, or to those of any others that benefit from the surety's performance, in order to deal with claims from subcontractors and suppliers and resume construction under the contract. Given the choice of paying out assessed damages or completing the contract, the surety will choose the lower-cost option. The surety industry estimates that in almost all of the confirmed claims, its member sureties step in and actively manage at least a portion of the contract until its completion.

No Additional Guarantee of Construction Quality

Performance bonds underwrite financial risks, but are not a guarantee of all of the terms of a contract. Additionally, the terms that are specifically related to contract performance are only relevant to performance bonds when there is a risk of default. If, for example, a contractor has performed marginal-quality work that the State transportation department is forced to approve because it is under pressure to eliminate the congestion caused by the project's work zones, then the State transportation department has no recourse to the surety, because a performance bond only applies in cases of default (i.e., where a serious breach has occurred and a contract is consequently terminated). A performance bond is not a guarantee of a certain level of performance; that is, a surety bond provides no guarantee against a contractor's marginal quality of work, so long as the contractor's failures are not large enough to trigger a default.

The worsening of a contractor's financial position is generally the controlling factor in most instances when a contractor fails to complete a contract. In these instances, indicators that a contractor may not be able to complete the contract can be identified by the contractor's financial position. These links result in sureties that focus their attention on both the financial capacity of the contractor and on monitoring and assessing the contractor's general ability to complete its work.

Role of the Surety

Because sureties need to monitor and assess contractors by the completion of contracts and because they need to manage the completion of contracts to lower the costs of claims, sureties generally take responsibility for the following: (1) the assessment of financial risk before a contract is let; (2) the ongoing monitoring of the financial health and performance of the contractor while the contract is being completed; (3) the handling and adjustment of claims; and (4) the completion of a contract to mitigate the harm to the owner. However, little evidence, if any, was found of a surety proactively working with a contractor to avoid default before the State transportation department reports a contractor's poor performance to the surety.

PERFORMANCE-BASED CONTRACTOR PREQUALIFICATION

Performance-based contractor prequalification developed to address the State transportation department need to evaluate the ability of a contractor to complete a specific project, over and beyond the contractor's financial ability. Some of the different aspects evaluated through a performance-based contractor prequalification system are: prior performance, claims history, past project experience, timely completion of past projects, quality of material and workmanship, technical ability, quality assurance plans, safety plans, environmental plans, and traffic control

plans. Alternative project delivery methods shift more responsibility onto the contractor for the quality of a project, and performance-based prequalification can evaluate a contractor's ability to manage and produce quality work.

National Cooperative Highway Research Program (NCHRP Web Document 38) categorizes the reasons State transportation departments have implemented a performance-based contractor prequalification program as one of two types.⁽¹⁾ The first represents frustrations felt by both owners and construction contractors. These frustrations include the following:⁽¹⁾

- Public owners generally treat low-quality construction work no differently than high-quality construction work.
- Public owners indirectly reward poor workmanship because they do not penalize poor workmanship, which gives a bidding edge to those contractors who consistently perform poorly.
- Administrative prequalification merely establishes a benchmark for financial capacity and not for technical capability.
- Reliance on performance bonding does not insulate the State transportation department from marginally competent contractors who have a strong financial foundation.

Many of these frustrations spring from the State transportation department's requirements to ensure "free and open competition" and to avoid unnecessary delays to much-needed transportation projects that result from bid protests. Most State transportation departments are required by law to procure construction projects in a manner that promotes "free and open competition."⁽⁴⁾ This requirement has been interpreted to mean that the State transportation department cannot generally restrict the ability of any given contractor to bid on public works.⁽⁵⁾ If a contractor believes that a given procurement process unfairly restricts its ability to compete and win, the common remedy for that contractor is to protest the contract award.⁽⁶⁾ A protest requires the State transportation department to suspend the award of the contract, and hence the start of construction, until the protest is resolved, which thereby delays the prosecution of the work.

Because prequalification inherently entails a reduction in the level of competition, these programs have to be well designed and avoid arbitrariness. A State's governing laws and regulations, as well as Federal requirements from the Miller Act (requiring performance bonds for Federal construction contracts), often constrain the State transportation department's ability to implement performance-based prequalification. For instance, the Delaware Code provides that State's transportation department with the authority to prequalify construction contractors and cites 10 specific reasons why a contractor can be found unqualified to bid.⁽⁷⁾ Two of these reasons, "inadequate experience to undertake the project" and "documented failure to perform on prior public or private construction contracts," can be addressed through performance-based prequalification.⁽⁷⁾ However, neither of these reasons can apply to a marginally qualified contractor who had not been directly penalized for poor workmanship, as expressed by *NCHRP Web Document 38*.⁽¹⁾

NCHRP Web Document 38 also details a second, timelier reason to implement performance-based contractor prequalification. This relates to the movement to alternative project delivery methods and a greater reliance on contractor quality control (QC). In 1995, for the first time, 23 CFR 637B allowed the use of contractor QC testing by the State transportation department as part of the project acceptance decision.^(6,8) The report describes this motivation in the following terms:⁽¹⁾

Changes in regulations regarding use of contractor quality testing in quality assurance decisions and continuing reduction in State transportation department personnel will increase the need for “quality driven” contractors in public transportation construction projects. This change, coupled with more departments adopting performance-based and performance-related specifications, places more need on contractors to know and use quality management in their field operations management. With more contractors providing the quality control function, the State transportation department’s role would change to a quality assurance role. As one part of the quality assurance process, there is a need for comprehensive methods to evaluate a contractor’s eligibility to engage in work from a quality perspective.

The same sentiments were expressed in a Transportation Research Board paper focused on contractor-led QC:⁽⁹⁾

As State highway agencies move further in this direction [the direction of contractor-led quality control], it is incumbent on them to first plan carefully during the procurement phase to ensure that they choose qualified teams. They must then draft contracts and specifications that put sufficient checks and balances in place so that these project delivery methods return quality equal to or better than that obtained by the traditional methods.

NCHRP Report 561 delved more deeply into the use of qualifications and past performance, including the use of both administrative and performance-based prequalification:⁽⁴⁾

Best-value procurement methods allow various elements to be considered in selecting a contractor on the basis of performance. Objective elements include contractor experience with similar projects, completion within schedule, compliance with material and workmanship requirements, timeliness and accuracy of submittals, and record of safety. Subjective elements include effective management of subcontractors, proactive measures to mitigate impacts to adjacent properties and businesses, training and employee development programs, corporate commitment to achieving customer satisfaction, and client relations... It is also recognized that, because of constrained staffing and budgets, it is not possible for State agencies to “inspect” quality into the work. Therefore, a procurement process is needed that considers value-related elements in awarding contracts.

Performance-based contractor prequalification is a vehicle for rewarding good performance and it satisfies a need to ensure that a better-qualified contractor with a record of good performance is entrusted with the increased autonomy in the quality management process required by contractor-led QC. Thus, the State transportation department properly discharges its responsibility to the traveling public to deliver a quality project with public money. To accomplish this purpose, the program needs to have all of the necessary components to collect

contractor performance data, analyze that data in a meaningful manner, and use the performance output in the prequalification decisionmaking system.

CHAPTER 2—LITERATURE REVIEW

This chapter presents the results of an in-depth literature review of performance based prequalification and the use of performance bonds in the highway industry. Sources reviewed include prequalification research studies, alternative project delivery studies that include prequalification, State transportation department literature available online, Means construction cost data, information from the SFAA, and academic sources. The literature was broken into four focus areas: previous contractor prequalification research, State contractor prequalification evaluation procedures, State contractor bidding procedures, and bonding costs. This chapter presents a summary of the literature results, as well as the details for each focus area.

LITERATURE REVIEW SUMMARY

The literature review included the following four focus areas: previous contractor prequalification research, State contractor performance evaluation procedure, State contractor bidding procedures, and bonding costs. Table 1 summarizes the topics of interest and types of sources for each of the focus areas reviewed.

Table 1. Literature review summary.

Focus area	Topics of interest	Types of sources
Previous contractor prequalification research	<ul style="list-style-type: none"> • Components of a performance-based prequalification program • Federal construction contractor appraisal support system • Performance-based prequalification implementation • Adjusting bidding and bonding capacity • Barriers to implementation 	<ul style="list-style-type: none"> • Prequalification research studies • Alternative project delivery studies that include prequalification
State contractor prequalification evaluation procedures	<ul style="list-style-type: none"> • Overview of existing industry contractor performance evaluation practices • Specific processes used by State transportation departments for contractor performance evaluation procedures 	<ul style="list-style-type: none"> • Prequalification research studies • Alternative project delivery studies that include prequalification • State transportation department literature available online
State contractor bidding procedures	<ul style="list-style-type: none"> • Specific processes used by individual State transportation departments for contractor prequalification 	<ul style="list-style-type: none"> • Prequalification research studies • Alternative project delivery studies that include prequalification
Bonding costs	<ul style="list-style-type: none"> • Cost of a performance bond • Default rates 	<ul style="list-style-type: none"> • Means construction cost data • Myers graduate thesis⁽¹¹⁾ • Surety and Fidelity Association of America

A more detailed review of the literature for focus areas is provided in the following sections.

PREVIOUS CONTRACTOR PREQUALIFICATION RESEARCH

The literature on this subject is both extensive and thorough, which underscores the interest and potential value of performance-based approaches to the transportation industry. *NCHRP Synthesis 190* found that State transportation departments rely on the following four strategies to qualify construction contractors to bid:⁽⁶⁾

- **Prequalification:** The contractor needs to be qualified before it can submit a bid.
- **Post-qualification:** Only the lowest responsive bidder is qualified for the State transportation department's determination of responsibility.
- **Performance bonding:** Reliance on the surety industry to identify qualified contractors.
- **Contractor licensing:** State-sponsored program to ensure that only qualified contractors can bid based on licensing requirements.

The authors of literature on this subject believe that the qualifications of a given contractor can have a marked impact on the success of the projects it executes. An article on design-build projects also notes that selecting the most qualified contractor “correlates to the lowest administrative burden” for the State transportation department, which implies that a well-qualified contractor requires less oversight and can be trusted to comply with contract requirements, such as contractor quality control (CQC) methods.⁽¹²⁾ As noted above, in *NCHRP Report 561*, Scott et al. justifies prequalification by noting, “because of constrained staffing and budgets, it is not possible for State transportation departments to ‘inspect’ quality into the work.”⁽⁴⁾ The same article provides a succinct definition of a prequalification process and a motivation to establish a thoughtful process:⁽⁴⁾

Prequalification in its simplest form is an assessment of financial responsibility, which often mirrors what sureties look for in making their underwriting decisions relating to issuance of bonds for public works projects. It also may include other factors such as demonstrated ability to perform a certain type of work. Whether by prequalification or other methods, public owners are increasingly exploring ways to include non-price factors, both qualitative and quantitative, in the procurement process to motivate contractors not only to improve their performance during construction, but equally as important, to build value into the end products of construction.

Once again, the merit of using prequalification to add value to the construction process is underscored. The idea of using performance-based prequalification as a means to motivate contractors to improve their performance during construction is also expressed by the authors. The authors note that this idea ultimately leads to the benefits of enhanced construction quality and reduced administrative burden. The New South Wales (NSW) Australia prequalification manual, which calls the process the “scheme,” describes the benefits of a performance-based prequalification process as follows:⁽¹³⁾

- It “allows the NSW Government as a major buyer of construction related services to more effectively implement continuous improvement initiatives in the construction industry to achieve better project outcomes.
- It results in significantly reduced tender assessment times and simplified contract administration because prequalified tenderers [bidders] have already demonstrated an understanding of and compliance with NSW Government construction industry benchmarks, with management procedures and systems requirements.
- It is in line with the NSW Government’s direction to do business with the best of the private sector, the Scheme provides for incentives for good performance and also for the application of restrictions or sanctions in the event of poor performance as measured against the respective scheme requirements.”

Review of Prequalification Studies

The subject of contractor qualification has generated a significant amount of research in the past decade, including five studies that specifically examine performance-based contractor prequalification. These studies are briefly summarized below.

Kentucky Transportation Center Report, KTC-01-24/SPR 212-00-1F, *Quality Based Prequalification of Contractors*, reports the results of an analysis of the effectiveness of the Kentucky Department of Highways’ (KDOH) contractor performance rating system and its incorporation into the prequalification process.⁽¹⁴⁾ It recommends the inclusion of a given contractor’s past project quality performance record as an integral part of the prequalification process.

Wisconsin Department of Transportation Synthesis Report, *Contractor Prequalification Quality-Based Rating* reports the practices of 35 State transportation departments that responded to a survey on the topic.⁽¹⁵⁾ The report found that the majority of both contractors and State transportation department respondents believed that performance-based prequalification can be implemented in a fair and equitable manner.

Manchester School of Management Report, *Applying Evidential Reasoning to Prequalifying Construction Contractors* was conducted in the United Kingdom and essentially proposes a logic-based mathematical model to optimize the contractor prequalification process.⁽¹⁶⁾

NCHRP Synthesis 390, *Performance-Based Construction Contractor Prequalification*, benchmarked the state of the practice using a survey of 41 U.S. State transportation departments and 7 Canadian provincial ministries of transportation.⁽¹⁷⁾ The synthesis proposed a three-tiered model for performance-based contractor prequalification that will be discussed in detail in a subsequent section of this report.

Analysis conducted for the Michigan Department of Transportation (MDOT) examination, *Study of Most Effective Practices for Determining Construction Contractors’ Eligibility to Bid on Construction Projects*, built on the analysis work of *NCHRP Synthesis 390*, and focused on practices in the upper Midwest, surveying the States that border Michigan.⁽¹⁸⁾ MDOT sponsored

this research, which resulted in the finding that the current MDOT performance-based contractor prequalification system is both fair and equitable, and is consistent with similar systems in the region.

All five of the reports cited above concluded that implementing performance-based contractor prequalification has the potential to add value to the highway construction procurement process.

Review of Studies on Alternative Project Delivery that Included Prequalification

As part of the research associated with alternative project delivery, a fair amount of information has been published related directly to prequalification of contractors. Each of the relevant studies most specifically assessed the contribution of contractor qualifications to the project selection and award process. A summary of the major studies is provided below.

- **AASHTO Guide for Design-Build Procurement** provides a comprehensive set of the qualifications and experience requirements that have successfully been included in project-specific prequalification for design-build contracts.⁽¹⁹⁾
- **NCHRP Synthesis 376, Quality Assurance in Design-Build Projects**, analyzes the impact of design-build contractor prequalification and experience on final project quality.⁽²⁰⁾
- **Transportation Cooperative Research Program (TCRP) Report 131, Guidebook for the Evaluation of Transit Project Delivery Methods**, presents a comprehensive list of qualifications and experience requirements that have successfully been used on the project-specific prequalification of contractors from transit projects delivered using alternative project delivery methods, such as DB, CMGC, etc.⁽²¹⁾
- **Airport Cooperative Research Program Report 21, A Guidebook for the Selecting Airport Capital Project Delivery Methods**, provides a comprehensive list of qualifications and experience requirements that has successfully been used on project-specific prequalification of contractors for airport projects delivered using the alternative project delivery methods, as covered in *TCRP Report 131*.⁽²²⁾
- **NCHRP Synthesis 402, Construction Manager-at-Risk Project Delivery for Highway Programs**, analyzes the impact of contractor prequalification on final project quality for project delivery using Construction Manager-at-Risk (CMR).⁽³⁾ This report found that a major advantage of CMR project delivery was the ability to utilize project-specific contractor performance-based prequalification that allowed the State transportation department to match the contractor's qualifications with the technical requirement of the project.

Components of a Performance-Based Prequalification Program

The literature summarized above suggests that most performance-based contractor prequalification programs consist of the same set of components, which are described as follows:

- A completed questionnaire/application furnished by the contractor that details the following information: financial data, available equipment and plant, construction experience for a specified period, names and backgrounds of key personnel, and classes/types of work for which qualification was requested.
- A formula/algorithm that converts financial data into a rated capacity, which establishes the maximum amount of work that a given contractor can be awarded in a given period.
- A contractor project performance evaluation system that focuses on ratings of contractor work quality and timeliness on a specific standard form.
- A formula/algorithm to adjust the rated financial capacity based on the accumulated record of project performance evaluations.
- An appeals process for a contractor that believes it has been unfairly or improperly rated. (See references 1, 4, 10, 14, 23, 24, 25, and 26.)

State transportation departments often use general past performance and experience criteria in their administrative prequalification procedures to admit a contractor to the State bidders list.⁽¹⁷⁾ By using performance-based qualification factors in the selection process, a State transportation department can filter out unqualified contractors, thereby increasing the probability that the project will be completed successfully.⁽²⁷⁾ However, the key to successful public sector application of qualification parameters in a bid is that “their application must be justifiable and defensible.”⁽⁴⁾ This observation speaks to the need expressed by Parvin to reduce the probability of bid protest by making the performance-based prequalification system transparent and easy to understand.⁽²⁸⁾ The Minnesota Department of Transportation defended its prequalification method for a design-build project in an award protest by establishing that its prequalification parameters were both “justifiable and defensible.”⁽⁵⁾

Figure 1 is taken from a paper by Hancher and Lambert that details the KDOH’s “performance-based” contractor prequalification process.⁽¹⁴⁾ The process combines the calculation of total maximum financial capacity with a performance-based evaluation through the assignment of an “annual eligibility rating,” which is used to adjust the contractor’s “maximum eligibility amount.” This value equals the amount of work a contractor may be awarded in a given year. Using the formula, “lower-quality work will reduce the allowable work volume, whereas high-quality work will increase the allowable work volume” for a contractor.⁽¹⁴⁾

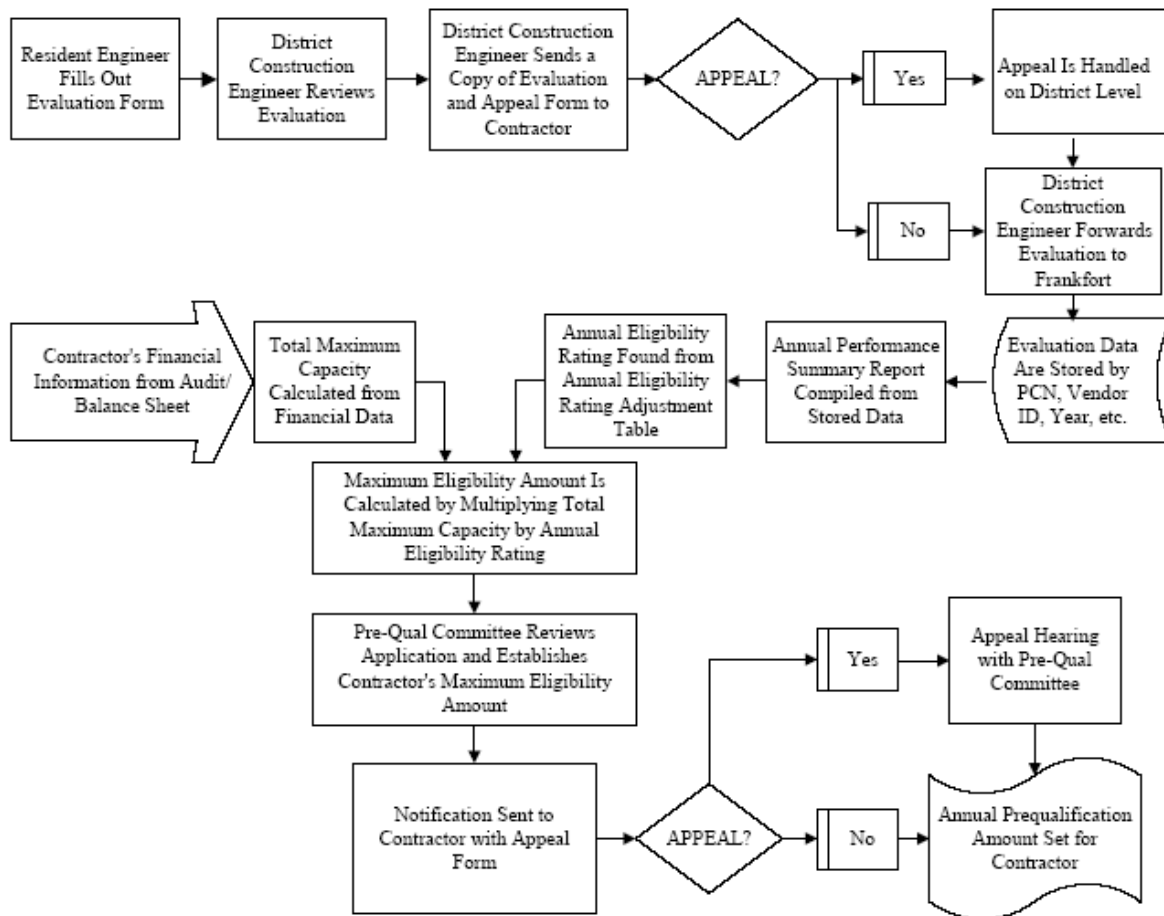


Figure 1. Flowchart. KDOH performance-based contractor prequalification process.⁽¹⁴⁾

Several authors have conducted research that evaluates the relative importance of the various components listed above. One early study included a survey of construction professionals from both project-owner and contractor organizations and asked them to rank order 20 prequalification factors by importance. Both rated financial stability, past project performance, and personnel availability and experience as the “key decision variables relevant for a generic contractor prequalification knowledge base.”⁽²³⁾ *NCHRP Web Document 38* also found project management/control skills, personnel experience, quality of final project, and experience with project type to be the most important, according to a similar group of survey respondents.⁽¹⁾ When these two studies are looked at together, the results of one’s contractor questionnaire/application and the other’s contractor project performance evaluation match one another, which validates the importance of these program components to a prequalification process based on two independent research efforts.

Evaluating contractor performance, then integrating these evaluations into the performance-based contractor prequalification system, provides a tangible means by which to reward good contractors and a disincentive for marginal contractors to perform badly. Other countries have been motivated to implement performance-based contracts for reasons that should resonate in the

United States. The motivation for the evaluation of contractor performance in New Zealand has been explained as follows:⁽²⁹⁾

The concept of performance-based contracts originated from a consideration of four factors, namely, (a) the increasing lack of personnel within the national road departments... (b) the frequency of claims... (c) the need to focus more on customers' satisfaction by seeking to identify the outcomes, products, or services that the road users expect to be delivered, and by monitoring and paying for those services on the basis of customer-based performance indicators; and (d) the need to shift greater responsibility to contractors throughout the entire contract period as well as to stimulate and profit from their innovative capabilities.

As demonstrated in *NCHRP Web Document 38*, these factors also motivate State transportation departments in the United States to look for methods by which to create efficiencies through contractor performance evaluations, as well as methods to mitigate the potential risk created by the trend toward the increased use of contractor QC in the project acceptance process. State transportation departments' performance evaluation programs have to pass the tests for both fairness and equity, which are essentially reflected in the types of information the State transportation departments collect in regard to past performance.

An attention to fairness should ensure that the evaluation system is transparent and furnishes a mechanism by which contractors can appeal a negative rating. Transparency can be achieved when the evaluation system and all its components are published in advance of the evaluation and when the State transportation department performs the evaluation in line with what has been published.⁽³⁰⁾ The inclusion of guidelines for the ratings used for individual components also contributes to consistency and minimizes biases. Furnishing an appeals process demonstrates to the contracting industry that the State transportation department is open to the challenges of its evaluation system through the use of due process, before a contractor is penalized by a negative rating.⁽⁴⁾ If implemented, these two elements can greatly ameliorate negative perceptions of potential harmful impacts of a new contractor performance evaluation system.⁽³⁰⁾

To further increase fairness in the process, KDOH allows contractors to rate KDOH's performance at the same time KDOH rates the contractor. These contractor ratings are used by KDOH to "determine quality improvements needed, personnel training needed, and topics for discussion at the annual meetings with the contractor associations and for evaluations of personnel and other uses, as deemed appropriate."⁽¹⁴⁾

A contractor's ability to appeal to have a negative rating changed or removed can also serve as a means by which to further ensure fairness. *NCHRP Report 561* notes that fairness demands a contractor have recourse to "due process."⁽⁴⁾ While a State transportation department may not want to create a separate formal disputes resolution system for performance evaluations, it should furnish within its evaluation framework a mechanism whereby a contractor has the ability to protest what it believes is an unfair assessment of its performance. Such a mechanism can be as simple as allowing the contractor to add rebuttal comments to the evaluation form and then charging the chain of command above the evaluator to investigate to determine if the contractor's protest has merit before the final evaluation is entered into the system. Some jurisdictions have a formal board or committee that will hear and decide appeals on qualification matters. The

inclusion of such elements of independence can significantly contribute to both the fairness and, equally as important, the perceived fairness of the system.

Federal Construction Contractor Appraisal Support System

The FHWA's Federal Lands Highway Divisions utilize the Department of Defense Construction Contractor Appraisal Support System (CCASS).^(9,31) An NCHRP study reports of the CCASS:⁽⁴⁾

The Federal Government and a number of State agencies have for many years maintained a database of contractor evaluations on past projects and often use this resource as a means to measure the contractor's track record. Despite certain drawbacks, this appears to be the best means of assessing past performance as it allows contractors the opportunity to appeal negative ratings.

The CCASS evaluation system has been in use for decades and serves not only to record actual contractor performance, but also as a means for Federal agencies to make a decision on the "responsibility" of bidders for a DBB project.^(9,32) In this system, a low bidder with several unsatisfactory ratings can be found "not responsible," and consequently, not be awarded the contract. CCASS requires that the agency evaluate the contractor's performance in five areas: quality control, timely performance, compliance with safety standards, the effectiveness of management, and compliance with labor standards.

The FHWA requires that the contractor be notified if the State transportation department believes it is not performing at a satisfactory level. This kind of mandated communication between the contract owner and the contractor provides the contractor with the ability to both correct the defect found by the contract owner and, if applicable, to refute or clarify the perceived defects. The CCASS process requires that the State transportation department forward all its ratings to the evaluated contractor and give that entity 30 days to comment on the rating.⁽³²⁾ The State transportation department then reviews the contractor's comments and determines whether or not to adjust the final rating.

CCASS evaluations are filed and remain in the contractor's record for six years. They are used as part of the prequalification process on DB and other types of negotiated contracts, as well as to determine responsibility on DBB contracts. This is accomplished by adding the following requirement—that the contractor have no unsatisfactory performance evaluations on file in CCASS—to the Federal definition of a "responsible bidder."⁽³²⁾

Based on the Federal Lands Highway Divisions experiences, it appears that using some form of evaluation of a given contractor's actual CQC performance is perceived as having a positive impact on final project quality. If these perceptions are accurate, this approach to evaluation should be part of a performance-based contractor prequalification program.

Performance-Based Prequalification Implementation

NCHRP Synthesis 390 asked, "Can performance-based construction contractor prequalification be implemented in a way to reward good contractors and encourage poor contractors to improve performance?"⁽³²⁾ The FDOT "ability factor," shown in figure 2 and table 2, is designed to reward a contractor's past performance by assigning a higher "ability factor" to those who have

exceeded the minimum requirements than to those who have not exceeded them.⁽³³⁾ The interviews with FDOT contractors familiar with the system indicated that not only did it furnish an incentive to maintain satisfactory quality, but that it was also generally deemed a fair and equitable system.⁽¹⁷⁾

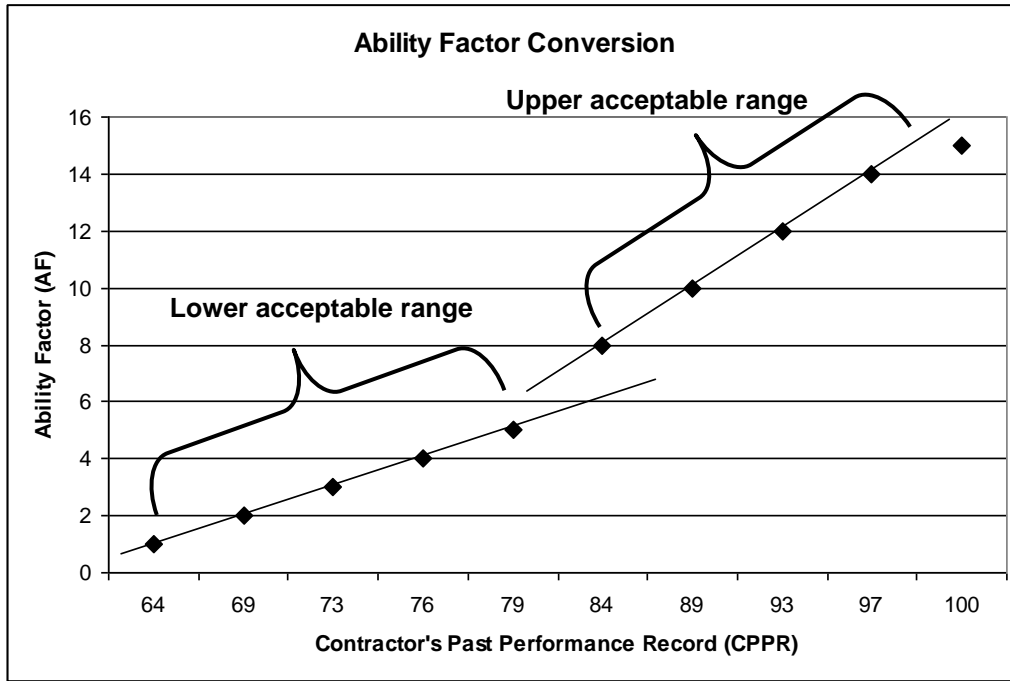


Figure 2. Line graph. FDOT “ability factor” conversion from contractor’s past performance record.⁽³³⁾

Table 2. Impact of the FDOT “ability factor” on maximum capacity rating.⁽³³⁾

Contractor’s Past Performance Record	Ability Factor	Current Ratio Factor	Adjusted Net Worth (ANW) (in \$ Millions)	Maximum Capacity Rating (in \$ Millions)
Large Company—ANW > \$100 million				
98–100	15	1.3	\$334.1	\$6,515
74–76	4	1.3	\$334.1	\$1,737
64 or less	1	1.3	\$334.1	\$434
Medium Company—ANW \$20 million to \$100 million				
98–100	15	1.3	\$52.7	\$1,028
74–76	4	1.3	\$52.7	\$274
64 or less	1	1.3	\$52.7	\$69
Small Company—ANW < \$20 million				
98–100	15	1.3	\$1.5	\$29
74–76	4	1.3	\$1.5	\$8
64 or less	1	1.3	\$1.5	\$2

The Canadian province of Ontario has also successfully implemented and sustained a system that encourages good performance. Contractors are rated in five work classifications: general road, structures, electrical, structural coating, and general maintenance. Both rated and new contractors need to demonstrate satisfactory experience in a given classification to be awarded their full “basic financial rating,” which is an MTO term for the maximum amount of awarded work a given contractor can have ongoing at any given point in time. It is similar to a surety’s bonding capacity and is determined in much the same way. If constructors do not have MTO experience, their experience with other public road agencies is considered and their “basic financial rating” may be reduced in accordance with a published formula.⁽³⁴⁾ Additionally, a fully qualified contractor’s “basic financial rating” is reduced by the amount of its ongoing work to determine an available financial rating. This subtraction parallels the approach used to determine bonding capacity in the United States.

A contractor’s “available financial rating” is determined at the point in time when a bid is tendered, and it needs to equal or exceed the contract rating. For example, a contractor with a basic financial rating of \$100 million that has \$80 million worth of awarded, ongoing work at the time of the bid has a \$20 million available financial rating. If the estimated value of the contract being bid is less than or equal to \$20 million, then this contractor is allowed to submit a bid. If the contract value is greater than \$20 million, then the contractor is unqualified to bid on this particular project, due to insufficient financial rating or capacity. Contractors with a record of poor performance may also be required to equal or exceed the maximum workload rating (MWL) for the project. The contractor performance index (CPI) is calculated from the contractor’s previously approved contract performance ratings (CPR) for each project and is used to determine if a contractor needs to satisfy the contract rating and the contract maximum workload rating.

Based on the CPI, a contractor is categorized into one of the three following “zones”:

- Green Zone: When CPI ranges from 70 to 100.
- Yellow Zone: When CPI is greater than 55 and less than 70.
- Red Zone: When CPI is greater than 35 and less than 55.
- A contractor with a CPI of less than 35 would not be deemed qualified to bid.

Green Zone contractors are allowed to bid on work up to their “financial basic rating” without adjustment for performance. Yellow zone contractors may have to meet the contract “maximum workload rating,” and may have their MWL reduced by a factor of up to 20 percent. Finally, Red Zone contractors will have their MWL reduced by a factor “calculated linearly 20 percent and 100 percent depending on their position in the zone (20 percent at 55 and 100 percent at 35).”⁽³⁴⁾ A contractor’s MWL is defined as the highest annual total dollar value of work awarded to a contractor in one of the five fiscal years preceding the current fiscal year.

The MTO includes an integrated infraction report system in the calculation of an adjusted financial rating that accounts for a contractor’s record of infractions issued against it. An

infraction is defined as a serious breach of contract, and includes, but is not limited to, the following specific behaviors:⁽³⁴⁾

- Failure to abide by tendering requirements.
- Incomplete or inaccurate tender declarations.
- Failure to abide by General Conditions of Contract.
- Serious issues that affect safety or the environment.
- The unsatisfactory timeliness of the completion of the work and services.
- The issuance of any Notice of Default.
- The manner of the unsatisfactory resolution of any disputes and whether such disputes were resolved, in accordance with the prescribed provisions of the contract.
- When an Infraction Report is issued, the Qualification Committee may take no action, issue a warning letter, or reduce the contractor's available financial rating for a specified period.

The infraction report becomes a very serious matter for contractors who wish to compete for work in Ontario, and the imposition of sanctions (adverse contract actions, such as termination) may create a severe hardship for an Ontario-based company, which then needs to leave the province to seek work. In the case of contractor exclusion (debarment), provisions in the policy create a distinct disincentive to immediately seek redress in the court system; if a contractor sues MTO, it may not do business with (e.g., award a contract to) that contractor. The infraction report also creates an incentive to complete MTO projects in a timely manner and in a fashion that is satisfactory to the MTO. Table 3 and table 4 show how five contractors distributed across the three zones that have the same "basic financial rating" and "maximum workload rating" would be affected by this system.

Table 3. Example of several MTO qualified contractors under a maximum workload rating adjustment.⁽¹⁷⁾

Contract Financial Rating = C\$8 Million; Contract Maximum Workload Rating = C\$5 Million						
Contractor	Basic Financial Rating (MWL Rating)	Contractor Total Ongoing Work (Total Current MTO Work)	Available Rating	Infraction Sanctions	Contractor Performance Index	Impose MWL Rating?
A	C\$12 million (C\$6 million)	C\$2 million (\$1.5 million)	C\$10 million	0	85 = Green zone	No
B	C\$12 million (C\$6 million)	C\$2 million (C\$1.5 million)	C\$9.4 million	5% (Environmental infraction)	74 = Green zone	No
C	C\$12 million (C\$6 million)	C\$2 million (C\$1.5 million)	C\$10 million	0	65 = Yellow zone ¹	Yes: MWL = C\$6 million
D	C\$12 million (\$6 million)	C\$2 million (C\$1.5 million)	C\$10 million	0	50 = Red zone ²	Yes: MWL = C\$6 million
E	C\$12 million (C\$6 million)	C\$2 million (C\$1.5 million)	C\$8.2 million	15% (Safety infractions)	72 = Green zone	No

MWL = Maximum workload

MTO = Ontario Ministry of Transportation

¹ Yellow zone penalty is discretionary; MTO can impose a reduction of the MWL of up to 20 percent. For this example, no penalty is assessed, but MWL is imposed.

² Red zone = Automatic linear reduction from 20 to 100 percent for the rating between 35 and 55.

