PRIMER ON CONTRACTING
For the Twenty-first Century

A Report of the
Contract Administration Task Force of the
AASHTO Subcommittee on Construction

Fourth Edition
2001

Chairman: Steve DeWitt, North Carolina DOT
Vice Chairman: Cal Gendreau, North Dakota DOT
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Editor's Note: This fourth edition of the "Primer on Contracting for the 21st Century" is dedicated to Mr. Ron Williams, State Construction Engineer, Arizona Department of Transportation, who served as both Vice Chairman and Chairman of the AASHTO Subcommittee on Construction – Contract Administration Task Force from 1995 –2001. Under Mr. Williams's leadership, the Task Force provided technical expertise and guidance by publishing several reports that documented best practices in the highway construction industry. The Subcommittee on Construction gratefully acknowledges Mr. Williams's contributions to the transportation industry.

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PREFACE

The 2001 version of the "Primer on Construction Contracting for the 21st Century" is an updated version of the 1997 *Primer on Contracting 2000*, which was prepared by the Contract Administration Task Force of the AASHTO Subcommittee on Construction and published as a bound report by AASHTO. It is not considered to be an official AASHTO guide or voluntary standard.

This document lists various contracting and contract administration techniques that are currently being used by various contracting agencies in their transportation programs. Neither AASHTO nor FHWA fully supports all of the techniques that are identified in this document. Some of the techniques are not appropriate for all contracting agencies and they should be used only where applicable. The contracting agencies should consult with their counsel to verify the legal sufficiency of using these techniques. Also, it is extremely important to coordinate with the highway industry in the development of any new contracting technique. Early industry involvement will facilitate the implementation and acceptance of techniques that have not been used in the past.

The Subcommittee on Construction welcomes comments on this Subcommittee Report and will consider all that are received. It is planned that comments on this report will be considered for incorporation in future editions of this report.

Comments on this report should be sent directly to the Secretary for the Contract Administration Task Force, AASHTO Subcommittee for Construction, at the address below.

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Introduction

At the 1996 meeting of the AASHTO Subcommittee on Construction, Chairman Don Lucas (IN), issued a challenge to the Subcommittee members. He asked them to consider what contracting practices should be available in the year 2000 and to identify institutional obstacles to innovation. Mr. Lucas stated that contracting agencies must be allowed to include quality factors in the procurement process to a greater degree than under our current system of procurement. During the Subcommittee's Task Force on Contract Administration's breakout session, various viewpoints on Contracting 2000 were identified. The following is a "white paper" that summarizes the opinions and views of the members of the AASHTO Subcommittee on Construction–Contract Administration Task Force.

The traditional competitive bidding system has served the public well over the past century. The foundation of this system is the principle of competitive sealed bids with award to the lowest responsive bidder who meets specific conditions of responsibility. Over the decades, this procurement system has provided taxpayers with an adequate, safe and efficient transportation facility at the lowest price that responsible, competitive bidders can offer. For the most part, it has effectively prevented favoritism in spending public funds while stimulating competition in the private sector.

While the low bid system has served the public well, it has not always optimized the overall quality of the final product and it is not necessarily the most efficient way to procure services for all types of highway contracts. State transportation administrators are subject to various political forces. Some states have gone through severe downsizing due to budget constraints. Others are under increased pressure to move critical projects quickly from the planning stage, through design and into construction. Deteriorating infrastructure is prompting public demand to "fix the problem yesterday; however, don't raise taxes." Underlying these external pressures is the basic requirement to include quality concepts in all phases of the highway program. Thus, there is a continuing need to review and evaluate any contracting procedure that promotes quality.

Past Efforts to Incorporate Quality in the Contracting Process

TRB Task Force A2T51

In 1987, the Transportation Research Board (TRB) established a Task Force on Innovative Contracting Practices (A2T51). This task force was created for the purpose of identifying promising innovative contracting practices for further evaluation. The task force addressed four major topic areas: bidding procedures, materials control, quality considerations and insurance and surety issues. In evaluating each of these areas, the task force considered the following:

1) Procedures and specifications that stifle initiative and innovations as well as those that encourage them;
2) Ways that current procedures and specifications adversely affect quality or unfairly assign risk;
3) Various types of performance-based quality assurance specifications that have been demonstrated to improve quality and equitably assign risk;
4) Effects of penalties and incentives;
5) Alternative methods of contract award that have been used successfully; and
6) Administrative, legal and other problems.

In December 1991, TRB published the final recommendations of Task Force A2T51 in a benchmark document entitled *Transportation Research Circular Number 386: Innovative Contracting Practices*. This report listed a number of short-term and long-term actions for each of the four major topic areas.

FHWA's Special Experimental Project No. 14 (SEP-14) - Innovative Contracting

While the TRB Task Force A2T51 was formulating its recommendations, the Task Force Chairman, Dwight Bower, subsequently requested that FHWA establish a project to provide a means to evaluate some of the task force's more project-specific recommendations, and SEP-14 was initiated on February 13, 1990. Since the initiation of SEP-14 in 1990, FHWA has approved the use of many innovative contracting practices for evaluation. Three of the four

original innovative contracting practices (A+B bidding, lane rental, and warranties) are no longer considered to be experimental in nature, and states may now use these techniques without FHWA Headquarters approval on Federal-aid projects. FHWA Division Administrators must approve warranty provisions on National Highway System (NHS) projects. The design-build contracting method will remain as an innovative contracting method that FHWA will continue to evaluate under SEP-14.

The National Quality Initiative

As a result of the National Quality Initiative (now known as the National Partnership for Highway Quality), many states developed and are evaluating quality assurance specifications and materials control procedures. The AASHTO Subcommittee on Construction and others have developed guide specifications for quality assurance procedures; however, much work remains to be done to fully implement quality assurance specifications within the highway industry.

Contracting for the 21st Century

In order to utilize and build upon previous efforts to implement quality concepts in the highway industry, the AASHTO Subcommittee on Construction and FHWA have developed a catalogue of contracting methods and procedures that will be used in the future. FHWA will coordinate and disseminate information regarding Contracting 2000 procedures, and the AASHTO states will provide the evaluations and recommendations concerning these contracting methods.

Through this joint AASHTO/FHWA relationship, the states will have a convenient documentation source for contracting information. “What's working? What's not? Who has used it?” are typical questions to be addressed. In addition, FHWA will serve as a resource in coordinating research, training, educational efforts and other program related issues. Similarly, AASHTO will provide program direction through its unique ability to provide input and consensus on highway industry issues.

In August 1996, Chairman Don Lucas challenged the Subcommittee to consider what contracting practices should be available in the year 2000. Contract Administration Task Force Chairman Len Sanderson led a group discussion on this subject at the Contract Administration Task Force Meeting in August 1996. The following is a list of topics that were offered for discussion:

- Performance-related specifications;
- Warranted products;
- Long-life products/end results;
- Buy quality;
- Incentive/disincentive;
- More surety/bonding company involvement in processing of warranty jobs;
- Use of variable or depreciating bonds on warranty jobs;
- Need to train technicians, construction superintendents, operating craftsmen and engineers;
- Lump sum bidding;
- Certification programs that are transferable;
- Standard matrix selection based on traffic volumes (pavement type, loading, etc.);
- Design-build/warranty;
- Design-build maintain;
- Improved work zone to improve motorist safety and eliminate delay;
- Payment based on quality control;
- Pavement management;
- Industry-State DOT communication in project development;
- Changing contractor roles;
- New products (such as High Strength Concrete); and
- Minimum staff level needed to maintain transportation infrastructure.

Subsequent to the 1996 meeting, several discussions took place regarding the role and need for a Contracting 2000 white paper. The above list of topics was modified to a composite list as identified in the Table of Contents. This list is not all-inclusive but merely represents the non-traditional contracting techniques for which there is some experience base. It is believed that this paper will serve as a living document that will be kept up to date and serve as a current reference for those interested in the "state-of-the-practice" for various contracting techniques in the highway program.

What is a primer?

Webster's dictionary defines a primer as an elementary textbook or a book covering the basic elements of a subject. That is the intent of the "Primer on Contacting for the 21st Century." It is not meant to serve as a detailed reference. It is only intended to provide very basic information on non-traditional contracting techniques. The Primer provides a description of the contracting technique, limited information regarding the use of these provisions, a list of contracting agencies that have some experience with the technique and a contact person for additional information.

Contracting Techniques for the 21st Century

Active Management Payment Mechanism

Description: The United Kingdom has developed a contracting and payment technique call "Active Management Payment Mechanism" (AMPM) which they hope to utilize on future design-build-finance-operate contracts. The UK is moving away from the A+B and lane rental concepts towards a lane availability concept. This concept involves a contractual provision that provides contractors with an incentive to maximize the availability of open lanes. The British Highways Agency will measure the average speed through the workzone and the actual traffic flow. Incentives will be based on measure travel speed and the measured volumes in comparison with theoretical percentages of roadway capacity.

Arizona DOT has implemented a form of the AMPM concept on the State Route 68 design-build project. ADOT is using a contractual provision that requires the design-builder to measure speed consistency and performance through the 13-mile construction work zone. The contract provided for a $400,000 travel time budget item that would be drawn against if the target travel time average was exceeded. Contractual incentives and disincentives would be implemented for performance above or below the contractual standard.

The design-builder elected to deploy an electronic license plate reader system developed by the British company Computer Recognition Systems. This system uses a camera and a light source to capture license plate images of passing vehicles. The license plate number is taken from the picture by image recognition software, encrypted then sent to the central computer at the contractor's office through a high-speed data connection. There is a second camera at the end of the project, which takes a second picture, encrypts that license plate number and sends it to the central computer. The central computer then attempts to match up license plates that enter and exit the limits of the construction project.

To date the contractor has experienced very few times when the average travel time goal has not been met. The license plate reader system is able to match around 11% of license plates between the start and finish of the project. This rate is considered good compared to other license plate reading projects around the world and is adequate for the average travel time estimates used on this project.

Owners: UK, AZ

Contacts: Mr. Yogesh Patel, British Highways Agency, 020 7921-4761; Ron Williams, Arizona DOT, (602) 712-7323, or William J. Higgins, Arizona DOT, (602) 712-8274.