Table 4. Example of several MTO qualified contractors under a maximum workload rating adjustment, part 2.

Contractor	MWL Reduction Adjustment	Exclusion?	Adjusted Financial Rating	Adjusted MWL Rating	Prequalified?
A	N/A	No	C\$10 million	N/A	Yes C\$10 million > C\$8 million
B	N/A	No	C\$9,400,000 (5% infraction = C\$600,000 reduction)	N/A	Yes C\$9.5 million > C\$8 million
C	0%	No	C\$10 million	C\$4.5 million (MWL C\$6 million less MTO work C\$1.5 million)	No C\$4.5 million < C\$5 million
D	40%	No	C\$10 million	C\$2.7 million (60% of MWL C\$6 million less MTO work C\$1.5 million)	No C\$2.7 million < C\$5 million
E	N/A	Yes (ongoing lawsuit)	Excluded	N/A	No Excluded, due to ongoing lawsuit

N/A = Not Applicable

MWL = Maximum workload

MTO = Ontario Ministry of Transportation

The third and final question addressed by *NCHRP Synthesis 390* is the following: “Can performance-based construction contractor prequalification add value to the completed construction project?”⁽¹⁷⁾ Both the synthesis survey and its contractor interviews found that the implementation of performance-based contractor prequalification was perceived as having a positive impact on the quality of various components of a project, thereby enhancing the value of that project. Since Ontario has a rigorous prequalification process and has consequently omitted the performance bond requirement for contractors, it has freed up savings in bonding costs, improved project quality, and potentially reduced contract administration effort that can be applied to other projects, which demonstrates the potential that performance-based construction contractor prequalification has to add value to the public transportation construction program.⁽¹⁷⁾

Literature on Adjusting Bidding and Bonding Capacity

The performance-based contractor prequalification programs detailed in *NCHRP Synthesis 390* reduce a marginal contractor’s bidding capacity in various ways, and thereby avoid “subsidizing” poor performance (see the Minchin and Smith interviews and those cited in *NCHRP Synthesis 390*).^(1,17) MTO’s program eliminated performance bonding altogether over 20 years ago.⁽¹⁷⁾

Since the cost of furnishing a performance bond is passed on to the State transportation department in the contractor’s bid, adjustment of the portion of a project value that requires a performance bond seems a logical approach to bonding modification within a performance-based contractor prequalification system. For example, a top performing contractor might only be required to furnish a bond on 50 percent of the contract amount, whereas less qualified contractors or contractors new to the State transportation department would need to bond 100 percent of the contract amount. A reduction in the percentage of the project value that requires a bond, based on a contractor’s past performance, would create an incentive for superior performers by reducing their bid price. U.S. performance bond rates run between 1 and 3 percent of the total bid amount, so this change in bid prices would be significant.⁽³⁶⁾ These savings would be passed on directly to State transportation departments because they would secure lower construction costs for projects. In fact, Florida, Maine, Virginia, and Washington have all experimented with using bonding for less than the entire contract amount.⁽¹⁷⁾

Many State transportation departments perceive that the purpose of bonding is to protect the State against contractor default.⁽¹⁴⁾ However, the majority of U.S. and Canadian survey respondents to the *NCHRP Synthesis 390* survey stated that a performance bond was not sufficient evidence of contractor prequalification. A rigorous performance-based prequalification system in place allows contractors who fail to complete a project to be penalized via a reduction in their performance rating or by their ultimate removal from the bidding list.

A rigorous performance-based prequalification system can carry more financial weight than a purely financial bonding system. As stated previously, MTO has a long history of not requiring bonds from their contractors. MTO’s annual construction program is approximately C\$2.1 billion. Based on the U.S. 2007 to 2009 national average, the average performance/payment bond costs would be 1.139 percent of the total contract cost.⁽¹¹⁾ Thus, the estimated savings (not accounting for any possible contract defaults) is approximately C\$24 million per year in bond costs. MTO utilizes a three-component system to thoroughly review the stability of its bidders.⁽³⁵⁾

- Administrative prequalification.
- Performance prequalification.
- Infraction system.

MTO stresses that the success of the system lies in the interrelationships between the components. While certain components of the system can function independently, the program works best when all the components are integrated.

The *NCHRP Synthesis 390* Three-Tiered Prequalification System

NCHRP Synthesis 390 proposes a three-tiered performance-based contractor prequalification system. This approach was developed, based on the study's comprehensive literature review, including the survey responses recorded from 41 U.S. State transportation departments and 7 Canadian provincial transportation ministries, a content analysis of solicitation documents from 35 State transportation departments, and interviews with 10 construction contractors from firms ranging in size from a local chip seal contractor to a major national Heavy Civil contractor. The recommended process is summarized in figure 3.

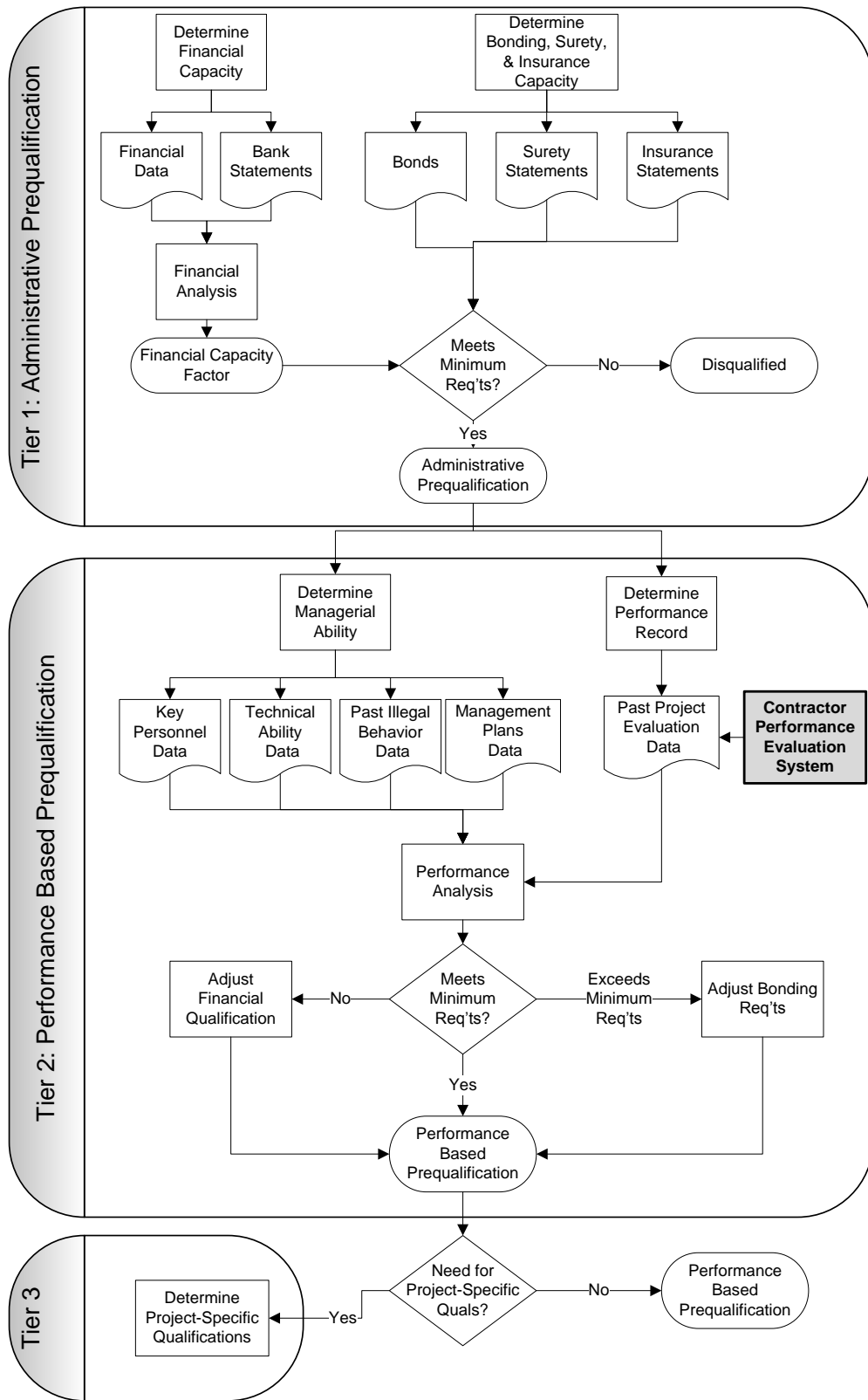


Figure 3. Flowchart. Three-tiered performance-based prequalification process.⁽¹⁷⁾

NCHRP Synthesis 390 uses the following definitions for each “tier” in the process detailed in figure 3:⁽¹⁷⁾

- **Administrative prequalification:** “A set of procedures and accompanying forms/ documentation that must be followed by a construction contractor to qualify to submit bids construction projects using traditional project delivery. These include evaluation of financial statements, dollar amount of work remaining under contract, available equipment and personnel, and previous work experience. This may be on a project-by-project basis or on a specified periodic basis.”
- **Performance-based prequalification:** “A set of procedures and back-up documents that must be followed by a construction contractor to qualify to submit a bid on a construction project based on quality, past performance, safety, specialized technical capability, project-specific work experience, key personnel, and other factors. This may be on a project-by-project basis or on a specified periodic basis and the project could be delivered using traditional design-bid-build or alternative project delivery methods such as design-build, construction manager/general contractor, or any other method.”
- **Project-specific prequalification:** “Contractor prequalification requirements that exist only for a single project. These normally address project technical/procurement factors that are considered essential for the success of the given project. They may include criteria that require the contractor to have had past experience building a certain technology (i.e., seismic retrofit, information and technology systems, etc.) or a given project delivery method such as design-build. They may also extend to cover specific experience for key project personnel and specific types of plant and equipment.”

Figure 4 provides additional details on the components of tier three.

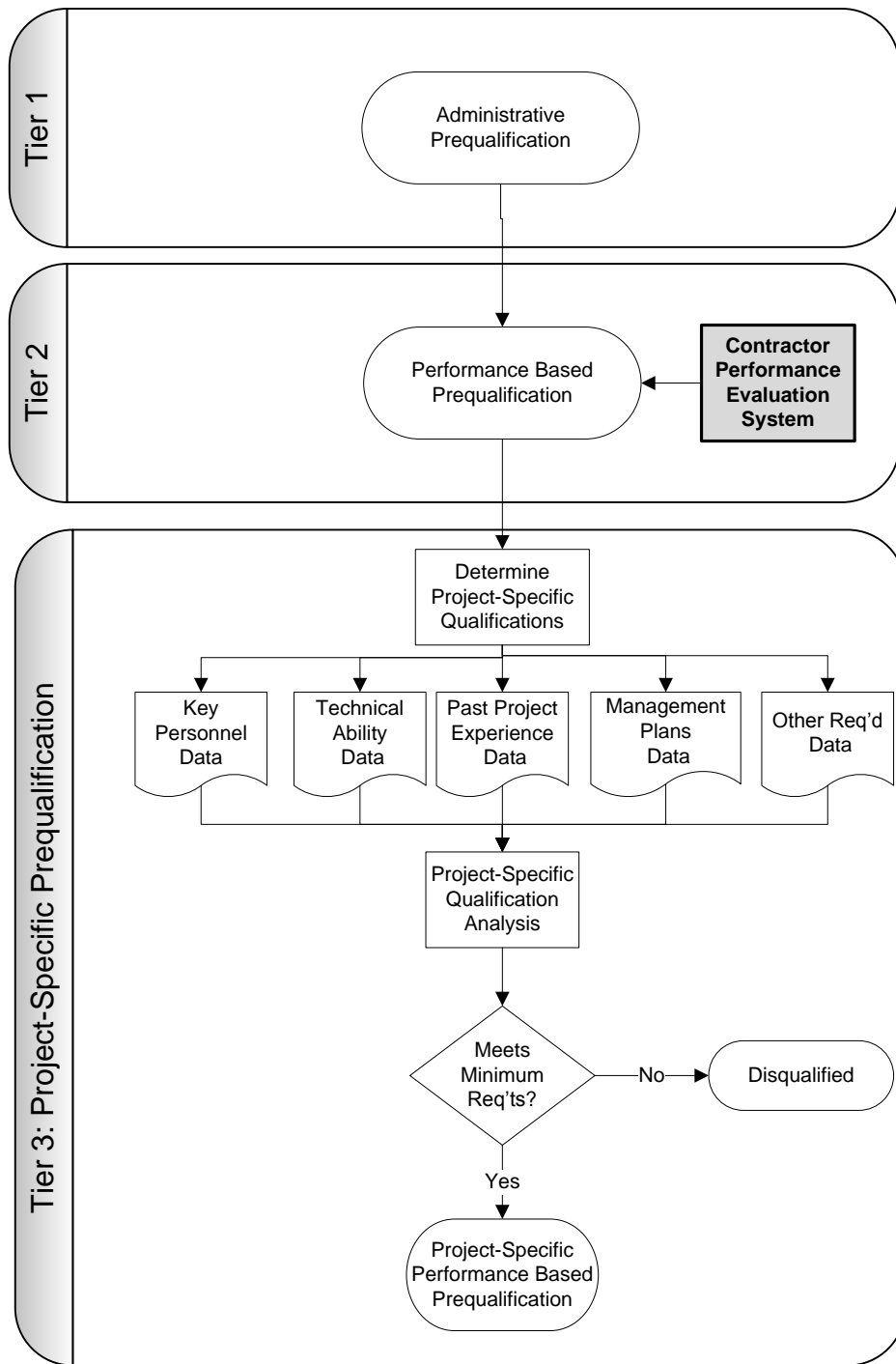


Figure 4. Flowchart. Three-tiered process with tier three-project-specific details.

Barriers to Implementation

The literature on performance-based prequalification devotes a significant amount of attention to evaluating the barriers and challenges to implementing a performance-based contractor prequalification system. (See references 1, 2, 17, 35, and 37.) Ultimately, the various analyses

reviewed in this study noted very few significant barriers to the implementation of performance-based contractor prequalification. Many State transportation departments already have some form of contractor evaluation included in their bid process; many have some form of performance-based prequalification included as well. Based on input provided by contractors, as collected in the literature, contractors would seem to welcome implementation of this approach as a tool to reduce or remove the number of marginally qualified contractors, against which they need to compete. Nevertheless, *NCHRP Web Document 38* notes that the following implementation issues will need to be addressed when a performance-based prequalification process is introduced:⁽¹⁾

- Integration with existing construction administration systems, such as SiteManager.
- Consideration of the evaluators' qualifications.
- Evaluation process administrative rules.
- Frequency of evaluations.
- Appeals process development.
- Lifespan of evaluations/duration of disqualification.
- Impact on contractor bonding.
- Legal implications.

Of the potential barriers listed above, significant focus should be placed on the implementation of administrative rules for the evaluation process.⁽²⁾ The State transportation department will need to ensure that its evaluators are indeed qualified to evaluate the subject contractors. In most cases, contractors should be evaluated by the State transportation department construction personnel who administer the evaluated contract. Implementation will require that an ongoing training program for the evaluators be developed and implemented to ensure consistency between evaluators and across different types of projects. This component of the program will also be necessary to demonstrate the State transportation department commitment to fairness and to ensure the reduction of as much subjectivity in the process as possible. Agencies that currently use this type of system (such as FHWA and FDOT) have found that a review of all contractor evaluations one level above the "evaluator" is also required to make the program as consistent as possible.^(31,33) This issue was highlighted in *NCHRP Synthesis 390*, in which 8 out of 10 interviewed contractors indicated that their major concern with performance-based prequalification is the agencies' ability to consistently rate them from project to project.

The administrative rules of the process also need to be transparent and logically derived.⁽²⁸⁾ It is important to determine the frequency of evaluations. The literature on this topic seems to support that at least one interim evaluation is provided to the contractor before the final evaluation. (See references 31, 32, 33, and 34.) FDOT furnishes evaluations on a monthly basis. The crucial element will be to notify the contractor when it is not performing well and to provide the contractor with the opportunity to correct its deficiencies and shortcomings, before negative

evaluations become part of its permanent record. There is a need for an appeals process whereby the contractor can refute an unfavorable rating, which provides the contractor with due process before it is penalized by the evaluator.

The question of the appropriate length of an evaluation's life span should also be addressed as an integral component of the evaluation process. *NCHRP Synthesis 390* found that the majority (73 percent) of its survey respondents maintained evaluations in their active record for at least three years. Survey results also support this time interval, and literature on the subject recommends a "rolling 3-year average."^(14,34) This selected duration creates an incentive for contractors to perform in a satisfactory manner, since a bad evaluation could impact the work that they can secure for a three-year period. The amount of time a contractor can remain disqualified due to certain behavior may be longer. Those that lose their qualification for criminal acts are usually debarred from participation indefinitely. In contrast, those that are disqualified for marginal performance, usually for defaulting on a contract, are able to regain their qualification after proving to the State department of transportation that they have corrected the problems that caused the default(s).

REVIEW OF STATE PREQUALIFICATION EVALUATION PROCEDURES

A survey conducted for *NCHRP Web Document 38* found that 29 States used some type of contractor prequalification process.⁽¹⁾ According to *Study of Most Effective Practices for Determining Construction Contractors' Eligibility to Bid on Construction Projects*, the major factors used to arrive at a contractor's prequalification rating are financial resources, experience, availability of necessary equipment, and past performance.⁽¹⁸⁾ MDOT is one example of a State that uses a prequalification procedure. In MDOT's current procedure, all prime contractors and subcontractors who intend to bid on projects, as well as those who request prequalification, need to be prequalified before they can submit a bid. The prequalification process follows the Bureau of Finance and Administration's classification and rating of bidders' administrative rules. MDOT currently requires a bid guarantee from all prime contractors bidding on a project. A performance bond is required from all prime contractors before they can begin work on MDOT projects, and MDOT requires that contractors renew their qualifications on an annual basis. Due to a recent change to the administrative rules, all contractors with a financial rating of more than \$10 million can now renew their qualification every two years.⁽¹⁸⁾

Post-qualification practices are also used by numerous State transportation departments. These typically involve consideration of a contractor's qualifications after the contractor has been selected on a low-bid basis. These qualifications are submitted in response to a State transportation department questionnaire to verify compliance with requirements of the contract. Post-project performance evaluation practices that impact contractor eligibility are in use at many State transportation departments.⁽¹⁸⁾ Ahn conducted a survey of U.S. States in 2008 and found that 28 States rely on some form of post-project evaluation.⁽⁶⁷⁾ The New York State Department of Transportation and the Rhode Island Department of Transportation both currently use post-qualification for contractor selection. Neither State currently has a specific performance-based rating evaluation scale for contractors. They rely on post-qualification instead of performance evaluations.⁽¹⁸⁾

State transportation departments generally review multiple factors in order to prequalify or post-qualify contractors. They typically assign a maximum amount of work a contractor can perform and the type of work they are allowed to perform, based on qualification determinations. The factors most commonly used by State transportation departments to evaluate contractors are as follows:⁽¹⁸⁾

- Past experience of contractor (87 percent).
- Financial capability (75 percent).
- Equipment and plant (72 percent).
- Past performance evaluations (72 percent).
- Past illegal behavior (72 percent).
- Detailed financial analysis (66 percent).
- Qualifications (resumes) (66 percent).
- Bonding capacity (60 percent).
- Calculated capacity factor (57 percent).
- Level of subcontracting (40 percent).

Not only may State transportation departments rely on different factors, but they may also require slightly different forms of documentation as proof from contractors. The actual amount of effort required for review by each State transportation department depends on the factors evaluated and the type and amount of proof required and reviewed.

State transportation department prequalification and post-qualification practices share certain similarities and differences across States. A majority (25 out of 33) of the States surveyed in Dye Management Group's eligibility practices reported that they only use prequalification methods to prequalify prime contractors. In addition, most States prequalify contractors in different work categories to ensure that the prequalification process accurately accounts for the fact that construction disciplines are varied and require different skills. The number of work classifications used varies by State transportation department. Most States (31 of 48 surveyed in *NCHRP Synthesis 390*, and 7 Canadian ministries of transportation) monitor contractor performance on projects, though the information obtained through monitoring is not used in the prequalification/eligibility determination process in all States. While some State transportation departments change a contractor's prequalification status based on their project performance, others do not. Policies regarding how to modify State limits are well documented and standardized in some State transportation departments, while others use a more subjective, less standardized approach.⁽¹⁷⁾

Most State transportation departments use a combination of methods to determine contractor eligibility. The results of 40 State transportation department surveys, as presented in Dye

Management Group’s report, along with information from *NCHRP Synthesis 390*, show that performance bonding and bid bonding/guarantee are the most widely used methods to determine the eligibility of contractors, followed by general prequalification.^(17,18) Any contractors that do not submit a bond/guarantee are almost always disqualified.

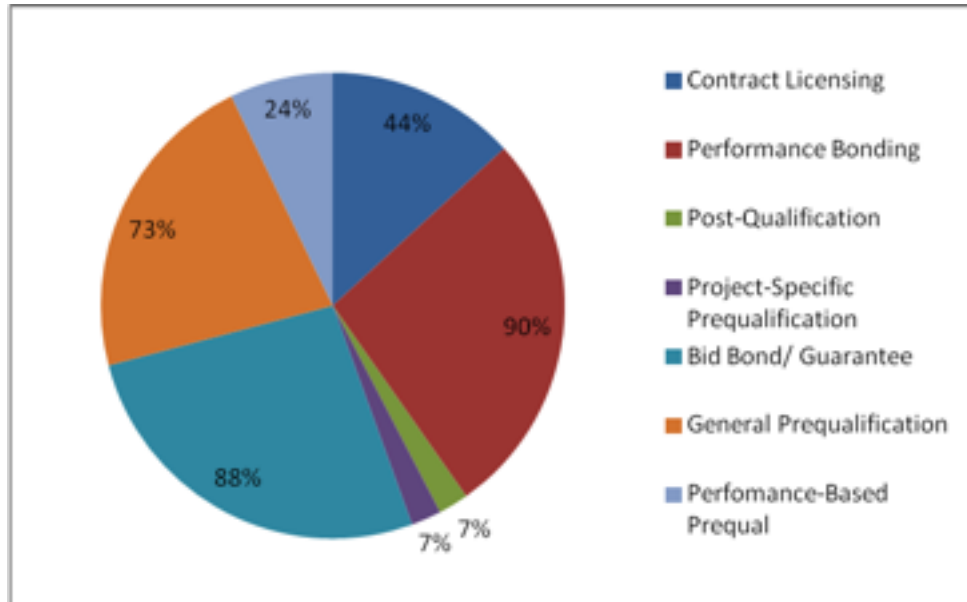


Figure 5. Common eligibility determination methods.^(17,18)

MDOT currently determines a contractor’s financial rating (also referred to as financial capability) by requiring that proof of financial capability be provided; this requirement needs to be met in order for a contractor to be prequalified. The financial rating for a contractor is calculated as follows: working capital (either positive or negative) is multiplied by nine; depreciation expenses on construction and transportation equipment allowed on contractor/bidder’s book of accounts is multiplied by nine; net booked construction and transportation equipment values, minus any long-term debt the equipment secures, is multiplied by four. The sum of all three factors is the total finance rating. If the contractor is applying for a financial rating of over \$1 million, the contractor is required to provide a certified audit (i.e., an audited financial statement). If the contractor is applying for a financial rating of less than \$1 million, the contractor submits a compiled financial statement, a reviewed financial statement, or an accounts receivable and bank statement verification form.

MDOT has used this formula to calculate financial rating for a number of years. The financial rating calculated is truncated to the number of thousands of dollars for ease of use and reporting, and is a general rating that applies to all of the 53 different work areas. The more specific financial rating for a work classification, which is calculated separately, can be lower than the overall financial rating. For specific work classifications (e.g., clearing and grubbing, asphalt, concrete, etc.), a contractor requests approval and submits information regarding their equipment, personnel, and team experience, which are considered components of the specific work class financial rating. A review of these factors is subjective, with no specific weights assigned to each, and a financial rating is determined for each work classification.⁽¹⁸⁾

State transportation departments that perform post-project evaluations use a variety of rating systems for their performance evaluations. The rating scales range from 4 to 11 numbers. Many State transportation departments use similar categories to one another to evaluate performance, but group them in different combinations. The narrowness or breadth of categories used varies from State transportation department to State transportation department. Twenty-five of the 26 State transportation departments surveyed that conduct post-project evaluations cited quality and management as categories used in their rating evaluation process. Scheduling was cited by 21 State transportation departments, while safety, traffic, and U.S. Department of Transportation (USDOT) cooperation were cited by 19 State transportation departments.⁽¹⁸⁾

The frequency of evaluation for post-project evaluation practices varies among State transportation departments. Nearly all evaluations are conducted at specific intervals. The Oregon Department of Transportation (ODOT, presented as ODOT-OR for the purposes of this report) evaluates the firm contractually responsible for a project annually, on the anniversary date of the notice to proceed for a project. Once completed, contractor performance evaluations are combined in a 12-month rolling average. The Virginia Department of Transportation (VDOT) incorporates their contractor evaluations into their monthly interim reports and into an annual or final report. In Connecticut, evaluations are conducted annually, as well as after the completion of projects.⁽¹⁸⁾

The South Dakota, North Carolina, Florida, Utah, and Maine transportation departments have minimum thresholds for prequalification that range from \$50,000 to \$250,000. By contrast, the city of Clearwater, FL, determines its prequalification threshold on a contractor-by-contractor basis that is dependent upon previous project performance. The Delaware Department of Transportation uses a project-specific prequalification process and the Detroit Metropolitan Wayne County Airport uses prequalification based specifically on the technical complexity of a project. VDOT changed its practice in 2006 and 2007 to allow contractors who have consistently performed well to bid on any amount of work, so long as they can provide a performance bond. Newer or marginal contractors are assigned specific limits and may be put on probationary status or given conditional prequalification. VDOT also reserves the right to review applications on a case-by-case basis. VDOT reported consistent contractor performance after it implemented the change, and is able to apply its savings—achieved through the elimination of internally conducted detailed financial reviews—in order to conduct more safety and quality reviews.

Table 5. Summary of State transportation department contractor performance evaluation categories.

State	Quality— Workmanship and Materials	Safety	Schedule	Home Office Support	Compliance	Environmental	Organization	Equipment	Payment of Accounts	Project Management	Prosecution of Work	Relations/ Cooperation	Traffic Control
Connecticut	x		x		x					x	x		
Florida	x							x			x	x	
Illinois	x				x	x	x				x	x	x
Indiana	x						x	x			x	x	
Iowa		x					x	x			x		
Kansas	x	x	x		x				x			x	
Kentucky	x	x	x	x	x			x				x	x
Maine	x	x			x					x		x	
Maryland	x	x	x		x	x						x	x
Massachusetts	x	x	x	x	x			x	x	x		x	
Michigan							x	x		x	x		
Missouri	x										x		x
Nebraska	x				x					x		x	
New Jersey	x	x	x		x		x			x			x
Ohio							x	x		x	x		
Oklahoma	x		x		x	x	x				x	x	x
Oregon	x	x	x		x	x			x	x			x
Pennsylvania					x			x			x		
South Carolina	x	x	x							x	x		
Utah	x	x	x		x	x				x		x	x
Vermont	x	x			x	x	x			x	x		x
Virginia	x	x				x				x			
Washington	x		x					x		x			
West Virginia	x		x				x	x		x		x	

Summary of State Performance Evaluation Documentation and USDOT DBE Outreach Efforts

Connecticut DOT (ConnDOT)

ConnDOT requires a contractor performance evaluation for contractors and subcontractors. Performance evaluations are undertaken annually and at the time of project completion for prime contractors, and only at the time of project completion for subcontractors. The rating evaluation form includes fairly detailed descriptions for ratings in five categories. The categories included in the form are quality of the work; performance of work; adherence to project schedule; implementation of Federal, State, and local policies, procedures, and regulations; and procedural/administrative. Connecticut has established consequences and “trigger” values for contractor performance ratings. These are described in ConnDOT’s construction manual, as follows.⁽³⁸⁾

These forms from all Districts are compiled and the five-year average is used to determine an overall, representative rating for each Contractor. They are used by the Department when determining the qualification of contractors, as well as responsibility issues. The Office of Construction provides the five-year average to the Office of Contracts and other interested units or agencies as requested.

If any annual project or overall project rating is at or below a 2.0, the Office of Construction sends a memorandum to the District requesting that the District meet with the firm to discuss the problems or deficiencies noted on the review.

If the five-year average rating is at or below a 2.5, the Office of Construction sends the firm a letter (copy the Office of Contracts), noting that their performance was lacking in certain areas and that they need to improve on future projects.

If the five-year average rating is at or below a 2.0, the Office of Construction sends the firm a letter (copy the Office of Contracts), putting the firm on notice that the firm is at risk of being found non-responsible.

A finding of non-responsibility may impact a firm’s future ability to be awarded work on Department projects.

Florida Department of Transportation (FDOT)

FDOT details their procedures and policies for the completion of the Contractor’s Past Performance Report in their Construction Project Administration Manual. They also provide a link to a standard spreadsheet for the Contractor’s Past Performance Report. The Contractor’s Past Performance Report is used to establish the contractor’s “Final Rating Score,” which is used to determine the contractor’s maximum capacity rating.⁽³⁹⁾

Indiana DOT (INDOT)

INDOT uses a standard form to rate contractors. The instructions include specific guidelines on the ratings to be given, and place particular emphasis on communication with the contractor throughout the project. Contractors are rated in the following areas:

- Organization, equipment, and personnel.
- Prosecution of the works.
- General relationships/cooperation.
- Quality of workmanship and materials.

Interestingly, INDOT also uses the same form to rate subcontractors. The positive and negative consequences associated with each rating are noted in the form in terms of positive and negative numbers, which trigger investigatory meetings with INDOT to remedy the specific issues.⁽³⁹⁾

Illinois Department of Transportation (IDOT)

IDOT rates contractors on a single form and guidelines for ratings are provided on the form. The form consists of two parts: the first part focuses on quality, and assigns a numerical rating to different work type categories (from earthwork to electrical to marine construction); the second part focuses on execution of the work. The contractor is evaluated for project execution across six categories: organization/prosecution of the work, cooperation, traffic control/site preparation, Equal Employment Opportunity (EEO)/labor compliance, erosion control, and quality control/quality assurance.⁽⁴¹⁾

Iowa Department of Transportation (IOWADOT)

IOWADOT conducts performance evaluations for every contract in excess of \$20,000 and for each bridge painting contract. The Contractor Evaluation Report needs to be completed for contractors and subcontractors. The contractor is evaluated in four areas: organization management, work performance, safety practices, and equipment.⁽⁴²⁾ The referenced document does not specify how the performance rating can impact a contractor or subcontractor's ability to continue to bid IOWADOT projects.

Kansas Department of Transportation (KDOT)

KDOT uses a relatively simple evaluation form for contractors. The form consists of eight categories, in which contractors are rated by both the field office and the district office:⁽⁴³⁾

- Work quality.
- Work timeliness.
- Payment of accounts.
- Cooperation with owners.
- Cooperation with the public.
- Public safety.

- Work site safety.
- Contract compliance.

Kentucky Transportation Cabinet (KYTC)

KYTC requires a Contractor's Performance Report on every project. Both prime contractors and subcontractors receive a performance evaluation. Prime contractors receive an annual report and a report at contract completion. Subcontractors receive a Performance Report at project completion or annually if they undertake a significant amount of work in a given year. The Contractor's Performance rating is reviewed by both a section engineer and a chief district engineer. Contractors have an opportunity to appeal the rating within 10 business days. KYTC's *Instructions and Guidelines for Contractor's Performance Report* notes that the contractor's average performance rating will be used to determine the Contractor's Maximum Eligibility Amount: "The Contractor's average performance rating (weighted by dollar amount of work performed) for the previous year will be used in the calculation of the Contractor's Maximum Eligibility Amount. Utilizing the scores from the Contractor's Performance Report will provide incentive for the Contractor to consistently perform at a high level of quality."⁽⁴⁴⁾

Maine Department of Transportation (MaineDOT)

MaineDOT has a form posted online for contractor performance evaluation. Contractors are rated in seven categories as above standard, standard, or below standard. The seven categories are quality of work; subcontractor's cooperation; environmental; safety; implementation of Federal, State, and local procedures and regulations; and procedural/administrative. Several of the categories consist of one to six subcategories. No administrative guidelines for completing the contractor performance rating were available on the website.⁽⁴⁴⁾

Maryland State Highway Administration (MDSHA)

MDSHA provided a copy of their form for rating contractors and subcontractors. The form details seven categories and assigns various weights to each as follows:⁽⁴⁶⁾

- Contractor administration, personnel, equipment, partnering and public relations.
- Minority-owned disadvantaged business/DBE/women's business enterprise compliance.
- Quality of work.
- Safety.
- Project schedule.
- Erosion and sediment quality assurance (QA) or environmental stewardship.
- Maintenance of traffic QA.

Massachusetts DOT (MassDOT)

MassDOT recently updated its policy through the issuance of an Engineering Directive on April 20, 2010. This directive introduced new Contractor Performance Reports for both contractors and subcontractors. The Contractor Performance Reports indicate that a deduction in the contractor's maximum amount of work rating is assessed if the rating is below 80 percent or if the project was completed late, due to the contractor's fault. The contractor's performance is evaluated in 9 categories with ratings of between 4 (poor) and 10 (excellent) assigned. Different weights are also applied to the individual category ratings. The categories rated and their respective weights out of a total of 10 are as follows:⁽⁴⁷⁾

- Workmanship (2.0).
- Safety (2.0).
- Schedule (1.5).
- Home office support (1.0).
- Subcontractor performance (1.0).
- Field supervision/superintendent (1.0).
- Contract compliance (1.0).
- Equipment (0.5).
- Payment of accounts (0.5).
- Contractor project management and administration (0.5).

Michigan Department of Transportation (MDOT)

MDOT revised its Contractor Performance Evaluation (CPE) procedure on January 13, 2011. All contracts let through the MDOT letting process require a CPE. Both contractors and subcontractors are evaluated, and the evaluations are completed in Field Manager. Evaluations are completed at the end of each project or annually for multi-year projects. As described in the memorandum, contractors are evaluated in the following four prime categories:⁽⁴⁸⁾

- Organization and management.
- Resources.
- Work performance.
- Subcontractor management.

Missouri Department of Transportation (MoDOT)

MoDOT undertakes contractor evaluations in the form of a questionnaire. The questionnaire consists of nine sections, with a considerable number of measures included in each. The sections are as follows:⁽⁴⁹⁾

- General provisions.
- Earthwork.
- Base and aggregate surfaces.
- Flexible pavements.
- Rigid pavements.
- Incidental construction.
- Structures.
- Roadside development.
- Traffic control facilities.

Nebraska Department of Roads (NDOR)

NDOR uses a single form to conduct contractor evaluations. The form consists of nine categories, which are evaluated with a rating scale of unsatisfactory, poor, fair, good, excellent, and superior. The NDOR construction manual indicates that poor contractor performance ratings may be considered when determining the contractor's bid rating.⁽⁵⁰⁾ The construction manual also indicates that this form is normally completed within a computer program, although paper versions are permitted. The date on this form is November 1978, which indicates that it may be an outdated version; an updated version may be available in Nebraska's SiteManager.

New Jersey Department of Transportation (NJDOT)

NJDOT revised its Contractor's Performance Evaluations process in June 2011. One unique feature of the New Jersey process is the central office's ability to promulgate custom evaluations for non-typical projects. This is the only instance found of a project-specific performance evaluation (not to be confused with project-specific prequalification). This process creates a mechanism whereby the evaluation can be directly correlated with the critical areas of performance. An example furnished in the document discusses how a project for building a large retaining wall requires a much higher degree of CQC to achieve the desired material and workmanship quality than an asphalt overlay project. Hence, NJDOT is able to raise the standard for a given project without impacting all other current projects. The degree of flexibility that the project-specific performance evaluation plans provides gives NJDOT the ability to reward excellent performance in project-critical tasks.⁽⁵¹⁾

Ohio Department of Transportation (ODOT-OH)

ODOT-OH evaluates contractors through a series of questions in four categories. Each question is responded to with a rating scale of 1, 5, 8, and 10. The categories are as follows:⁽⁵²⁾

- Organization and management.
- Equipment.
- Work performance.
- Subcontractor management.

Oklahoma Department of Transportation (ODOT-OK)

ODOT-OK (the Oklahoma Department of Transportation is known as ODOT but is represented as ODOT-OK for purposes of this report) uses a Contractor Performance Evaluation Form, along with supporting information, and the form is available on their website. The evaluation form provides guidance on how to use five numerical ratings to rate contractors. ODOT-OK evaluates contractors in the following six areas:⁽⁵³⁾

- Quality of work.
- Organization and prosecution of work.
- Cooperation.
- Traffic control and maintenance of traffic.
- Erosion control.
- EEO and DBE and labor compliance.

Oregon Department of Transportation (ODOT-OR)

The process to evaluate contractors is described in detail in the Oregon Administrative Rules. ODOT-OR evaluates prime contractors annually, and then within 60 days of a project's substantial completion. (This is termed "second notification" in ODOT-OR's materials, and is defined as "the date on which required construction work, including change order work and extra work, has been satisfactorily completed, except for minor corrective work, and the recording of daily time charges cease.")⁽⁵⁴⁾ Contractor performance evaluations are collected and combined in a 12 month rolling average. Should a contractor's performance fall below a score of 80, varying degrees of consequences are imposed, with provisions for multiple occurrences of poor performance. Oregon evaluates contractors in nine categories; several sub-criteria are examined within each category. The evaluation is presented in a questionnaire-type format, and each question is answered with a five-point scale. The evaluated categories are as follows:⁽⁵⁴⁾

- Supervision.
- Progress schedule.
- Quality of materials and workmanship.
- Payment.
- Affirmative action.
- Safety.
- Traffic control.
- Compliance with regulations.
- Major breach.

Pennsylvania Department of Transportation (PennDOT)

PennDOT completes all contractor performance evaluations electronically, in a system called the Engineering and Construction Management System. The most current contractor performance evaluation and the preceding five evaluations are used in a semi-annual determination of the Contractor's Ability Factor. This ability factor is then used to determine the contractor's maximum capacity rating. The Contractor's Past Performance Report has three main rated categories (listed below); each consists of several subcategories. The evaluation is conducted in a questionnaire format, with several questions included within each subcategory. The rating scale uses decimal numbers less than or equal to 1.00. The following three categories are evaluated:⁽⁵⁵⁾

- Managing the project.
- Managing compliance.
- Managing resources.

South Carolina Department of Transportation (SCDOT)

SCDOT has an extensive CPE system. Their system is particularly unusual in that 80 percent of the rated categories are objective measures. SCDOT has provisions in their system to address the entry of new contractors, whereby these firms are prequalified on the basis of their safety records, as expressed by the Experience Modification Rate, which is assigned based on their workers' compensation insurance premiums.⁽⁵⁶⁾ As performance evaluation data is collected, it is integrated into the new contractor's ratings. SCDOT can choose to create a project-specific prequalification by designating a minimum CPS (Contractor Performance Score) required to be permitted to bid. Such projects are typically more complex than normal or have some requirement that SCDOT deems a justification to restrict the pool of potential bidders to those with CPSs that are above the minimum required CPS. The contractor performance evaluation has 6 categories, each of which can be assigned up to 100 points. The first five scoring categories are

all objectively derived from specific performance measures. The different performance measures and their respective weights are as follows.⁽⁵⁶⁾

- Safety (15 percent): based on workers compensation claims files.
- On-budget (15 percent): based on the paid amount compared to the bid amount.
- On-time (20 percent): based on how well the contractor met the “Substantial Work Complete Date.”
- Quality (20 percent): based on the results of a Quality Management Team audit field scores.
- Claims denied (10 percent): based on the percentage of the claim amount denied.
- Assessment by the resident engineer (20 percent): this process consists of a subjective evaluation and follows an 18-question questionnaire format.

SCDOT statistically analyzes the entire population of CPSs for a given year and establishes the Contractor Performance Threshold (CPT), defined as the “CPS below which performance is judged to be substandard.” The year’s CPT is the point equal to the mean CPS, minus two standard deviations. For example, if the mean CPT is 77.9, and the standard deviation of the population is 4.4, the CPT will be 69.0. Once set, a contractor whose CPT falls below 69.0 will not be allowed to bid on projects that have a minimum required CPS.

Utah Department of Transportation (UDOT)

The UDOT Contractor Performance Rating consists of the rating of 40 questions on a scale of 0 to 10, where 0 indicates non-performance and 10 indicates performance 100 percent of the time. The 40 questions included are grouped into 9 categories that are assigned various weightings. The categories, with their corresponding weightings, are as follows.⁽⁵⁷⁾

- Quality control/workmanship: 10 percent.
- Safety: 15 percent.
- Work zone traffic control: 15 percent.
- EEO labor compliance: 5 percent.
- Environmental compliance: 10 percent.
- Administration/organization/supervision: 10 percent.
- Partnering: 5 percent.

- Scheduling: 15 percent.
- Public relations: 15 percent.

Vermont Agency of Transportation (VTrans)

VTrans evaluates contractor performance in 11 categories and asks a series of questions in each category. The Prime Contractor Project Performance Evaluation is considered in the prequalification process by the prequalification committee and is used as the basis from which to accept, deny, or modify the number of projects a contractor is permitted to bid on at any given time. The evaluated categories are as follows:⁽⁵⁸⁾

- Contract administration.
- Personnel.
- Submittals/certifications.
- Environmental.
- Structures.
- Covered bridges.
- Paving.
- Earthworks.
- Traffic control.
- Incidental construction.
- Safety.

Virginia Department of Transportation (VDOT)

VDOT has a contractor evaluation process that consists of monthly interim reports and an annual, or final, report. The CPE Interim Report is completed monthly for 48 possible work categories. Monthly interim reports are completed for both contractors and subcontractors. Several questions are included for each work category and are scored on a scale from 0 to 4. The annual or final report consists of several sections, the first two of which relate most specifically to the contractor evaluation. The first section of the report combines all of the monthly scores from the interim reports. The second section of the report consists of an evaluation of the contractor in four categories by the district/area construction engineer. There are several questions within each category, which are scored from one to five, and five is the highest score possible. VDOT uses these performance evaluations in their prequalification process. The consequences for poor performance are laid out in a VDOT directive/memorandum: “a contractor/Subcontractor will be removed from the list of qualified bidders if it receives one

score below 60 or three scores in a 24-month period below 70.”⁽⁵⁹⁾ The four rated categories are as follows:⁽⁶⁰⁾

- Safety.
- Company management of project.
- Environmental.
- Final product.

Washington State Department of Transportation (WSDOT)

WSDOT’s contractor performance evaluation system has two evaluation components. The first component is the numerical rating of contractor performance in four categories, while the second component of the contractor evaluation is comprised of a narrative. The quantitative component’s categories are as follows:

- Administration/management/supervision.
- Quality of work.
- Progress of work.
- Equipment.

The second component of the contractor evaluation is comprised of a three-part narrative. The purpose of this narrative is to furnish factual explanations with specific citations from the project record to document both good and poor work. The narrative, qualitative categories are as follows:

- General elements.
- Below standard elements.
- Superior elements.

Contractors with poor performance may be assigned a “conditional qualification” status, which may limit their bidding ability as follows: “[c]onditional qualification of a contractor may be affected when the overall performance of the contractor has become less-than-standard...A contractor placed in conditional status may be restricted in bidding ability for highway projects or other sanctions may be placed in effect.”⁽⁶¹⁾ WSDOT does have an appeals process for both the contractor’s performance rating and for restrictions placed on bidding.⁽⁶¹⁾

West Virginia Department of Transportation (WVDOT)

WVDOT staff complete a form for contractor performance. The contractor is evaluated in nine areas rated as outstanding, satisfactory, fair, or unsatisfactory. The nine categories are as follows:⁽⁶²⁾

- Workmanship.
- Performance.
- Supervision.
- Coordination.
- Labor.
- Equipment.
- Contractor/engineer relationship.
- Contractor/public relationship.
- Choice of subs and suppliers.

Wyoming Department of Transportation (WYDOT)

WYDOT evaluates contractors using a six-level scale and a “not applicable” rating option. Contractors are evaluated in 10 categories; each category consists of several subcategories. The categories are as follows:⁽⁵⁹⁾

- Management and organization of prime work.
- Management and organization of subcontract work.
- Project processes and submittals.
- Working relationship with WYDOT personnel.
- Prosecution of the work.
- QC.
- Traffic control.
- Compliance with work site requirements.
- Cooperation with others/public relations.
- Completion of project.

Through contact with State transportation departments' staff, it was determined that 10 States do not rate contractor performance. These States are Alabama, Arizona, Arkansas, Hawaii, Idaho, Minnesota, New Mexico, North Dakota, South Dakota, and Texas.

United States Department of Transportation (USDOT)

The USDOT Office of Small Business Bonding Education Program partners with the surety industry nationally to encourage small businesses become bondable. Historically, bondability has been a challenge for many disadvantaged businesses and this program aims to help businesses grow by obtaining or building bonding capacity.

The USDOT Bonding Education Program proactively encourages small contractors to conduct an assessment of the administrative functions of the business to mitigate risks and using the surety prequalification process to build a profitable and a sustainable business, and ultimately become bondable. This contractor development program is a resource that assists small business chief executive officers to not only achieve capacity building goals; it connects federal technical resources to state transportation projects, and increases the pool of viable DBE contractors available in the market.

REVIEW OF STATE CONTRACTOR BIDDING PROCEDURES

Most States (45 of 50) require that performance bonds be used in conjunction with other contractor eligibility evaluation methods. Most States also require that performance bonds be secured for contracts over a specific dollar amount, typically \$25,000, although the minimum contract amount ranges from any dollar value (in California) to much higher values (in Indiana, where the minimum is \$200,000). The dollar amount of the required performance bond also varies by State, ranging from a percentage of the contract amount to the full contract amount. Performance bonding requirements may also extend to subcontractors.⁽¹⁸⁾

Several States do not always require performance bonds for the full value of the project. FDOT requires that the secured performance bond value be equal to the contract price, except for contracts greater than \$250 million (an amount in excess of which is generally too great for a single performance bond to be issued), or if the State otherwise finds that a bond in the amount of the contract is not reasonably available, in which case the bond amount will be set at the largest amount reasonably available. For contracts greater than \$250 million, the State transportation department can use a combination of bonds equal to a portion of the contract amount, along with an alternative means of security applied to the remaining portion, such as letters of credit, U.S. bonds and notes, parent company guarantees, and/or cash collateral to replace bond requirements.⁽¹⁸⁾

For design-build contracts, States need to include the cost of design and other non-construction services in the bond amount in order for the bond to be conditioned on performance of those services and for the persons who perform those services to be protected by the bond. In Illinois, the Public Construction Bond Act requires only one bond for the completion of a contract; this includes performance, payment, subcontractors used, and all labor performed. In Louisiana, the performance and payment bond needs to be issued either by a U.S. Treasury, a listed bonding company, or by a Louisiana insurer with a Best's credit rating of "A-" or better.⁽¹⁸⁾

According to the survey reported on in the effectiveness report, most States (28 of the 41 surveyed) require a 100 percent performance bond on projects. A review of State procurement laws found that only five States, Arkansas, Connecticut, Oregon, Vermont, and Wisconsin, do not always require some type of performance bond on projects. In each case, a performance bond may be waived or the contractor may provide a substitute type of security, such as a cashier's check for 100 percent of the contract amount.⁽¹⁸⁾

REVIEW OF BONDING COSTS

Determining a generalized cost of performance bonds is not a particularly straightforward task. The surety industry rates each contractor individually, in the context of a specific contract, and develops a separate premium for each individual project performance bond. Hence, it is nearly impossible to generalize or infer a specific cost for the bonding of a given project. A work written by Peurifoy and Oberlender, provides the following guidance:⁽⁶³⁾

All government agencies and many private owners require a contractor to furnish a performance bond to last for the period of construction of a project. The bond is furnished by an acceptable surety to ensure the owner that the work will be performed by the contractor in accordance with the contract documents. In the event a contractor fails to complete a project, it is the responsibility of the surety to secure completion. Although the penalty under a performance bond is specified as 25, 50, or 100 percent of the amount of the contract, the cost of the bond is usually based on the amount of the contract and duration of the project.

The cost of a performance bond varies based on a number of factors, but is primarily based on the capacity of the contractor to perform the work and the financial stability of the contractor. Table 6 lists the average performance bond costs in 2002, as provided by Peurifoy and Oberlender in their analysis of the subject, and shows bond costs as a range in cost in terms of dollars per \$1,000 of project value.⁽⁶³⁾ When these costs are translated to percentages of project value, the bond costs range from 0.65 to 1.2 percent for Heavy Civil projects.

Table 6. Representative costs of performance bonds per \$1,000.⁽⁶³⁾

Project Size	Building Projects (\$/\$1,000 of project value)	Heavy Civil Projects (\$/\$1,000 of project value)
First \$500,000	\$14.40	\$12.00
Next \$2 million	\$8.70	\$7.50
Next \$2,500,000	\$6.90	\$5.75
Next \$2,500,000	\$6.90	\$5.25
> \$7,500,000	\$5.75	\$4.80

Means Construction Cost Data (Means), a well-recognized source of construction costs for project estimation, provides percentage values for performance bond costs. In Mean's construction data book for Heavy Construction, the cost of bonds for Highways and Bridges is listed as a range from 0.4 to 0.93 percent of total contract value.⁽⁶⁴⁾ A thesis on the cost effectiveness of performance bonds, written by Lorena Myers of the University of Florida in 2009, collected State construction data from September 2007 to September 2009. As part of this study, the SFAA reported that the cost of performance bond premiums on projects typically

ranged from 2 percent of total contract cost for small projects (i.e., those valued at less than \$100,000) to 0.5 percent for very sizeable projects (i.e., those valued at more than \$50 million). Table 7 shows one-time performance bond premiums for different ranges of contract amounts, as reported by the SFAA.

Table 7. State transportation department construction performance bond rates.⁽¹¹⁾

Contract Amount	Performance Bond Premium	Project Size Category	Percent
\$100,000	\$1,200–\$2,500	< \$1 million	2.50
\$1 million	\$7,700–\$13,500	\$1 million–< \$10 million	1.35
\$10 million	\$56,950–\$81,000	\$10 million–< \$50 million	0.81
\$50 million	\$206,475–\$341,000	> \$50 million	0.68

Myers’ thesis also provided data for 19,135 construction projects for 30 States, shown in table 8, and found that the 2007 to 2009 U.S. national average of bond premiums was 1.139 percent. Surprisingly, only six States reported contractor defaults between 2007 and 2009: Alabama, Georgia, Idaho, Mississippi, South Carolina, and Texas. For these States, there were a total of 10 defaulted contractors over 34 projects, while the rate of default was 0 for all other States. The benefit-cost analysis concluded that only one State realized a net benefit as a result of using secured performance bonds.

Table 8. State default rates.⁽¹¹⁾

State	Number of Defaults	Total Projects	State	Number of Defaults	Total Projects
Alabama	7	631	Michigan	0	1,303
Alaska	0	187	Minnesota	0	447
Arizona	0	205	Mississippi	2	392
Arkansas	0	408	Montana	0	231
California	0	1,237	New Jersey	0	256
Colorado	0	326	New Mexico	0	126
Connecticut	0	134	New York	0	559
Delaware	0	170	Ohio	0	1,393
Georgia	19	513	South Carolina	6	681
Hawaii	0	129	South Dakota	0	292
Idaho	2	188	Texas	1	1,333
Illinois	0	2,682	Washington	0	650
Iowa	0	1,424	West Virginia	0	945
Kansas	0	643	Wisconsin	0	901
Maine	0	545	Wyoming	0	204

CHAPTER 3—OVERVIEW OF INDUSTRY OUTREACH EFFORT

Four outreach efforts were conducted to obtain feedback from the major parties that are involved in the use of construction contract performance bonds. Representative State transportation departments, their contractors, and sureties all participated in this outreach effort. The representative State transportation departments completed surveys on their use of performance bonds, contractor evaluation methods, and views on performance-based prequalification. Contractors also completed surveys to provide input on the use of performance bonds and performance-based prequalification methods. The SFAA provided overall surety industry data, summarized industry practices, and participated in interviews. The final step of the outreach effort was the completion of case studies for five State transportation departments. This chapter presents each of these efforts and the corresponding results.

STATE TRANSPORTATION DEPARTMENT, CONSTRUCTION CONTRACTOR AND SURETY SURVEY/INTERVIEW RESPONSES

Survey/Interview Participants

Six State transportation departments participated in the transportation agency survey: the Alabama Department of Transportation (ALDOT), FDOT, Georgia Department of Transportation (limited responses were provided), MoDOT, SC DOT, VTrans, and the California Department of Transportation (Caltrans). These participants represented small, medium, and large transportation agencies and reflected a reasonable geographical cross-section for data collection.

At each State transportation department, one person took primary responsibility for completion of the survey, although he or she may have consulted other members of the agency. The individuals who participated held a range of positions within their organization, including director of construction, State construction engineer, State engineer, assistant State construction engineer, and principal transportation engineer.

Eleven construction contractors responded to a separate contractor survey. Their responses reflected a wide range of organization sizes, types, and degrees of focus on State transportation department-specific work. At the time of the survey, national firms employed six of the participants, while regional firms employed two of them. Of the remaining participants, one was employed by a firm that does international work, one was employed by a single State, and one was employed by a single locality.

Five contractors described their typical role on a State transportation department project as that of a general contractor and one identified its role as solely that of a subcontractor. The remaining five reported that their organization takes on the role of either a general contractor or a subcontractor, depending on the project. Nine of the organizations focus primarily on roadway work, while two focus on bridge work.

The majority of the construction contractors stated that their average annual volume of State transportation department work exceeds \$100 million. Two participants noted a lower annual volume—between \$6 million and \$10 million—while one participant noted an annual volume of \$1 million to \$5 million.

Before the surety survey was distributed to a sample of surety companies, the SFAA reviewed it and concluded that better industry-wide data and opinions could be obtained from the SFAA than from individual companies. The SFAA collects all of the data that State insurance regulators in the industry require and is the designated statistical reporting agent for the surety and fidelity industries in all U.S. States, except Texas. The information provided by the SFAA and data collected by these regulators was used in this research effort. The SFAA summarized industry practices and provided quantitative data, where possible, in response to specific written questions. SFAA officials and representatives from five surety companies also participated in the interviews.

Survey/Interview Results

The input from representative State transportation departments, contractors, the SFAA, and surety company representatives was assessed as part of an effort to evaluate the benefits and costs of performance bonds and performance-based prequalification methods. In order to understand all perspective on these tools, a better understanding of State transportation department and contractor attitudes was needed. Contractors noted their misgivings about the value of performance bonds, given their cost. However, State transportation departments expressed hesitation at the idea of abandoning the use of performance bonds. The surety industry outlined the benefits of performance bonds during prequalification and construction and presented data on the costs of performance bonds.

A significant number of State transportation departments believed that a performance-based prequalification process would improve the quality and timeliness of project delivery and enhance State transportation department-contractor relationships. Contractors appeared uniformly open to an equitable performance-based prequalification process as a means to improve project delivery. Survey responses suggest that performance-based prequalification methods can be implemented and/or refined to better emphasize the performance and financial factors that are most relevant to effective project delivery.

The data was collected using two different methods. A small number of State transportation departments and contractors were surveyed in detail, the SFAA provided surety information from the aggregated data of filings made to State regulators, and several surety companies provided additional anecdotal input. This resulted in two very different data sets: a set of microeconomic data from a sample of State transportation departments and contractors, which may or may not be representative of their populations, as well as a set of macroeconomic data from the entire population of sureties. The premiums sureties charge contractors for performance bonds are found where the two data sets intersect (i.e., both data sets report upon the same statistics). These results are found consistent and do not differ significantly from each other. Sureties report premium rates with a mean of 0.64 percent and a standard deviation of 0.26 percent, while contractors report an average premium rate of 0.70 percent (as shown in table 9) with a standard deviation of 0.80 percent. Given that the difference between the two means is only 0.06 percent, the hypothesis that both are estimates of the same true mean of the population cannot be rejected (all of the sources of the premium rates).

Table 9. Respondent contractor-reported bond rates.

Project Size	Low (Percent)	Average (Percent)	High (Percent)
Cost for project bond when bond < \$100,000	0.22	1.06	2.5
Cost for project bond when bond \$100,000–\$1 million	0.22	0.99	2.5
Cost for project bond when bond > \$1 million–\$10 million	0.22	0.93	2.5
Cost for project bond when bond > \$10 million–\$50 million	0.0976	0.70	0.85
Cost for project bond when bond > \$50 million–\$100 million	0.475	0.52	0.85
Cost for project bond when bond > \$100 million	0.475	0.52	0.85
Overall Average		0.79	

The data also indicates the following:

- The State transportation department-reported average default rate is 0.69 percent. Applied to the combined 2010 reported-letting budget of \$6.2 billion for the surveyed State transportation departments, this reported default rate would result in \$42.8 million worth of defaulted contracts across the surveyed State transportation departments.
- Under the current administrative system (illustrated in table 10), State transportation departments reject a much higher rate of new applicants (7.6 percent) than renewal applicants (0.4 percent).

Table 10. Respondent State transportation department prequalification rejection rates.

Prequalification Workload	Low	Average	High
Annual number of new prequalification applicants	10	27.5	50
New applicants rejected (percent of total)	0	7.6	20
Annual number of renewal prequalification applicants	75	330	570
Renewal applicants rejected (percent of total)	0	0.4	0

Also, numerous conclusions about the potential benefits and structure of performance-based contractor prequalification can be made. In summary, the conclusions are as follows:

- Table 11 shows that both contractors and State transportation departments feel that a performance-based contractor prequalification process has the potential to improve overall project performance.

Table 11. Impact of performance-based contractor prequalification.

Impacted Project Performance Factor	Believe Would Improve (Percent)	
	Contractor	State Transportation Department
Workmanship quality	100	60
Safety	100	60
Timely project completion	100	60
Timely punch-list completion	100	60
Personnel experience	100	60
Warranty responsiveness	100	60
Personnel competence	88	40
Contractor cooperation with property owners	88	60
Timely construction submittal	86	60
Maintenance of traffic	75	60
Number of claims/disputes	75	80
Environmental compliance	75	40
Contractor cooperation with stakeholders	75	60
Contractor cooperation with public concerns	75	60
Management of subs	75	NR
Agency inspection	63	40
Contractor cooperation with agency	63	80
Liens	63	NR
Number of bidders	50	20
Material quality	50	40
Number of contractor-requested change orders	50	60
Achieving DBE goals	25	40

NR = No Response.

- Table 12 indicates that both contractors and State transportation departments rate the evaluation of “corporate qualifications” (i.e., qualifications that relate to the experiences and qualifications of the contractor organizations) more highly than they rate the evaluation of contractors’ programs.

Table 12. Respondent State transportation department and contractor performance factor rankings.

	Ranking of Effectiveness	
	Transportation Department Rank	Contractor Rank
Corporate Qualifications		
Past projects performance evaluations of contractor	1	2
Past relevant experience of the contractor	1	1
Past illegal behavior	1	4
Qualifications of key personnel	1	3
Claims history	5	4
Professional licensing of key personnel	9	9
Level of subcontracting (amount of work subcontracted)	12	12
Evaluated Programs	Transportation Department Rank	Contractor Rank
Safety plans	6	4
Environmental plans	7	9
Traffic control plans	8	9
Equipment and plant	9	7
Quality assurance plans	11	7
Use of DBEs	13	14
Public communications/public relations	14	12

- Table 12 also indicates that both contractors and State transportation departments believe past performance, relevant experience, illegal behavior, personnel qualifications, and claims history are likely the most critical factors for determining a contractor’s effectiveness.
- Table 12 also indicates that the State transportation departments rate past projects’ performance evaluations of contractor, past relevant experience of the contractor, past illegal behavior, and qualifications of key personnel as the most critical factors, equally.
- Table 13 shows that contractors believe that a marginal contractor has an unfair advantage over a well-qualified contractor under the current system, which is reinforced by their belief that implementing performance-based contractor prequalification would disqualify the marginal contractors from bidding.

Table 13. Respondent contractor views on methods of determining project qualification.

Please Indicate Your Level of Agreement with the Following Statement:	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
“Performance bonds guarantee the State transportation department will award its work to a qualified contractor.”	2	0	2	2	2
“A well-qualified contractor cannot compete on a level playing field with a marginally qualified contractor with the same bonding capacity.”	5	1	2	0	0
“If eligibility to bid was based on satisfactory past project performance, some of my competitors would not be eligible to bid.”	3	5	0	0	0
“I believe a performance-based prequalification system can be established that is reasonably objective and fair.”	2	6	1	0	0
“I would support a performance-based system if there are appropriate appeal mechanisms.”	2	5	1	0	0
	Very Satisfied	Satisfied	Neither	Dissatisfied	Very Dissatisfied
Please Indicate Your Level of Satisfaction with the Bonding Companies’ Valuation Process.	0	5	4	0	1

Numerous State transportation department respondents and all contractor respondents expressed the belief that project performance can be quite valuable as an indicator of a contractor’s ability to deliver projects in an effective and timely manner. This suggests that improvements in the area of performance-based prequalification could benefit the project delivery process.

While all respondents considered financial factors important to ensuring effective project delivery, contractor respondents did not appear as confident as State transportation departments in the role that surety companies play. These differing opinions may be due, in part, to misconceptions about the nature of performance bonds and the roles that sureties play in the

evaluation of contractors and the completion of a contract. These possible misconceptions are described below.

First, performance bonds are not insurance. They do not guarantee against non-completion of a contract under all conditions, as insurance would (if insurance companies made such a product available). Instead, performance bonds come into play only when the contractor has defaulted on completion of the contract and is in financial default (i.e., is unable to provide the funds to remedy the situation). Performance bonds are more a form of credit than insurance, in that they are priced like credit. Sureties go through the same steps to evaluate contractors as banks go through to evaluate corporate borrowers, and sureties have the same rights to monitor and intervene in the affairs of their contractors as do other creditors.

Second, sureties' role as creditors gives sureties a superior ability to assess the financial and managerial capacities of contractors over long periods of time and to intervene in the affairs of contractors to prevent and avoid defaults. However, the advanced evaluation and intervention capabilities are limited by the nature of performance bonds themselves; these bonds do not guarantee the quality of work, nor do they guarantee that the full costs to complete a project in default will be covered by the performance bond.

Finally, and most relevant to the objective of improving the quality of contracted construction work through the prequalification of contractors, performance bonds give no protection against mediocre work. Sureties do not evaluate contractors in terms of the completion of timely, high-quality work that satisfies State transportation departments' expectations. Sureties are unable to obtain data from State transportation departments about contractor performance, and even if the sureties could and did obtain such data, the low rates of default and the sureties' limited obligations give the sureties little incentive to raise the costs of performance bonds in order to incorporate the contractor performance data.

The surety industry's responses portray the significant benefits surety companies provide to State transportation departments throughout the construction process, which their unique status as the contractors' creditors enables the sureties to provide. State transportation departments seem more attuned to the specific advantages of this service than contractors are and consequently appear unwilling to abandon the perceived security that performance bonds provide. Contractors have greater reservations about this conclusion and feel more strongly that performance-based prequalification methods can lead to improved project delivery, possibly even in place of performance bonds.

Analysis of the responses obtained from State transportation departments, contractors, the SFAA, and select surety companies suggests that opportunities to standardize and integrate performance-based prequalification methods as part of a more comprehensive prequalification process should be addressed to improve project delivery. The results provide an initial indication of State transportation departments' and contractors' appetites for improvements to the prequalification process, as well as an indication of potential areas for improvement, supplementation, and consolidation of the contractor evaluation process. Additionally, they reinforce the conclusion of *NCHRP Synthesis 390* that barriers to performance-based prequalification implementation are low among members of the construction industry and that, while State transportation departments show little willingness to completely abandon

performance bonds, they acknowledge the potential benefits of evaluating contractor project performance and using the information in the prequalification process.⁽¹⁷⁾

The bond benefit-cost analysis, in part based on the quantitative data detailed above, will be presented below. That analysis will integrate the data with indirect costs and additional economic factors, where applicable. The benefit-cost analysis and the information provided in this report, along with information collected in the literature review, will drive the elements of the prequalification model, also provided below.

OVERVIEW OF THE CASE STUDIES

Case studies were conducted with five State transportation departments: Iowa, Oklahoma, Utah, Virginia, and Washington State to evaluate the performance-based prequalification model in relation to the current prequalification practices of the State transportation departments; to get the State transportation department perspective on performance bonds; and gather project data for the benefit-cost analysis of both performance bonds and performance-based contractor prequalification.

All of the participants have some form of a performance-based prequalification system in place. The level of sophistication varies from reference checks to contractor project performance evaluations, and the level of integration of performance-based prequalification into the prequalification process also varies. All of the State transportation departments thought that the performance-based prequalification model was a good model. However, most indicated that they would not drop their current system for the new model because of the costs to replace their existing systems. Also, the States with more sophisticated systems already included most aspects of the performance-based prequalification model. The case studies indicated that a reduction in the value of a performance bond is not an advantage for good performers because the resulting change in performance bond premium price is minimal.

None of the participants could remember a time when a surety got involved in a project before the State transportation department requested the surety's involvement. The studies also showed that the State transportation department would not necessarily know if the surety was involved with the contractor before the State transportation department's request. Only two States reported any defaults between 2007 and 2011, and each of those States reported one default. Respondents from several States mentioned that the benefit of having performance bonds, even though the default rate is so low, is the State transportation department's ability to threaten to contact the surety if a contractor is not performing well. This is an effective threat because if the surety is informed that a contractor is not performing well, it can impact the contractor's premium rate on the next contract and make the contractor less competitive. None of the participants was comfortable eliminating performance bonds.

During the case studies, several different types of data were collected for the benefit-cost analysis. Each State was asked to identify how many full time employees were required to administer the performance bond system and the performance-based prequalification system. Also, each State was asked to provide contract values for each of the projects that occurred between 2007 and 2011, as well as the number of defaults that occurred over the investigated

time period. A summary of this data is shown in table 14, and appendix B includes a summary of each case study.

Table 14. Summary of case study data.

State	Average annual value of awarded contracts (2007–2011)	Average number of contracts awarded annually (2007–2011)	Total number of defaults (2007–2011)	Number of FTE's for performance bond	Number of FTEs for performance based prequalification	Percent of project value that is bonded	Average estimated annual cost of performance bonds (2007–2011) ¹
Iowa	\$636,196,168	776	0	0.50	0.5	100	\$4,453,373
Oklahoma	\$757,314,976	1476	0	N/A	0.675	100	\$5,301,205
Utah	\$637,271,320	168	0	1	1	100	\$4,460,899
Virginia	\$527,702,787	362	0	0.50	2	100	\$3,693,920
Washington	\$217,543,476	95	1	0.75	2	100	\$1,522,804

¹Based on a 0.8 percent performance bond premium rate.

N/A = Not Applicable.

FTE = Full Time Equivalent.

CHAPTER 4—BENEFIT-COST ANALYSIS OF PERFORMANCE BONDS

This chapter presents analysis of the benefits and costs of performance bonds. Additionally, this chapter determines a default rate for the industry.

BENEFITS OF PERFORMANCE BONDS

The benefits a State transportation department receives from a performance bond are derived from three different phases of the project: before the contract, during the contract, and after a claim is filed. However, the State transportation department receives financial benefits from a performance bond only after a claim is filed. There is some dispute about the value of the benefits during the contract, however. Because the near-miss benefit (explained below) claimed by the sureties could not be validated during the case studies and there was no data pertaining to the near misses, it was not included as a financial benefit.

Before the Contract

The benefits received by the State transportation department before the contract begins result from the typical long-term relationship between the surety and the contractor and the surety's use of enterprise risk management² to underwrite the performance bond. The long-term relationship between a surety and a contractor allows the surety to understand the contractor's business plan and assess the contractor's managerial capacity to execute that plan. When a surety, as a creditor, uses the enterprise risk management approach to underwrite a contractor, it gives the contractor the incentive to adopt the enterprise risk management discipline in its own management and governance. The cost of each of these benefits is included in the cost of the premium for the performance bond.

During the Contract

Near Misses

The sureties state that benefits the State transportation department receives during the contract result from the surety's effort to sustain a contractor during the project and the ability of the State transportation department to use the threat of calling the surety to improve contractor performance. Like a lender, the surety can intervene to prevent failures and losses in ways that the State transportation department cannot; the result of this proactive effort is referred to as "near misses." The validity of this benefit is disputed in the industry. During the case studies performed for this investigation, none of the State transportation departments had experienced a surety proactively working with an at-risk contractor before the State transportation department reported a problem with a contractor. In fairness, the State transportation department may not ever know that the surety is working with the contractor behind the scenes. However, because the sureties' claims of the existence of near misses could not be validated, it was not included as

² Enterprise risk management is the consideration of uncertainty in all aspects of decisionmaking across the full span of an organization's activities. All aspects of decisionmaking can be viewed from different perspectives, and the consideration of uncertainty should be evident from each of those perspectives. ISO 31000 defines six steps of enterprise risk management: 1. define goals and objectives in terms of risk and reward; 2. event identification; 3. risk assessment; 4. risk mitigation; 5. management controls; and 6. reporting.

a financial benefit, and yet any costs associated with this purported benefit are included in the premium for the performance bond.

Future Premium Increases

During the case studies performed with five State transportation departments, it was reported that the biggest benefit of having a performance bond during a project is the department's ability to threaten to call the surety if the contractor's project performance does not improve. The performance bond premium assigned to a contractor for a specific project is based on the financial risk of the contractor. As a result, a contractor does not want the State transportation department to report poor performance on an ongoing project to the surety, because such a report is likely to impact the surety's evaluation of the contractor's financial risk on future projects, which could potentially increase the contractor's premium rate on future performance bonds. This would disadvantage the contractor on future bids.

After a Claim is Filed

After a claim is filed, the benefit the State transportation department receives depends on the option taken by the surety to remedy the default. Once a project defaults, the surety can pay damages to the State transportation department, assume the role of the contractor and complete the project, or hire a new contractor to complete the project. The benefits of each option have a financial value, and the costs associated with these benefits are included in the premium cost of the performance bond. The benefits of each of these options are discussed below.

Surety Pays Damages

When the surety elects to pay the damages, it provides the State transportation department with capital funds that the State transportation department would have had to obtain from its own sources, had the bond not been in place. The amount paid is based on the assumption that the financial benefit is equal to the costs to complete the project. However, the amount replaced may be less than the amount needed to complete the contract if a contractor has entered default partway through construction. Some possible reasons that the amount replaced is less than the amount needed include the following:

- The surety is not obligated to pay for repairs to completed, faulty work that the State transportation department has already accepted.
- The amount that the State transportation department would have paid to complete the contract may be higher or lower than the sum of the unit prices that were bid in the contract.
- The amount paid to a contractor, which is the result of front-loaded progress payments for items that have not been completed at the point of default, cannot be recovered as part of the damages.