Alternate Bids / Designs

Description: Some contracting agencies use alternate bidding procedures when more than one alternate is judged equal over the design life and there is a reasonable possibility that the least costly design approach will depend on the competitive circumstances.

Alternate pavement type bidding. FHWA has discouraged the use of alternate pavement type bidding. This policy is based on the fact that it is difficult, if not impossible, to develop truly equivalent alternate designs for Portland cement concrete pavement and asphaltic concrete pavements. However, on March 29, 1996, FHWA's Highway Operations Division approved Missouri's request for an alternate pavement bidding procedure under SEP-14. Missouri actively involved the paving industry in the process of developing alternate pavement type specifications and bid adjustment factors. Missouri DOT's July 1998 revised final report documents their experiences and recommendations with this technique.

Several State DOTs have recently evaluated alternate pavement type bidding procedures that incorporate life cycle costs in the award of the contract. The Michigan DOT and the Louisiana DOT&D let projects in 2001 which utilized life-cycle cost estimates in determining the successful lowest bidder. These State DOTs developed

pavement typical sections and specifications that purported to maintain a level playing field for the bituminous and Portland cement paving industries. On the other hand, the Kentucky Transportation Cabinet (KYTC) let an alternate pavement type bidding project with no bid adjustment for life-cycle costs. The KYTC determined that the design alternate sections were functionally equivalent from an initial and a life-cycle cost viewpoint. It is noted that FHWA's SEP-14 approval is necessary for Federal-aid projects that use a bid adjustment when considering the award of alternate designs.

Alternate structure type bidding. From December 1979 to August 1995, FHWA had a policy that required the preparation of alternate designs for major structures. This resulted in increased competition and an estimated average savings of two million dollars per structure. However, in August 1995, FHWA rescinded this policy and now allows the states to use its own procedures for preparing designs for major structures.

In 1980 PennDOT instituted a policy of alternate designs for all structures. PennDOT's alternate bridge design policy allows contractors to propose an alternate bridge design at the time of bid submission. The alternate design may include virtually any aspect of the bridge design including: a redesigned superstructure, substructure, span length, etc. The contractor may not change the clear span distances (horizontal/vertical clearances) or the horizontal/vertical alignments. The alternate design must be equivalent to the "as-designed" structure. An acceptable preliminary conceptual alternate bridge design must be approved within 30 calendar days of bid opening; otherwise, the contractor must build the "as-designed" structure at no additional cost. Value engineering may be applied to the "as-designed" structure. The contractor must pay for a portion of PennDOT's cost to review the alternate design (up to $5,000). The preliminary results indicate a cost savings of 10 percent for major structures and 7.2 percent for non-major structures.

Additive Alternate Bidding. Some owners use a bidding technique called additive alternates when it is necessary to keep the awarded contract amount within budget. Under this procedure, the owner includes most of the project scope-of-work in "base-bid" items, and then specifies "additive alternates" which may be selected if the "base-plus-alternates" price is within budget. The owner must clearly specify the priority of alternates which will be considered and indicate that the award will be based on the lowest responsive bid considering the sum of the base bid and additive alternates which are within budget. The FHWA Federal Lands Highway Division and several other local public agencies have used this technique.

Agencies: MO, PA, LA, MI, FHWA Federal Lands Highway Division

Contacts: Ken Fryer, Missouri DOT, (314) 751-3689; Gary Hoffman, Pennsylvania DOT, (717) 787-6898; Steve Bower, Michigan DOT (517) 322-5198; Gary Sharpe, Kentucky Transportation Cabinet, (502) 564-3280.

References: (5)

Alternative Dispute Resolution (ADR)

Description: The use of ADR techniques allows fair-minded people to resolve their differences in a manner which emphasizes reasonableness and fairness. The magnitude of dispute resolutions ranges from less hostile methods, such as negotiation, and increases up to litigation. The methods vary by the assistance from outside sources and the amount of decision taken away from the disputing parties. Traditional resolution methods include: negotiation, mediation, non-binding arbitration, arbitration and litigation. Non-traditional methods include: disputes review board, mini-trial and partnering.

> ***Disputes Review Board***. This non-traditional method requires the creation of a standing committee of three persons which meets on a regular basis to review and resolve all project disputes before they become formal claims. Both parties choose a member who represents them and select the third "neutral" member. The operating procedures are described in the contract and both parties share the operating costs. The board renders written decisions; however, the decisions are typically non-binding upon the parties. This technique has been used in AK, CA, CO, DE, FL, HI, PA, ME, MA and WA.

Mini-Trial. Mini-Trials are more formal than mediation in that a dispute is treated as a business problem. Lawyers and experts present a summary of their "best case" to senior officials of the owner and the contractor. The senior officials settle the dispute with the aid of a neutral party. Pennsylvania (PennDOT) used this method to settle a construction claim on the Schuylkill Expressway project.

PennDOT Mini-Trial Procedures. Each party is represented by a principal participant with the authority to settle the dispute on behalf of the party represented. The FHWA also has a representative at the mini-trial who has the authority to approve any settlement reached by the parties. A neutral advisor to be selected jointly by the parties chairs the mini-trial. The neutral advisor performs a mediation function, enforces time limitations, asks questions of witnesses, and, if necessary, issues an advisory opinion on the merits of the dispute. The presentations at the mini-trial are informal with the rules and procedures stated in the agreement. The mini-trial is conducted within a specific time frame.

Partnering. Partnering is not truly an ADR method, but merely a change in the attitude and the relationship between owner and contractor. It often results in a relationship between the owner and contractor that promotes achievement of mutual and beneficial goals. For this reason, many State DOTs have promoted the partnering concept to reduce claims and expedite projects. A January 1995 AASHTO Subcommittee on Construction survey found that:

- 46 out of 50 states utilize partnering;
- Partnering has resulted in favorable results in reducing claims. (34-yes, 1-no, 11-undecided);
- 19 out of 50 states used a Dispute Review Panel. (19-yes, 31-No); and
- A panel has been successful in resolving disputes. (14-yes, 0-no, 5-undecided).

Agencies: See above.

Contact: Jerry Yakowenko, FHWA, (202) 366-1562, for general information.

Bid Averaging

Description: Florida DOT is evaluating this technique on a few state-funded highway projects. The high and low bids are not considered. The remaining bids are averaged and the bidder closest to the numerical average is awarded the contract. The theory behind this technique is that the contractors are encouraged to submit reasonable bids for work. Theoretically, unreasonably low bids are eliminated, and a contractor with a reasonable bid is selected. FHWA did not approve this concept under SEP-14 as it did not fit within the legal framework of 23 U.S.C. 112.

Agencies: FL

Contact: Ken Leuderalbert, Florida DOT, (850) 414-4383.

References: (5)

Certified Producer Programs

Description: Indiana has initiated a program to certify aggregate and hot mix asphalt producers. The Indiana Certified Aggregate Producer Program is a program in which a qualified mineral aggregate producer desiring to supply material to INDOT shall do so by assuming all of the plant site controls and a portion of the testing responsibility that had been previously assumed by INDOT. The program focused on production testing by the producer and a site specific Quality Control Plan that indicates how the producer proposes to control the materials at the plant. Benefits of the program to the producer include improved aggregate uniformity.

The Indiana Certified Hot Mix Asphalt Producer Program is a program in which the producer takes responsibility for all aspects of the production of quality hot mix asphalt in accordance with contract requirements and the

department monitors the producer's production, sampling and testing procedures. The Certified HMA Producers Program is now a requirement for all QC/QA projects. The contractor may substitute a QC/QA mix from a Certified Plant on some Non-QC/QA mixes. Acceptance of the materials is based on a certification from the plant with no further testing by the Department.

Agencies: IN

Contact: Timothy Bertram, Indiana DOT, (317) 232-5502.

Constructability Reviews

Description: AASHTO's 1998-1999 Strategic Plan, Item #5-4, stated the following: "Identify and advocate cost savings associated with constructability reviews between designers and construction personnel and encourage participation by contractors and suppliers during design." In 1999, the AASHTO Subcommittee on Construction conducted a survey of the current use of constructability reviews in the US. With a 90% response rate from the states, the survey revealed the following (contact Steve DeWitt, NCDOT, for details):

- 74% of all respondents had a constructability review process.
- 15% of constructability reviews are performed at the 15% design complete status, 23% at the 60% complete stage, 27% at the 95% complete stage and 35% at other stages.
- 59% of respondents consider all projects as candidates for constructability reviews.
- 88% of respondents did not have a method of quantifying the benefits of constructability reviews.
- Reported benefits include: fewer change orders, better plans, fewer claims, reduced contract time, safer designs, education, higher quality, reduced impacts to motorists, better understanding of project by construction personnel prior to construction.
- 59% of the respondents perform post-construction reviews.

The Kentucky DOT is utilizing a "Constructability Review Process" under SEP-14 to obtain the construction industry's input during the design phase and to prequalify bidders. The Paris-Lexington Road reconstruction project provides for widening the roadway from two to four lanes for 19.3 km (12 miles). It is envisioned that the work will require four to five contracts, let over a two-to-three-year period. Total cost is estimated at $50-75 million. The proposed concept is not design-build but rather a process whereby contractors interested in bidding any of the contracts involved with the project must prequalify at the beginning of the project and then participate, with the State's designer (already under contract), in a constructability exercise to finalize the project design. When project contracts are advertised, only contractors who have thus been prequalified and have participated in the constructability exercise will be permitted to bid. Each contract will be awarded on the basis of the lowest competitive bid.

Current Research: The University of Washington is currently conducting NCHRP Project 20-07, Task 124 "Costs/Benefits of Constructability Reviews." The objective of this research is to develop the following: (1) implementation guidelines that are suitably flexible to encompass the broad range of DOT organizational structures and resource capabilities, and (2) a procedure for assessing the costs and benefits of constructability reviews.

In 1998, The Texas Transportation Institute completed NCHRP Project 10-42, *Constructability Review Process for Transportation Facility*. The objective of this research study was to develop a methodology for a constructability review process for application by transportation agencies. The research identified concepts, evaluated the application of existing analytical tools, and provided implementation procedures for tailoring this methodology to individual transportation agencies.