Surety Completes the Project

When a surety decides to assume the contractor's responsibility and complete the contract, the State transportation department accrues the following two benefits:

- The contract is completed in less time than it would be if a new contractor were brought in, which minimizes delays to project completion and to opening the area to traffic. An assumption that this benefit is, in effect, avoidance of the societal cost of construction was made and it was assumed equal to the lane rental charges levied by government agencies that close public roads for construction purposes. These rates vary by jurisdiction, location, and time of day (peak versus off-peak), but typical values are approximately \$2,000 per day on a \$10 million highway construction contract and \$10,000 per day, or \$100,000 per week, on a \$100 million highway construction contract.⁽⁶⁵⁾
- The contract does not have to be re-bid, and therefore the contract price does not increase. An assumption was made that this benefit is equal to the difference between the lowest bid and the second-lowest bid, which has been estimated as 7 percent.³

It is assumed that, together, these benefits result in the completion of a defaulted contract approximately 60 days sooner than if a State transportation department had to complete the contract on its own. (It is estimated that the State transportation department would require a minimum of 60 days to re-bid the uncompleted portions of the contract.)

Surety Hires a New Contractor

When the surety takes over a project, the construction contract does not have to be re-bid, and therefore, the contract price does not increase. Otherwise, the State transportation department would re-bid the project, which typically results in a higher price, because typically the original contractor had the lowest bid on the project. This benefit is assumed equal to the difference between the lowest bid and the second-lowest bid, which is estimated as 7 percent.

Defaults occur in the highway industry less than 1 percent of the time. The average default rate for five State transportation departments between 2008 and 2010 never reached 1 percent, instead ranging from 0.34 to 0.69 percent. This was further validated by default rates between 0 and 0.55 percent from five additional State transportation department case studies between 2007 and 2011. Therefore, the default benefit would be equal to the default rate multiplied by the total capital program value. In the following benefit-cost analysis, the highest default rate of 0.69 percent is used.

Based on the infrequency of defaults (less than 1 percent of the time), defaults are considered a statistically random event and cannot be attributed to any particular category of project. As a result, State transportation departments reported that the biggest benefit to a performance bond is the ability to improve a contractor's performance by threatening to report poor performance to the surety. Reporting poor performance can impact the contractor's ability to secure a future performance bond with that surety; therefore, it is an effective motivator.

³ The mean of the differences between the lowest bid and second-lowest bid in 128 contracts let in 2010 in Alabama, California, Florida, Georgia, South Carolina, and Vermont was 7.3 percent. These 128 contracts were the subset of 642 contracts let in those states that were each over \$1 million in value and were not repaving contracts. The mean difference for all 642 contracts was 8.7 percent and the mean difference for the subset of 292 contracts of all types over \$1 million was 7.5 percent.

PERFORMANCE BOND COSTS

The total costs of performance bonds that the State transportation department is ultimately responsible for are the performance bond premium, passed through by the contractor, and the State transportation department administrative costs associated with the management of performance bonds. Below is a discussion of the method used to calculate the total performance bond costs that are the responsibility of the State transportation department.

Performance Bond Premium Cost

The performance bond premium cost results from the premium charged by the surety and the percent of the contract value that needs to be bonded, as shown in figure 6.

$$\begin{aligned} & \textit{Performance Bond Premium Cost} \\ & = \textit{Premium Percentage} \times \textit{Contract Value} \\ & \times \textit{Percent of Contract to be Bonded} \end{aligned}$$

Figure 6. Equation. Performance bond premium calculation.

Determining a generalized cost of performance bonds is not a particularly straightforward task. The surety industry rates each contractor individually, in the context of a specific contract, and develops a separate premium for each individual project performance bond. Hence, it is nearly impossible to generalize or infer a specific cost for the bonding of a given project. Peurifoy and Oberlender provide the following guidance:⁽⁶³⁾

All government agencies and many private owners require a contractor to furnish a performance bond to last for the period of construction of a project. The bond is furnished by an acceptable surety to ensure the owner that the work will be performed by the contractor in accordance with the contract documents. In the event a contractor fails to complete a project, it is the responsibility of the surety to secure completion. Although the penalty under a performance bond is specified as 25, 50, or 100 percent of the amount of the contract, the cost of the bond is usually based on the amount of the contract and duration of the project.

The actual performance bond premium rate charged to a specific contractor accounts for the contract amount and project duration, as indicated above. The rate also varies based on a number of factors, mainly the contractor's capacity to perform the work and its financial stability.

Table 15 lists the average performance bond costs in 2002, as provided by Peurifoy and Oberlender in their analysis of the subject, and shows bond costs as a range in cost in terms of dollars per \$1,000 of project value. When these costs are translated to percentages of project value, the bond costs range from 0.65 to 1.2 percent for Heavy Civil projects.

Table 15. Representative costs of performance bonds per \$1,000.⁽⁶³⁾

Project Size	Heavy Civil Projects (\$/\$1,000 of project value)
First \$500,000	\$12.00
Next \$2 million	\$7.50
Next \$2,500,000	\$5.75
Next \$2,500,000	\$5.25
> \$7,500,000	\$4.80

A portion of surety bond costs is fixed and does not decrease as the bonded amount decreases. Sureties' costs are reflected in the bond premium, so that the premium, when expressed as a percentage of the amount bonded, will be larger for smaller bonds and smaller for larger bonds. This is reflected in the results of the outreach survey of prime highway contractors, which found that the price to secure performance bonds ranges from 0.22 to 2.5 percent of the contract amount, depending on the project's size (see table 16 for details).

Table 16. Respondent contractor-reported bond rates.

Project Size	Low (Percent)	Average (Percent)	High (Percent)
Cost for project bond when bond < \$100,000	0.22	1.06	2.5
Cost for project bond when bond \$100,000–\$1 million	0.22	0.99	2.5
Cost for project bond when bond > \$1 million–\$10 million	0.22	0.93	2.5
Cost for project bond when bond > \$10 million–\$50 million	0.0976	0.70	0.85
Cost for project bond when bond > \$50 million–\$100 million	0.475	0.52	0.85
Cost for project bond when bond > \$100 million	0.475	0.52	0.85
Overall Average		0.79	

Means Construction Cost Data (Means), a well-recognized source of construction costs for project estimations, provides percentage values for performance bond costs. In Means' construction data book for heavy construction, the cost of bonds for highways and bridges is listed as a range from 0.4 to 0.93 percent of total contract value.⁽⁶⁴⁾ A thesis on the cost effectiveness of performance bonds, written by Lorena Myers of the University of Florida in 2009, collected State construction data from September 2007 to September 2009. As part of this study, the SFAA reported that the cost of performance bond premiums on projects typically ranged from 2 percent of total contract cost for small projects (i.e., those valued at less than \$100,000) to 0.5 percent for very sizeable projects (i.e., those valued at more than \$50 million). Table 17 shows one-time performance bond premiums for different ranges of contract amounts, as reported by the SFAA.

Table 17. State transportation departments construction performance bond rates.⁽¹¹⁾

Contract Amount	Performance Bond Premium	Project Size Category	Percent
\$100,000	\$1,200–\$2,500	< \$1 million	2.50
\$1,000,000	\$7,700–\$13,500	\$1 million–< \$10 million	1.35
\$10,000,000	\$56,950–\$81,000	\$10 million–< \$50 million	0.81
\$50,000,000	\$206,475–\$341,000	> \$50 million	0.68

The surety industry is required to report data to regulators in all 50 States, which includes the number of performance bonds that are underwritten and the premiums paid for those bonds. Sureties report this data differently from State to State, so data can only be aggregated and used nationwide in an approximate fashion. With that caveat, it appears that in 2010 in the United States, the surety industry underwrote approximately \$170 billion in construction contracts for bridges, highways, and airport runways issued by all levels of government, of which approximately \$60 billion was for resurfacing contracts. The premiums for these bonds appear to have been priced at between \$300 million and \$350 million, which implies that the 2010 premium rate in this sector was approximately \$2.25 per \$1,000 of bond amount. Interviews conducted with surety company representatives suggest that such a premium is low by historical standards, so it is not used as the sole reference point in this review.

A point estimate, such as the one above, is a weighted average of a non-linear pricing structure, as illustrated in table 18 provided by the SFAA.⁴

Table 18. Non-linear premium structure in a typical bridge or highway performance bond.

Bonded Amount	Total Premium \$ per \$1,000 of Bonded Amount
First \$500,000	\$10.80
\$500,000–\$2,500,000	\$6.70
\$2,500,000–\$5 million	\$5.30
\$5 million–\$7,500,000	\$4.90
Above \$7,500,000	\$4.40

Because the performance bond premium rate is not linear, it is important to not use an overall average of all project sizes for the benefit-cost analysis. Also, there is minimal variability of the premium rates reported through different avenues; as such, the premium rates and project categories shown in table 16 are used for the benefit-cost analysis at the end of this chapter.

Based on data available online, the percent of the contract value required to be bonded varies from State to State, from 25 percent to 100 percent, depending on the size of the project. However, only six states do not require 100 percent contract value performance bond. When a project is larger than \$500 million, the percent of contract value that requires a bond can change

⁴ The SFAA is the designated statistical reporting agent for the surety and fidelity industries in all U.S. States, except Texas. In these 49 states, the association collects all of the data required by State insurance regulators from the industry.

because it is difficult for a single company to acquire a performance bond of that amount. As a result, a 100 percent contract value is used in the benefit-cost analysis.

State Transportation Department Administrative Costs of Performance Bonds

The administrative costs are the costs associated with the additional staffing required to manage the performance bond process. The calculation to find this number is shown in figure 7.

$$\begin{aligned} & \textit{Administrative Performance Bond Cost} \\ & = \textit{of Full Time Employees} \times \frac{\textit{Work Hours}}{\textit{Year}} \times \frac{\textit{Cost}}{\textit{Hour}} \end{aligned}$$

Figure 7. Equation. Administrative costs of performance bonds.

As reported by the five case study State transportation departments, the administrative staff required to manage the performance bonds process ranges between 0.5 full time employees and 1 full-time employee. Using the most costly option, one full-time employee at a fully burdened rate of \$100/hour, the annual cost to administer the performance bonding process is \$104,000. Due to the minimal cost compared to the premium cost of performance bonds, the annual cost to administer the process is not included in the overall cost of the performance bond process.

DEFAULT RATE

The default rate measures the frequency of the occurrence of defaults and is used to measure the risk of default. Default rate equals the number of defaults divided by the total number of projects. The actual default rate for the industry is not a published number. Also, using default data from a single year and/or from a single State transportation department does not account for any anomalies and can skew the data. Accordingly, the average default rate was determined based on project data from multiple states and multiple years available in literature, and on outreach efforts and case studies conducted during this investigation.

Myers' thesis provided data for 19,135 construction projects for 30 States, shown in table 19.⁽¹¹⁾ Only six States reported contractor defaults between 2007 and 2009: Alabama, Georgia, Idaho, Mississippi, South Carolina, and Texas. For these States, there were a total of 10 defaulted contractors over 34 projects, while the rate of default was 0 for all other States. The total default rate for the entire 30 States is 0.19 percent. The second half of the data was collected as the recession hit the United States, which causes an expectation of a higher than normal default rate during this time frame. Even with the potential for a higher default rate, due to the recession, the default rate is only 0.19 percent. The bigger concern is hiring a contractor for many different jobs, which thereby impacts all jobs if the contractor defaults, as is evidenced by the fact that only 10 contractors defaulted during 34 different projects.

Table 19. State default rates.⁽¹¹⁾

State	Number of Defaults	Total Projects	Default Rate (Percent)
Alabama	7	631	1.1
Alaska	0	187	0
Arizona	0	205	0
Arkansas	0	408	0
California	0	1,237	0
Colorado	0	326	0
Connecticut	0	134	0
Delaware	0	170	0
Georgia	19	513	3.7
Hawaii	0	129	0
Idaho	2	188	1.06
Illinois	0	2,682	0
Iowa	0	1424	0
Kansas	0	643	0
Maine	0	545	0
Michigan	0	1,303	0
Minnesota	0	447	0
Mississippi	2	392	0.51
Montana	0	231	0
New Jersey	0	256	0
New Mexico	0	126	0
New York	0	559	0
Ohio	0	1,393	0
South Carolina	6	681	0.88
South Dakota	0	292	0
Texas	1	1,333	0.075
Washington	0	650	0
West Virginia	0	945	0
Wisconsin	0	901	0
Wyoming	0	204	0

During the outreach effort conducted with State transportation departments, the average default rate between 2008 and 2010 of five of the responding State transportation departments never reached 1 percent, but instead ranged from 0.34 to 0.69 percent (see table 20 for details). The highest default rate, 0.69 percent, occurred in 2010, though the annual default rate increased from 2009's rate at only two of the State transportation departments.

Table 20. Contractor respondent default rates (2008–2010).

	Low	Average	High	Total	Default Rate (Percent)
2010 Letting budget (\$ millions)	\$150	\$1,242	\$2,507	\$6,208	N/A
Number of 2010 projects let	100	378	604	1,891	0.69
Number of 2010 defaults	0	3	7	13	
Number of 2009 projects let	150	408	628	2,038	0.34
Number of 2009 defaults	0	2	3	7	
Number of 2008 projects let	100	337	633	1,684	0.36
Number of 2008 defaults	0	2	4	6	
Average					0.46

Note: Includes Alabama, California, Florida, South Carolina, and Vermont.

N/A = Not Applicable.

Five case studies performed as part of this research gathered project data between 2007 and 2011. Of the five States, only one had a default that respondents could remember during this time frame. Again, the average default rate was less than 1 percent and ranged between 0 and 0.21 percent, as shown in table 21.

Table 21. State transportation department case study default rates (2007–2011).

State	Number of Defaults	Total Number of Projects	Default Rate (Percent)
Iowa	0	3,980	0
Oklahoma	0	974	0
Utah	0	912	0
Virginia	0	1,811	0
Washington	1	481	0.21

Last, the surety industry underwrote approximately 85 percent of the bridge and highway construction that all levels of government undertook in 2010, but this represented only approximately 9 percent of the surety industry’s underwriting across all sectors. Similarly, public-sector bridge and highway construction accounted for only 15 percent of the construction sector’s \$1.09 trillion output⁵ in the United States during 2010. The surety industry wrote \$3.5 billion of performance bonds in that year, which, at an average premium of 0.64 percent, suggests that during a typical year, more than half of the construction efforts in the United States, both public and private, are covered by performance bonds.

As seen by the above data, defaults occur in the highway industry less than 1 percent of the time. Thus, defaults are considered a statistically random event that cannot be attributed to any

⁵ U.S. Bureau of Economic Analysis, Annual Industry Accounts, Gross Output by Industry.

particular category of project. In the following benefit-cost analysis, the highest average default rate of 0.69 percent is used to maximize the benefits of performance bonds.

PERFORMANCE BOND BENEFIT-COST ANALYSIS

The benefit-cost analysis of performance bonds is based on the above performance bond cost analysis and the performance bond benefit analysis. Because the performance bond cost varies by project size, the benefit-cost analysis has been conducted for five different project size categories. The cost of the performance bond is the contract value multiplied by the average performance bond premium percentage, as shown in figure 8.

$$Performance\ Bond\ Cost = Average\ Performance\ Bond\ \% \times Contract\ Value$$

Figure 8. Equation. Performance bond cost calculation.

Using the upper limit of each project size category, the associated performance bond costs are shown in table 22.

Table 22. Performance bond costs by project size.

Project Size	Average Performance Bond (Percent)	Performance Bond Cost
< \$100,000	1.06	\$1,060
\$100,000–\$1 million	0.99	\$9,900
\$1 million–\$10 million	0.93	\$93,000
\$10 million–\$50 million	0.70	\$350,000
\$50 million–\$100 million	0.52	\$520,000
> \$100 million	0.52	\$520,000

The most common remedy for a highway project construction default is for the surety to take over the project; this remedy also provides the highest benefit to the State transportation department. A default rate of 0.69 percent is used unilaterally in the benefit calculations because it was the highest average default rate identified by the research. The benefits result from the costs of default avoided by the State transportation department: expected cost of default, completion of contract at original cost, and completion of contract on schedule. The expected cost of default avoided by the State transportation department is equal to the default rate multiplied by the project value, shown in figure 9.

$$Avoided\ Cost\ of\ Default = Default\ Rate \times Contract\ Value$$

Figure 9. Equation. Avoided default cost calculation.

The avoided cost of re-bidding the defaulted contract is equal to the contract value multiplied by the default rate and the assumed increase in costs that result from a re-bid of 7 percent, shown in figure 10.

$$\text{Avoided Cost of Rebid} = 7\% \times \text{Contract Value} \times \text{Default Rate}$$

Figure 10. Equation. Avoided cost of re-bid calculation.

The avoided cost of additional delay due to default is equal to the days saved multiplied by the daily delay rate and the default rate, shown in figure 11. For projects less than \$1 million, it was assumed that the delay would be 30 days at a daily rate of \$1,000. Projects between \$1 million and \$10 million were assumed to have 60 days of delay at a daily rate of \$5,000. Projects greater than \$10 million were assumed to have 60 days of delay, at a daily rate of \$10,000.

$$\begin{aligned} \text{Avoided Schedule Delay Cost} \\ = \# \text{ of Days Delayed} \times \text{Daily Delay Rate} \times \text{Default Rate} \end{aligned}$$

Figure 11. Equation. Avoided delay calculation.

The total benefit of a performance bond received by the State transportation department is equal to the sum of the above three benefits, shown in figure 12.

$$\begin{aligned} \text{Total Benefit} = \text{Avoided Cost of Default} + \text{Avoided Cost of Rebid} + \\ \text{Avoided Schedule Delay Cost} \end{aligned}$$

Figure 12. Equation. Total performance bond benefit calculation.

Table 23 provides assumptions for the performance bond benefit analysis. Table 24 uses the assumptions in table 23 to provide a summary of performance bond benefits and upper limit of the project size category for the contract value in the calculations.

Table 23. Assumptions for the performance bond benefit analysis.

Project Size	Average Performance Bond Premium (Percent)	Number of Days Saved	Cost per Day Saved	Cost to Re-bid (Percent of Contract)
< \$100,000	1.06	30	\$1,000	7
\$100,000–\$1 million	0.99	30	\$1,000	7
\$1 million–\$10 million	0.93	60	\$5,000	7
\$10 million–\$50 million	0.70	60	\$10,000	7
\$50 million–\$100 million	0.52	60	\$10,000	7
> \$100 million	0.52	60	\$10,000	7

Table 24. Performance bond benefits by project size.

Project Size	Avoided Cost of Default	Avoided Cost of Re-bid	Avoided Schedule Delay Cost	Total Benefit
< \$100,000	\$690	\$48	\$207	\$945
\$100,000–\$1 million	\$6,900	\$483	\$207	\$7,590
\$1 million–\$10 million	\$69,000	\$4,830	\$2,070	\$75,900
\$10 million–\$50 million	\$345,000	\$24,150	\$4,140	\$373,290
\$50 million–\$100 million	\$690,000	\$48,300	\$4,140	\$742,440
> \$100 million	\$690,000	\$48,300	\$4,140	\$742,440

The benefit-cost analysis included the calculation of the benefit-cost ratio. The benefit-cost ratio is equal to the performance bond benefit divided by the performance bond cost. A value greater than one indicates a net benefit to the State transportation department for performance bonds; a value less than one indicates a net cost to the State transportation department for performance bonds; and a value of one indicates there is no net cost or net benefit for the performance bond. The analysis required the following different elements to have assumed values: number of days the schedule is delayed as a result of a default; the cost per day of a schedule delay; the default rate; the cost to re-bid a project; and the contract value used in each project size category to calculate the benefit-cost ratio. However, the resulting benefit-cost ratio is heavily influenced by the assumptions made; should any of the assumption values change from the assumptions in table 23, the benefit-cost ratios will change. For each iteration of the analysis, table 25 shows which assumptions varied from the assumptions in table 23, as well as the resulting benefit-cost ratios.

Table 25. Performance bond benefit-cost ratio.

Project Size	Benefit-cost ratios with varied assumptions			
	Original Assumptions from Table 23 and Default Rate of 0.69 Percent	Default Rate = 0.46 Percent	Doubled the Number of Days Saved	Lower Limit of Project Category for Contract Value
< \$100,000	0.89	0.59	1.08	2.65
\$100,000–\$1 million	0.76	0.51	0.79	0.95
\$1 million–\$10 million	0.82	0.54	0.84	1.02
\$10 million–\$50 million	1.06	0.71	1.07	1.11
\$50 million–\$100 million	1.42	0.95	1.43	1.44
> \$100 million	1.42	0.95	1.43	1.43

These analyses show that if the default rate is held constant at 0.69 percent, projects over approximately \$10 million have a net benefit from performance bonds; projects between \$100,000 and \$1 million have a net cost for performance bonds; and projects less than \$100,000

and between \$1 million and \$10 million vary between net cost and net benefit. However, when the default rate is lowered to 0.46 percent, the average default rate from table 20, the benefit-cost ratios are less than one for all project categories, indicating a net cost for performance bonds on all projects. For further details of this analysis, see appendix C.

CHAPTER 5—PERFORMANCE BOND PARADOX

This chapter presents the performance bond paradox. That paradox is that in spite of the fact that default rates are quite low, State transportation departments are unwilling to eliminate the performance bonds meant to deter or mitigate the effects of defaults. Subsections include State transportation department and contractor perspective on performance bond elimination, performance bonds' ability to help State transportation departments select a competent contractor, bonding requirements, and project frequency. This chapter also contains a recommendation for raising the minimum project size that requires a performance bond.

STATE TRANSPORTATION DEPARTMENT AND CONTRACTOR PERSPECTIVE ON PERFORMANCE BOND ELIMINATION

During the outreach effort to the industry, 6 States responded to a State transportation department survey and 11 construction contractors responded to a separate contractor survey. One of the topics of the transportation survey was the concept of eliminating performance bonds and the overall satisfaction of the performance bond system's ability to select a competent contractor.

Vtrans and ALDOT noted that they would be very uncomfortable if performance bonds were eliminated. VTrans does not use risk management professionals because its projects are too small to justify their use, and no projects defaulted between 2008 and 2010 (out of approximately 350 total projects). The survey respondent from ALDOT was not sure whether his or her department had a risk management professional, nor could he or she provide project default information. The SCDOT respondent stated that he or she would be somewhat uncomfortable if performance bonds were eliminated. The South Carolina respondent did not know if SCDOT had a risk management professional and reported 14 defaults on more than 1,000 projects from 2008 to 2010.

Even when the rate of default was considerably lower, two State transportation departments still noted the same level of discomfort. Caltrans and FDOT reported that they are both somewhat uncomfortable eliminating performance bonds, despite the fact that both have risk management professionals on staff and that each only experienced six defaults between 2008 and 2010. (Caltrans completed over 1,800 projects and FDOT completed over 1,300 during this period.) See table 26 for more details. Additionally, the five State transportation department case studies found that none of the State transportation departments were willing to totally eliminate performance bonds from the prequalification process at this time.

Table 26. State transportation department respondent descriptive information.

State	Prequalification	Audit Prequalified Contractors	Bonding Requirements	Post-Project Contractor Performance Evaluation?	Comfort Level if Performance Bonds are Eliminated
Alabama	Yes	No	Full coverage required	No	Very uncomfortable
California	No	N/A	Full coverage—flexibility for mega projects	No	Somewhat uncomfortable
Florida	Yes	No	Full coverage, but no bond for projects < \$250,000 and only \$250 million coverage for projects > \$250 million	Yes	Somewhat uncomfortable
Georgia	Yes	NR	NR	NR	NR
South Carolina	Yes	No	Full coverage required	Yes	Somewhat uncomfortable
Vermont	Yes	No	Full coverage required	Yes	Very uncomfortable

N/A = Not Applicable.

NR = No Response.

These data suggest that smaller State transportation departments, as well as State transportation departments that do not closely track their contractor rates of default, may be most uncomfortable eliminating performance bonds. Irrespective of their default rates and risk management procedures, State transportation departments currently appear rather comfortably wedded to the use of performance bonds.

PERFORMANCE BOND ABILITY TO HELP STATE TRANSPORTATION DEPARTMENTS SELECT A COMPETENT CONTRACTOR

In *NCHRP Synthesis 390*, the 24 State transportation departments surveyed mostly expressed satisfaction with the current bonding system’s ability to identify competent construction contractors, as shown in table 27. In fact, only the Florida, New Mexico, and Oklahoma State transportation departments noted that they were dissatisfied with the current bond system.⁽¹⁷⁾

Florida has an extensive performance-based contractor prequalification system and has been using it for a number of years. (FDOT nonetheless reported being somewhat uncomfortable

eliminating performance bonds.) It should be noted that ODOT-OK does not currently have a high number of qualified specialty contractors bidding on work.

Table 27. State transportation department satisfaction with current bond system.⁽¹⁷⁾

State Transportation Department	Rated Satisfaction with Current Bond System	State Transportation Department	Rated Satisfaction with Current Bond System
Arizona	Satisfied	New Hampshire	Satisfied
Arkansas	Satisfied	New Mexico	Dissatisfied
California	Satisfied	North Carolina	Satisfied
Colorado	Satisfied	Oklahoma	Dissatisfied
Connecticut	Satisfied	Pennsylvania	Don't know
Florida	Dissatisfied	South Carolina	Satisfied
Louisiana	Satisfied	Texas	Very satisfied
Maine	Very satisfied	Utah	Satisfied
Maryland	Satisfied	Vermont	Satisfied
Massachusetts	Satisfied	Virginia	Satisfied
Nevada	Satisfied	Washington	Satisfied

Based on the responses to the contractor survey, most contractors did not believe that the ability to furnish performance bonds provided a guarantee of competence. A minority felt that performance bonds guaranteed that a State transportation department would award its work to qualified contractors, while most felt that a well-qualified contractor and a marginally qualified contractor who have the same bonding capacity did not compete on a level playing field. Responding contractors believed that well-qualified contractors are typically penalized when performance bonds are the primary (non-price-related) qualification for making a bid award. Based on the responses to the State transportation department survey, only one State transportation department felt similarly, while three State transportation departments felt that well-qualified contractors are not penalized through the use of performance bonds.

All responding contractors believed that the implementation of performance-based prequalification would eliminate some contractors from the bidding process, while only half expressed satisfaction with the current bonding company valuation process. Most contractors supported the idea that a fair system can be developed through the use of a performance-based system, which validates a similar finding in *NCHRP Synthesis 390*.⁽¹⁷⁾

Almost all responding contractors expressed confidence in the applicability of an objective and fair performance-based prequalification system, and most noted that they would support a performance-based system if it included an “appropriate” appeals component (see table 28 for details). All agreed that performance-based prequalification enables State transportation departments to select qualified contractors more readily than a selection process, without a prequalification step. Based on these findings, it seems that the construction industry would not be a barrier to the implementation of performance-based contractor prequalification.

Table 28. Respondent contractor views on methods of determining project qualification.

Please Indicate Your Level of Agreement with the Following Statement:	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
“Performance bonds guarantee the State transportation department will award its work to a qualified contractor.”	2	0	2	2	2
“A well-qualified contractor cannot compete on a level playing field with a marginally qualified contractor with the same bonding capacity.”	5	1	2	0	0
“If eligibility to bid was based on satisfactory past project performance, some of my competitors would not be eligible to bid.”	3	5	0	0	0
“I believe a performance-based prequalification system can be established that is reasonably objective and fair.”	2	6	1	0	0
“I would support a performance-based system if there are appropriate appeal mechanisms.”	2	5	1	0	0
	Very Satisfied	Satisfied	Neither	Dissatisfied	Very Dissatisfied
Please Indicate Your Level of Satisfaction with the Bonding Companies’ Valuation Process.	0	5	4	0	1

PERFORMANCE BOND PARADOX

The default rate for the industry is less than 1 percent, which indicates that it is a statistically random and infrequent event. State transportation departments protect themselves against potential financial losses from a default by requiring contractors to purchase performance bonds, though performance bonds have not been shown to have a causal relationship in default prevention. The SFAA reported that nationally, State transportation departments spent \$300 million to \$350 million in 2010 on performance bonds just for resurfacing projects to cover the less than 1 percent chance of a default. Additionally, 5 States spent \$114,159,432 between

2007 and 2011 on performance bonds to be able to handle the financial burden of 2 defaults out of 8,158 projects, of which more than 50 percent were worth less than \$1 million. However, when asked about abandoning the use of performance bonds, State transportation departments were very hesitant to do so. It appears that State transportation departments are not currently comfortable eliminating performance bonds. However, State transportation departments were more comfortable with the idea of possibly raising the minimum contract value that requires a performance bond.

PROJECT FREQUENCY

Project data from 2007 to 2011 was collected from five State transportation departments as part of the case studies performed during this investigation. Based on this actual project data, it was found that 68 percent of the construction program value was attributed to projects of \$10 million or less, and 15 percent of the construction program value was attributed to projects of \$1 million or less, as shown in figure 13. It was also found that 98 percent of the total number of projects in the construction program were less than \$10 million in contract value, and 69 percent of the total number of projects in the construction program were less than \$1 million, as shown in figure 14. There is no reason to suspect that this is not an accurate representation of the industry.

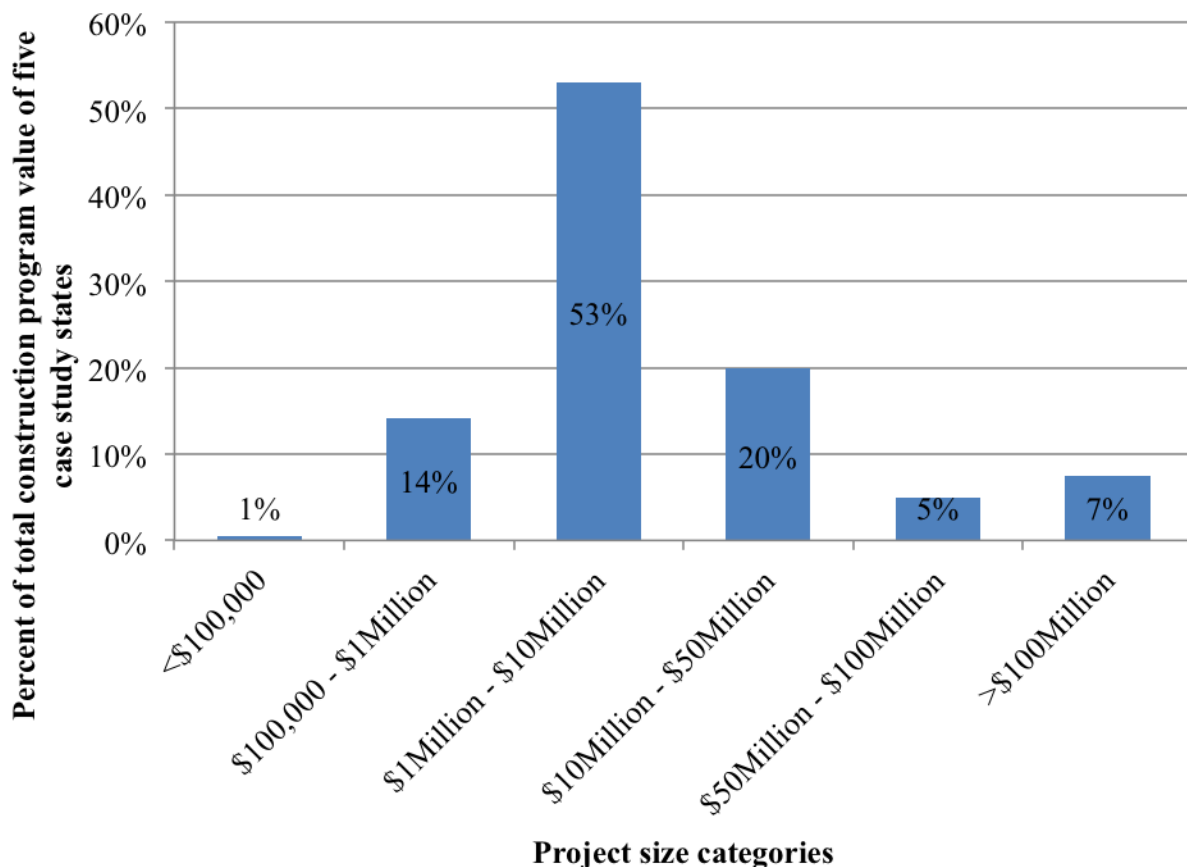


Figure 13. Graph. Percent of construction program based on total value in project category.

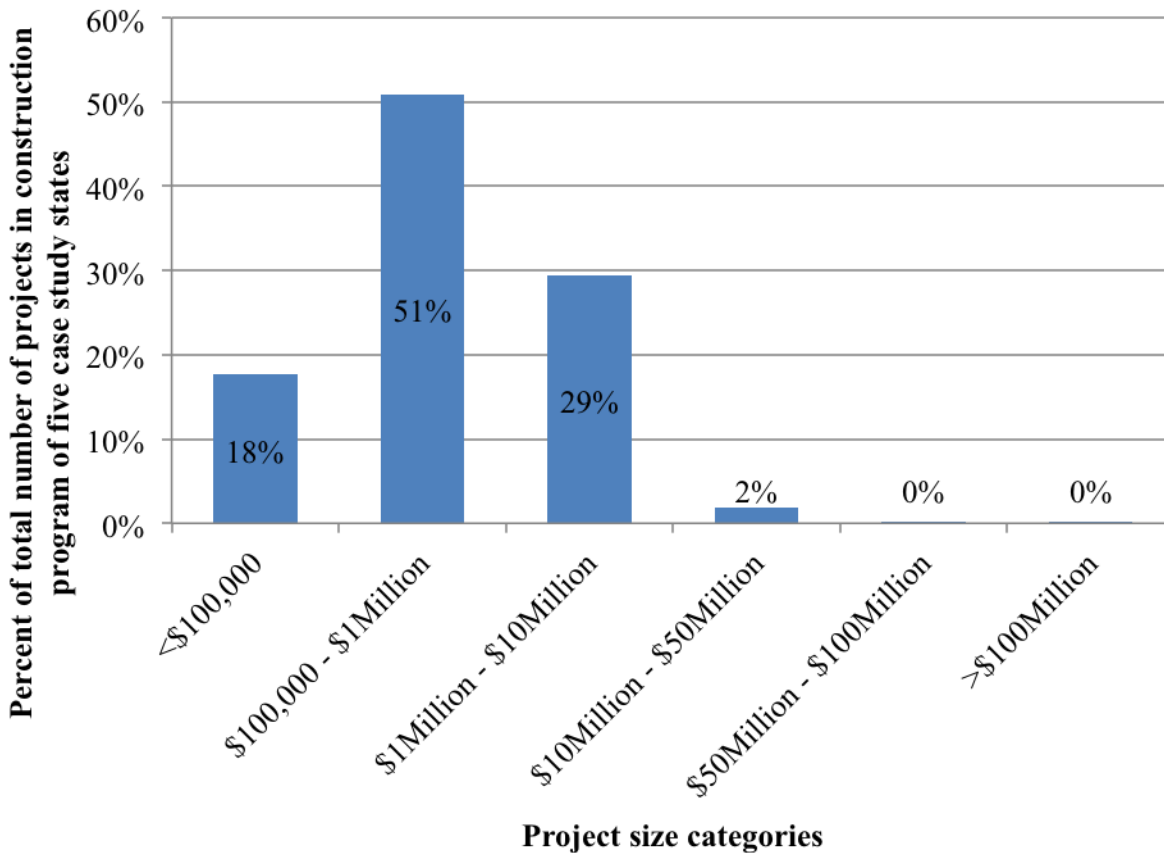


Figure 14. Graph. Percent of construction program based on number of projects in each project size category.

RAISE THE FLOOR OF PERFORMANCE BOND REQUIREMENT

While most States do not accept the abandonment of performance bonds, several States did suggest that they would be interested in raising the minimum project value that requires a bond. Currently, the minimum project value that requires a bond varies between \$0 and \$300,000. Based on the previous benefit-cost analysis, projects with a contract value of less than \$10 million tend to experience a net cost from performance bonds. Also, more than half of the projects in a State construction program, by value and by number, are worth less than \$10 million, as shown in figure 13 and figure 14. Because of the sensitivity of the performance bond benefit-cost analysis to the assumptions, State transportation departments will most likely debate increasing the minimum project size that requires a bond. It is recommended that the minimum be somewhere between \$1 million and \$10 million.

The total cost savings of raising the floor of the minimum project size that requires a bond was calculated for each case study for the years 2007 through 2011. The total cost savings values were calculated by multiplying the total dollar amount for projects awarded under \$100,000, between \$100,000 and \$1 million, and greater than \$1 million to \$10 million, by the associated average performance bond premium percentage, 1.06, 0.99, and 0.93 percent, respectively. The total savings that results from raising the performance bond floor to \$1 million is the sum of the

savings from projects under \$100,000 and projects between \$100,000 and \$1 million between 2007 and 2011. The total savings that result from raising the performance bond floor to \$10 million is the sum of the savings from projects under \$100,000, projects between \$100,000 and \$1 million, and projects between \$1 million and \$10 million. Table 29 illustrates the amount of money each of the case study States could have saved between 2007 and 2011 if the minimum contract value that requires a bond was raised to between \$1 million and \$10 million.

Table 29. Five year cost savings from increase in minimum contract value that requires a performance bond.

State	Savings if Performance Bond Minimum Raised to \$1 Million	Savings if Performance Bond Minimum Raised to \$10 Million
Iowa	\$7,860,376	\$26,361,418
Oklahoma	\$2,418,408	\$12,673,639
Utah	\$1,986,490	\$13,118,597
Virginia	\$4,843,811	\$21,415,938
Washington	\$1,182,681	\$6,517,335

While there is the ability to achieve considerable premium savings by raising the performance bond threshold, there remains a risk, albeit small, that a State transportation department will still experience a default. A State transportation department can further reduce the likelihood of default through the implementation of performance-based prequalification because it will help screen out poorer performing contractors. If a default does occur, the State transportation department still can recover funds from the contractor to offset the cost of default. Any unrecovered costs would be borne by the State transportation department, but as the above analysis indicates, large savings in bond premiums can significantly offset these costs.

CHAPTER 6—BENEFIT-COST ANALYSIS OF PERFORMANCE-BASED CONTRACTOR PREQUALIFICATION

This chapter identifies and analyzes the costs and benefits of performance-based contractor prequalification. It also presents contractor and State transportation department perspectives on various aspects of contractor screening from the five State case studies, plus costs of performance-based contractor prequalification versus performance bonds to State transportation departments.

Performance-based contractor prequalification is more comprehensive than the surety industry's financial prequalification that occurs when it issues a bond. Performance-based contractor prequalification incorporates a contractor's performance record with a given agency in the prequalification process through a past project evaluation system that creates a record of actual performance. Numerous agencies—FDOT, MTO, and the U.S. Army Corps of Engineers, to name three examples—use this type of performance information to determine eligibility to bid and to limit the amount of work on which a given contractor can bid. Additionally, the increased use of alternative project delivery methods to accelerate project schedules, as well as the decline in number of State transportation personnel, has led public agencies to depend more on contractor QC programs. This shift has turned performance-based contractor prequalification into a risk mitigation strategy and has increased the use of project-specific prequalification.

The evaluation of contractor performance and the integration of these evaluations into the performance-based contractor prequalification system provide a tangible means by which to reward good contractors and a disincentive for marginal contractors to perform badly. Other countries have been motivated to implement performance-based contracts for reasons that should resonate in the United States.

As demonstrated in *NCHRP Web Document 38*, these factors also motivate State transportation departments in the United States to look for methods by which to create efficiencies through contractor performance evaluations, as well as methods for mitigating the potential risk created by the trend toward the increased use of contractor QC in the project acceptance process.⁽¹⁷⁾ Agency performance evaluation programs have to pass the tests for both fairness and equity, which are essentially reflected in the types of information the agency collects about past performance.

Agencies currently use numerous approaches to incorporate contractor performance into the prequalification process. While the variation is substantial, the motivation for implementing these systems is generally the same; to correlate contractor performance with a contractor's ability to competitively bid, which thereby creates an incentive for good performance and encourages marginal performers to improve.

This chapter explores the benefits and costs of performance-based prequalification based on data collected through the literature review, the outreach efforts with the State transportation departments and the contractors, and the five State transportation department case studies. However, as a result of these efforts, it was found that there is no specific quantitative data about the benefits of performance-based prequalification available at this time. There is no available data because the benefits were either qualitative, such as an improved relationship with the

contractor; the benefit, such as improved schedule, could not be measured in a specific way to show that performance-based prequalification was directly responsible for the benefit; the State transportation department did not track the data required; or there was no baseline data with which to compare the claimed benefit. As a result, instead of a detailed benefit-cost analysis, the benefits of performance-based contractor prequalification will be described in a qualitative manner, and the costs will be described in financial terms.

PERFORMANCE-BASED CONTRACTOR PREQUALIFICATION BENEFITS

Currently, no entity tracks the benefits of performance-based contractor prequalification in a quantitative manner. Quantitative conclusions cannot be drawn based on measures that are currently tracked because the nature of the benefits is qualitative; there are no baseline measures to compare the tracked data to; and/or it is difficult to attribute the measured improvement directly to performance-based prequalification. Nonetheless, the overall opinion of performance-based prequalification in both industry and academia is that it does improve a project. States that currently have performance-based prequalification programs continue to move forward with their existing programs, and some are enhancing their existing programs to make them more robust. Discussion of this activity can be found in the case studies in appendix B.

Neither State transportation department personnel nor contractors consider the ability to secure a performance bond a reliable indicator of a contractor's qualification to perform high-quality work; rather, they view a contractor's past performance as such an indicator. Based on the literature review, outreach efforts with State transportation departments and contractors, and five State transportation department case studies, the overall benefits of performance-based contractor prequalification occur in the following project areas:

- Overall project performance.
- Project quality.
- Project timeliness.
- Number of claims.
- Contractor and State transportation department relationship.

The benefits from performance-based prequalification identified by both the contractor survey responses and the State transportation department case studies are the following:

- Improved quality of work.
- Improved timeliness of delivery.
- Improved safety.
- Improved personnel experience.
- Improved contractor cooperation with the agency.

The remainder of this chapter will attempt to provide further insight into the benefits of performance-based prequalification.

In the survey of contractors and State transportation departments conducted during this research, there was support for performance-based prequalification. Overall, the contractors express that when performance-based contractor prequalification is used, both the quality of work and the timeliness of delivery improve. All contractors surveyed believe that workmanship quality, safety, timely project completion, timely punch-list completion, personnel experience, and warranty responsiveness improve when performance-based prequalification is implemented. State transportation department respondents did not agree on how these aspects of project delivery are impacted; some felt that there would be no change to these factors.

State transportation departments appeared to be more focused on the impact of performance-based contractor prequalification on State transportation department-contractor relations. State transportation department respondents most often cited improvements in the number of claims filed (i.e., fewer claims) and contractor cooperation with the agency when performance-based prequalification is implemented. The only negative aspect of the implementation of performance-based contractor prequalification mentioned by a minority of the State transportation department or contractor respondents was the thought that there would be a decrease in the number of contractors that bid on a given contract.⁶ Otherwise, the responses for other aspects of project delivery were all either positive or neutral, where neutral indicated no predicted change.

While contractors express greater across-the-board support of performance-based prequalification than State transportation departments, on average, both groups view the addition as a positive benefit. Contractors believe that quality and timeliness improve when performance-based contractor prequalification is used, and State transportation departments believe that State transportation department-contractor relations improve when it is used. Table 30 provides a side-by-side comparison of these responses.

⁶ Any prequalification method will be restrictive to some extent. In the contractor survey, one contractor respondent noted that his or her company found it difficult to secure performance bonds for large projects with contract values above \$50 million, due to the company's relative youth and subsequent inability to rely on cash reserves for operating capital.

Table 30. Impact of performance-based contractor and State transportation department prequalification.

Impacted Project Performance Factor	Believe Would Improve (Percent)	
	Contractor	State Transportation Department
Workmanship quality	100	60
Safety	100	60
Timely project completion	100	60
Timely punch-list completion	100	60
Personnel experience	100	60
Warranty responsiveness	100	60
Personnel competence	88	40
Contractor cooperation with property owners	88	60
Timely construction submittal	86	60
Maintenance of traffic	75	60
Number of claims/disputes	75	80
Environmental compliance	75	40
Contractor cooperation with stakeholders	75	60
Contractor cooperation with public concerns	75	60
Management of subs	75	NR
Agency inspection	63	40
Contractor cooperation with agency	63	80
Liens	63	NR
Number of bidders	50	20
Material quality	50	40
Number of contractor-requested change orders	50	60
Achieving DBE goals	25	40

NR = No Response.

The case studies were conducted with five different states: Iowa, Oklahoma, Utah, Virginia, and Washington. Each of these states has implemented some form of performance-based contractor prequalification. The different versions of performance-based prequalification varied from checking past project references to evaluating contractor performance during projects and incorporating these scores into the prequalification process. During the case studies, it was found that the State transportation departments had difficulty providing specific details about how the overall project performance improved because of performance-based prequalification. However, some participants stated that the project went more smoothly as a result of the performance-based prequalification and that there seemed to be less chaos on the project. The case study participants did all agree that performance-based prequalification was beneficial and that each State transportation department plans to continue to perform this prequalification. During the case studies, each State transportation department was asked to rate the impact of performance-

based contractor prequalification on a number of different project aspects that ranged from procurement through completion of the project. Table 31 shows the impact ratings from each of the five State transportation departments. The possible ratings were worse, no change, better, or no opinion.

Table 31. State transportation department perspective of the impact of performance-based contractor prequalification on different aspects of a project.

Project Aspect	Iowa	Oklahoma	Utah	Virginia	Washington
Number of bidders	No change	Worse	No change	Better	Better
Material quality	No change	Better	Better	No change	Better
Workmanship quality	No change	Better	Better	Better	Better
Safety	No change	No change	Better	Better	Better
Maintenance of traffic	No change	No change	Better	Better	Better
Level/amount of agency inspection required	No change	No change	Better	Better	Better
Timely contractor completion of activities	No change	Better	Better	Better	Better
Personnel experience	No change	Better	No change	Better	Better
Personnel competence	No change	Better	No change	Better	Better
Number of contractor-initiated change order requests	No change	No change	No change	No opinion	Better
Number of claims/disputes	No change	No change	No change	No opinion	Better
Responsiveness on warranty call-backs	No change	No opinion	No change	No change	Better
Achievement of DBE goals	No change	No change	No change	No change	No change
Environmental compliance	No change	No change	No change	Better	Better
Contractor cooperation with all parties involved in the project	No change	Better	No change	Better	Better

Iowa rated the impact of performance-based contractor prequalification as no change for every project aspect because Iowa has been doing its own form of performance-based prequalification for more than 20 years, and the participants had no other experience against which to compare it. The remaining four states all gave “better” ratings for both workmanship quality and timely completion of activities, which indicates that both of these are improvements from performance-based prequalification. Unlike the outreach effort with the State transportation departments, these four State transportation departments are in agreement with the overall results of the contractor survey, which found an improvement in quality of work and the timeliness of delivery as the result of performance-based contractor prequalification.

Three out of the remaining four states rated the impact of performance-based contractor prequalification as “better” on the following project aspects:

- Material quality.
- Safety.
- Maintenance of traffic.
- Level/amount of agency inspection required.
- Personnel experience.
- Personnel competence.
- Contractor cooperation with all parties involved in the project.

While the above aspects are not unanimously rated as an improvement that results from performance-based prequalification, they are still considered benefits because the agencies that responded have very different experiences with performance-based prequalification. Safety and personnel experience are again in agreement with the contractor improvements from performance-based prequalification. Contractor cooperation with all parties involved in the project is also the primary benefit of performance-based prequalification identified by the State transportation departments that participated in the outreach survey.

The only “worse” rating was from Oklahoma, and it was for the number of bidders. It is notable that two of the states rated the number of bidders as “better.” The outreach efforts also identified that the number of bidders was likely to be reduced, due to performance-based prequalification. The variance in the case study ratings could be explained, based on the definition of the response choices and what indicates an improvement. In some circumstances, it may be considered that an increase in the number of bidders results in a more competitive environment, which could be considered an improvement. However, in other circumstances, it could be that the number of bidders decreases, but among that number, more are truly qualified to perform the work or make up the majority of the bidder pool, which could be considered an improvement. Each case study is described in further detail in appendix B.

PERFORMANCE-BASED CONTRACTOR PREQUALIFICATION COSTS

A State transportation department can experience significant costs at the beginning of a performance-based prequalification system, such as development of a performance evaluation process, infrastructure development costs, and internal and external training costs. This analysis does not consider these costs; rather, it considers the costs associated with the operation of a performance-based prequalification system.

The administrative cost of a performance-based contractor prequalification is the only cost a State transportation department will incur with that prequalification system, whereas the State transportation department will pay both administrative costs and premiums for performance bonds, which costs considerably more. The cost of performance-based contractor

prequalification results from the additional staff required to manage the system. Research showed across five different States that the additional staff varied between 0.5 full-time employees and 2 full-time employees. Typically, the additional staff required by the performance-based contractor prequalification system has an average fully burdened cost of approximately \$50 per hour. This results in an annual cost between \$52,000 and \$208,000. This cost range is the result of performance-based prequalification programs that are at various stages of implementation.

While the administrative cost of performance-based contractor prequalification can be higher than the administrative cost of performance bonds, this cost is negligible compared to the annual premium costs of performance bonds.

CHAPTER 7—PROPOSED PERFORMANCE-BASED CONTRACTOR PREQUALIFICATION SYSTEM

This chapter presents a model for a performance-based contractor prequalification program, based on industry examples and literature. First is a discussion of the goals and requirements for the system, followed by the presentation of each of the three tiers of the model: administrative prequalification, performance-based prequalification, and project-specific prequalification. The program includes a quantitative method for modifying the contractor bidding capacity, based on the results of performance ratings.

GOALS AND REQUIREMENTS FOR A PERFORMANCE-BASED CONTRACTOR PREQUALIFICATION SYSTEM

The challenge in creating a model for performance-based prequalification is to achieve meaningful incentives for good performance and to encourage improvements to poor performance.⁽³⁹⁾ The model should not be too difficult to administer and the rating or evaluation of the contractor should be clear, tied to key project performance measures, transparent, and should include an appeals process that is perceived as fair and is fair. Also, each State has unique factors, such as geography, weather, demographics, and politics, which require that the model is adaptable to the needs and priorities of each State. The proposed performance-based contractor prequalification program considered the following four guiding principles for its development:

- The specific elements of a performance-based contractor prequalification system should add value to the project, in terms of performance risk reduction.
- The elements of a performance-based contractor prequalification system should be justifiable and defensible.
- Contractors with a track record of excellent performance should be rewarded; State transportation departments should increase the amount of work on which such contractors can bid.
- Contractors with a record of poor performance should be encouraged to improve; State transportation departments should reduce the amount of work such contractors can bid on until said contractors' performance improves.

The proposed performance-based prequalification model combines elements of the processes used by IOWADOT, FDOT, ODOT-OH, and MTO, and borrows concepts and terminology from each. Additionally, *NCHRP Synthesis 390* provides the basic foundation for the performance-based prequalification model in this chapter.⁽¹⁷⁾ This approach, developed in the *NCHRP Synthesis 390*, is based on the study's comprehensive literature review, including the survey responses recorded from 41 U.S. State transportation departments and 7 Canadian provincial ministries of transportation; a content analysis of solicitation documents from 35 State transportation departments; and interviews with 10 construction contractors, from firms that range in size from a local chip seal contractor to a major national Heavy Civil contractor.

The model proposed here consists of a two-tier process that is applicable to design-bid-build projects, and an optional third tier for project-specific qualification for DBB best value, DB, construction manager/general contractor, public-private partnerships, other alternate project delivery methods, and projects with specialized requirements. The following is a summary of the tiers:

- Tier one consists of administrative prequalification, which is comprised of financial analysis conducted by the agency, a records check, and the assembly of optional external documented information (figure 15).
- Tier two focuses on contractor performance and encompasses two primary areas: the determination of the contractor's managerial ability and a post-project evaluation of the contractor performance on each contract. These factors are used in conjunction with tier one's financial analysis output to determine the amount of work upon which a contractor can bid (figure 21).
- Tier three is a project-specific prequalification tier designed to closely evaluate the contractor's qualifications and experience in terms of the specific needs of a given project. This final tier is an optional portion of the prequalification process and is intended for use on projects that are delivered by methods other than traditional design-bid-build and/or on a project that has requirements beyond the standard boilerplate requirements (figure 25).

Tier One—Administrative Prequalification

The first tier of the performance-based contractor prequalification model (shown in figure 15) consists of administrative prequalification (as defined in *NCHRP Synthesis 390*), which is already used, to varying degrees, by most State transportation departments. *NCHRP Synthesis 390* defines administrative prequalification, as follows:⁽¹⁷⁾

A set of procedures and accompanying forms/documentation that must be followed by a construction contractor to qualify to submit bids on construction projects using traditional project delivery. These include evaluation of financial statements, dollar amount of work remaining under contract, available equipment and personnel, and previous work experience. This may be on a project-by-project basis or on a specified periodic basis.

Administrative prequalification consists of the following three components:

- Financial analysis conducted by the agency, including analysis that uses audited financial statements, bank statements, etc.
- An optional records check to determine whether the contractor has committed any major contractual infractions, such as breach, failure to complete a punch list, failure to make good on a warranty, etc. An agency may also choose to include citations for failure to comply with safety and/or environmental standards that are set by outside enforcement agencies.

- Assembly of optional external documentary information, such as bonds, surety verification of the ability to furnish bonds, required insurances in the proper amounts, et cetera, as required by law or as desired by the agency to validate information developed by the contractor.

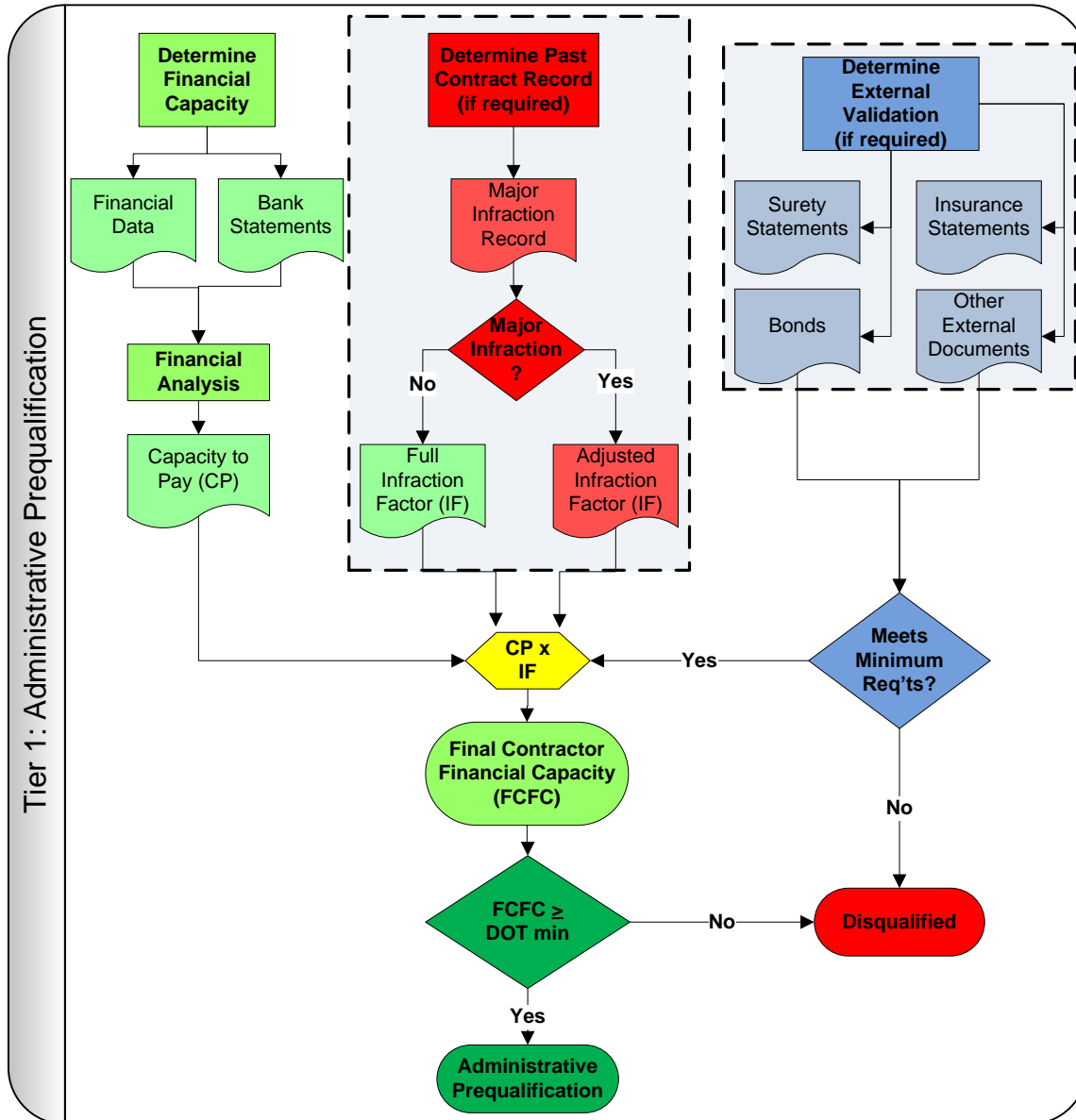


Figure 15. Chart. Tier one administrative prequalification.

The first aspect of tier one administrative prequalification is an evaluation of the contractor's financial situation. At a minimum, a State transportation department should assess the financial positions of contractors for the following situations:

- **Lowering the Costs of Performance Bonds for Large Contracts.** When an agency lets a contract with a value of \$100 million or more, for example, the agency can allow

proposals from only prequalified firms to reduce the cost of the performance bond for that contract. Only firms that are creditworthy and have a good performance record would be prequalified. All of the proponents so prequalified should present relatively low risks to their sureties and thus should be able to obtain the required performance bond at a relatively low cost. Likewise, the lower costs of performance bonds obtained by these prequalified proponents should pass to the State transportation department in the form of lower bids.

- **Relying on a Contractor’s Ability to Pay for Small Contracts.** On a small contract of \$1 million or less, for example, an agency may decide to forgo the cost of a performance bond because it is passed through in the bids for the contract, and retain the risk that the contractor might be unable to pay for the remedy to a contractual failure. In this case, it is even more critical to assess the financial health of the contractor.

Administrative prequalification requires, at a minimum, that the contractor’s final contractor financial capacity is greater than or equal to a minimum requirement established by the State transportation department. The final contractor financial capacity is based on the contractor’s capacity to pay and on an infraction factor, based on the contractor’s past contract record with the State transportation department, as shown in figure 16. If a contractor’s resulting final contractor financial capacity does not at least meet the minimum State transportation department requirement, then the contractor is disqualified. External validation, such as surety statements, bonds, and insurance statements, can also be an added measure for administrative prequalification. When external validation is included, both the minimum external validation and minimum final contractor financial capacity requirements have to be met in order to gain administrative prequalification and move on to tier two performance-based prequalification.

$$\begin{aligned} \text{Final Contractor Financial Capacity (FCFC)} \\ = \text{Infraction Factor (IF)} \times \text{Capacity to Pay (CP)} \end{aligned}$$

Figure 16. Equation. Final contractor financial capacity calculation.

There are two steps required to calculate a contractor’s final contractor financial capacity:

1. Calculation of the contractor’s capacity to pay.
2. Determination of the infraction factor.

To a contractor, payments to place a remedy for a contractual failure are an unexpected expense. The contractor’s liquidity is the most reliable indicator of its ability to make unexpected payments in the short run (i.e., without liquidating fixed assets or otherwise changing its capital structure). In the longer run (i.e., over periods of more than one year) the contractor’s solvency is indicated by its ability to withstand the variability of economic cycles and still be able to make unexpected payments. State transportation departments should satisfy themselves regarding the following:

- The contractor has sufficient liquidity at the outset of a contract to pay out a loss up to the full value of the contract.

- If it is expected that the duration of the contract will be more than one year, the contractor is sufficiently solvent that changes in its capital structure will not jeopardize its ability to pay out a remedy up to the full value of the contract.

A contractor's liquidity is reflected in the value of assets that can be liquidated (i.e., converted into cash within 1 year) and made available for investment or spending. The amount by which these current assets exceed the value of the contractor's corresponding current liabilities, and the amount of cash the contractor needs to retain as a minimum balance, are the amounts available to pay for a remedy for a contractual failure. Liquidity and solvency measures have been used in varying forms by the surety industry, FDOT, the IOWADOT, UDOT, ODOT-OH, and MTO as a basis for computation of a contractor's bidding capacity. Specific to this model, the liquidity and solvency measures are used to calculate the capacity to pay.

Generally accepted accounting principles classify all of a contractor's assets according to their use in the delivery of services and how readily they can be turned into cash.

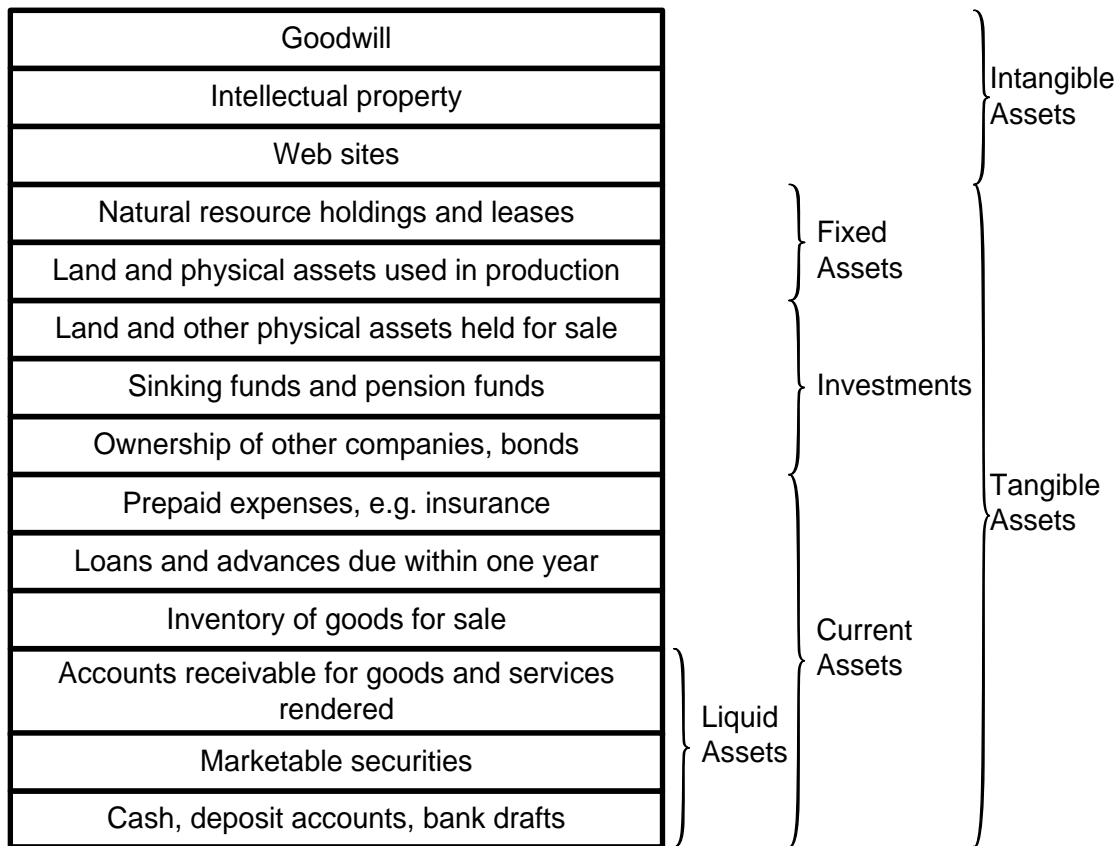


Figure 17. Graph. Classes of assets.

Assets that can be converted into cash within one year are current assets; liabilities that need to be retired within one year are current liabilities. Liquidity is the amount by which current assets exceed current liabilities (i.e., net current assets); in other words, the amount of cash that could be made available within one year to meet unexpected expenses, as shown in figure 18.

$$\text{Liquidity (Net Assets)} = \text{Current Assets} - \text{Current Liabilities}$$

Figure 18. Equation. Liquidity calculation.

The liquidity of the contractor on the day that the contractor needs to make an unexpected payment to remedy a contract failure is what matters to a State transportation department. The agency cannot know that, however; all it can know is the liquidity of the contractor at the outset of the letting process. Months or years could elapse from the onset of the letting process to the date on which the contractor fails to meet its obligations.

The liquidity of a contractor can change significantly and quickly: a sudden downturn in work can result in rapid draw-downs of cash, as the contractor continues to pay the wages of key personnel, make long-term lease payments for heavy equipment, and service its debt. Energy and material prices, often fixed for the durations of construction contracts, can escalate suddenly and erase profit margins. The longer the duration of the contract, the less certain a State transportation department can be that the contractor's liquidity will be as good towards the end of a contract as it was in the beginning.

Over periods longer than the one year that is defined for current assets and current liabilities, State transportation departments should look at the contractor's ability to draw upon longer-term resources to maintain its liquidity in the face of deteriorating business conditions. The long-term ability is best indicated by the contractor's solvency, or the contractor's ability to draw upon its existing assets and its future income to meet its long-term obligations.⁷ In general terms, a firm with higher solvency can withstand more adverse economic conditions and still meet the basic test of survival: continued payment of its obligations. In the specific terms of paying for the remedy to a contract failure, a contractor with higher solvency is more likely to maintain sufficient liquidity through adverse economic conditions in order to make that unexpected payment.

The general measure of a contractor's solvency is the extent to which its assets exceed its liabilities (i.e., equity), as shown in figure 19. This general measure indirectly includes income because all income retained by the contractor becomes part of and increases the contractor's assets. For this reason, some of the specific measures of solvency deal with income separately from assets.

$$\text{Solvency (Equity)} = \text{Assets} - \text{Liabilities}$$

Figure 19. Equation. Solvency calculation.

The contractor's capacity to pay that takes into account net current assets should be the basis of the capacity to pay on a short project that lasts up to 1 year. For longer projects, contractors can draw upon their equity to make payments; this is reflected in their capacity to pay. In figure 20, net current assets is the liquidity measure (current assets – current liabilities) and equity is the solvency measure (assets – liabilities). The equation also includes a weighting for the duration of

⁷ Interest payments on debt, the final principal payment on debt, lease payments, and any other fixed obligations.

the project; on a shorter-duration project, liquidity is more heavily weighted, while on a longer-duration project, solvency is more heavily weighted.

$$\text{Capacity to Pay (CP)} = \frac{1}{n} \text{Net Current Assets} + \left(1 - \frac{1}{n}\right) \text{Equity}$$

Figure 20. Equation. Capacity to pay calculation.

Where:

n equals the duration of the project expressed in years, with a minimum value of 1 year and a maximum value of 5 years.

Similar to what is currently practiced by some State and Federal agencies, the model includes a system for addressing major contract breaches or incidents. The system is modeled from the Ontario infraction system and is similar to the Florida Deficiency Letter. Both MTO and FDOT typically issue a warning, followed by an adverse contracting action if the contractor does not make the required corrections. If one or more major infractions are found, the contractor's capacity to pay will be decreased according to the State transportation department's published infraction factor scale, which is based on the severity of the specific infraction and the length of time since it occurred, which results in the final contractor financial capacity, as shown in figure 16.

At this time, a specific infraction factor scale is not proposed. However, the spectrum of results from the infraction factor scale could range from complete disqualification, due to a previous recent default, to a small capacity to pay reduction for an old contract, for which a warranty callback was ignored. FDOT has created an infraction factor scale, which could possibly be modified for individual State transportation department use. The length of time the contract record remains valid also needs to be resolved before the proposed model is implemented. In the industry, contract records currently remain on file anywhere from 3 years to an indefinite point in time. *NCHRP Synthesis 390* found that agencies that conducted contractor performance evaluations generally kept evaluations for a minimum of 3 years.

As stated above, if the final contractor financial capacity meets or exceeds the State transportation department's minimum financial requirements and the minimum external requirements are met, then the contractor moves on to tier two performance-based prequalification. Otherwise, the contractor is disqualified.

Tier Two—Performance-Based Prequalification

Tier two focuses on contractor performance and encompasses two primary areas: the determination of the contractor's managerial ability and a post-project evaluation of performance on each contract. *NCHRP Synthesis 390* defines performance-based prequalification in the following way:⁽¹⁷⁾

A set of procedures and back-up documents that must be followed by a construction contractor to qualify to submit a bid on a construction project based on quality, past performance, safety, specialized technical capability, project-

specific work experience, key personnel, and other factors. This may be on a project-by-project basis or on a specified periodic basis and the project could be delivered using traditional design-bid-build or alternative project delivery methods such as design-build, construction manager/general contractor, or any other method.

Performance-based prequalification, tier two, qualifies contractors to bid on a specific project, based on the contractor's available bidding capacity. For a given project, the contractor's available bidding capacity is its bidding capacity, based on the final contractor financial capacity from tier one and its past three years' performance ratings, less the current ongoing contracts value, which is the value of work the contractor is currently committed to for all public and/or private owners with whom it has an active construction contract. Figure 21 graphically illustrates the mechanics of tier two.

A contractor is qualified if the resulting available bidding capacity value exceeds the project contract value estimate requirement established by the State transportation department for the given contract, which is equal to current engineer's estimate for the project in question.