Contact: Dr. Stuart Anderson, Texas Transportation Institute, (409) 845-2407, Dr. Donn Hancher, University of Kentucky, (606) 257-4857, Steve DeWitt, North Carolina DOT, (919) 733-2210; Paul Gravely, Kentucky Transportation Cabinet, (502) 564-4780; Assistant Professor Philip Dunston, University of Washington, (206) 685-1795.

Agencies: NC, KY, CA, CT, DE, WA

References: (5), (9)

Construction Manager At Risk

Description: The vertical building industry has been using a contracting technique called construction-manager-at-risk for many years. Under this procedure, an owner selects a design and construction management consultant on the basis of qualifications, experience, fees for management services and prices for the target cost of construction as well as an estimated ceiling price. The consultant then proceeds with the preliminary design. At some point in the design process (typically at the 60-90% design completion), the owner and the consultant will agree on a guaranteed maximum price for the construction of the project. Many owners favor this contracting technique as it gives them greater control of the design process, yet it still provides for innovation and constructability recommendations in the design phase.

The Florida DOT is using the construction manager at risk technique in combination with traditional design-bid-build on the $1.349 billion Miami Intermodal Center, a large parking garage / transit / roadway project in Miami.

Agencies: FL

Contact: Ken Leuderalbert, Florida DOT, (850) 414-4383.

Contract Maintenance

Description: Contract maintenance means the use of private sector forces to perform maintenance services that were previously done by the owner. This may include both routine or preventive maintenance activities. Contracting agencies may use 'means and methods' type contracts or 'performance-based' contracts. For "means and methods" contracts, the contracting agency specifies the materials and methods that must be used to satisfactorily complete the work. The contractor has little incentive to provide innovation in performing the contract work. Under performance-based contracts, much of the risk for the maintenance of certain assets is transferred from the agency to the contractor in accordance with level-of-service requirements outlined in the contract documents. Virginia and Florida are two states that have been leaders in this type of contracting. Using these two contracting approaches, it is estimated that as of 1999 approximately $2.5 billion in maintenance work was contracted out to the private sector.

Virginia DOT has entered into a $131.6 million five-year contract with VMS Inc. in a pilot project to provide turnkey maintenance services on 160 km (101 miles) of I-95 and 95 km (59 miles) of I-77. The services provided include all routine maintenance such as mowing roadsides, painting pavement markings, snow removal and operations up to and including major rehabilitation and restoration work. The agreement requires that VMS provide maintenance services that are equal to or better than the maintenance services that VDOT historically provides. VDOT estimates that this approach will save $22 million over the life of the contract.

In 2000, the Florida DOT signed a $73.5 million performance-based maintenance contract for all maintenance activities on 274 miles of I-75 for a 7-year period.

In August 2000, the D.C. Department of Public Works entered into a $69 million, 5-year contract with VMS Inc. to provide all maintenance services on the National Highway System in the District. This contract uses many performance measures to evaluate the contractor's performance.

Agencies:

- Virginia DOT–I-95, all maintenance services, $131.6 million
- Florida DOT–all maintenance services for 274 miles of I-75, 7 years, $73.5 million
- D.C. Department of Public Works–all maintenance service for 344- lane miles, 5 years, $69.6 million
- Texas DOT–all maintenance services for 153 miles on several Texas interstates, 5 years, $32 million
- Oklahoma Turnpike–John Kilpatrick Turnpike in northwest Oklahoma City, 17 lane-miles, 3-year contract
- Orlando-Orange County Expressway Authority–50 lane miles of roadway, bridge, and toll facilities along State Route 429

Contacts: Jim Sorenson, FHWA, (202) 366-1333, for general contract maintenance information; Frank Gee, Virginia DOT, (804) 786-2783, for VDOT privatization.

Contractor Quality Control Test Results in the Acceptance Decision

Description: A few states are currently evaluating the concept of utilizing contractor quality control test results (to varying degrees) as part of the Agency's acceptance determination.

Some States, such as Indiana and Virginia, have evaluated State-funded pilot projects that rely solely on contractor quality control test information.

On Federally funded projects, FHWA's regulations for Quality Assurance Procedures for Construction (Title 23 CFR 637 B) prescribe FHWA policy. Contractor quality control testing results may be used in an Agency's acceptance determination provided that such testing is random and is validated by acceptance or verification testing by the Agency. Acceptance or verification testing is still performed by the Agency, usually at some lesser frequency. This position is also supported by AASHTO and documented in AASHTO's February 1996 Implementation Manual for Quality Assurance. The verification sampling and testing are to be performed by qualified testing personnel employed by the Agency or its designated agent (excluding the contractor).

Massachusetts and Florida have initiated projects that will provide for contractor quality control testing with a certain amount of State acceptance or verification testing. This approach requires a contractor quality control plan and applies statistical specification limits to the contractor quality control results and Agency verification results.

Transportation Research Board Study 01-0405, "Statistically Based Methods for Verification Testing," provided a national overview of how the State DOTs are currently using split-sample and independent-sample verification procedures for the purpose of comparing test results or verifying the contractor's overall construction process in independent assurance programs and quality assurance construction specifications. The paper provides an understanding of the statistical concepts involved with split-sample and independent-sample comparison procedures, and what information an Agency needs in order to determine if a contractor's overall test results are valid.

Agencies: IN, VA, FL, MA

Contacts: Firooz Zandi, Indiana DOT, (317) 232-5529; Frank Gee, Virginia DOT, (804) 786-2783; Rob Elliott, Florida DOT, (850) 414-4381; Greg Doyle, FHWA-Massachusetts, (617) 494-3279.

References: N/A

Cost-Plus-Time Bidding

Description: Cost-plus-time bidding, more commonly referred to as the A+B method, involves time, with an associated cost, in the low bid determination. Under the A+B method, each bid submitted consists of two components:

- The "A" component is the traditional bid for the contract items and is the dollar amount for all work to be performed under the contract.
- The "B" component is a "bid" of the total number of calendar days required to complete the project, as estimated by the bidder. (Calendar days are used to avoid any potential for controversy which may arise if work days were used.)

The bid for award consideration is based on a combination of the bid for the contract items and the associated cost of the time, according to the formula:

$$(A) + (B \times \text{Road User Cost/Day})$$

This formula is used only to determine the lowest bid for award and is not used to determine payment to the contractor. The contractor's estimate for the completion of critical work becomes the contract time and an I/D provision is usually used to keep the bidding-playing field level. For critical projects that have high road user delay impacts, the A+B bidding method can be an effective technique to significantly reduce these impacts. After a five-year evaluation period under SEP-14, A+B bidding was declared operational on May 4, 1995 and is no longer considered to be experimental.

See Appendix B, Innovative Contracting Technical Provisions from NCHRP 20-7, Task 109, for sample technical provisions for A+B bidding with I/D provisions.

Agencies: In all, 28 States and the District of Columbia (see Appendix B) have thus far used the A+B Bidding method under SEP-14. Of these, Maryland, Missouri, Florida, and New York have been the most active users. California used the A+B Method to reconstruct critical bridges damaged and destroyed in the Los Angeles earthquake. A 1998 informal FHWA survey (with 37 responding Divisions) showed 18 states letting approximately 70 A+B contracts with I/D provisions in the past year.

Contacts: For general information–Jerry Yakowenko, FHWA, (202) 366-1562; Chris Lawson, FHWA, (202) 366-0606.

References: (4), (5)

Design-Build

Description: The design-build concept allows the contractor maximum flexibility for innovation in the selection of design, materials and construction methods. With design-build procurement, the contracting agency identifies the end result parameters and establishes the design criteria. The prospective bidders then develop design proposals that optimize their construction abilities. The submitted proposals may be rated by the contracting agency on factors such as design quality, timeliness, management capability and cost. These factors may be used to adjust the bids for the purpose of awarding the contract.

Federal statutes require that construction contracts be awarded to the lowest responsive, responsible bidder, while engineering service contracts are awarded according to qualifications-based selection procedures. Because the design-build concept combines these two types of services in one contract, FHWA considers design-build contracts experimental. FHWA's SEP-14 concept approval is necessary for all FHWA funded design-build projects.
Some members of the highway construction industry are opposed to the design-build method of contracting. Many association members believe that smaller firms would be economically disadvantaged when attempting to compete with larger firms on design-build contracts. Bidders would also incur significant expenses preparing proposals, and it would be difficult for unsuccessful firms to stay competitive. The very nature of a design-build contract presents an apparent conflict with the Brooks Act which requires qualifications-based selection procedures for engineering services contracts. The industry has many concerns about the shift in responsibility required with the use of warranty provisions in design-build-warrant contracts. Some engineering associations also have many concerns regarding professional design liability issues.

TEA-21 provides a modification of Title 23 United States Code that will eventually allow states to use the design-build contracting on a limited basis. FHWA is currently developing design-build regulations. After the implementation of the final rule, State DOTs will be able to utilize the design-build technique for projects over $50 million and ITS projects over $5 million without FHWA Headquarters approval. Other projects will continue to be approved under FHWA's SEP-14 program. FHWA is also required to submit a report to Congress on the effectiveness of design-build by June 9, 2003.

Agencies: Under SEP-14, FHWA has approved the use of the design-build contracting method for twenty-four states and several local public agencies including New York City, the District of Columbia, the City of Milwaukee, and the Texas Turnpike Authority. (See Appendix B).

Contacts: For general information–Jerry Yakowenko, FHWA, (202) 366-1562; Carol Jacoby, FHWA, (202) 366-1561.

References: (4), (5), (6)

Design-Build-Maintain (Operate)

Description: Several states have initiated design-build-operate-maintain projects. The Transportation Corridor Agencies in California used this concept on several toll road projects. These toll roads include the San Joaquin Hills Corridor, Eastern Transportation Corridors, and Foothill Transportation Corridors. These three corridors will provide more than 96 km (60 mi) of new freeways at a cost of approximately $2.5 billion. Contracts have been awarded and design and construction work is underway. Similarly, California Assembly Bill 680 will provide the legal authority and financing for several toll roads that will use the plan, design, finance, construct and lease back method of procurement and ownership. This concept has also been utilized on toll-road projects in Virginia, Colorado and Texas.

Canada's Northumberland Strait Crossing Project is a design-build-maintain project that provides for the financing, design, construction and operation of a 12.9-km bridge for 35 years following construction. Similarly, Canada is currently constructing the Toronto Toll Highway 407 project under the design-build-operate concept.

In August 2000, the Massachusetts Highway Department awarded a design-build-operate-maintain contract to Modern Continental to reconstruct Route US-3 from the I-95/Route 128 interchange in Burlington, MA to the New Hampshire border. This $385 million, 30-year contract will widen the existing 21-mile, two lane highway to include three lanes. It will provide for the replacement of 47 bridge structures and the upgrade of 13 interchanges.

Contacts: For general information–Jerry Yakowenko, FHWA, (202) 366-1562; Carol Jacoby FHWA, (202) 366-1561; for the Northumberland Strait Project–Ross Gilmour, SCI, (403) 244-9090; (416) 326-6172.

References: (5), (7)

Design-Build-Warrant

Description: Some agencies have combined the conditions of a warranty clause with a design-build contract. This technique may be more appropriate for selected Intelligent Transportation System projects that incorporate technological features where the contracting agency would benefit from a limited warranty for workmanship, materials and system functionality.

Agencies: A number of states, including AK, MI, and UT, have used design-build-warrant projects under SEP-14.

Contacts: For general information–Jerry Yakowenko, FHWA, (202) 366-1562; or Carol Jacoby, FHWA, (202) 366-1561.
References: (5)

Design-Sequencing

Description: The California DOT (Caltrans) does not currently have design-build legislative authority, however, Caltrans is proceeding with a unique contracting approach titled “design-sequencing.” Assembly Bill No. 405 was signed into law September 15, 1999. It allows Caltrans to utilize design-sequencing on six pilot projects. The California legislature determined that there were possible time savings involved with a process of contracts whereby the start of “construction is not dependent on the completion of plans and specification for (an) entire project, but

only …for each construction phase." The legislature defined this in the bill as "Design Sequencing." Under this procedure, Caltrans prepares the plans to an approximate 30% stage of completion. The bid documents must include all potential bid items, however, since the design is not complete, final quantities for all work may not have been determined. Caltrans intends to provide bid quantities that are within 25% of the final quantities. Contractors are pre-qualified based on past performance, experience and qualifications. Caltrans awards a contract to the lowest responsive bidder. The contractor is given the notice-to-proceed and then Caltrans completes the design during the early stages of construction.

Agencies: CA

Contact: Linda Fong, Caltrans, (916) 653-8559.

Disincentive for Unbalanced Bidding

Description: The North Carolina DOT is utilizing a contract provision that delays full payment for contract items that it believes may be unbalanced. The specification reads as follows:

> *Any excess monies included in an unbalanced bid price which the Department determines to be in excess of a reasonable unit or lump sum bid price for the work shall be retained by the Department until the last partial payment estimate, at which time these funds will be paid to the contractor. These retained funds will not be eligible for deposit in any trust account established pursuant to this contract nor for interest for such delay in the payment for the retained portion of the bid price. Partial payment for work performed on an unbalanced bid item shall be at the reasonable unit lump sum price determined in accordance with this sub article.*
>
> *For purposes of this subarticle, a reasonable unit or lump sum price will be deemed to be the average of the Engineer's Estimate and the individual balanced bid prices received from the other bidders for the item in question.*

Agencies: NC

Contact: Steve DeWitt, North Carolina DOT, (919) 733-2210.

Electronic Media in the Contracting Process

Description: Many states have web pages that provide data on the contracting process. Some list proposed bid letting dates, plan-holders lists, bid tabs from past lettings, average bid unit prices, and award data. (See Appendix D for an abbreviated list.) Several state DOTs are using electronic media for the posting and in some cases receipt of bid proposals. Such systems promise potential savings in time and cost to both the agency and contractors.

> ***Electronic bidding.*** The software program Trns•port has two components that the State DOTs and the contracting industry have been using to expedite procedures in the construction bidding process. Trns•port's Expedite software is used in bid preparation by contractors in 34 states. Contractors are able to download bid quantities from a State DOT web site and then use Expedite to fill in the unit prices and calculate a total bid price. This avoids costly computation errors on the contractor's part and simplifies bid tabulation by the State DOTs. Expedite will also alert contractors when blanks or errors are found in the bid preparation. A few State DOTs are also evaluating Trns•port's Bid Express software, a subscription service that was developed to provide web-based bidding for the transportation industry. It allows access to a web site that provides historical as well as current letting information. In addition to bid tabulations and advertisements, the web site provides a schedule of prices, planholder lists, eligible bidders, addenda and electronic bidding software. As of mid-2001, Bid Express listed a number of State DOTs who are piloting Internet bidding programs (IA, WI,

GA, SC). Several other states (AZ, LA, MI, MN, NM, NC, OK and VA) are also initiating pilot programs under Trns•port. Other States such as Texas and California are developing their own Internet bidding systems.

Electronic Documents. The US Army Corps of Engineers has been utilizing "electronic bid sets" (electronic plans, specifications and proposal documents) for several years. In early 1997, Utah DOT produced an electronic bid document for the mammoth I-15 design-build project. The entire set of contract documents for this $1.325 billion project was included on a set of 4 CD ROMS. In June 1998, Virginia DOT produced a set of totally electronic bid documents for a pilot project on Route 250, Henrico County. By making electronic files available via CD ROM, users can view, print, zoom-in on pertinent information, measure certain distances and determine areas for quantity take-offs.

Agencies: Receiving electronic bid data—AR, CO, FL, GA, IA, IN, MT, NC, NY, OH, OK, SC, TX, WI, WV, WY; others with significant activities—UT, KY, VA. (See Appendix D)

Contacts: For general information–Jerry Yakowenko, FHWA, (202) 366-1562; for the specifics of Texas DOT's Internet bidding—Scott Nichols, (512) 416-2550; Lem Dobbs, Georgia DOT, (404) 656-5325.

Escrow of Bid Documents

Description: Several states have utilized an escrow of bid document special provision on large complex contracts that have the potential for litigation. Generally, the escrowed documents remain in a depository and are not used until the state receives a notification of intention to file a claim from the contractor. A guide specification for escrowing bid documents can be found in Section 103.08 of AASHTO's 1998 *Guide Specifications for Highway Construction*.

New Jersey DOT standard specification 103.06 requires the successful bidder to escrow its bid preparation documents in order to pursue any or all claims arising under the contract reviewed by the Claims Review Board. A failure by the bidder to escrow its bid preparation documents constitutes a waiver by the bidder of any rights to have claims arising under the contract reviewed by the Claims Review Board.

According to Synthesis No. 28 of the Transit Cooperative Research Program, "Managing Transit Construction Contract Claims," seven of the twenty-one survey respondents indicated that their transit agency was using an escrow of bid document contract provision. It was noted that the escrow provisions have faced stiff opposition from the construction industry. Others claim that escrow provisions may no longer be as effective as originally conceived. Some in the industry believe the widespread use of sophisticated computer techniques allows the manipulation of the actual bid documents and the creation of a substitute bid document skewing the data differently from the actual bid. The skewed document could then be submitted in escrow as the actual bid preparation document. However, there is no direct evidence that this practice has occurred to date.

Agencies: CO, GA, HI, WA, NJ

Contact: Jerry Yakowenko, FHWA, (202) 366-1562, for general information.

Flexible Notice-to-Proceed Dates

Description: For small non-critical projects, such as certain rural bridge replacement projects, North Carolina DOT establishes the number of calendar days that is required to complete the project once work starts. The contractor is given a window of up to six months as to when he starts to work. Contractors seem to like this flexibility as it allows them to utilize their resources better. NCDOT also recently used this concept in letting a large number of guardrail projects where they were concerned about getting good competition from a limited number of guardrail contractors.

Agencies: NC

Contact: Steve DeWitt, North Carolina DOT, (919) 733-2210.

Funding of Resource Agency Positions

Description: Several State DOTs currently fund environmental and historic preservation resource agency positions for work associated with their transportation programs. They believe this accelerates their sister State agency's review of transportation programs and develops better working relationships with these agencies. The Ohio DOT currently funds three resource agency positions and the North Carolina DOT currently funds eleven similar positions. The Arizona DOT also has a similar program with its State resource agencies. While this increased flexibility may result in lower bid prices for the owner, it may also have a negative impact in making it more difficult to schedule construction inspection resources.

Agencies: AZ, OH, NC

Contacts: Ron Williams, Arizona DOT, (602) 712-7323; William J. Higgins, Arizona DOT, (602) 712-8274.

Improved Motorist Safety in Work Zones by Contracting Methods

Description: In February 1998, FHWA joined the American Road and Transportation Builders Association to improve safety in highway work zones by creating the National Work Zone Safety Information Clearinghouse. The purpose of the Clearinghouse is to provide information and referrals to government agencies, public and private organizations, and the general public concerning the safe and effective operation of traffic work zones. The Clearinghouse is managed by the Texas Transportation Institute at Texas A&M University. It provides comprehensive and up-to-date information on work zone-related issues (http://wzsafety.tamu.edu/). This includes information on work zone laws, products, public education, public outreach, regulations, research reports, specifications, statistics, training courses and key experts in each of these areas.

In early 1998, the Federal Highway Administration's Office of Program Quality Coordination conducted a Quality Improvement Review to identify the best practices of the FHWA and the State DOTs for enhancing safety, improving mobility, and reducing traffic congestion/delays during construction and maintenance operations. The Team compiled its findings into a summary report, "Meeting the Customer's Needs for Mobility and Safety During Construction and Maintenance Operations," and posted detailed descriptions of 262 best practices on the FHWA web site (http://www.fhwa.dot.gov/quality/BestPrac2.htm).

Many other states have excellent programs to reduce accidents in workzones. NCDOT's IMPACT program includes a driver education program which promotes recognition, reaction and responsibility while driving through workzones (contact Steve DeWitt for details).

Contacts: Chuck Sears FHWA, (202) 366-1555; Steve DeWitt, North Carolina DOT, (919) 733-2210.