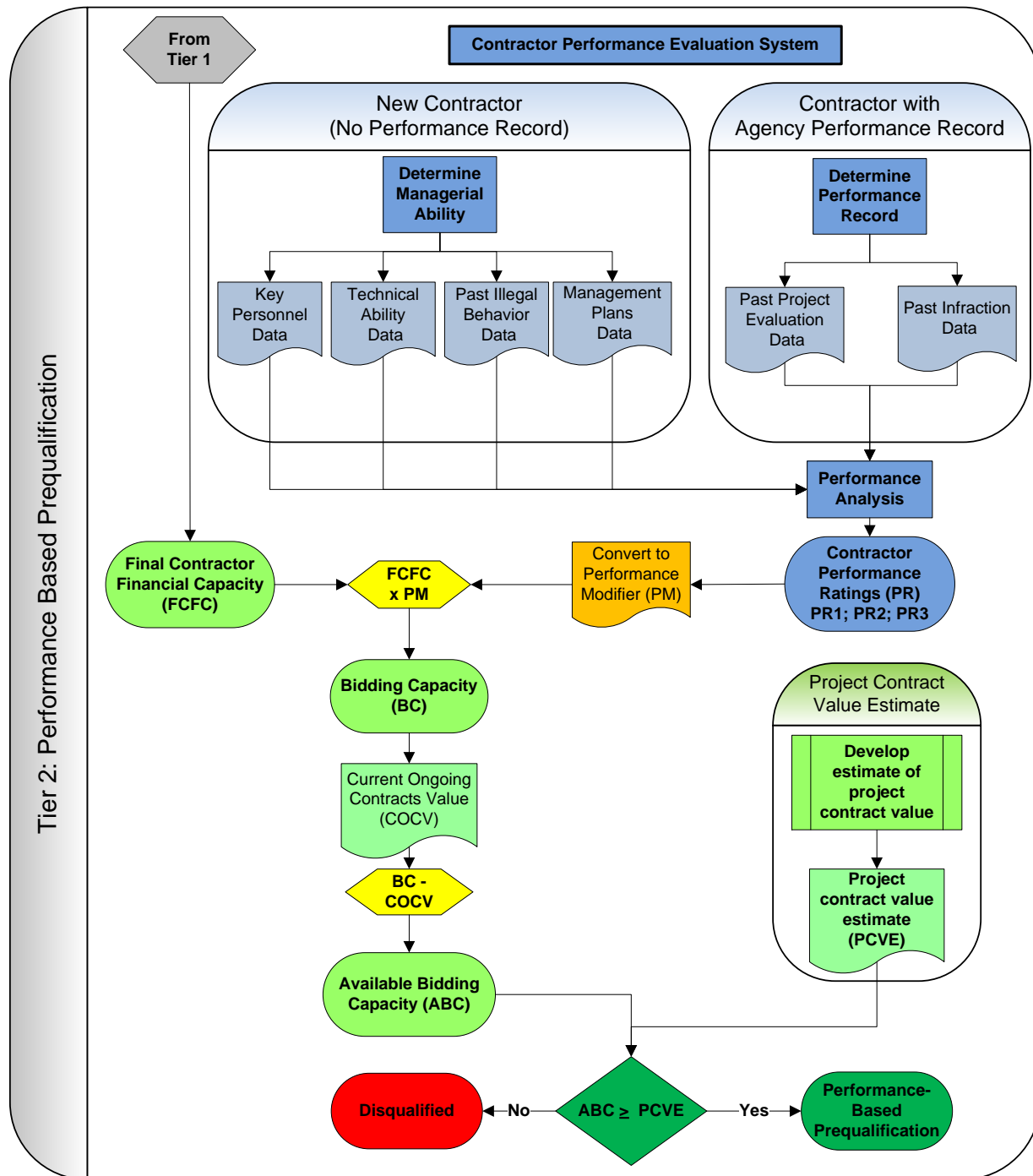


Figure 21. Chart. Tier two performance-based prequalification.

Contractors that are currently qualified and already have performance scores on contracts would be assigned a performance rating once a year, as is done in the Ontario system. The performance modifier is modeled after MTO’s method for determining a contractor’s overall performance score, which uses the contractor’s performance rating for the past three years, as determined by the agency’s performance-based contractor evaluation system. Figure 22 shows that the latest year’s average performance rating carries half the weight and the oldest year’s performance

rating carries the least weight. This use of the last three years, with the heaviest weight on the most recent years, gradually reduces a year with an adverse rating's impact to the point where, after three years, it disappears, in order to create an objective mathematical process to reward a marginal contractor who is committed to improving performance. The system contains a mechanism that skews the performance modifier from the past toward the present to forgive an uncharacteristic, yet well-deserved performance rating. The performance modifier is computed using the equation in figure 22.

$$\text{Performance Modifier (PM)} = \frac{[3(PR1) + 2(PR2) + 1(PR3)]}{6}$$

Figure 22. Equation. Performance modifier calculation.

Where:

PR1 = average of all performance ratings for most recent year (year 1).

PR2 = average of all performance ratings for next most recent year (year 2).

PR3 = average of all performance ratings for oldest year (year 3).

New contractors that do not have performance records and that were administratively qualified in tier one would be assigned a starter performance modifier, based on an agency-determined set of factors that could include the following:

- Technical ability.
- Key personnel.
- Past illegal behavior
- Management plans, such as contractor quality control plans, environmental protection plans, etc.
- References from other public owners.
- Field evaluation of work underway for other owners.
- Other factors, per State transportation department preference.

The computation of the contractor's bidding capacity is deliberately modeled after the performance bonding paradigm, where the performance modifier replaces the surety evaluation of contractor default risk. The contractor's bidding capacity is the maximum amount of work a given contractor can bid on if it has no other ongoing obligations, which is the product of the final contractor financial capacity and the performance modifier, as shown in figure 23.

The scale for a performance modifier varies from State to State, such as a 100-point scale, a 10-point scale, or a scale that uses 1 as average, with a maximum score of 1.5 and a minimum

score of 0.5. In order to achieve a realistic bidding capacity, the final contractor financial capacity is multiplied by a financial factor that results from the performance modifier. In the surety world, the final contractor financial capacity is multiplied by a risk factor that varies between 5 and 10, whereas FDOT uses an ability factor between 5 and 15 to multiply the final contractor financial capacity. Depending on the performance modifier scale used by the State transportation department, the performance modifier can be used directly for the financial factor to compute the bidding capacity or the performance modifier can be converted to a financial factor.

$$\begin{aligned} \text{Bidding Capacity (BC)} \\ &= [\text{Final Contractor Financial Capacity (FCFC)} \\ &\times \text{Financial Factor (FF)}] \end{aligned}$$

OR

$$\begin{aligned} \text{Bidding Capacity (BC)} \\ &= [\text{Final Contractor Financial Capacity (FCFC)} \\ &\times \text{Performance Modifier (PM)}] \end{aligned}$$

Figure 23. Equation. Bidding capacity calculation.

At this point, the algorithm performs the same function that current systems in Iowa and Utah do; it reduces the amount of work a contractor can bid on, based on its past performance. To completely achieve the research goals, a process for rewarding contractors with superior records of performance is also needed. There are two viable alternatives to supply this function as follows:

- Allow the financial factor to range between 5 for low performers and 15 for the best of the best.
- Fix the financial factor to a given amount, such as 7.5, and implement a performance rating system that yields performance modifiers that can be greater than 1.0.

In both options, the bidding capacity for a superior performer would be higher when using the performance-based prequalification model than it would when using the bonding capacity that results from the surety industry's analysis.

The first alternative follows the same philosophy as the FDOT model that uses an ability factor, which essentially equates the financial factor, based on the performance modifier, to the multiplier of the final contractor financial capacity, which results in the bidding capacity of the contractor. Table 32 shows the proposed method for the first alternative, which allows the financial factor to range from 0 to 15 times the final contractor financial capacity, analogous to the FDOT system. Three performance ranges are established: green for superior performance, orange for above-average performance, and yellow for satisfactory performance. Because the green range includes the top performers, the surety would provide bonding up to 10 times the final contractor financial capacity. This system would allow the superior group to bid up to 15 times its final contractor financial capacity. The second group is the above-average performers, and the assumption was made that the surety industry would bond them at the average rate of 7.5 times the final contractor financial capacity. The upper end of this group would also have the

incentive ability to bid more work than the surety supports. The last group would be the satisfactory group.

Table 32. Linking financial factor to performance alternative.

Financial Capacity	Performance Modifier	Financial Factor	Bidding Capacity	Surety Bonding Capacity	Incentive/Disincentive Extra/Less Bidding Capacity Over Surety
\$950,000	100	15	\$14,250,000	\$9,500,000	\$4,750,000
\$950,000	97	14	\$13,300,000	\$9,500,000	\$3,800,000
\$950,000	95	13	\$12,350,000	\$9,500,000	\$2,850,000
\$950,000	93	12	\$11,400,000	\$9,500,000	\$1,900,000
\$950,000	91	11	\$10,450,000	\$9,500,000	\$950,000
\$950,000	89	10	\$9,500,000	\$7,125,000	\$2,375,000
\$950,000	87	9	\$8,550,000	\$7,125,000	\$1,425,000
\$950,000	84	8	\$7,600,000	\$7,125,000	\$475,000
\$950,000	82	7	\$7,125,000	\$7,125,000	\$0
\$950,000	80	6	\$7,125,000	\$7,125,000	\$0
\$950,000	65–79	5	\$4,750,000	\$4,750,000	\$0
\$950,000	64	5	\$3,707,317	\$4,750,000	(\$1,042,683)
\$950,000	60	5	\$3,475,610	\$4,750,000	(\$1,274,390)
\$950,000	56	5	\$3,243,902	\$4,750,000	(\$1,506,098)
\$950,000	50	5	\$2,896,341	\$4,750,000	(\$1,853,659)

The second alternative assumes an output from the tier two contractor performance evaluation system that yields the performance modifiers shown in table 33. Rather than three groups of contractors, as above, there are two. The average contractor's performance modifier is equal to one. A performance modifier above 1.00 permits a contractor to bid on more work than it could if its bidding capacity equaled its surety-developed bonding capacity. The reverse is true if it is below 1.00.

Table 33. Alternative performance modifier system.

Financial Capacity	Performance Modifier	Financial Factor	Bidding Capacity	Surety Bonding Capacity	Incentive Extra Bidding Capacity Over Surety
\$950,000	1.45	7.5	\$10,331,250	\$7,125,000	\$3,206,250
\$950,000	1.40	7.5	\$9,975,000	\$7,125,000	\$2,850,000
\$950,000	1.35	7.5	\$9,618,750	\$7,125,000	\$2,493,750
\$950,000	1.30	7.5	\$9,262,500	\$7,125,000	\$2,137,500
\$950,000	1.25	7.5	\$8,906,250	\$7,125,000	\$1,781,250
\$950,000	1.20	7.5	\$8,550,000	\$7,125,000	\$1,425,000
\$950,000	1.15	7.5	\$8,193,750	\$7,125,000	\$1,068,750
\$950,000	1.10	7.5	\$7,837,500	\$7,125,000	\$712,500
\$950,000	1.05	7.5	\$7,481,250	\$7,125,000	\$356,250
\$950,000	1.00	7.5	\$7,125,000	\$7,125,000	\$0
\$950,000	0.95	7.5	\$6,768,750	\$7,125,000	(\$356,250)
\$950,000	0.90	7.5	\$6,412,500	\$7,125,000	(\$712,500)
\$950,000	0.85	7.5	\$6,056,250	\$7,125,000	(\$1,068,750)
\$950,000	0.80	7.5	\$5,700,000	\$7,125,000	(\$1,425,000)
\$950,000	0.75	7.5	\$5,343,750	\$7,125,000	(\$1,781,250)

Before each letting, the State transportation department would require each bidder to disclose its current ongoing contracts value. The State transportation department would then subtract that amount from each contractor’s bidding capacity to find the available bidding capacity, as shown in figure 24. If the available bidding capacity was greater than the contractor’s bid amount, it would be considered a responsible bidder, and if it had the low bid, it could then be awarded the contract. If the available bidding capacity was less than the contractor’s bid amount, the agency would declare the contractor non-responsible for this particular project only and reject its bid. This would permit that contractor to remain eligible to continue to bid on projects that did not exceed its available bidding capacity. Thus, the marginal contractor is not debarred. The agency is merely limiting the risk it will take on continued marginal or unsatisfactory performance on future projects.

$$\begin{aligned} \text{Available Bidding Capacity}(ABC) \\ = \text{Bidding Capacity}(BC) - \text{Current Ongoing Contracts Value}(COCV) \end{aligned}$$

Figure 24. Equation. Available bidding capacity calculation.

The State transportation department develops a project contract value estimate for the project in question from the current engineer’s estimate. This value will either equal the engineer’s estimate or be increased by an amount to account for market conditions. In order to acquire a tier two performance-based prequalification, the contractor’s available bidding capacity value needs to equal or exceed the project contract value estimate requirement for the given contract, which is equal to the estimated value of the contract that will be completed in a single fiscal year or

equal to the highest estimated fiscal-year expenditure on a project that will take multiple years to complete. If the contractor’s available bidding capacity is not at a minimum equal to the project contract value estimate, then the contractor is disqualified; otherwise, the contractor is prequalified, so long as there is not a project-specific prequalification required on the project. If there is a project-specific prequalification, then the contractor advances to the tier three project-specific prequalification process.

Below are three scenarios that illustrate how the first and second tiers of the proposed model would work.

Scenario A

A new contractor with excellent supporting documents, recommendations, and an excellent technical score would have its available bidding capacity determined as follows:

Table 34. Contractor prequalification scenario A, tier one.

Tier One	
Capacity to Pay (CP) =	\$2.7 million
Final Contractor Financial Capacity (FCFC) =	\$2.7 million
Minimum Final Contractor Financial Capacity =	\$500,000

\$2.7 million > \$500,000; therefore, this contractor is administratively prequalified.

Since this is a new contractor, no major infractions could have been incurred, so its capacity to pay becomes its final contractor financial capacity. Since the contractor exceeds the minimum final contractor financial capacity, it meets the tier one qualification.

Table 35. Contractor prequalification scenario A, tier two.

Tier Two	
Managerial Ability Evaluation for New Entrant (performance modifier) =	75
Minimum Performance Modifier =	65
New Contractor Financial Factor (FF) =	1.0
Bidding Capacity (BC) =	Final Contractor Financial Capacity (Financial Factor) = \$2.7 million (1.0) = \$2.7 million
Current Ongoing Contracts Value (COCV) =	\$1.1 million
Available Bidding Capacity (ABC) =	\$1.6 million
Project Contract Value Estimate =	\$1 million

\$1.6 million > \$1 million; therefore, this contractor is performance-based prequalified.

The new contractor in Scenario A is evaluated based on its key personnel, technical ability, past illegal activity, and management plans. Based on these factors, the contractor is assigned a performance modifier of 75, which would likely exceed the minimum score (for the purposes of this example, assume FDOT’s minimum score of 65). The new contractor would not be eligible

for a financial factor increase, but since its available bidding capacity is greater than the project contract value estimate, it would still be qualified to submit a bid and to start building a performance record with the State transportation department.

Scenario B

This scenario is for an existing contractor that incurred one minor infraction for removing concrete for a bridge barrier wall and allowing broken concrete to fall into sensitive wetland. A 20 percent sanction on its capacity to pay was imposed as a result. The contractor’s annual performance rating is also low, due mostly to insufficient onsite supervision on several projects. Based on these factors, the contractor’s available bidding capacity does not meet the minimum project contract value estimate, due to the fact that the contractor was not able to receive a financial factor greater than one, due to the low performance modifier.

Table 36. Contractor prequalification scenario B, tier one.

Tier One	
Capacity to Pay (CP) =	\$22 million
Final Contractor Financial Capacity (FCFC) =	\$17.6 million (applying 20 percent infraction)
Minimum Final Contractor Financial Capacity =	\$500,000

\$17.6 million > \$500,000; therefore, this contractor is administratively prequalified.

Table 37. Contractor prequalification scenario B, tier two.

Tier Two	
Performance Modifier (PM) =	55
Minimum Performance Modifier =	65
Contractor Financial Factor (FF) =	1.0
Bidding Capacity (BC)=	Final Contractor Financial Capacity (Financial Factor) = \$17.6 million (1.0) = \$17.6 million
Bidding Capacity (BC)=	\$17.6 million
Current Ongoing Contracts Value (COCV) =	\$14.1 million
Available Bidding Capacity (ABC) =	\$3.5 million
Project Contract Value Estimate =	\$5.5 million

\$3.5 million < \$5.5 million; therefore, this contractor is disqualified.

This contractor would normally seek a contract that is the size and nature of the contract in Scenario B. The contractor meets the tier one qualification requirements. However, after factoring its infraction, the contractor only has \$17.6 million of capacity to pay remaining. Under tier two of the performance evaluation, it fails to meet the minimum performance modifier needed to obtain a financial factor greater than 1.0, which results in an available bidding capacity of \$3.5 million. The project requires that the available bidding capacity is at least \$5.5 million in order to qualify to bid on the project, and therefore, this contractor is not qualified to bid. Had

the contractor put more focus on its performance, it may have been eligible for a performance modifier increase, which could have offset the reductions from the infraction and workload.

Scenario C

In this scenario, an existing contractor has invested heavily in staff training on safety and environmental topics, as well as in project management and team-building skills. The contractor is approximately the same size as the one in Scenario B and wants to bid on the same project. The contractor has had considerable bidding success lately and has a significant amount of work on the books. The State transportation department appreciates the contractor’s professional conduct and cooperative project approach, and because of this, the contractor has received excellent evaluations on most of their agency projects. The contractor’s Performance Modifier corresponds to a financial factor of 10.0 and it has not incurred an infraction on any of its projects in numerous years.

Table 38. Contractor prequalification scenario C, tier one.

Tier One	
Contractor Capacity to Pay (CP) =	\$21 million
Infraction Factor =	1
Final Contractor Financial Capacity (FCFC) =	\$21 million
Minimum Final Contractor Financial Capacity =	\$500,000

\$21 million > \$500,000; therefore, this contractor is administratively prequalified.

Table 39. Contractor prequalification scenario C, tier two.

Tier Two	
Performance Modifier (PM) =	89
DOT Minimum Performance Modifier =	65
Contractor Financial Factor (FF) =	10.0
Bidding Capacity (BC) =	Final Contractor Financial Capacity (Financial Factor) = \$21 million (10) = \$21 million
Contractor Bidding Capacity (BC) =	\$210 million
Current Ongoing Contracts Value (COCV) =	\$180 million
Contractor Available Bidding Capacity (ABC) =	\$30 million
Project Contract Value Estimate =	\$5.5 million

\$30 million > \$5.5 million; therefore, this contractor is performance-based prequalified.

Since the contractor in Scenario C has not incurred any major infractions, their capacity to pay becomes their final contractor financial capacity, and because they exceed the minimum final contractor financial capacity, they meet the tier one qualification requirements. In addition, this contractor’s performance modifier corresponds to a financial factor of 10.0; as a result, their bidding capacity rises from \$21 million to \$210 million. The contractor has an available bidding capacity greater than the project contract value estimate and therefore qualifies to submit a bid.

Even though this contractor would have initially been disqualified, due to insufficient capacity to pay, their consistently strong performance enables them to qualify in spite of the high value of their ongoing contracts. This performance level could have a similar positive impact in the case of an infraction that was incurred from one isolated incident.

Tier Three—Project-Specific Prequalification

Tier three, detailed in figure 25, is a project-specific prequalification tier that is designed to closely evaluate a contractor's qualifications and experience in terms of the specific needs of a given project. *NCHRP Synthesis 390* defines project-specific prequalification in the following way:⁽¹⁷⁾

Contractor prequalification requirements that exist only for a single project. These normally address project technical/procurement factors that are considered essential for the success of the given project. They may include criteria that require the contractor to have had past experience building a certain technology (i.e., seismic retrofit, ITS, etc.) or a given project delivery method such as design-build. They may also extend to cover specific experience for key project personnel and specific types of plant and equipment.

This final tier is an optional portion of the prequalification process and is intended for use only on projects delivered by alternative project delivery methods and/or on projects that have specific requirements, such as experience. For instance, a design-bid-build project for the seismic retrofit of a major bridge requires a contractor that has some level of specific technical experience in order to mitigate the risks to quality and service life. The project-specific prequalification for this hypothetical project could be as simple as restricting competition to only those contractors that can show documented, relevant experience. At the other extreme, a design-build project estimated to cost hundreds of millions of dollars may require a complex evaluation of contractor qualifications and past experience in order to short-list the best-qualified design-build teams before they evaluate pricing information.

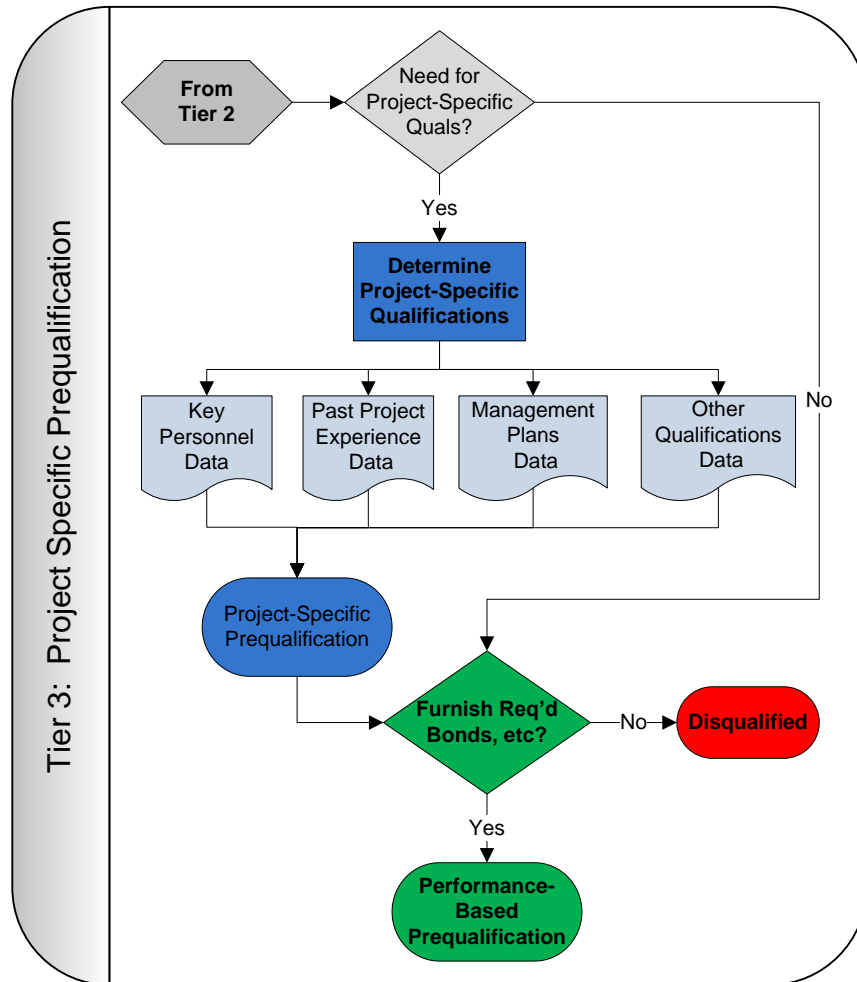


Figure 25. Chart. Tier three project-specific prequalification.

The following scenario illustrates how the model will typically operate. A State transportation department has determined that project-specific prequalification is required for a mechanically stabilized earth wall system that will need to be much higher than the State’s previously built mechanically stabilized earth walls. Six contractors are competing. Five of the six contractors have identical financial capacity and work experience, but have different performance records. The sixth contractor is a smaller firm with an exceptional track record. The agency has a minimum financial capacity rating of \$1 million to be administratively prequalified for this class of work. Table 40 shows how the tier one operates for this particular scenario.

Table 40. Tier one administrative prequalification example scenario.

Tier One—Administrative Prequalification						
State transportation department minimum financial capacity = \$1,000,000						
Contractor	Capacity to Pay	Major Infraction Record	External Validation	Major Infraction Adjustment (Percent)	Final Contractor Financial Capacity	Administrative Prequalification?
A	\$12 million	0	Ok	100	\$12 million	Yes \$12 million > \$1 million
B	\$12 million	Warranty deficiency 2 years ago	Ok	95	\$11.4 million	Yes \$11.4 million > \$1 million
C	\$12 million	0	Ok	100	\$12 million	Yes \$12 million > \$1 million
D	\$12 million	0	Ok	100	\$12 million	Yes \$12 million > \$1 million
E	\$12 million	Two cure notices in past 2 years	Ok	50	\$6 million	Yes \$6 million > \$1 million
F	\$8 million	0	Ok	100	\$8 million	Yes \$8 million > \$1 million

From table 40, all six interested contractors are administratively qualified to proceed to tier two, where their past performance will be factored into the qualification to bid on this specific project. The following are the tier two assumptions for this example:

- The engineer’s estimate for the given project is \$28 million. By statute, the agency is allowed to award a project at 8 percent over the engineer’s estimate at the time of the letting. Therefore, the project contract value estimate = 1.08 x \$28 million = \$30 million.
- Contractor performance modifier and financial factors are set using table 40.

Table 41 shows the outcome of the tier two prequalification calculations. Two contractors were eliminated from the bidding because their performance reduced the amount of work that they could continue to bid. If contractor B would have raised its performance rating to an 82, it would have been allowed to bid. Contractor E’s dismal performance record, combined with its infraction history, was also eliminated, even though its current financial position was equal to that of contractors A through D. Without the performance-based prequalification program, contractor E could conservatively have gotten a performance bond for five times its capacity to pay (\$60 million) less its current ongoing contracts value (\$30 million). This would have been \$30 million and it would have been allowed to bid on this project.

Table 41. Tier two performance-based prequalification example scenario.

		Tier Two—Performance-Based Prequalification Project Contract Value Estimate = \$30 million						
Contractor	Final Contractor Financial Capacity	Performance Modifier	Financial Factor	Bidding Capacity	Current Ongoing Contracts Value	Available Bidding Capacity	Performance-Based Prequalification?	
A	\$12 million	88	9.5	\$120 million	\$80 million	\$34 million	Yes \$34 million > \$30 million	
B	\$11.4 million	75	5	\$57 million	\$40 million	\$17 million	No \$17 million < \$30 million	
C	\$12 million	84	8	\$96 million	\$40 million	\$56 million	Yes \$56 million > \$30 million	
D	\$12 million	80	6	\$72 million	\$40 million	\$32 million	Yes \$32 million > \$30 million	
E	\$6 million	56	5	\$30 million	\$30 million	\$0	No 0 < \$30 million	
F	\$8 million	97	14	\$112 million	\$20 million	\$92 million	Yes \$92 million > \$30 million	

Note: Performance modifier and financial factor from table 40.

The State transportation department uses a two-envelope system similar to the one used by the NSW Department of Commerce in Australia. This system requires that bidders submit a sealed envelope that contains their project-specific qualification data and a second sealed envelope that contains a responsive bid. The first envelopes are opened publicly and the qualification data in them is then compared to the prequalification criteria. The second envelopes of those unqualified bidders are returned to the bidders unopened and are declared nonresponsive. The remaining bid envelopes are then opened and the contract is awarded to the lowest responsive bidder. The State transportation department establishes the following three evaluation criteria for project-specific prequalification, as follows:

- The contractor shall have built a minimum of five mechanically stabilized earth (MSE) walls in excess of x meters high and y meters long.
- The contractor shall assign the general superintendent from at least one of the relevant projects listed in the qualifications identified for the project at hand.
- The contractor shall have no minor safety infractions for projects that are completed or ongoing in the 12 months that proceed the date the bids are due. Table 42 shows the details of this scenario.
- Table 42 shows the outcome, based on the results of the previous two tiers.

Table 42. Tier three project-specific prequalification example scenario.

Tier Three—Project-Specific Prequalification							
Contractor	Project-Specific Prequalification Criteria			Meet all prequalification criteria?	Hypothetical Bid Amount	Responsive/ Responsible?	Final Result
	Number of MSE wall projects completed (min of 5)	Is the superintendent from a qualifying MSE project?	Any minor safety infractions over past 12 months? (max of 0)				
A	6	Yes	No	Yes	\$31,400,000	Yes	
B				Excluded in tier two			
C	5	No	No	No	\$30,800,000	Excluded	
D	5	Yes	No	Yes	\$33,500,000	Yes	
E				Excluded in tier two			
F	8	Yes	No	Yes	\$29,350,000	Yes	Winner

The literature on performance-based prequalification devotes a significant amount of attention to evaluating the barriers and challenges to implementing a performance-based contractor prequalification system. (See references 1, 2, 17, 35, and 37.) Ultimately, the various analyses reviewed in this study noted very few significant barriers to the implementation of a performance-based contractor prequalification. Many State transportation departments already have some form of contractor evaluation included in their bid process; many have some form of performance-based prequalification included as well. Based on input provided by the contractor surveys and collected in the literature, contractors seem to welcome implementation of this approach as a tool to reduce or remove the number of marginally qualified contractors against whom they need to compete. Nevertheless, *NCHRP Web Document 38* notes that the following implementation issues will need to be addressed when introducing a performance-based prequalification process, as follows:⁽¹⁾

- Integration with existing construction administration systems, such as Site Manager.
- Qualifications of the evaluators to consider.
- Evaluation process administrative rules.
- Frequency of evaluations.
- Appeals process development.
- Lifespan of evaluations/duration of disqualification.
- Impact on contractor bonding.
- Legal implications.

Of the potential barriers listed above, significant focus should be placed on the implementation of administrative rules for the evaluation process.⁽²⁾ The agency will need to ensure that its evaluators are indeed qualified to evaluate the subject contractors. In most cases, contractors should be evaluated by the agency construction personnel who administer the evaluated contract. Implementation will require that an ongoing training program for the evaluators be developed and implemented to ensure consistency between evaluators and across different types of projects. This component of the program will also be necessary to demonstrate the agency's commitment to fairness and to ensure the reduction of as much subjectivity in the process as possible. Agencies that currently use this type of system (such as FHWA and FDOT) have found that a review of all contractor evaluations one level above the "evaluator" is also required to make the program as consistent as possible.^(31,33) This issue was highlighted in *NCHRP Synthesis 390*, in which 8 out of 10 interviewed contractors indicated that their major concern with performance-based prequalification is the agencies' ability to rate them consistently from project to project.⁽¹⁷⁾

The administrative rules of the process also need to be transparent and logically derived.⁽²⁸⁾ It is important to determine the frequency of evaluations. The literature on this topic seems to support at least one interim evaluation provided to the contractor before the final evaluation. (See references 31, 32, 33, and 34.) FDOT furnishes evaluations on a monthly basis. The crucial

element will be to notify the contractor when it is not performing well and to provide it with the opportunity to correct its deficiencies and shortcomings before negative evaluations become part of its permanent record. There is a need for an appeals process, whereby the contractor can refute an unfavorable rating, which provides the contractor with due process before it is penalized by the evaluator.

The question of the appropriate length of an evaluation's life span also needs to be addressed because it is an integral component of the evaluation process. *NCHRP Synthesis 390* found that the majority (73 percent) of its survey respondents maintained evaluations in their active record for at least 3 years.⁽¹⁷⁾ Survey results also support this time interval, and literature on the subject recommends a "rolling [3]-year average."^(2,34) This selected duration creates an incentive for contractors to perform in a satisfactory manner, since a bad evaluation could impact the work they can secure for a 3-year period. The amount of time a contractor can remain disqualified, due to certain behavior, may be longer. Those that lose their qualification because of criminal acts are usually debarred from participation indefinitely. In contrast, those contractors that are disqualified for marginal performance, usually because they default on a contract, are able to regain their qualification after they prove to the agency that they have corrected the problems that caused the default(s).

In addition to the literature review, the topic of acceptance for implementation of performance-based prequalification was tackled during the outreach surveys with both the State transportation departments and the contractors. All responding contractors believed that implementing performance-based prequalification would eliminate some contractors from the bidding process, while only half expressed satisfaction with the current bonding company valuation process. Most contractors supported the idea that a fair system can be developed through the use of a performance-based system, which validates a similar finding in *NCHRP Synthesis 390*.⁽¹⁷⁾

Almost all responding contractors expressed confidence in the applicability of an "objective and fair" performance-based prequalification system and most noted that they would support a performance-based system if it included an "appropriate" appeals component (see table 13 for details). All agreed that performance-based prequalification enables agencies to select qualified contractors more readily than does a selection process that does not have a prequalification step. Based on these findings, it seems that the construction industry would not be a barrier to the implementation of performance-based contractor prequalification.

The State transportation departments had more mixed attitudes toward performance-based prequalification. None of the State transportation departments agreed that performance bonds guarantee that a State transportation department will award work to qualified contractors, and three out of five disagreed with the statement. Three State transportation departments felt that using a performance-based prequalification process can assist with the selection of more qualified contractors. One State transportation department that currently uses performance-based prequalification indicated that the process provides its agency with "more assurance that contractors bidding on the work have experience, financial resources, and equipment necessary to perform the work."

When asked if contractors would be receptive to the implementation of performance-based prequalification, two out of three State transportation department respondents, whose agencies

do not currently use performance-based prequalification, said they felt contractors would not welcome the change. This perception stands in marked contrast to the overwhelmingly positive feedback that contractors provided about the change. State transportation department respondents otherwise felt that agency members, the bonding industry, general public, and legislators would either be neutral to or would welcome the implementation of performance-based prequalification (see table 43 for response rates).⁸

Table 43. Respondent State transportation department views on stakeholder willingness to adopt performance-based prequalification.

Willingness to Use Performance-Based Prequalification	Would Actively Work to Institute the Change	Would Welcome the Change	Would Be Neutral to the Change	Would Not Welcome the Change	Would Actively Work to Prevent the Change
Agency members	0	1	2	0	0
Contractors that bid agency work	0	0	1	2	0
The bonding industry	0	0	3	0	0
The general public	0	1	2	0	0
Legislators	0	0	3	0	0

Interestingly, when representatives of the agencies that do not use performance-based prequalification were asked what the greatest barrier to the implementation of performance-based contractor prequalification would be, no two respondents identified the same obstacle. One cited construction industry opposition; one cited a lack of agency resources to expand the program; one cited a fear of legal repercussions associated with unfavorable decisions made during a performance-rating process; and one cited the belief that it cannot be implemented in a “fair and equitable” manner.

The results of the outreach surveys with the State transportation departments and contractors reinforce the *NCHRP Synthesis 390* conclusion that barriers to performance-based prequalification implementation are low among members of the construction industry and that, while State transportation departments show little willingness to completely abandon performance bonds, they acknowledge the potential benefits of evaluating contractor project performance and entering it in the prequalification process.

⁸ State transportation department respondents noted that their agency’s control over making changes to prequalification practices extended to changes to administrative rules (provided the rules still followed the applicable legislation) and their ability to influence changes to legislation.

CHAPTER 8—CONCLUSIONS

This chapter summarizes the overall conclusions of this research project. Each area of the research will be addressed: the literature review, industry outreach efforts, case studies, benefit cost ratios, performance bond paradox, and the performance-based prequalification model.

LITERATURE REVIEW

Several conclusions follow from a critical analysis of the literature. First, the literature demonstrates that there are essentially three levels of contractor prequalification: administrative, performance-based, and project specific. Second, it shows that agencies take three approaches to the use of performance bonds: they bond the entire contract amount, bond a portion of the contract amount, or require no performance bonds. Third, it shows that the ability to secure a performance bond is not considered a reliable indicator of a contractor's qualification to perform high-quality work, whereas contractor past performance is considered such an indicator.

This examination found at least 23 State transportation departments that currently use some form of contractor performance evaluation, though the factors they assess vary. Quality of workmanship and materials were the factors most frequently evaluated (19 out of 23 States evaluate these factors). Thirteen States evaluate contract compliance, 11 States evaluate prosecution of the work, and 10 States evaluate safety and project management.

The Florida and South Carolina State transportation departments use sophisticated performance-based contractor evaluation programs and have successfully applied adjustments to the amount of work a marginal contractor can bid on, as a mechanism by which to encourage contractors with less than satisfactory performance records to improve. MTO's performance-based prequalification system also relies on this mechanism and has completely eliminated performance bonding from its program. A number of States (e.g., California, Minnesota, and Colorado) require less than full-performance bond coverage on certain projects.

The increased use of alternative project delivery methods to accelerate project schedules, as well as the decline in number of State transportation department personnel, has led public agencies to depend more on contractor QC programs. This shift has turned performance-based contractor prequalification into a risk mitigation strategy and has increased the use of project-specific prequalification. SCDOT has implemented a project-specific performance evaluation program to focus further on selecting contractors whose qualifications, competency, and performance records more closely match specific project requirements. Successful performance-based contractor prequalification programs have been shown to consist of the following five components:

- Administrative prequalification, which includes facts about a contractor's financial status, equipment, plant, and various other factors.
- A formula to determine if a contractor is financially qualified to undertake the given work, based on the administrative data collected.

- A project performance contractor evaluation program that produces the data necessary to assess a given contractor's record of performance.
- An algorithm that converts the evaluation output into an index that can be used to determine prequalification.
- An appeals process that permits rated contractors to seek redress for ratings that they believe are not accurate, without having to resort to legal action.