References: N/A

Incentive/Disincentive Provisions for Early Contract Completion

Description: Incentive/disincentive (I/D) provisions for early completion are intended to motivate the contractor to complete the work on or ahead of schedule. It allows a contracting agency to compensate a contractor a certain amount of money for each day identified that critical work is completed ahead of schedule and assess a deduction for each day the contractor overruns the I/D time. The contracting agency specifies the time required for critical work and uses this provision for those critical projects where traffic inconvenience and delays are to be held to a minimum. The I/D amounts are based upon estimates of such items as traffic safety, traffic maintenance and road user delay costs. Florida has utilized a variation of the incentive/disincentive provision that provides a variable I/D amount relative to the time of early or late completion. For example, a larger incentive is provided for a ten-day early completion than for a one-day early completion.

In February 2000, the Michigan DOT (MDOT) completed an evaluation of the use of I/D clauses on 26 projects let and completed in 1998 and 1999. MDOT reported that 65% of I/D projects were completed early, 12% were completed on time and 23% were completed late. MDOT found that the average net reduction in contract days was 19% in comparison with similar projects that were let with an expedited schedule clause requiring the contractor to work a six calendar-day week but without the use of an I/D provision. The average I/D rate for these 26 projects was $18,500 and the average project user delay savings was $610,500. MDOT indicated that I/D provisions will result in an average expenditure of 1.5% of the contract amount.
See Appendix B, *Innovative Contracting Technical Provisions*, from NCHRP 20-7, Task 109, for sample technical provisions for incentive/disincentive clauses for early completion.

Agencies: Many State DOTs used I/D clauses under FHWA's National Experimental and Evaluation Program No. 24 in the early 1980s. The use of I/D clauses became operational in 1989. A 1990 survey by the Iowa DOT showed that 35 states have used I/D provisions. However, a 1998 informal FHWA survey (with 37 responding Divisions) showed 18 states letting approximately 150 I/D contracts in the past year.

Contacts: For general information–Jerry Yakowenko, FHWA, (202) 366-1562; Chris Lawson, FHWA, (202) 366-4639.

References: (1), (2), (3), (4)

Indefinite Quantity / Indefinite Delivery

Description: Michigan and some municipalities are currently using an innovative contracting method described as "indefinite quantity/indefinite delivery" (ID/IQ, also known as job order, task order, area-wide, county-wide, city-wide, and open ended contracting). Under this method, contractors bid on unit work items with the location to be determined under future work orders. An estimate of the total work over the life of the contract is provided in each contract. In Michigan's project, the State provides a work order for the installation of traffic signals at each location. Several municipalities utilize this contracting method on a city-wide or area-wide basis to provide greater flexibility in the construction program.

Delaware DOT uses open-ended contracts for an $80 million roadway rehabilitation program. It uses these contracts to let one-year or multi-year hot-mix overlay contracts in various zones throughout the state. These contracts have allowed DelDOT to complete relatively small resurfacing projects in an efficient and manner.

Florida DOT calls this "push-button" contracting and has been using it for maintenance and traffic operations activities for years.

Various branches of the military have used job order contracting for facility maintenance, repair, and minor construction (reference the Federal Acquisition Regulations, Subpart 16.500, Indefinite Delivery Contracts). In addition, numerous public works departments have utilized ID/IQ or area-wide contracts for guardrail repair, highway sign design and installation, pavement marking, bridge design, bridge maintenance, etc.

Agencies: MI, DE, MD, FL

Contact: Paul Miller, Michigan DOT, (517) 373-2300.

References: (5)

Intelligent Transportation System Contract Procurement Techniques

Description: The implementation of ITS technologies, either as stand-alone projects or in combination with traditional construction projects, frequently presents some unique challenges concerning procurement techniques. In

order to address these evolving issues, FHWA currently has many informational efforts underway to assist the states with procurement issues related to ITS implementation. Some of the noteworthy efforts include the following:

- Informational memo entitled *Procurement Information for ITS Projects*, dated 5/1/97–This memo discusses the applicability of various FHWA procurement laws and regulations as they relate to ITS projects.
- *FHWA Federal-aid ITS Procurement Regulations and Contracting Operations* Booze, Allen and Hamilton; Published August 1997–This report contains ITS procurement guidelines and describes the specific steps necessary to meet Federal-aid regulations. It includes case studies and examples of ITS procurement techniques.
- *Report on Innovative Contracting Practices for ITS*, L.S. Gallegos and Associates, published 5/1/97–This report presents a "tool kit" of procurement techniques successfully used by agencies to implement ITS.
- *Virginia DOT Public-Private Partnership Procurement for ITS: A Case Study Report*, Booze, Allen and Hamilton, draft in progress as of 9/5/97–This case study report will document the issues that the State of Virginia DOT addressed in developing a public-private partnership exemption to the State's procurement regulations for ITS initiatives and the lessons learned in establishing the partnership agreement.
- *Case Studies on Innovative State Procurement Practices*, Jack Kay, TransCore, draft in progress as of 9/5/97–This report will define critical issues associated with deploying, operating and maintaining ITS under state regulations used for Federal-aid projects.
- *Innovative Procurement Awareness Seminar*, Transcore, currently available–This is a four- to six-hour awareness seminar on innovative procurement procedures at the state and local levels.
- *ITS Software Procurement Document*, MitreTech, under development–This report will present guidance on procuring software that will be used in deploying ITS technology.

Contact: Shelley Row, FHWA Office of Traffic Operations, (202) 366-1993.

Intelligent Transportation System Technology in Work Zones

Description: Intelligent Transportation Systems (ITS) is the application of advanced sensor, computer, electronics, communications technologies and management strategies in an integrated manner to increase the safety and efficiency of travel. Applying ITS to construction work zones could consist of a combination of traffic management and traveler information systems in locations where agencies currently do not have the needed technology infrastructure. These systems provide agencies with the capabilities to control traffic and manage incidents through the implementation of various operational strategies based on current travel demand. The benefits of these systems are to provide advanced notice to travelers of roadway conditions to more accurately predict travel times, attempt to keep congestion from occurring, and mitigate the duration and impacts when congestion and incidents occur. Tests have documented that these systems have significantly increased traffic flow through work zones, increased drivers' confidence in real-time traffic information, decreased variability of traffic speeds within work zones and decreased the average speed of traffic approaching work zones.

511 Traveler Information. On July 21, 2000, the Federal Communications Commission (FCC) approved the US DOT's request to establish a national three-digit telephone number for traveler information. The FCC designated "511" as the single traveler information telephone number to be made available to states and local jurisdictions across the country. Today, there are at least 300 telephone numbers across the country that are being used to provide traveler information. One easy to remember number, regardless of the traveler's location, gives travelers' choices - choice of time, choice of mode of transportation, choice of route - saving lives, time and money. 511 is being implemented locally. Each jurisdiction evaluates its local requirements and decides how and when to implement 511.

New work zone software. In cooperation with Mitretek Systems, the FHWA Operations and Intelligent Transportation Systems Research Team has developed a new work zone delay estimation software called "Quickzone". This software will assist the State DOTs in the following tasks: 1) quantification of corridor delay resulting from capacity decreases in work zones; 2) identification of delay impacts of alternative project phasing plans; 3) supporting tradeoff analyses between construction costs and delay costs; 4) examination of impacts of construction staging, by: location along mainline, time-of-day (peak vs. off-peak), season (summer vs. winter); 5) assessment of travel demand measures and other delay mitigation strategies; and 6)

development of work completion incentives. A free beta-version of the software is available at the following site: http://www.tfhrc.gov/its/quickzon.htm .

Use of web information. Many State DOTs are beginning to use Internet websites to provide project related information to the public. The New Mexico State Highway and Transportation Department's web site (http://www.thebigi.com) receives about two to three thousand hits per day. It provides general project information, traffic reports, traffic camera views, message boards, phasing diagrams and even video drive-through models of the completed project.

Current use of ITS technology in workzones:

New Mexico: The NM SHTD utilized an independent market research to poll the public on how the Big I project was progressing. More than 93 percent of respondents either strongly agreed or agreed that work on the Big I Reconstruction Project is "progressing well". Some of NMSHTD's success may be attributable to the use if ITS technology. The NMHTD claims that ITS has allowed them to improve traffic flow monitoring and accelerate their response to incidents.

Illinois: The use of ITS technology in a workzone on I-55 near Springfield resulted in no significant (>1/8 mile) traffic back-ups, a reduced rate of traffic citations and only two crashes – one attributed to fatigue and the other to alcohol.

Michigan: MDOT's use of ITS technology on I-496 in Lansing reduced construction time (two seasons to one), resulted in a quicker incident response time, real-time information on problem areas for travelers and more effective communication with local agencies.

Arkansas: The Arkansas State Highway and Transportation Department's use of ITS on I-40 near West Memphis produced information at strategic locations for alternate routes, improved safety through traveler information on traffic backups, resulted in better incident response and reduced delay through better traffic coordination.

Additional information regarding FHWA's work zone programs may be obtained from: http://www.ops.fhwa.dot.gov/wz/workzone.htm; and the work zone clearing house http://wzsafety.tamu.edu.

Agencies: See above.

Contacts: For general information–James Pol, FHWA, (202) 366-4374; Tracy Scriba, SAIC, (202) 366-0855.

ISO 9000 Certification

Description: As part of an overall effort to improve quality, many agencies are considering the International Standards Organization (ISO) 9000 Certification. Utah DOT required Wasatch Construction, I-15 design-build contractor, and all of its major subcontractors and consultants to provide and participate in a quality program in conformance with ANSI/ASQC Q9001 (ISO 9001). Wasatch developed a Quality Plan, which included quality objectives, policies and procedures. Wasatch was required to have a documented quality program certified (or registered) to ANSI/ASQC Q9001 within 12 months of the Notice-to-Proceed.

The New York City Triborough Bridge and Tunnel Authority has implemented an ISO 9000 certification process for the Authority. It has implemented a requirement requiring ISO 9000 standards in all contract work.

Agencies: UT, New York City Triborough Bridge and Tunnel Authority

Contacts: For general information—Ken Jacoby, FHWA, (202) 366-6503; for specific information—John Bourne, I-15 Project Director, UDOT, (801) 594-6364; Robert Nespeco, Triborough Bridge and Tunnel Authority, (212) 486-2437.