INDUSTRY OUTREACH EFFORT

Input was received via surveys from representative State transportation departments, contractors, the SFAA, and surety company representatives, as part of an effort to evaluate the benefits and costs of performance bonds and performance-based prequalification methods. Also, a better understanding of State transportation department and contractor attitudes toward these tools was desired. Contractors noted their misgivings about the value of performance bonds, given the cost of these bonds. However, State transportation departments expressed hesitation at the idea of abandoning the use of performance bonds. The surety industry outlined the benefits of performance bonds during prequalification and construction and presented data on the costs of performance bonds.

A significant number of State transportation departments believed that a performance-based prequalification process would improve the quality and timeliness of project delivery and enhance State transportation department-contractor relationships. Contractors appeared uniformly open to an equitable, performance-based prequalification process as a means to improve project delivery. Survey responses suggest that performance-based prequalification methods can be implemented and/or refined to better emphasize the performance and financial factors that are most relevant to effective project delivery.

Numerous conclusions from the outreach efforts about the potential benefits and structure of performance-based contractor prequalification have been made. In summary, the conclusions are as follows:

- Both contractors and State transportation departments feel that a performance-based contractor prequalification process has the potential to improve overall project performance.
- Both contractors and State transportation departments rate the evaluation of “corporate qualifications” (i.e., qualifications that relate to the experiences and qualifications of the contractor organizations) more highly than they rate the evaluation of contractors’ “programs.”
- Both contractors and State transportation departments believe past performance, relevant experience, illegal behavior, personnel qualifications, and claims history are likely to be the most critical factors when determining a contractor's effectiveness.

- Contractors believe that a marginal contractor has an unfair advantage over a well-qualified contractor under the current system, which is reinforced by their belief that implementing performance-based contractor prequalification would disqualify the marginal contractors from bidding.

Numerous State transportation department respondents and all contractor respondents expressed the belief that project performance can be quite valuable as an indicator of a contractor's ability to deliver projects in an effective and timely manner. This belief suggests that improvements in the area of performance-based prequalification could benefit the project delivery process.

While all respondents considered financial factors important to ensuring effective project delivery, contractor respondents did not appear as confident as State transportation departments in the role that surety companies play. These differing opinions may be due, in part, to misconceptions about the nature of performance bonds and the roles that sureties play in the evaluation of contractors and the completion of a contract. These possible misconceptions are described below.

First, performance bonds are not insurance. They do not guarantee against non-completion of a contract under all conditions, as insurance would (if insurance companies made such a product available). Instead, performance bonds come into play only when the contractor has defaulted on completion of the contract and is in financial default (i.e., is unable to provide the funds to remedy the situation). Performance bonds are more a form of credit than insurance in that they are priced like credit; sureties go through the same steps to evaluate contractors as banks go through to evaluate corporate borrowers; and sureties have the same rights to monitor and intervene in the affairs of their contractors as do other creditors.

Second, sureties' role as creditors gives them a superior ability to assess the financial and managerial capacities of contractors over long periods of time and to intervene in the affairs of contractors to prevent and avoid defaults. However, the advanced evaluation and intervention capabilities are limited by the nature of performance bonds themselves; performance bonds do not guarantee the quality of work, nor do they guarantee that the full costs to complete a project in default will be covered by the performance bond.

Finally, and most relevant to the objective of improving the quality of contracted construction work through the prequalification of contractors, performance bonds provide no protection against mediocre work. Sureties do not evaluate contractors in terms of the completion of timely, high-quality work that satisfies State transportation department expectations. Sureties are unable to obtain data from State transportation departments about contractor performance, and even if they could and did, the low rates of default and sureties' limited obligations give them little incentive to raise the costs of performance bonds in order to incorporate contractor performance evaluations.

The surety industry's responses portray the significant benefits surety companies provide to State transportation departments throughout the construction process, which their unique status as the contractors' creditors enables them to provide. State transportation departments seem more attuned to the specific advantages of this service than contractors are, and consequently, appear unwilling to abandon the perceived security that performance bonds provide. Contractors have

greater reservations about this conclusion and feel more strongly that performance-based prequalification methods can lead to improved project delivery, possibly even in place of performance bonds.

Analysis of the responses obtained from State transportation departments, contractors, the SFAA, and select surety companies suggests that opportunities to standardize and integrate performance-based prequalification methods as part of a more comprehensive prequalification process should be addressed, in order to improve project delivery. The results provide an initial indication of State transportation departments' and contractors' appetites for improvements to the prequalification process, as well as an indication of potential areas for improvement, supplementation, and consolidation of the contractor evaluation process. Additionally, the results reinforce the conclusion of *NCHRP Synthesis 390*; that barriers to performance-based prequalification implementation are low among members of the construction industry, and that while State transportation departments show little willingness to completely abandon performance bonds, they acknowledge the potential benefits of evaluating contractor project performance and using the information in the prequalification process.⁽¹⁷⁾

STATE TRANSPORTATION DEPARTMENT CASE STUDIES

Case studies were conducted with five State transportation departments: IOWADOT, ODOT-OK, UDOT, VDOT, and WSDOT, in order to evaluate the performance-based prequalification model in relation to the current prequalification practices of the State transportation departments; to obtain the State transportation departments perspective on performance bonds; and to gather project data for the benefit-cost analysis of both performance bonds and performance-based contractor prequalification. The following conclusions resulted from the case studies:

- All participant State transportation departments are proponents of a performance-based contractor prequalification system.
- None of the State transportation departments were willing to eliminate the use of performance bonds.
- Defaults on State transportation department projects are rare occurrences.
- A performance bond is beneficial because it enables a State transportation department to threaten to call a contractor's surety to report bad performance, which can be an effective way to motivate the contractor to improve performance.
- State transportation departments have not had a surety become involved in a project, unless the sureties were called in by the State transportation department. State transportation departments also acknowledge that they would not know if the surety was involved in the project before the State transportation department requested the surety's involvement.
- There was no evidence found about the surety's involvement in a project that prevents a default, also called a near miss.

Overall, all five states were proponents of performance-based prequalification. However, they are reluctant to change their performance-based prequalification system to the proposed one in this research project, primarily because each believes that their own system works well, and the amount of time and effort to implement a new system is too great when the current one is fine.

BENEFIT-COST ANALYSIS

The following presents the benefit-cost analysis conclusions for both performance bonds and performance-based contractor prequalification. Overall, a benefit cost ratio of less than one indicates a net cost, a benefit cost ratio of greater than one indicates a net benefit, and a benefit cost of one indicates that the costs and benefits are equal.

Performance Bonds

The benefit-cost ratio for performance bonds is equal to the performance bond benefit divided by the performance bond cost. A value greater than one indicates that performance bonds provided a net benefit to the State transportation department; a value less than one indicates that performance bonds caused a net cost to the State transportation department; and a value of one indicates that performance bonds provide no net cost or net benefit.

The default rate of projects is a key factor when determining the benefits of the performance bond. This research determined that the default rate for the highway industry was less than 1 percent, which indicates that a default is a random occurrence. The benefit calculations used a default rate of 0.69 and 0.47 percent, which are the highest rate found and an average rate, respectively.

The benefits of a performance bond are the following:

- The avoided cost of re-bidding the project after a default occurs.
- The avoided schedule delay as a result of a default.
- The avoided cost of the default.

The costs of a performance bond are the following:

- The performance bond premium, which can range between 0.22 and 2.5 percent of the project value.
- The costs to the State transportation department to administer a performance bond program. This cost was found to be negligible in comparison to the performance bond premium and was not used in the overall cost calculation.

In order to complete the benefit-cost analysis, the following different elements required assumed values: number of days the schedule is delayed as a result of a default; cost per day of a schedule delay; default rate; cost to re-bid a project; and the contract value used in each project size category to calculate the benefit-cost ratio. The overall benefit-cost analysis of performance bonds proved to be very sensitive to these assumptions, and as a result, several different analyses

were conducted, using a different value for one of the assumptions in each analysis. More details on these analyses can be found in appendix C. These analyses show that if the default rate is held constant at 0.69 percent, projects over approximately \$10 million have a net benefit from performance bonds; projects between \$100,000 and \$1 million have a net cost for performance bonds; and projects less than \$100,000 and between \$1 million and \$10 million vary between net cost and net benefit. However, when the default rate is lowered to 0.46 percent, the average default rate from table 20, the benefit-cost ratios are less than one for all project categories, which indicates a net cost for performance bonds on all projects.

Performance-Based Prequalification Benefit Cost

Even though the benefits of performance-based prequalification are not quantitatively tracked, it is the overall opinion of both the highway industry and academia that performance-based prequalification improves a project. The case studies further validated this finding, based on the fact that all of the State transportation departments continued to use their performance-based prequalification systems and several continued to enhance these systems through the development of further technology, in order to make these systems more robust. As a result of the lack of quantitative measures, the qualitative benefits of performance-based prequalification were investigated.

Based on the literature review, outreach efforts with State transportation departments and contractors, and five State transportation department case studies, the overall benefits of performance-based contractor prequalification occur in the following project areas:

- Overall project performance.
- Project quality.
- Project timeliness.
- Number of claims.
- Contractor and State transportation department relationship.

The benefits from performance-based prequalification identified by both the contractor survey responses and the State transportation department case studies are the following:

- Improved quality of work.
- Improved timeliness of delivery.
- Improved safety.
- Improved personnel experience.

The benefit from performance-based prequalification is improved contractor cooperation with the agency, a benefit that was identified by both the State transportation department survey responses and the State transportation department case studies.

The major cost associated with implementing performance-based prequalification is the cost of State transportation department staff to administer the program. Start-up costs involved with a performance-based prequalification program were not considered in these studies. Based on the case studies, it is estimated that the cost of the State transportation department staff to administer a performance-based contractor prequalification program is between \$52,000 and \$208,000 annually. This cost range is the result of performance-based prequalification programs that are at various stages of implementation, from checking references to a program that conducts project evaluations and integrates them into the prequalification process.

PERFORMANCE BOND PARADOX

Because defaults happen so infrequently, it seems counter intuitive that State transportation departments are unwilling to eliminate the use of performance bonds; however, the State transportation departments are, in fact, unwilling to eliminate these bonds. Even the contractors weren't all in favor of eliminating performance bonds. In response to this paradox, an analysis was conducted to determine if performance bonds could be used more effectively. Currently, the majority of the States require performance bonds for 100 percent of the value of a project for all projects.

Based on the default data, it was not found that any particular size or type of project was more likely to default than any other project; default is a random occurrence.

It is recommended to raise the minimum project size that requires a performance bond to between \$1 million and \$10 million. The following are the reasons for this price increase:

- The default rate is not based on project size, type of project, or delivery method.
- A default is a random occurrence.
- A performance bond does not in itself prevent a default.
- The repercussions that ensue when a smaller project defaults are not of a magnitude that requires the protection of a performance bond.
- The performance bond premium rate for smaller projects is higher than it is for larger projects.
- The amount of savings a State transportation department can receive from this change can be put towards future projects or used to manage the risk of not having a performance bond.

If the five case study states had raised the minimum project size that requires a performance bond to \$1 million, the State transportation departments could have saved between \$1.9 million and \$7.9 million over 5 years. If the minimum project size had been raised to \$10 million, then the savings would have been between \$6.5 million and \$26 million over 5 years.

PERFORMANCE-BASED CONTRACTOR PREQUALIFICATION MODEL

Based on the project research and analysis, a performance-based prequalification model was developed. The model combines elements of the processes used by FDOT, ODOT-OH, and MTO, and it borrows concepts and terminology from each. The model accounts for a contractor's financial capacity, rewards good performance, and encourages improvement for marginal performance by prequalifying a contractor, based on a bidding capacity that is determined by rating prior performance. The model consists of a two-tier process that is applicable to design-bid-build projects, as well as an optional third tier for alternative project delivery methods, such as design-build, construction manager/general contractor, and public-private partnerships. It also can be used for design-bid-build projects on which a State transportation department wants to do a performance evaluation. A summary of the tiers is provided as follows:

- Tier one consists of administrative prequalification, which is composed of financial analysis conducted by the agency, a records check, and the assembly of optional external documented information.
- Tier two focuses on contractor performance and encompasses two primary areas: the determination of the contractor's management ability and a post-project evaluation of the contractor performance on each contract. These factors are used in conjunction with tier one's financial analysis output to determine the amount of work upon which a contractor can bid.
- Tier three is a project-specific prequalification tier designed to closely evaluate the contractor's qualifications and experience in terms of the specific needs of a given project. This final tier is an optional portion of the prequalification process and is intended for use on projects that are delivered by methods other than traditional DBB and/or on a project that has requirements beyond the standard boilerplate requirements.

APPENDIX A: GLOSSARY

Table 44. Glossary of financial terms.

<i>Available Bidding Capacity</i>	<p>The amount of bidding capacity left after subtracting the current ongoing contract value from the bidding capacity.</p> $\text{Available Bidding Capacity (ABC)} = BC - COCV$
<i>Bankrupt</i>	<p>Declared in law to be unable to meet its current obligations. To qualify for bankruptcy, a corporation or individual would have to: (1) be insolvent; and (2) have a current ratio that is less than one.⁽⁶⁶⁾</p>
<i>Bidding Capacity</i>	<p>The maximum amount of work a given contractor can bid on if it has no other ongoing obligations.</p> $\text{Bidding Capacity (BC)} = [FCFC \times PM]$
<i>Capacity to Pay</i>	<p>A measure of the contractor's liquidity and solvency over the duration of a project (minimum of 1 year to a maximum of 5 years).</p> $\text{Capacity to Pay (CP)} = \frac{1}{n} \text{Net Current Assets} + \left(1 - \frac{1}{n}\right) \text{Equity}$
<i>Current Assets</i>	<p>Assets that one can reasonably expect to convert into cash, sell, or consume in operations within a single operating cycle, a single construction contract in this case, or within a year if more than one cycle is completed each year.⁽⁶⁶⁾</p>
<i>Current Liabilities</i>	<p>Obligations that need to be retired within one year and thus are expected to require the use current assets to retire them.⁽⁶⁶⁾</p>
<i>Current Ongoing Contracts Value</i>	<p>The value of work the contractor is currently committed to for all public and/or private owners with whom it has an active construction contract.</p>
<i>Final Contractor Financial Capacity</i>	<p>The result of the Capacity to Pay multiplied by the infraction factor.</p>
<i>Financial Factor</i>	<p>A factor based on the performance modifier that alters a contractor's bidding capacity.</p>
<i>Income</i>	<p>Revenues less expenditures. Revenues include revenues from operations and revenues from investment transactions; expenditures include operating expenditures, debt service, and depreciation.⁽⁶⁶⁾</p>
<i>Infraction Factor</i>	<p>A factor that reflects if a contractor has had any major contract breaches or incidents such as default, illegal activity, ignored warranty call back, etc.</p>

<i>Liquidity (Net Current Assets)</i>	Indicator of a contractor's ability to make unexpected payments in the short run = Current Assets – Current Liabilities.
<i>Net Worth</i>	Assets less liabilities, also known as <i>Equity</i> . ⁽⁶⁶⁾
<i>Operating Income</i>	Revenues from operations less operating expenses and depreciation. This focuses on the results of ongoing operations of the business and excludes the impacts of other investment activities. ⁽⁶⁶⁾
<i>Performance-Based Prequalification</i>	A set of procedures and backup documents that need to be followed by a construction contractor to qualify to submit a bid on a construction project based on quality, past performance, safety, specialized technical capability, project-specific work experience, key personnel, and other factors. This information may be provided on a project-by-project basis or on a specified periodic basis. The project could be delivered using traditional design-bid-build or alternative project delivery methods, such as design-build, construction manager/general contractor, or any other method. ⁽¹⁷⁾
<i>Performance Bond</i>	A promise from a surety that monetary compensation or contract completion services will be provided to the owner if the contractor fails to complete all the services required under the construction contract, which insulates the State transportation department from potential damages due to contractor default. It is like credit in that the surety provides a bond with the expectation of no loss.
<i>Performance Modifier</i>	<p>A calculation of an overall performance rating for a contractor based on the most recent three years, with a heavier weighting of more recent years.</p> $\text{Performance Modifier (PM)} = \frac{[3 (PR1) + 2 (PR2) + 1 (PR3)]}{6}$ <p>Where:</p> <p><i>PR1</i> = Average of all performance ratings for most recent year (year one).</p> <p><i>PR2</i> = Average of all performance ratings for next most recent year (year two).</p> <p><i>PR3</i> = Average of all performance ratings for oldest year (year three).</p>
<i>Performance Rating</i>	The ratings that result from the project contractor performance evaluations.

<i>Project Contract Value Estimate</i>	A State transportation department developed an estimate of the value of the contract for the project in question. This value will either equal the engineer's estimate or be increased by an amount to account for market conditions. It is also equal to the estimated value of the contract that will be completed in a single fiscal year or equal to the highest estimated fiscal-year expenditure on a project that will take multiple years to complete.
<i>Solvency</i>	Indicator of a contractor's ability to withstand the vicissitudes of economic cycles = Assets - Liabilities.
<i>Working Capital</i>	Current assets less current liabilities. Also known as <i>Net Current Assets</i> . ⁽⁶⁶⁾

APPENDIX B: CASE STUDIES

IOWADOT PERFORMANCE-BASED PREQUALIFICATION PROJECT CASE STUDY

Agency name: Iowa Department of Transportation (IOWADOT)

Delivery method(s) the organization is allowed to use:

- Design-Bid-Build

Does the agency use performance-based prequalification in any form? Yes.

Which projects require performance bonding? All projects.

What is the value of the performance bonds required for projects? 100 percent of construction cost.

Agency's prequalification process

IOWADOT has an annual prequalification program based on a review of the contractor's financials, experience, and equipment, and it places the heaviest weight on a contractor's work performance, organizational management, and safety. Contractors need to prequalify for specific types of work and there are minimum financial requirements for larger projects. The current system has been in place for the past 30 years. The management and implementation of the prequalification program requires half the time of one technician (1,040 hours). The size, type, and/or complexity of a project does not change the effort required to prequalify.

Once prequalified, IOWADOT calculates the bidding capacity of each contractor, based on the company's financials and past performance evaluations as shown in figure 26. The ability factor (AF) is calculated from the most recent 30 project performance evaluations, which is used in figure 27. If a contractor has no previous IOWADOT performance evaluations, an average project performance score (APPS) of 50 is assigned. The current program has APPSs for contractors that range between 12.5 and 80.0 on a 100-point scale.

Bidding Capacity

$$= \text{Current Assets} - \text{Current Liabilities} - \frac{1}{2}(\text{Net Current Assets} - \text{Net Current Liability})(\text{Ability Factor})$$

Figure 26. Equation. Contractor bidding capacity calculation.

$$AF = (\text{Average Project Performance Score})/10$$

Figure 27. Equation. Ability factor calculation

The contractor project performance evaluations are done at the completion of every project. The contractor receives a copy of the completed performance evaluation. If the evaluation is negative, the contractor does not have to be informed prior to submittal of the performance evaluation. IOWADOT does not have an appeals process in place for a contractor that receives a negative project performance evaluation. A negative project performance evaluation does not automatically disqualify a contractor from future work. However, a negative performance evaluation does impact the bidding capacity of a contractor because it also negatively impacts the AF. All performance evaluations remain on the record indefinitely. Because the performance evaluation system has been in place for 30 years, IOWADOT does not have any other experiences to compare the existing performance evaluations system to. As a result, IOWADOT cannot identify the impact performance has had on the overall success of projects.

One effective practice that IOWADOT employs is to send out a letter of commendation to the top 15 contractors in the State on an annual basis. This letter turns into a marketing instrument for those contractors and stimulates competition within the contracting community to become part of the IOWADOT top 15 firms. A challenge for the current performance evaluation program is that there is poor calibration between individual IOWADOT raters; the final evaluation score varies, due to variance in how different IOWADOT staff evaluates the performance. Additionally, if a contractor owns significant assets, its ability factor could drop very low and it would still be able to bid.

Agency's experience with performance bonding and sureties

IOWADOT requires all projects to have a performance bond valued at 100 percent of the construction cost.

In the past 24 years, IOWADOT has implemented approximately 24,000 contracts and has only had to call in a surety 12 times, and only 1 of those resulted in a default. When the default occurred, there was a 4 to 6 week delay in the project. However, if this delay had occurred later in the construction season, the delay would have had a much larger impact. To resolve the default, the surety asked that the project be re-let to a different contractor and then paid the difference over the original contract.

IOWADOT remembered the specifics of three other situations where assistance from the surety was required. In these three occasions, the contractors asked to be released from their contracts because of reasons unrelated to their performance. Two decided to not invest in specialty equipment upgrades, which were required for their contracts, and the third decided to concentrate all their business in a neighboring State with a bigger construction budget. On all three occasions, IOWADOT got the surety involved and agreed to re-let the contracts with the surety to pay the difference between the original amount and the low re-bid. On two of those projects, IOWADOT got the projects for less than the original amount and refunded the difference in the bond to the surety. IOWADOT has never had a surety inform them of a performance issue or become involved in a project without an agency's request.

IOWADOT received a monetary payment to satisfy the performance bond for the project that defaulted. IOWADOT has never had a dispute with any performance bond surety about sufficient compensation for a performance bond. In IOWADOT's experience, 99 percent of the time a surety is informed of a performance issue, the surety does not become involved and the project does not default. The other 1 percent of the time, the surety becomes involved and the project does not default.

IOWADOT has a low satisfaction with sureties, due to the lack of communication between IOWADOT and the surety. A performance bond has become a cost of doing business, which IOWADOT believes brings nearly no benefit. Currently, it is required by law to bond 100 percent of the project amount that is at risk. IOWADOT believes that there would be a benefit to increasing the minimum contract value that requires a 100 percent bond from \$25,000 to a reasonable number. The current threshold for a 100 percent bond (\$25,000) was established thirty years ago and is an arbitrary number.

IOWADOT would consider using an alternative means of screening/evaluating contractors in place of performance bonds. IOWADOT suggested replacing the performance bond system with performance-based contractor evaluations because a performance-based contractor system exists, works well at IOWADOT, and is accepted by the industry. IOWADOT would also consider using another means to screen/evaluate contractors as a supplement to the use of performance bonds, because doing so would save money.

Agency's views on the model for performance-based prequalification

IOWADOT believes that the model could help drive the successful delivery of projects if the model is powerful enough to impact large contractors to the same extent as small contractors. Because IOWADOT already includes performance evaluations in the prequalification of a contractor, it is not anticipated that implementation of the model would change project cost, project duration, risk of contractor defaults, or staff responsibilities. The project-specific prequalification aspect of the model could be used for special design bid build projects to further ensure that specific qualifications are available on those projects, such as specialty geotechnical jobs, or complex structural jobs. The model could be implemented at IOWADOT, but could experience a challenge with the industry if people believe it incorporates subjective evaluations. Finally, IOWADOT suggested that project-specific prequalification not be tied to alternative project delivery. Rather, IOWADOT suggested the use of a two-step prequalification system that only allows the bids of the contractors that pass the qualifications to be opened because then people believe this eliminates subjectivity. However, it is likely that there could still be industry opposition to the two-step system, even though the subjectivity is considered eliminated.

Table 45. IOWADOT project data.

Year	Value of Awarded Contracts	Number of Contracts	Number of Defaults
2007	\$431,783,499.92	620	0
2008	\$507,727,178.97	727	0
2009	\$805,490,601.73	849	0
2010	\$705,230,796.94	845	0
2011	\$730,748,762.18	939	0

ODOT-OK PERFORMANCE-BASED PREQUALIFICATION PROJECT CASE STUDY

Agency Name: Oklahoma Department of Transportation (ODOT-OK)

Delivery method(s) the organization is allowed to use:

- Design-Bid-Build

Does the agency use performance-based prequalification in any form? Yes

Which projects require performance bonding? All

What is the value of the performance bonds required for projects? 100 percent of construction cost

Agency's prequalification process

ODOT-OK has a prequalification program based on a review of the contractor's financials, experience, and equipment and places the heaviest weight on a contractor's financial analysis. Contractors are required to renew the prequalification every two years. However, the prequalification renewal clock resets every time a contractor completes a project with ODOT-OK, in these cases a contractor is required to renew at least every five years. Contractors need to prequalify for specific classes of work and complete a favorable financial analysis. Post-project performance evaluations are conducted and can impact prequalification status. State statute allows three unsatisfactory evaluations in a 1-year period before suspension or debarment may be considered. The outcome of the financial analysis determines the total value of ODOT-OK work that the contractor may bid on within a specific class. This is a pass/fail test, where the contractor's financials need to exceed the value of the projects under contract, plus the value of the contracts the contractor wants to bid on in a given letting.

The management and implementation of the prequalification program requires 67.5 percent of a full-time employee, which consists of one clerk at 40 percent, a second clerk at 25 percent, and a supervisor at 2.5 percent. The size, type, and/or complexity of a project does not change the effort required to prequalify.

The contractor performance evaluations are conducted at the completion of every project. The contractor receives a copy of the completed performance evaluation. ODOT-OK has no clear policy on whether or not the contractor has to be informed of a negative evaluation. ODOT-OK does not have a formal appeals process in place for a contractor that receives a negative performance evaluation, but it allows an informal appeal to be made to an individual one level higher than the person who completed the evaluation. A negative performance evaluation does not automatically disqualify a contractor from future work. There is no mechanism to permit a negative performance evaluation to impact the bidding capacity of a contractor, short of suspension or debarment. All performance evaluations remain on the record indefinitely. ODOT-OK believes that project performance evaluations enhance quality, timely completion, and contractor cooperation with the resident office.

The interviewee stated that the most effective practice of the existing prequalification program was the financial analysis and its use to determine bidding eligibility.

Agency’s experience with performance bonding and sureties

ODOT-OK requires all projects to have a performance bond valued at 100 percent of the construction cost. It has occasionally met with a surety when a contractor has had a performance issue. Beyond those meetings, ODOT-OK has no knowledge of what the surety may be doing behind the scenes to address the issue.

Overall, ODOT-OK is satisfied with sureties and the way they manage performance bonding. It believes that the current system is effective, as evidenced by the low default rate.

ODOT-OK would not consider using an alternative means to screen/evaluate contractors in place of performance bonds.

Agency’s views on the model for performance-based prequalification

The ODOT-OK design bid build prequalification system is similar to the tier one and tier two elements of the proposed performance-based contractor prequalification model. The ODOT-OK design bid build prequalification system also includes something similar to tier three of the proposed model for specialty projects (like cable barrier projects). The interviewee felt that the ODOT-OK system could be improved by determining bonding/surety at the annual prequalification stage; currently, ODOT-OK only uses bonding/surety information at the project bidding stage to allow/disallow a contractor to bid on a specific project. By including the bonding/surety information in the annual prequalification stage, ODOT-OK only has to manage the bonding/surety evaluation once, rather than for every project each contractor bids on. The maximum bidding limit is set at 2.5 times the working capital (working capital = current assets – current liabilities).

Table 46. ODOT-OK project data.

Year	Value of Awarded Contracts	Number of Contracts	Number of Defaults
2007	\$633,768,354.70	1,095	0
2008	\$703,136,032.36	1,135	0
2009	\$965,306,457.21	1,556	0
2010	\$744,806,340.68	1,625	0
2011	\$739,557,693.21	1,968	0

UDOT PERFORMANCE-BASED PREQUALIFICATION PROJECT CASE STUDY

Agency Name: Utah Department of Transportation (UDOT)

Delivery method(s) the organization is allowed to use:

- Design-Bid-Build
- Construction Manager/General Contractor
- Design-Build
- Public-Private Partnership

Does the agency use performance-based prequalification in any form? Yes

Which projects require performance bonding? All projects

What is the value of the performance bonds required for projects? Projects under \$500 million require a bond of 100 percent of the project value; projects over \$500 million require a bond of 50 percent of the project value.

Agency's prequalification process

UDOT requires contractors to prequalify on an annual basis for projects over \$1.5 million. Prequalification is based on a contractor's financial capacity, performance evaluation, and amount of experience working for UDOT. Currently, financial capacity carries the most weight in a contractor's ability to prequalify. However, in about a year, UDOT will implement a new prequalification process that will increase the weight of performance evaluations and change the performance evaluation system. The current prequalification system requires the work of one full-time UDOT employee, regardless of the project size, type, or complexity.

Contractors become prequalified for a certain amount of work. If a contractor's financial capacity is over \$50 million, that contractor can bid on any UDOT work. Prequalification is not required for projects less than \$1.5 million; therefore, UDOT's prequalification system is really made for contractors with financial capacities between \$1.5 million and \$50 million, as the agency believes contractors in this range pose the greatest risk. The prequalification system does not vary based on the project type, size, or complexity.

Contractors are prequalified for a certain amount of work, which is determined by multiplying their adjusted equity by their performance factor and the sum of their experience rating factor, financial factor, and additional experience factor. A contractor's adjusted equity is determined by the contractor's financial statement. The performance factor is based on the average of the contractor's last 3 years of performance evaluations completed by the resident engineer, with a minimum of three ratings. The experience rating factor is determined by the contracts, estimates, and agreements manager, based on a contractor's amount of experience working on UDOT projects. The comptroller determines a contractor's financial factor, based on information from the contractor's financial statement. The contracts, estimates, and agreements manager

determines the additional experience factor, based on the contractor's average performance factor for the past year.

UDOT's current contractor performance evaluation system is conducted by the resident engineer at the completion of every project, uses a ten-point scale for evaluation, and is very subjective. Interim performance evaluations are suggested as a partnering tool. The performance evaluation covers quality control and workmanship; safety; work zone traffic control; EEO/labor compliance; environmental compliance; administration, organization, and supervision; partnering; schedule; and public relations. In general, UDOT's ratings have been very high; any low ratings didn't have the data or hard evidence to back them up because the evaluations were so qualitative. If a contractor is given an overall performance rating of less than 70 percent, an explanation is required.

Contractors receive a copy of their performance ratings. UDOT is required to notify contractors before it submits a negative performance evaluation, and there is an appeals system in place. All performance evaluations remain on the record for three years. A negative performance evaluation does not automatically disqualify a contractor from future work, but it does limit the contractor's bidding capacity.

UDOT is currently developing a new electronic performance evaluation system that will focus on objective measures of quality, safety, and schedule, and will be more heavily weighted when calculating the amount of work for which a contractor is prequalified. UDOT's new performance evaluation system will include a three-strike approach. The department will give contractors two attempts to fix an identified performance issue, and after the third incident of the same performance issue, the contractor's bidding privileges will be modified.

Agency's experience with performance bonding and sureties

UDOT requires all projects under \$500 million to have a performance bond of 100 percent of the project value. In the past, UDOT has investigated reducing the amount of the performance bond, but found that the economic benefits were minimal and not commensurate with the risk. For projects over \$500 million, the performance bond value is reduced to 50 percent of the project value. Other than project value, nothing changes the performance bonding requirements. UDOT estimates that it takes one full-time employee to manage the performance bond requirements.

Performance bonds are not a part of UDOT's prequalification process. For each project, only the awarded contractor is required to supply a performance bond; thus, not all of the bidding contractors have to go through the effort. Performance bonds are not included in the annual prequalification because UDOT has experienced fluctuations in contractor's abilities to get performance bonds over the course of a year.

Other than one default that happened 5 years ago, UDOT has had very little experience, if any, working with sureties. That default case was the only time that UDOT remembers working with a surety on a project or even initiating contact with a surety about a performance issue. In the case of the default, UDOT notified the surety of the performance problem, the surety didn't do anything to prevent the default, and the contractor defaulted. There was an 8 to 12 month delay on the project as a result of the default, which UDOT does not believe the surety could have decreased. As a result of the default, UDOT incurred additional project costs, due to added

construction management. Further, the public was affected by the inconvenience of an idle construction project.

UDOT has never had a surety work proactively with a contractor to improve performance or attempt to avoid a default unless the surety was first called in by UDOT. In UDOT’s experience, sureties are not involved in any aspect of a project, unless UDOT calls them. UDOT does share poor contractor performance evaluations with the surety, but it has never received responses from the surety in those cases.

UDOT would not consider eliminating or supplementing the performance bond requirement on projects. The department regards performance bonding as a form of cheap insurance.

Agency’s views on the model for performance-based prequalification

Overall, UDOT believes that the model is headed in the right direction. The agency is very supportive of incorporating contractor performance into the prequalification process, but has identified two areas of the model that could use some reconsideration: performance bonding on an annual basis and the reduction of the value of the performance bond.

UDOT has experienced fluctuations in the performance bond values that contractors are able to secure over the course of a year. These fluctuations are a reflection of the condition of contractors’ business over the course of the year. Because such fluctuation cannot be captured in an annual performance bond requirement for prequalification, UDOT requires a performance bond for every awarded contract. While UDOT understands it would be more convenient for a contractor to acquire only one performance bond over the course of the year, the agency believes this is too risky to pursue, as indicated in tier one of the model.

UDOT previously considered reducing performance bond amounts on projects as a cost-savings measure. However, the agency found that the savings from the reduction of the performance bond value were negligible and not worth the additional risk. As a result, UDOT does not believe there is a benefit to including the reduction of the performance bond amount in tier two of the model.

Table 47. UDOT project data.

Year	Value of Awarded Contracts	Number of Contracts	Number of Defaults
2007	\$441,855,551.30	177	0
2008	\$460,590,019.31	143	0
2009	\$1,090,116,707.13	206	0
2010	\$557,318,674.76	180	0
2011	\$636,475,647.30	134	0

VDOT PERFORMANCE-BASED PREQUALIFICATION PROJECT CASE STUDY

Agency name: Virginia DOT (VDOT)

Delivery method(s) the organization is allowed to use:

- Design-Bid-Build
- Design-Build
- Public-Private Partnership

Does the agency use performance-based prequalification in any form? Yes

Which projects require performance bonding? All projects over \$250,000

What is the value of the performance bond required for projects? 100 percent of the project's value

Agency's prequalification process

VDOT prequalifies contractors every three years and requires annual reviews and updates. VDOT has two full-time employees to manage the contractor prequalification process. This process does not include contractor performance evaluations, which are conducted by VDOT inspectors in the field on a regular basis. The prequalification status is based on a contractor's overall safety score, VDOT's performance evaluations, and a financial review. The financial review is not in-depth and is only intended to establish whether a contractor's financial standing is positive or negative. The review only impacts the bonding requirements, not the prequalification of the contractor. VDOT has five prequalification status levels: prequalified, prequalified probationary, prequalified inactive, prequalified conditional, or prequalified subcontractor.

Prequalified status allows contractors to bid on all projects up to their bonding ability and requires a minimum prequalification score of 80, a minimum performance evaluation score of 85, and a minimum safety score of 70. A prequalified probationary or prequalified inactive status indicates that a contractor meets the minimum safety score and has demonstrated the ability to complete the type of work for which prequalification is requested, but has not performed work for VDOT, and thus does not have a performance evaluation score. A firm that is probationary or inactive can have no more than three ongoing projects with VDOT at one time, and each project needs to have a contracted value of less than \$2 million. A firm is determined to be conditionally prequalified when its quality and/or safety scores are below VDOT's desired standards. A conditionally prequalified firm can have only one active project at any given time and is limited to a maximum value of \$1 million in contracted work at one time. A prequalified subcontractor goes through a similar process, but can only bid on subcontractor work.

A contractor's prequalification status is determined by the prequalification score, of which VDOT's performance rating represents 70 percent and the company's overall safety score (based on the Experience Modification Ratio) represents 30 percent. VDOT's contractor performance

ratings are conducted on all projects on a monthly basis, and a comprehensive score is calculated at the end of the projects. The performance evaluation, which is automated through an electronic form, assesses all scopes of work, quality, and safety on a four-point scale (ranges from 1 to 4). A VDOT project inspector is required to fill out the contractor performance evaluations monthly. If a particular element of a project is inactive, the inspector assigns a score of 0 and does not include that score in the overall monthly performance score. At the end of the project, the interim (monthly) scores are converted into a comprehensive project score. The comprehensive scores remain on the record at VDOT permanently, and there is an appeals process available for contractors to dispute any performance ratings.