Lane Rental

Description: Like cost-plus-time bidding and the active management payment mechanism, the goal of the lane rental concept is to encourage contractors to minimize road user impacts during construction. Under the lane rental concept, a provision for a rental fee assessment is included in the contract. The lane rental fee is based on the estimated cost of delay or inconvenience to the road user during the rental period. The fee is assessed for the time that the contractor occupies or obstructs part of the roadway and is deducted from the monthly progress payments.

The rental fee rates are stated in the bidding proposal in dollars per lane per time period, which could be daily, hourly or fractions of an hour. For many early lane rental projects, neither the contractor nor the contracting agency give an indication as to the anticipated amount of time for which the assessment will apply and the low bid was determined solely on the lowest amount bid for the contract items. However, Indiana and Florida have included the lane rental bid in the determination of the low bid similar to A+B bidding.

Agencies: Five states have used lane rental and reported favorable results under SEP-14. Lane rental was declared operational on May 4, 1995, and is no longer considered experimental. Since it was declared operational, a number of other states have evaluated the lane rental method. (See appendix B.)

Contacts: For general information–Jerry Yakowenko, FHWA, (202) 366-1562; or Chris Lawson , FHWA, (202) 366-4639.

References: (4), (5)

Lump Sum Bidding (No Quantities)

Description: While lump sum bidding is not new to the highway industry, Florida has developed several lump sum projects under SEP-14 with a new variation. The contractor is provided with a set of bid documents and is required to calculate quantities and develop a lump sum bid for all work. The contractor bears the responsibility for any change in the estimated quantities. Any costs associated with changed or unforeseen conditions as well as added or deleted work will be negotiated using standard practices.

Agencies: FL

Contact: Ken Leuderalbert, Florida DOT, (850) 414-4383.

References: (5)

Multi-Parameter Bidding including Quality (A+B+Q Bidding)

Description: Similar to cost-plus-time bidding, this concept envisions a contracting system where a bidder would bid the cost for completing the work (A), the time for completing critical work (B) (optional), and the level of quality or performance that would be achieved over a specified period of time (Q). A warranty bond or a method of making payment in future years would be necessary to implement this system. A similar concept titled "Pay for Performance" was suggested by Leet Denton and Frederic Lang in 1992, but did not receive a favorable review with many highway industry representatives.

Warranty Performance Bidding (A-Q bidding). Maryland, Kentucky, and a few other states have utilized a multi-parameter bidding to determine the length of a project warranty. On a Maryland bridge painting project, the bidders established the length of the warranty by an A-Q formula where A is the cost of the project and Q is the credit for each year that the contractor bids beyond the minimum five-year period up to a maximum of ten years. The contractor was given a credit of $35,000 for each additional year beyond the five-year period. For example, if the contractor submitted a bid of $300,000 and agreed to provide an eight-year warranty, their bid would be reduced by

$105,000 (3 time $35,000). Their bid for award comparison purposes would be $195,000, but the official contract amount would be $300,000. Maryland SHA determined the credit amount by estimating the cost to repaint the structure and dividing it by the ten-year warranty period.

The Kentucky Transportation Cabinet utilized multi-parameter biding on an alternate pavement type bidding project. Proposers were required to provide a five-year minimum warranty. For each additional year of warranty offered, their bid price for consideration was reduced by a fixed amount.

Agencies: MD, KY

Contacts: Paul Perkins, Maryland State Highway Administration, (410) 5445-8372; Gary Sharpe, Kentucky Transportation Cabinet, (502) 564-3280.

Reference: N/A

Nighttime Work Restrictions and Conditions

Description: NCHRP Synthesis No. 218, "Mitigation of Nighttime Construction Noise, Vibrations, and Other Nuisances," discusses many of the issues associated with night time construction and provides a current state-of-the-practice for state DOT methods to mitigate adverse impacts.

Some states have found an increase in the amount of work that must be done at night. Minnesota DOT made a commitment to improve the safety of construction work zones by implementing a team to make highway workers sufficiently visible during low-visibility conditions. MnDOT worked with two Minnesota-based companies specializing in reflectivity: 3M, the manufacturer of 3M Scotchlite Reflective Material; and Head Lites Corporation, a company specializing in creating high-visibility products. Together they created a set of proposed high-visibility garment specifications. While the specifications are still being improved, feedback from highway workers will lead to garments that offer a much higher level of 24-hour visibility and performance in and around the construction work zone.

MnDOT has set several high goals for its current specification program including increasing 24-hour, four-season visibility in and around a construction work zone; changing drivers' attitudes and behaviors when driving through a work zone; requiring all of MnDOT's 2,000 highway workers to wear the high-visibility retro-reflective garments that meet the final specifications; and, ultimately, incorporating MnDOT's specifications into the MUTCD so that highway workers will be more visible to motorists.

Agencies: MN

Contact: Mike Marttila, Minnesota DOT, (651) 205-4400.

No Excuse Incentives

Description: Florida DOT has used No Excuses Bonus* contracts to give the contractor an incentive to complete the contract work on time. The contractor is given a "drop-dead date" for completion of a phase of work or the entire project. If the work is completed in advance of this date, the contractor will receive a bonus. There are no excuses, such as weather delays, for not making the completion date. On the other hand, there are no disincentives (other than normal liquidated damages) for not meeting the completion date.

Other states are also proceeding with different versions of a "no excuse incentive" (NEI) clause.

- Iowa DOT is using an NEI clause that will provide for a $250,000 incentive for early completion on an I-35 reconstruction project. The NEI provision simply states that "any delays due to weather, change orders,

overruns of quantities, utility delays, or any other delays will not be considered as justification to modify the calendar date."

- Virginia DOT is using an NEI provision on a $100 million contract that is the first phase of the massive Springfield interchange project. An NEI provision will provide for a $10 million incentive for the completion of critical work by August 18, 2001 or a $5 million incentive for completion by November 17, 2001. A noteworthy provision in VDOT's clause requires the contractor to sign a statement releasing the state from any and all claims, causes, issues, demands, disputes and matters of controversy of any nature or kind.

- The New Mexico SHTD is proposing to use an NEI provision as a contractual incentive for the I-25 / I40 construction contractor to finish the project in 24 months. New Mexico is providing a 16-17 acre parcel with development potential as the incentive for the contractor.

* The term incentive is preferred rather than 'bonus.' The incentive amount should be based on a public savings for opening the project early (road user cost, or other as appropriate). The term bonus implies something paid in addition to what is expected, sometimes not having a basis in cost or benefit.

Agencies: FL, VA, IA, NM

Contacts: Ken Leuderalbert, Florida DOT, (850) 414-4383; Lee Onstott, New Mexico State Highway and Transportation Department, (505) 827-5631.

References: (5)

Performance-Related Specifications (PRS)

Description: Performance-related specifications (PRS) are quality assurance specifications that describe the desired levels of key materials and construction quality characteristics that have been found to correlate with fundamental engineering properties that predict performance. These quality characteristics (for example, air voids in asphaltic pavements, and strength of concrete cores) are amenable to acceptance testing at the time of construction. True performance-related specifications not only describe the desired levels of these quality characteristics, but also employ the quantified relationships containing the characteristics to predict subsequent pavement performance. They thus provide the basis for rational acceptance and/or price adjustment decisions. Simply put, PRS are improved quality assurance specifications. Their major distinguishing feature is the use of improved acceptance plans with rationally derived performance-related price adjustments. As in conventional QA specifications, it is the desired product quality rather than the desired product performance that is specified.
In May 2000, FHWA sponsored a national meeting in conjunction with the National Partnership for Highway Quality to plan a national strategy to develop a long-range plan for performance related specification research and implementation. It is anticipated that a PRS steering group will be formed with various representatives from AASHTO, FHWA, and industry. This working group will plan and coordinate efforts to implement PRS in the highway industry.

In early 2001, FHWA distributed PaveSpec 3.0, a software pavement design program, designed to develop and demonstrate performance-related specifications (PRS) for jointed plain concrete pavements (JPCP). The software has specifically been designed to help State DOTs determine performance-related pay factors (and pay adjustments) for JPCP highway pavements. PaveSpec 3.0 was written in support of the FHWA's project titled "Laboratory/Field Investigation of Performance-Related Specifications for PCC." For additional details see: http://www.tfhrc.gov//pavement/pccp/pavespec/tech_sum/index.htm

Agencies: PRS are in various stages of research and development. NJDOT has used PRS on a limited basis. The NJDOT PRS were developed for pavement and structural concrete and call for acceptance testing with price adjustment provisions for slab thickness, strength, and smoothness. FHWA has conducted evaluations of PCC PRS shadow field trial projects, where actual contractor pay was not affected, in Iowa, New Mexico, Missouri, and Kansas. FHWA's objectives were to verify/confirm the PRS effectiveness, determine its reasonableness, and identify potential problem areas.

In early 2000, the Indiana Department of Transportation (INDOT) let a project that contained PRS for PCC pavement. The specifications were based on FHWA's Guide for Developing PRS for PCC Pavements (FHWA-RD-98-155) and were compiled by a team consisting of the INDOT, Purdue University, ERES Consultants, and staff from the FHWA Division Office and Headquarters. The project was successfully completed in the fall of 2000. INDOT is now planning a second PRS paving project, this time using more advanced PRS that are beyond the basic level 1 PRS employed on the first project. In addition, FDOT, with the help of ERES Consultants and staff from the FHWA Division Office and Headquarters, in 2001 developed PRS that will be employed on a PCC paving project in 2002. Also later in 2001, Caltrans will begin development of PRS for a PCC paving project.

Contacts: Ken Jacoby, FHWA, (202) 366-6503; Peter Kopac, FHWA, (202) 493-3151; Gary Crawford, (202) 366-1286, for PRS Evaluations; Ted Ferragut, TDC Partners, 703-836-1671.

References: (1)

Practical Method of Paying for Unabsorbed Home Office Overhead (UHOO) Costs

Description: Agencies are often faced with the problem of determining the amount of compensation for UHOO costs paid to contractors due to owner-caused delays. If a state has the legal authority to pay unabsorbed home office overhead, typically an agency can: 1) pay overhead and indirect cost charges as claimed by the contractor; 2) conduct a lengthy and costly audit of the contractor's financial records to establish acceptable compensation levels for these claims; or 3) negotiate with the contractor for a mutually acceptable compensation level. All three of these approaches are inconvenient, costly, and time consuming.