Within the performance ratings, every aspect, other than project management, is evaluated objectively and compared to requirements and specifications. Project management is more subjectively evaluated and is rated using an A, B, C, D, and F rating scale (like school grades). VDOT is satisfied with this process because it is mostly objective and there are notes in the project diaries or reports that correspond to the project. Contractors and subcontractors are removed from the list of prequalified bidders if they receive one score below 60, or if in a 24 month period, they receive 3 scores below 70 on a contractor performance evaluation annual or final report. Lower contractor performance evaluation scores can also impact a contractor's prequalification status level.

Because the contractor performance evaluation is so heavily weighted in VDOT's prequalification, contractors that are new to VDOT can have difficulty quickly becoming fully prequalified. VDOT has the ability to provide a project waiver if a contractor has no experience with VDOT and therefore no contractor performance evaluation. The waiver considers VDOT's past performance evaluations of the contractor's key team members (if they have done work for VDOT in another capacity), performance ratings from other State transportation agencies, and/or accommodation letters from owners of projects the contractor completed that were similar to VDOT's work.

Overall, VDOT believes that the current prequalification process provides for better projects, more bidders on projects, and overall improvement in final work products. The number of prequalified bidders has increased since the implementation of VDOT's performance-based prequalification process. It is speculated that the higher number of bidders is a result of the five different prequalification status levels that replaced the previous pass/fail prequalification. The prequalification status levels also allow contractors to stumble and not be completely disqualified from all VDOT work.

Agency's experience with performance bonding and sureties

Overall, VDOT has had good experiences with sureties and performance bonding. The agency averages two possible defaults a year, and one a year, at most, actually defaults. VDOT informs sureties about performance issues 100 percent of the time and has never had a surety inform VDOT about a performance issue on a project. VDOT has never had a dispute with a surety about a default, and every time VDOT has been through a default, the surety finished the project; the surety didn't monetarily reimburse the agency. When a default occurs, the project experiences, on average, a 3-month shutdown.

VDOT estimates that it takes the equivalent of one full-time employee working ten days per month to manage the performance-bond system; however, this work is spread among many department staff. VDOT believes it is possible for a surety to work with a contractor to avoid default, once the surety has been informed of a performance issue, but it has no firsthand knowledge of this type of action.

VDOT has used a construction manager in place of a surety when a contractor has demonstrated the ability to perform the work and makes the lowest bid, but cannot secure a bond for the project. In this case, the construction manager monitors the entire project and receives all VDOT project payments. Construction managers are responsible for paying themselves and all subcontractors, and whatever is left goes to the contractor. VDOT does not know the exact cost of this alternative because the construction manager is hired directly by the contractor.

VDOT is willing to use this system again. While the agency does not currently evaluate a construction manager’s ability to perform work, if the system did replace performance bonding, some sort of qualification system would be needed for construction managers because they are not at risk on the project. The system would provide larger companies with the opportunity to be the construction manager and mentor the contractor.

Agency’s views on the model for performance-based prequalification

VDOT is passionate about the inclusion of contractor performance-based evaluations in prequalification regulations and requirements. Overall, VDOT views the model as a great framework for performance-based prequalification for agencies that currently prequalify based on only financial requirements. However, VDOT would not implement the model verbatim because it is not an improvement over the system the agency has in place.

VDOT thinks the financial capacity determination and reduction of performance bonds are redundant because sureties already complete these activities. Because sureties are at risk on a project, they conduct a very thorough examination of a firm before they provide a performance bond, which includes an analysis of the firm’s financial capacity. VDOT does not have the expertise or resources to determine a contractor’s financial capacity to the same depth and accuracy as a surety can. The second redundancy is the reduction of the performance bond value for firms that exceed minimum performance expectations. VDOT believes this essentially already occurs when sureties offer lower-cost performance bonds to firms they consider stable or lower risk than unstable or higher-risk firms.

Table 48. VDOT project data.

Year	Value of Awarded Contracts	Number of Contracts	Number of Defaults
2007	\$551,527,205.05	389	0
2008	\$622,724,764.51	409	0
2009	\$416,585,354.88	283	0
2010	\$547,838,809.66	401	0
2011	\$499,837,802.09	329	0

WSDOT PERFORMANCE-BASED PREQUALIFICATION PROJECT CASE STUDY

Agency name: Washington State DOT (WSDOT)

Delivery methods the organization is allowed to use:

- Design-Bid-Build
- Design-Build

Does the agency use performance-based prequalification in any form? Yes

Which projects require performance bonding? All projects

What is the value of the performance bonds required for projects? For projects under \$500 million, WSDOT requires a performance bond of 100 percent of the project's construction value. For projects over \$500 million, the value of the performance bond can be reduced on a project-by-project basis.

Agency's prequalification process

WSDOT prequalifies contractors annually (typically in March). The prequalification process is dictated by sections 468-16-010 through 468-16-210 of the Washington Administrative Code. WSDOT estimates that it takes the equivalent of two full-time employees to manage the prequalification process. However, this work is not the sole responsibility of two full-time employees; it is spread among many people. The workload fluctuates throughout the year; in March, the workload is heavy, due to the annual prequalification process, and at other times of the year, when the project load is light, the prequalification workload is light, too.

The three most important prequalification factors are financial capacity, past work experience, and a prime contractor's performance report. The financial capacity of a contractor, which is evaluated using the contractor's financial statement, determines the size of a project that the contractor can bid on. WSDOT requires prime contractors to self-perform 30 percent of the work on the project they are bidding on. Past work experience is evaluated to determine what type of work a contractor is qualified to perform, which involves speaking with past clients about the contractor's work. The prime contractor performance report is completed by the WSDOT project team at the completion of all WSDOT projects. The report is then shared with the contractor, prior to its submittal to WSDOT upper management. There is an appeals process, and the results can increase or decrease the final bidding capacity rating the contractor receives from WSDOT.

WSDOT is happy with its current prequalification process and feels it gets better projects as a result of the process. The prime contractor's performance report and past work experience are the most useful parts of the evaluation because they ensure that a contractor has the ability and experience to successfully complete a project (which essentially prevents a paving contractor from bidding on a bridge project and vice versa). The financial capacity is similar to the bonding process and does not add as much.

Agency's experience with performance bonding and sureties

For all projects under \$500 million, WSDOT is legally required to have a performance bond for 100 percent of the project value. A performance bond is required for projects over \$500 million, but the value of the bond may be reduced on a case-by-case basis (though this reduction has only happened a couple times on mega projects, due to the difficulty of bonding them). WSDOT's performance-bond process requires the completion of a standard form, and it is estimated that the workload for this procedure equates to a partial full-time employee. When there is an exception to the process or a performance issue is identified, the workload can increase to one full-time employee. If a surety has to become involved in the project, the project team's workload increases to manage the surety and bring the surety up to speed on the project.

WSDOT has not had a recent project default. In all recent cases, the surety stepped in before default and finished the project, which resulted in no stoppage or lost time on the project. When a performance issue surfaces on a project, WSDOT contacts the surety for assistance 100 percent of the time. Usually, the surety has not learned of the performance issue prior to WSDOT's contact. WSDOT typically has to contact a surety on 5 to 10 percent of all projects. In the recent economic climate, this amount of contact has increased minimally. Though WSDOT has not had any recent defaults, WSDOT has also not had a surety work with a contractor early in the project to avoid default.

A contractor's performance is not included in the performance-bond process (outside of the standard evaluations used by the surety). Any performance-based evaluations of the contractor are included in the administrative prequalification process. WSDOT's performance ratings (which are conducted at the completion of a project) have never been shared with a surety.

Overall, WSDOT thinks performance bonds are valuable and considers sureties essential to projects. Sureties have proved useful because they have assisted with the completion of projects before they reached default, and if nothing else, threatening to call a surety is an effective way to improve a contractor's performance.

Agency's views on the model for performance-based prequalification

The performance-based prequalification model is similar to WSDOT's current process. One difference is that WSDOT cannot legally lower the performance bond requirement for a contractor, while the second tier of the model adjusts the performance bond requirement if the contractor exceeds the minimum performance standards. Because WSDOT has already implemented a system that is similar to the model, the agency does not believe the new model would result in any changes to project cost, duration, staff responsibilities, or risk of contractor default. WSDOT does believe that it has gotten better projects because it uses a performance-based system to prequalify contractors, since the agency has been able to procure contractors with the right experience. However, WSDOT does not have any quantifiable proof that it has gotten better projects because of its use of this system.

Table 49. WSDOT project data.

Year	Value of Awarded Contracts	Number of Contracts	Number of Defaults
2007	\$406,244,656.83	135	0
2008	\$319,250,602.30	117	0
2009	\$281,766,937.37	146	1
2010	\$74,202,021.55	64	0
2011	\$6,253,163.82	13	0

APPENDIX C: DETAILED PERFORMANCE BOND COST ANALYSES

Four iterations of the performance bond benefit-cost analysis were conducted because the analysis is sensitive to the assumptions. The benefit-cost ratio analysis for performance bonds started with the baseline assumptions listed in analysis one. Each analysis investigates the impact of a change in the assumptions on the benefit-cost ratio. The title and introduction of each analysis indicates the assumption change for that individual analysis. Also, each analysis includes the following four tables: the performance bond cost results, the assumptions, the performance bond benefits, and the resulting benefit-cost ratio. These analyses show that if the default rate is held constant at 0.69 percent, projects over approximately \$10 million have a net benefit from performance bonds; projects between \$100,000 and \$1 million have a net cost from performance bonds; and projects less than \$100,000 and between \$1 million and \$10 million vary between net cost and net benefit. However, the analysis where the default rate was lowered to 0.46 percent resulted in benefit-cost ratios less than one for all project categories, indicating a net cost for performance bonds on all projects.

ANALYSIS 1

This analysis was conducted with a default rate of 0.69 percent and the value of the upper limit of each project size category. Overall, this analysis shows that projects over \$10 million have a net benefit from performance bonds, and projects less than \$10 million have a net cost from performance bonds.

Table 50. Analysis 1 performance bond cost.

Project Size	Average Performance Bond (Percent)	Performance Bond Cost
< \$100,000	1.06	\$1,060
\$100,000–\$1 million	0.99	\$9,900
\$1 million–\$10 million	0.93	\$93,000
\$10 million–\$50 million	0.70	\$350,000
\$50 million–\$100 million	0.52	\$520,000
> \$100 million	0.52	\$520,000

Table 51. Analysis 1 assumptions.

Project Size	Default Rate (Percent)	Number of Days Saved	Cost per Day Saved	Cost to Re-bid (Percent of Contract)
< \$100,000	0.69	30	\$1,000	7
\$100,000–\$1 million	0.69	30	\$1,000	7
\$1 million–\$10 million	0.69	60	\$5,000	7
\$10 million–\$50 million	0.69	60	\$10,000	7
\$50 million–\$100 million	0.69	60	\$10,000	7
> \$100 million	0.69	60	\$10,000	7

Table 52. Analysis 1 performance bond benefit.

Project Size	Avoided Cost of Default	Avoided Cost of Re-bid	Avoided Schedule Delay Cost	Total Benefit
< \$100,000	\$690	\$48	\$207	\$945
\$100,000–\$1 million	\$6,900	\$483	\$207	\$7,590
\$1 million–\$10 million	\$69,000	\$4,830	\$2,070	\$75,900
\$10 million–\$50 million	\$345,000	\$24,150	\$4,140	\$373,290
\$50 million–\$100 million	\$690,000	\$48,300	\$4,140	\$742,440
> \$100 million	\$690,000	\$48,300	\$4,140	\$742,440

Table 53. Analysis 1 performance bond benefit-cost ratio.

Project Size	Performance Bond Cost	Performance Bond Benefit	Benefit-Cost Ratio
< \$100,000	\$1,060	\$945	0.89
\$100,000–\$1 million	\$9,900	\$7,590	0.76
\$1 million–\$10 million	\$93,000	\$75,900	0.82
\$10 million–\$50 million	\$350,000	\$373,290	1.06
\$50 million–\$100 million	\$520,000	\$742,440	1.42
> \$100 million	\$520,000	\$742,440	1.42

ANALYSIS 2: DEFAULT RATE = 0.46 PERCENT

This analysis was conducted with a default rate of 0.46 percent and the value of the upper limit of each project size category. Overall, this analysis shows that all projects have a net cost from performance bonds.

Contract Value = Upper Limit of Project Size Category

Table 54. Analysis 2 performance bond cost.

Project Size	Average Performance Bond (Percent)	Performance Bond Cost
< \$100,000	1.06	\$1,060
\$100,000–\$1 million	0.99	\$9,900
\$1 million–\$10 million	0.93	\$93,000
\$10 million–\$50 million	0.70	\$350,000
\$50 million–\$100 million	0.52	\$520,000
> \$100 million	0.52	\$520,000

Table 55. Analysis 2 assumptions.

Project Size	Default Rate (Percent)	Number of Days Saved	Cost per Day Saved	Cost to Re-bid (Percent of Contract)
< \$100,000	0.46	30	\$1,000	7
\$100,000–\$1 million	0.46	30	\$1,000	7
\$1 million–\$10 million	0.46	60	\$5,000	7
\$10 million–\$50 million	0.46	60	\$10,000	7
\$50 million–\$100 million	0.46	60	\$10,000	7
> \$100 million	0.46	60	\$10,000	7

Table 56. Analysis 2 performance bond benefits.

Project Size	Avoided Cost of Default	Avoided Cost of Re-bid	Avoided Schedule Delay Cost	Total Benefit
< \$100,000	\$460	\$32	\$138	\$630
\$100,000–\$1 million	\$4,600	\$322	\$138	\$5,060
\$1 million–\$10 million	\$46,000	\$3,220	\$1380	\$50,600
\$10 million–\$50 million	\$230,000	\$16,100	\$2760	\$248,860
\$50 million–\$100 million	\$460,000	\$32,200	\$2760	\$494,960
> \$100 million	\$460,000	\$32,200	\$2760	\$494,960

Table 57. Analysis 2 performance bond benefit-cost ratio.

Project Size	Performance Bond Cost	Performance Bond Benefit	Benefit-Cost Ratio
< \$100,000	\$1,060	\$945	0.89
\$100,000–\$1 million	\$9,900	\$7,590	0.76
\$1 million–\$10 million	\$93,000	\$75,900	0.82
\$10 million–\$50 million	\$350,000	\$373,290	1.06
\$50 million–\$100 million	\$520,000	\$742,440	1.42
> \$100 million	\$520,000	\$742,440	1.42

**ANALYSIS 3: CHANGE NUMBER OF DAYS DELAYED,
DEFAULT RATE = 0.69 PERCENT**

This analysis was conducted with a default rate of 0.69 percent and the value of the upper limit of each project size category. Also, the number of days delayed in the benefits was doubled for each project category. Overall, this analysis shows that projects over \$10 million and below \$100,000, have a net benefit from performance bonds, and projects between \$100,000 and \$10 million have a net cost from performance bonds.

Contract Value = Upper limit of Project Size Category

Table 58. Analysis 3 performance bond cost.

Project Size	Average Performance Bond (Percent)	Performance Bond Cost
< \$100,000	1.06	\$1,060
\$100,000–\$1 million	0.99	\$9,900
\$1 million–\$10 million	0.93	\$93,000
\$10 million–\$50 million	0.70	\$350,000
\$50 million–\$100 million	0.52	\$520,000
> \$100 million	0.52	\$520,000

Table 59. Analysis 3 assumptions.

Project Size	Default Rate (Percent)	Number of Days Saved	Cost per Day Saved	Cost to Re-bid (Percent of Contract)
< \$100,000	0.69	60	\$1,000	7
\$100,000–\$1 million	0.69	60	\$1,000	7
\$1 million–\$10 million	0.69	120	\$5,000	7
\$10 million–\$50 million	0.69	120	\$10,000	7
\$50 million–\$100 million	0.69	120	\$10,000	7
> \$100 million	0.69	120	\$10,000	7

Table 60. Analysis 3 performance bond costs.

Project Size	Avoided Cost of Default	Avoided Cost of Re-bid	Avoided Schedule Delay Cost	Total Benefit
< \$100,000	\$690	\$48	\$414	\$1,152
\$100,000–\$1 million	\$6,900	\$483	\$414	\$7,797
\$1 million–\$10 million	\$69,000	\$4,830	\$4,140	\$77,970
\$10 million–\$50 million	\$345,000	\$24,150	\$8,280	\$377,430
\$50 million–\$100 million	\$690,000	\$48,300	\$8,280	\$746,580
> \$100 million	\$690,000	\$48,300	\$8,280	\$746,580

Table 61. Analysis 3 performance bond benefit-cost ratio.

Project Size	Performance Bond Cost	Performance Bond Benefit	Benefit-Cost Ratio
< \$100,000	\$1,060	\$1,152	1.08
\$100,000–\$1 million	\$9,900	\$7,797	0.79
\$1 million–\$10 million	\$93,000	\$77,970	0.84
\$10 million–\$50 million	\$350,000	\$377,430	1.07
\$50 million–\$100 million	\$520,000	\$746,580	1.43
> \$100 million	\$520,000	\$746,580	1.43

ANALYSIS 4: CHANGE THE CONTRACT VALUE

This analysis was conducted with a default rate of 0.69 percent and the value of the lower limit of each project size category. Also, the days of delay are the same as they are in the original analysis (analysis one). Overall, this analysis shows that projects over \$1 million provide a net benefit from performance bonds, and projects less than \$1 million have a net cost from performance bonds.

Contract Value = Lower Limit of Project Size Category

Table 62. Analysis 4 performance bond cost.

Project Size	Average Performance Bond (Percent)	Performance Bond Cost
< \$100,000	1.06	\$106
\$100,000–\$1 million	0.99	\$990
\$1 million–\$10 million	0.93	\$9,300
\$10 million–\$50 million	0.70	\$70,000
\$50 million–\$100 million	0.52	\$260,000
> \$100 million	0.52	\$260,000

Table 63. Analysis 4 assumptions.

Project Size	Default Rate (Percent)	Number of Days Saved	Cost per Day Saved	Cost to Re-bid (Percent of Contract)
< \$100,000	0.69	60	\$1,000	7
\$100,000–\$1 million	0.69	60	\$1,000	7
\$1 million–\$10 million	0.69	120	\$5,000	7
\$10 million–\$50 million	0.69	120	\$10,000	7
\$50 million–\$100 million	0.69	120	\$10,000	7
> \$100 million	0.69	120	\$10,000	7

Table 64. Analysis 4 performance bond benefits.

Project Size	Avoided Cost of Default	Avoided Cost of Re-bid	Avoided Schedule Delay Cost	Total Benefit
< \$100,000	\$69	\$5	\$207	\$281
\$100,000–\$1 million	\$690	\$48	\$207	\$945
\$1 million–\$10 million	\$6,900	\$483	\$2,070	\$9,453
\$10 million–\$50 million	\$69,000	\$4,830	\$4,140	\$77,970
\$50 million–\$100 million	\$345,000	\$24,150	\$4,140	\$373,290
> \$100 million	\$690,000	\$48,300	\$4,140	\$742,440

Table 65. Analysis 4 performance bond benefit-cost ratio.

Project Size	Performance Bond Cost	Performance Bond Benefit	Benefit-Cost Ratio
< \$100,000	\$106	\$281	2.65
\$100,000–\$1 million	\$990	\$945	0.95
\$1 million–\$10 million	\$9,300	\$9,453	1.02
\$10 million–\$50 million	\$70,000	\$77,970	1.11
\$50 million–\$100 million	\$260,000	\$373,290	1.44
> \$100 million	\$260,000	\$742,440	1.43

APPENDIX D: EXISTING PERFORMANCE-BASED PREQUALIFICATION MODEL ALGORITHMS

Agencies currently use numerous approaches to incorporate contractor performance into the prequalification process. While the variation is substantial, the motivation to implement these systems is generally the same—to correlate contractor performance with a contractor’s ability to competitively bid, which therefore creates an incentive for good performance and encourages marginal performers to improve. The following expresses the philosophy of including performance in the contracting process:⁽²⁹⁾

The concept of performance-based contracts originated from a consideration of four factors, namely, (a) the increasing lack of personnel within the national road departments... (b) the frequency of claims... (c) the need to *focus more on customers’ satisfaction* by seeking to identify the outcomes, products, or services that the road users expect to be delivered, and *by monitoring and paying for those services on the basis of customer-based performance indicators*; and (d) the need to shift greater responsibility to contractors throughout the entire contract period *as well as to stimulate and profit from their innovative capabilities*. [Emphasis added]

Four representative agencies with different successfully implemented systems—FDOT, IOWADOT, ODOT-OH, and MTO—can serve as a foundation for a generic model of the performance-based contractor prequalification process.

FDOT

FDOT has had a contractor performance rating system in place since 1982, which it uses during its prequalification process.⁽³⁹⁾ FDOT evaluates contractor performance in the following 10 areas:

- Quality.
- Management.
- Cost.
- Traffic.
- DBE/EEO participation.
- Environmental.
- Traveling public.
- Agency cooperation.
- Property owner cooperation.
- Submittals.

Florida uses performance rating procedures and guidelines to rate contractors and has an appeal process in place for the contractor’s performance rating.

The core of FDOT’s approach is the determination and use of an AF. If a contractor already works for FDOT and has at least three “contractor past performance reports,” FDOT uses the components shown in table 66 to first determine each contractor’s Ability Score (AS). FDOT sums the scores of the contractor past performance reports together with the previous average score and then divides by the total number of scores used. (A separate evaluation process is used to determine an AS for new contractors.) FDOT then uses the matrix shown in table 67 to assign AFs. If the contractor has two or more contractor past performance reports in which it received an AS lower than 76 in the 12 months preceding the contractor’s fiscal year end date, then their assigned AF is reduced to 4.

Table 66. FDOT ability score.⁽³⁹⁾

AS	
	Maximum Value
Organization and Management	
Experience of principals	15
Experience of construction supervisors	15
Work Experience	
Completed Contracts	
Highway and bridge related	25*
Non-highway and bridge related	10
Ongoing Contracts	
Highway and bridge related	25*
Non-highway and bridge related	10
Total	100

* Maximum value shall be increased to 35 if applicant’s experience is exclusively in highway and bridge construction.

Table 67. FDOT AF matrix.⁽³⁹⁾

AF	
If AS is:	AF is:
98–100	15
94–97	14
90–93	12
85–89	10
80–84	8
77–79	5
74–76	4
70–73	3
65–69	2
64 or less	1

Table 66 shows the impact of past performance on a contractor’s ability to bid. Contractors with an AS of 80 or above can receive an AF upwards of 8 times those of contractors with an AS of less than 80. When the AS drops below 65, a contractor receives no benefit from the score and the ultimate ability to bid is based strictly on financial capacity. The FDOT system shows the powerful impact that the inclusion of past performance in bidding capacity calculation can have. In theory, a contractor with a perfect performance record—reflected by an AS of 100—can bid on 15 times more work than it could have bid on if the decision was based solely on the surety industry’s performance bonding capacity (as illustrated in the formula to determine the FDOT Maximum Capacity Rating (MCR) in figure 29).

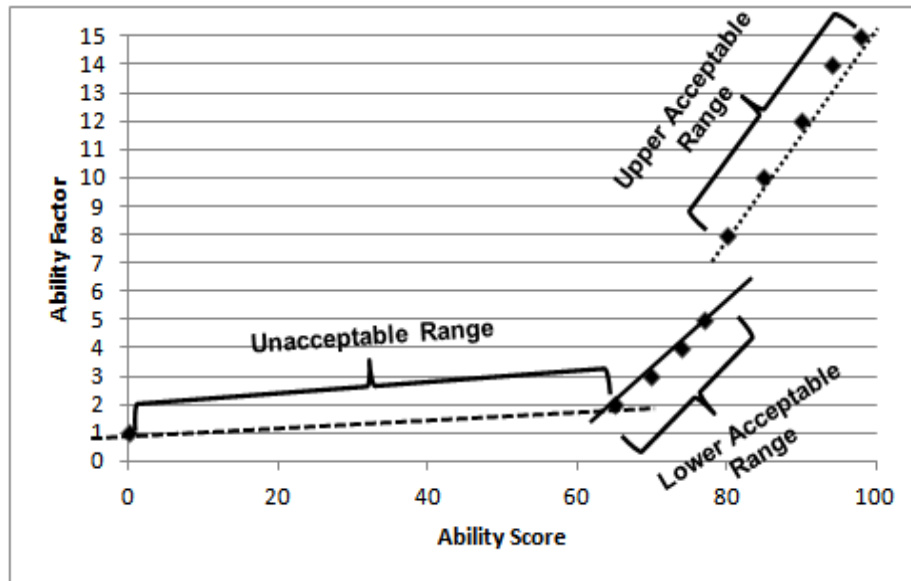


Figure 28. Line graph. FDOT contractor ability score/ability factor relationship.

Once an AF has been determined, FDOT uses it to determine the MCR, or “the total aggregate dollar amount of uncompleted work an applicant may have under contract at any one time as prime contractor and/or subcontractor.”⁽³⁹⁾ The formula for MCR follows:

$$MCR = AF \times CRF \times ANW$$

Figure 29. Equation. Maximum capacity rating.

Where:

MCR = Maximum Capacity Rating

AF = Ability Factor

CRF = Current Ratio Factor (or Adjusted New Assets/Adjusted Net Liabilities.

ANW = Adjusted Net Worth

FDOT further provides that contractors with an AF greater than 80 and a current ratio factor greater than 1 can request an increase in their MCR if they can provide a letter from a surety that shows that their current bonding capacity exceeds the calculated MCR. There are two tiers within this group that are eligible for a new limit to their MCR, termed their surety capacity

(SC). For contractors with an AF of 91 and greater, the MCR will be the aggregate of contracts amount specified in the surety commitment letter. For contractors with an AF between 80 and 90, the following formula is used in conjunction with table 68.

$$SC = SM \times MCR \times (CRV \div TRV)$$

Figure 30. Equation. Surety capacity.

Where:

SC = Surety Capacity

SM = Surety Multiplier

MCR = Maximum Capacity

CRV = Construction Revenues

TRV = Total Revenues (as set forth in applicant’s financial statements)

Table 68. FDOT ability score/surety multiplier.

AS	Surety Multiplier
88	6.8
87	6.2
86	5.6
85	5.0
84	4.6
83	4.2
82	3.8
81	3.4
80	3.0

FDOT’s approach shows a clear impact of a contractor’s past performance on a contractor’s access to future work, also seen through the MCR value’s linear relationship with past performance. For contractors with superior ratings (i.e., those with ratings greater than 80), there is also the potential for “bonus” access to available work, in the form of additional capacity adjustments. This approach encourages contractors to perform well without indirectly granting a subsidy to poorly performing contractors.

While the system does not provide a direct financial benefit to the owner by reducing total bonding costs, it clearly creates an incentive that can motivate contractors to improve their performance. Like many other jurisdictions, Florida includes a rather lengthy list of causes for suspension, revocation, and denial of qualification in their prequalification process. This list provides FDOT with an additional tool to use to address extreme cases of substandard contractor performance.

IOWADOT

Figure 31 is the formula used by IOWADOT to determine the amount of work a contractor can bid on, based on its past performance. That performance is quantified with the ability factor, which is derived from contractor performance evaluations.

Bidding Capacity

$$= \text{Current Assets} - \text{Current Liabilities} - \frac{1}{2} (\text{Net Current Assets} - \text{Net Current Liability})(\text{Ability Factor})$$

Figure 31. Equation. IOWADOT bidding capacity calculation.

ODOT-OH

ODOT-OH evaluates a contractor or subcontractor's performance during each of their projects and then uses the evaluation to determine the amount of work the contractor can bid on. The system is quite simple and is included here, in part, to illustrate a performance-based contractor prequalification process in its most basic form. ODOT-OH's process includes the use of rating guidelines and it mandates that additional supporting documentation requirements are met in instances of poor contractor performance. Contractor performance evaluations from the previous calendar year are averaged and then used to determine a prequalification factor, as shown in table 69.

Table 69. ODOT-OH prequalification factor matrix.

Previous Year's Average Evaluation Score (Percent)	Prequalification Factor
85 or greater	10
80–84	9
70–79	8
60–69	7
55–59	6
50–54	5
Below 50	1

The contractor's bidding capacity is then determined by multiplying its net asset value—as presented in the documents submitted for ODOT-OH's administrative prequalification process—by the prequalification factor. As a result, contractors with good performance are rewarded with increased bidding capacity, while poorly performing contractors have decreased access to work. ODOT-OH has also created a Prequalification Review Board to hear appeals of contractor performance evaluation results and other qualification-related decisions. The board demonstrates ODOT-OH's recognition of the importance of establishing processes that are perceived as fair and it also helps ensure contractor confidence in the system.

MTO

MTO has maintained its performance-based prequalification process since the 1960s and relies on this process in place of bid bonds and performance bonds. MTO uses a comprehensive contractor performance rating system and evaluates contractor performance across a wide range of categories, using objective criteria wherever possible. MTO annually establishes contractor performance ratings using CPRs calculated for the previous three years. The CPR is calculated as a weighted average, in such a way that recent ratings are weighted higher. As a result, the most recent poor and improved performances have a greater impact on the CPR. MTO also provides rating guidelines and a process for contractors who would like to appeal the contractor performance ratings.

MTO's system includes two components that address contractor performance: the infraction report process and the CPR system. The infraction report process is designed to address very significant contract incidents across four areas: project management, quality, safety, and environmental. The infraction report system is activated when a contractor commits a serious breach of contract that includes, but is not limited to, the following specific behaviors: ⁽³⁴⁾

- Failure to abide by tendering requirements.
- Tender declarations that are incomplete or inaccurate.
- Failure to abide by general conditions of contract.
- Serious issues that affect safety or the environment.
- The [unsatisfactory] timeliness of the completion of the work and services.
- The issuance of any Notice of Default.
- The manner of the [unsatisfactory] resolution of any disputes, and whether such disputes were resolved in accordance with the prescribed provisions of the contract.

When such an incident occurs, a report is prepared and submitted to the MTO Qualification Committee (comprised of senior ministry staff) for review. The committee then decides how to proceed and implements one of the following:

- Takes no further action.
- Issues a warning letter.
- Applies sanctions.

Sanctions that arise from infraction reports are applied to a contractor's contractor financial rating, and as a result, access to work is immediately reduced.

MTO uses a unique method to determine the impact of the CPR system. Contractors that maintain a performance rating of more than 70 are placed in a "green zone" and can bid on work

that falls within the contractors’ financial rating, based on the evaluation of financial documents that the contractor submits during the administrative prequalification process. If a contractor’s performance rating falls below 70, MTO imposes a dollar-value limit on the work it can take on, called the Maximum Workload Rating (MWR), to restrict the contractor’s ability to bid. The MWR is the highest annual total dollar value of work awarded to a contractor over the previous five fiscal years.

When contractors’ performance ratings are greater than 55 and less than 70, they are placed in a “yellow zone.” The qualification committee can decide merely to impose the MWR limitation or to reduce it by up to 20 percent for contractors placed in this zone. Contractors are put in a “red zone” if their performance ratings are between 35 and 55. If placed in the red zone, the contractor’s MWR is automatically reduced, based on the rating the contractor receives on a linear scale that ranges from 20 to 100 percent of total MWR. Any sanctions imposed during the infraction process can further reduce the contractor’s MWR.

As mentioned earlier, the Ontario process is also unique in that MTO does not require bonding, which results in a direct financial benefit to the ministry. A contractor’s performance does not impact the contractor’s costs of work; it impacts a contractor’s access to work. Of course, contractors pay the cost of good performance, which corresponds with an increased value to the owners, who benefit from the higher level of performance.⁽¹⁷⁾ While the punitive nature of reducing a contractor’s access to work creates a significant incentive to improve quality and/or contract performance, it does not necessarily compensate the contractor for the additional cost that higher performance may entail.

Ontario’s system impacts the contractors’ eligibility in various ways. Below are three scenarios that illustrate how the Ontario system applies in several scenarios.

Scenario A

A contractor is evaluated using the information shown in table 70.

Table 70. MTO scenario A evaluation.

Measure	Value
Basic Financial Rating	\$12 million
Work on Hand	\$5 million
Contractor Performance Index (CPI)	78
MWR	\$5.5 million
Infractions	10 percent (Subcontractor drove excavator through creek)
Available Rating	$(\$12 \text{ million} - 10\% (\$12 \text{ million})) - \$5 \text{ million} = \5.8 million

The contractor would like to submit a bid for a contract that requires a rating of \$6 million and a MWR of \$4 million.

Since the contractor has a CPI greater than 70, it falls in the green zone, and therefore is not subject to the MWR. However, the contractor only has \$5.8 million of Available Rating (AR) and the contract requires an AR of \$6 million. As a result, the contractor cannot submit a bid for this contract. Had the contractor not incurred the infraction, it would have been eligible to bid on this contract.

Scenario B

A contractor is evaluated using the information shown in table 71.

Table 71. MTO scenario B evaluation.

Measure	Value
Basic Financial Rating	\$25 million
Work on Hand	\$11 million
Contractor Performance Index (CPI)	65 (Qualification Committee imposed MWR, with no additional reduction)
MWR	\$8.8 million
Infractions	None
Available Rating	\$25 million – \$11 million = \$14 million

The contractor would like to submit a bid for a contract that requires a rating of \$13 million and a MWR of \$10 million.

Since the contractor has a CPI of 65, it is in the yellow zone. The Qualification Committee decided to impose a MWR on this contractor, with no further reductions applied. The contractor has \$14 million of AR for a contract that requires a rating of \$13 million and therefore meets the financial requirements. However, the contract also requires \$10 million as its MWR. Since the contractor is subject to a MWR of \$8,8 million, the contractor is not able to qualify to submit a bid for this project.

Scenario C

A contractor is evaluated using the information shown in table 72.

Table 72. MTO scenario C evaluation.

Measure	Value
Basic Financial Rating	\$425 million
Work on Hand	\$51 million
Contractor Performance Index (CPI)	51
MWR	\$62.5 million
Infractions	15 percent (due to series of serious incidents of inappropriate traffic control)
MWR Adjusted	20 percent + (4 / 20 x 80 percent) = 36 percent \$62.5 million – 15 percent – 36 percent = \$30.625 million
Available Rating	(\$425 million – 15 percent (\$425 million)) – \$51 million = \$310.25 million

The contractor would like to submit a bid for a contract that requires a rating of \$90 million and a MWR of \$50 million.

Since the contractor has a CPI of less than 55, it is in the red zone. The Qualification Committee automatically imposed a MWR reduction of 15 percent for the infraction, as well as an additional MWR adjustment, based on the specific CPI assigned to the contractor. This large contractor has an AR of \$310.25 million for a contract that requires an AR of \$90 million. However, this contractor's poor contract performance has resulted in a significantly reduced MWR. For contractors subject to a MWR, the contract requires a MWR rating of \$50 million. This contractor only has a MWR of \$30.625 million and therefore cannot qualify to submit a bid on this project.

The Ontario system is designed to treat large and small contractors equally when their performance falls below the expected standard. Nonetheless, a reduced financial capacity may have a significant impact on small contractors, whereas the work volume of large contractors with significant financial resources may not be greatly impacted, since they typically work for a wide range of transportation agencies in many geographical areas. When substandard performance forces MTO to impose the MWR limitation, the contractor—regardless of its size—cannot increase its MTO work volume above the highest amount of work that was successfully obtained in the past five years. This subsequently forces the offending firm to either seek work from agencies it has not previously worked with or to increase its workload for agencies for which it has, or is currently, performing work. This evaluation system increases a contractor's uncertainty of its ability to bid when it receives poor evaluations, which creates a significant incentive for contractors to maintain satisfactory performance.

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