NCHRP Project 20-5, Synthesis 32-10 (currently under development), “Compensation for Contractors Home Office Overhead” will document how State DOTs are compensating contractors for unabsorbed home office overhead for contract delays. It will identify the methods and percentages currently being used and report on the advantages and disadvantages of each method of compensation.

Caltrans is initiating a pilot project in which a special provision will be used to provide a payment method for unabsorbed home office overhead under certain conditions. The payment is based on a percentage of the total contract amount with the following conditions:

- For UHOO delays less than or equal to 12 percent of the number of working days originally specified in the contract, no payment is made.

- For UHOO delay days greater than 12 percent and less than or equal to 49 percent of the number of working days originally specified in the contract, UHOO will be computed as 5 percent of the contractor's original contract bid amount divided by the total number of working days originally specified in the contract, multiplied by the number of UHOO delay days exceeding 12 percent.

- If UHOO delays exceed 49 percent, an audit will be conducted by Caltrans to determine the payment for unabsorbed extended UHOO.

FHWA has allowed participation in UHOO costs only in cases when the owner agency caused the delay during which time the UHOO costs could not be charged off to earnings and the contractor was prevented from doing other work . Otherwise FHWA’s position has been to disallow UHOO when a State’s standard specification for extra work and force account work provide for full compensation at either the contract unit price, or a negotiated unit price.

Agencies: CA

Contact: Joe Dobrowlski, Caltrans, (916) 654-2157.

Prompt Payment / Return of Retainage

Description: The recently revised US DOT DBE regulations (49 CFR Part 26.29) require a contract clause for prompt payment and return of retainage to all subcontractors. The first provision requires prime contractors to pay subcontractors for satisfactory performance of their contracts. The second provision also provides that there is a prompt return of retainage payment for the prime to the subcontractor when the subcontractor's work is satisfactorily completed. On May 8, 2001, the US DOT issued a Notice of Proposed Rule Making which proposes several modifications to the above regulation to allow more flexibility in making prompt payments.

> ***Prompt Payment:*** The regulation did not result in major changes to the current practices of 31 State DOTs. The most dramatic impact of the regulation was that, for the first time, ten State DOTs and the Virgin Islands established prompt payment provisions (GA, KS, KY, MT, NE, NC, ND, OK, PR, SD, VIR IS).
>
> ***Return of Retainage:*** By contrast, the regulation had a significant impact on most of the State DOTs standard practices. In 33 states, the triggering mechanism for release of such monies was changed from the acceptance of the total contract to the satisfactory completion of the subcontractor's work during the life of the contract. The most dramatic impact of the regulation was that nine states eliminated the practice of withholding retainage from primes (CO, GA, KS, KY, MT, NC, OH, VT, VA). Five states are also prohibiting primes from withholding retainage from subcontractors (CO, GA, KY, OH, VT).

Contact: Charles Klemstine, FHWA Office of Civil Rights, (202) 366-6753.

Public-Private Partnerships / Toll Roads

Description: A 'public-private partnership' is a broad term used to describe a contract between a public owner and a private entity who have agreed to certain financial and contractual responsibilities. In such contracts, a private entity finances or invests in a transportation project by developing, designing, building and/or maintaining a roadway or bridge for a specified duration in return for monetary compensation, toll revenues or development rights. Many of the first U.S. roadways were privately financed by associations, users and the automotive industry. In some countries, concessionaires are used to allow corporations with mixed capital structure or privately owned corporations to finance, design, build and operate toll roads.

Agencies:

- CA–Build Operate Transfer (transfer after construction); SR-91 Express Lanes, $126 million
- CO–Toll Road, E-470 $341 million
- MO–Build Operate Transfer, Lake of the Ozarks Bridge, $23.6 million
- VA–Build Operate Transfer–Dulles Greenway $325 million
- VA–Rt. 895 Connector, $323 million, DB/F, via the VA Public-Private-Transportation Act
- VA–Route 288, $236 million, via the VA Public-Private-Transportation Act
- VA–Coalfields Expressway, $1.1 billion, via the VA Public-Private-Transportation Act
- New Brunswick, Canada–Design-Build-Operate-Maintain, Prince Edward Island Bridge
- Texas Turnpike Authority–$3.22 billion, 122-mile contiguous tollway
- Denver E-470–$1.2 billion , 46-mile beltway along the eastern edge of the Denver metro area

Contacts: For FHWA's major project information–Carol Jacoby, FHWA, (202) 366-1562; for general information regarding Virginia's Public-Private Transportation Act–Frank Gee, Virginia DOT, (804) 786-2783.

Quality Assurance Specifications

Description: AASHTO defines quality assurance as "all those planned and systematic actions necessary to provide adequate confidence that a product or service will satisfy given requirements for quality." Quality Assurance

specifications (previously referred to as QC/QA specifications) are mathematical probability (statistically) based specifications that recognize the normal variability of construction materials. They assign quality control sampling, testing, and inspection responsibility to the contractor and include some level of acceptance sampling, testing, and inspection by the Agency. Random sampling and testing is required to measure the statistical quality level of materials produced and placed. Quality assurance specifications identify specific quality characteristics to be measured for acceptance and typically provide for price adjustments related to a defined quality level of the product.

The Quality Construction Task Force of the AASHTO Subcommittee on Construction published a document titled *1999 Construction Quality Management Database Survey*. This is a convenient summary of the state DOTs' practices for Quality Assurance and Performance Related specifications. The AASHTO *Implementation Manual for Quality Assurance* (February 1996) and companion *Quality Assurance Guide Specification* (February 1996), as well as the National Quality Improvement Task Force Report on *Quality Assurance Procedures for Highway Construction* (FHWA DP-89, June 1994) are useful reference documents to assist in developing and implementing Quality Assurance specifications.

Agencies: At least 44 states in the U.S. and 3 Provinces in Canada use Hot Mix Asphalt QA specifications; about a dozen states use Portland Cement Concrete pavement and/or structural QA specifications; and a few states use QA specifications for embankments and aggregate base.

Contacts: Ken Jacoby, FHWA, (202) 366-6503; or Peter Kopac, FHWA, (202) 493-3151.

Quality Factors Affecting Prequalification, Bidding, and Contract Administration

Description: Several states currently have specifications and policies that allow for the use of past performance information, construction quality and contract progress in the contract administration process.

Summary of current practices: Professors R. Edward Minchin of Pennsylvania State University and Gary R. Smith of Iowa State University are currently preparing NCHRP Report 10-54, "Quality-Based Performance Rating of Contractors for Prequalifcation and Bidding Purposes." The objective of this study is to: 1) develop a quality-based system for performance-rating contractors for either prequalification or bid-selection and 2) prepare an implementation plan as a guide for transportation agencies and industry. The completion date is anticipated in late 2001.

The 1999 Transportation Research Board Paper #156, "Contractor Performance Rating – Where Are We Now?", provides a brief overview of the findings of NCHRP Report 10-54. Appendix G provides a copy of Table 3 from this report showing a State-by-State synthesis of the use of qualification factors and past performance.

Use of performance ratings to influence contract retainage: Maryland State Highway Administration has initiated a program to reduce the retainage requirements of contractors based on their performance ratings. Contractors with "A" evaluations for the last two years may have their retainage reduced from the normal 5 percent to 0 percent. This requirement is subject to the contractor's ability to maintain an "A" rating through interim reviews. Contractors with a "B" evaluation for the last two years may receive a reduced retainage requirement of 2.5 percent . Contractors with a "C" rating will be subject to the normal MDSHA 5 percent requirement. Contractors with a "D" rating for the last two years will begin at a 5 percent retainage and will be evaluated monthly with the retainage being raised to 10 percent for continued "D" performance. New bidders who have not previously been rated by MDSHA may be eligible for a reduction in retainage based on their past performance on highway and bridge work which can be documented by other public agencies. All other contractors who do not have a current rating would start with a 5 percent retainage.

Use of qualifications criteria to adjust bidding: The Oregon DOT used a form of price/qualifications-based bidding to replace the counterweight trunnion assemblies on the I-5 lift span bridge over the Columbia River. This contract was awarded on the basis of the highest composite score considering both price information and technical criteria. The composite score was determined with a 50 percent weight for cost and 50 percent weight for technical qualifications. The technical evaluation factors include: 1) waterfront/ moveable bridge construction experience, 2)

fabrication of complex machinery experience, 3) crane maintenance, inspection and operation, and 4) construction management team.

Oregon DOT was pleased with the use of this contracting method. Five contractors bid the project. It so happened that the contractor receiving the highest technical evaluation score was also the lowest bidder. Christie Constructors completed the critical contract work 14 days ahead of schedule and received the maximum incentive award. An April 9, 1998, report titled "Technical Qualifications Plus Price Contracting for Lift Span Trunnion Replacement" is available from Oregon DOT.

Use of contract progress information to adjust prequalification ratings: Virginia standard specification 102.01 allows VDOT to temporarily disqualify a bidder when the dollar value of work completed on a current contract is more than ten percent of the dollar value of the work that should have been completed on the basis of the contractor's latest approved progress schedule. VDOT uses this clause judiciously and provides contractors with ample notification and due process to allow a contractor to explain the reasons for the lack of progress.

Similarly, Section 108-8 of the North Carolina DOT specifications allows the state to remove a contractor from the qualified bidders list when a contractor can not justify at least "unsatisfactory" progress (generally described as more than 15 percent behind the progress schedule).

Use of performance ratings for contract incentives: The New Jersey DOT is evaluating a "Contractor Performance Rating System" on a pilot project. During the life of the contract, NJDOT rates the contractor's performance in such areas as: the progress schedule, job site safety, traffic control, environmental compliance, project management, and many items related to contract compliance. An overall weighted rating of 3.0 or less may result in probation or removal from the NJDOT's prequalification list while an overall rating of 5.0 may result in a maximum contract incentive of up to 5%.

Arizona DOT is evaluating a similar system on a $70 million urban design-build project. ADOT is using quantified checklists as a basis for incentive payments. ADOT used a contractual provision which made available an incentive payment (up to $260,000) for development and successful implementation of a workmanship inspection program internally to the design-builders organization. On this project, the design-builder is giving all of the incentive earned to the construction workers.

Use of performance ratings to adjust prequalification ratings and eliminate performance bonds: The Ontario Ministry of Transportation utilizes a prequalification rating system that includes factors for contractor performance and quality considerations. The prequalification ratings ensure that any contractor who wishes to bid on contracts is financially and technically capable of satisfactorily perform the work within the specified time. Initially, the Ministry intended to apply these rating criteria to the bidding process, however, industry concerns led the Ministry to limit this approach to their prequalification process. In conjunction with this program, the Ministry has eliminated the requirement for performance bonds and relies strictly on this prequalification program to ensure project completion.

Agencies: VA, NC, FL, Ontario, Mid-Bay Bridge Authority

Contacts: Frank Gee, Virginia DOT, (804) 786-2783; Steve DeWitt, North Carolina DOT, (919) 733-2210; Gene Figg, Florida DOT, (850) 224-7400; Ron Williams, Arizona DOT, (602) 712-7323, or William J. Higgins, Arizona DOT, (602) 712-8274; Mike Sigfried, New Jersey DOT, (609) 530-3811; David G. Manning, Ontario Ministry of Transportation, (905) 704-2197; Bob Harrison, Maryland SHA, (410) 545-0072; Ken Stoneman, Oregon DOT, (503) 986-3000.

Shadow Tolls

Description: Shadow tolls are fees paid to a facility operator by an owner (not by the facility users) for the services provided by the operator over the life of the franchise agreement. The shadow toll amount is based upon the type of vehicle and the distance traveled. This contracting technique is both an element of the owner's highway finance plan and a contracting mechanism where a private developer / facility operator accepts the risks of designing,

building, financing, and operating (DBFO) a highway facility. The concept of shadow tolls is particularly applicable to public/private partnerships and it is being used in the United Kingdom to develop a private sector of the highway industry that has the capability to perform all functions of the highway agency.

The benefits of financing and contracting under the shadow toll concept include the following:

- Within the broad concept of privatization, it cultivates the development of DBFO firms;
- It supplements the concept of DBFO and provides an incentive for the consideration of life-cycle concepts in the design, construction, maintenance and operation of the facility;
- Within limits, the risk of traffic projections can be transferred to the DBFO company;
- The owners monetary obligations for project development and operational costs are known in advance and guaranteed for a particular traffic level for the length of the franchise;
- The DBFO company assumes the traditional owner's responsibilities for a facility over the length of the franchise thus mandating a long-term approach to planning, design, construction, maintenance and operation of a facility. Quality must be considered in every phase of the franchise plan in order to build a cost effective facility and operate it at the lowest possible cost. The developer must plan for and design a facility which meets the expected needs of the projected traffic. The franchise agreement provisions require that the facility be operated and maintained in a manner which will minimize the impact to the road users;
- The U.K. Highways Agency claims that the eight shadow toll contracts signed to date will result in a 15 percent savings in comparison with the costs of traditional project development, however, this savings is very sensitive to the discount rate. Other branches of the UK Government are disputing the purported savings.
- Payments do not begin until the roadway is open for traffic. This is a powerful incentive to expedite the project delivery process.
- Other quality incentives include bonus payments for accident reductions and payment deductions for lane closures during maintenance.

The URS / Greiner's March 1998 Report titled "The Selective Use of Shadow Tolls in the United States" documents the applicability and use of this concept (http://www.fhwa.dot.gov/innovativefinance/shadtoll.htm).

Countries: UK, Finland

Contact: Raymond Tillman, URS/ Greiner Inc., (212) 736-4444.

Systems Integrator / Systems Manager

Description: Some ITS projects utilize this contracting technique to procure the services of a systems integrator / systems manager during the planning, design and construction of a project. The system integrator divides the project into several subsystems, designs all subsystems, provides technical advice relative to complex and critical components, develops system software, integrates and tests subsystems, and supervises operator training. The system integrator is precluded from performing the construction work of the deployment but can be retained to augment the transportation agency's project management capability with contract administration, project management, project inspection and construction supervision activities.

Under FHWA's SEP-14 program, Kentucky and Colorado have used the system integrator / system manager concept to plan, design and construct ITS facilities. Some of the construction work will be let and administered by competitively bid subcontracts awarded by the system integrator. It is recognized that there may be some ITS construction elements which would be more desirable to let as subcontracts to the system integrator contract. In certain situations, it will be a logical assignment of risk and responsibility to perform the work by a subcontract to the system integrator rather than through a prime contract administered by CDOT. FHWA's SEP-14 approval may be necessary on FHWA-funded projects, if an owner desires to combine "design and construction" services within the scope of the systems integrator / system manager contract.

Agencies: Advanced Traffic Management Systems in Atlanta; Boston; Cincinnati; Dallas; Fort Worth; Hartford, CT; Houston; Maryland CHART; Montgomery Co., MD; NJ Magic I-80; and Orlando.

Contact: Jon Obenberger, FHWA, (202) 366-2221.

References: (8)

Train Technicians, Construction Superintendents, Operating Craftsmen, and Engineers

Description: Many states have pursued certification programs in conjunction with a quality improvement program or with their transition to quality control/quality assurance programs. The FHWA regulation on Quality Assurance Procedures for Construction (23 CFR Part 637.209) states that "After June 29, 2000, all sampling and testing data to be used in the acceptance decision or the independent assurance program shall be executed by qualified sampling and testing personnel." The document title "Guidelines for Establishing a Technician Training and Certification Program" was published in September 1997 by the National Quality Initiative Steering Committee. It is a guide to help the states develop technician certification programs that satisfy the requirement of 23 CFR 637.

An organization, known as the Transportation Curriculum Coordination Council (TCCC), has been formed to prioritize and coordinate training development initiatives in construction, maintenance, materials, project management, and associated transportation disciplines in order to better focus efforts and resources nationally. The Federal Highway Administration's Office of Asset Management (HIAM) provided the impetus. The Western Alliance for Quality Transportation Construction (WAQTC), along with other regional groups, AASHTO, industry partners, National Highway Institute, and FHWA, contributors comprise membership. (See Appendix H, Main Contacts for the Transportation Curriculum Coordination Council.)

During 2000 and 2001, the TCCC met and embraced the value of working together in the development and prioritization of future training in transportation disciplines. Needs are identified and prioritized by the TCCC on a yearly basis. A national training web site is also being developed by the group to share up to date information with various partners and customers. It was agreed that the courses or other materials developed or adopted by this organization are intended as core instructional materials of a quality that may be utilized nationally as qualification or certification tools; however, organizations may use these materials in the manner that best addresses their specific needs.

Contacts: Howe Crockett, Chair, FHWA-Western Federal Lands, (360) 696-7750; John A. Perry, FHWA Office of Asset Management, (202) 366-2023.

References: (12)

Transferable Certification Programs

Description: Within various regions of the country, groups have formed to address the requirements of Federal Regulation CFR 637, Quality Assurance Procedures for Construction. In addition to the Transportation Curriculum Coordination Council (TCCC) noted above, there are five other regional groups that have been formed to address transferable certification programs.

- NETTCP is the "New England Transportation Technician Certification Program." The organization is a non-profit corporation managed by a Board of Directors. The Board of Directors includes representatives from the six NE States DOTs (CT MA ME NH RI VT), FHWA, FAA, industry and industry organizations, consultants and academia. NETTCPs website (http://www.nettcp.com) gives a full description of the organization and what NETTCP offers.

- The Western Alliance for Quality Transportation Construction (WAQTC) is a cooperation effort of twelve states: AK, AR, CA, CO, HI, ID, MT, NM, NV, OR, UT, WA and FHWA's Western Federal Lands Highway Division. The WAQTC is looking for a management firm to coordinate the program. The WAQTC has a web site (http://waqtc.org) with links to each member DOT. Each State keeps track of their certifications but

WAQTC has a single numbering system (name, qualification number, and the test procedures in which the folks are certified. Materials are in digital format and are available.

- The FHWA Multi-Regional Training and Certification Group (M-TRAC) includes membership from ten mid-west states (IL, IN, IA, KS, MI, MN, MO, NE, OH, and WI). North Dakota also actively participates in the M-TRAC group.

- The Mid-Atlantic Region Technician Certification Program (MARTCP) is a cooperative effort between MD, PA, NJ, DE, VA, WV, FHWA, and the District of Columbia. The organization's website is located at http://www.martcp.org.

The Southeast Task Force on Technician Training and Certification (SETFTTC) includes membership from twelve southeastern states (WV, VA, NC, SC, GA, FL, KY, TN, AL, MS, LA, AR) and the FHWA Southern Resource Center. SETFTTC's web site is located at http: www.dot.state.fl.us/statematerialsoffice/setaskforce, and provides contacts for each State's training programs in asphalt, concrete, soils, and aggregates.

Agencies: See above.

Contacts: Howe Crockett, Chair, FHWA-Western Federal Lands, (360) 696-7750; John A. Perry, FHWA Office of Asset Management, (202) 366-2023.

References: (12)

Warranties

Description: Warranties have been successfully used by some states on non-Federal projects for many years, to protect investments from early failure. Prior to 1991, the FHWA had a long-standing policy that restricted the use of warranties to electrical and mechanical equipment. The rationale for the restriction was that such contract requirements may indirectly result in Federal-aid funds covering maintenance costs, and the use of Federal-aid funds for routine maintenance is prohibited by law.

On August 25, 1995, FHWA published an Interim Final Rule (IFR) for warranties for projects on the NHS. The IFR states that warranty provisions shall be for a specific construction product or feature. Routine maintenance items are still not eligible. The IFR also prohibits warranties for items not within the control of contractors. The warranty Final Rule was published in the April 19, 1996, *Federal Register*. For non-NHS projects, warranty clauses may be used in accordance with State procedures.

Some construction industry associations have taken a position against any warranty provision that unfairly burdens a contractor with the responsibility for items that are not within its control. Highway contractors do not have control over the myriad of elements that affect the durability of a highway project (level of public investment—initially and in routine maintenance; specification of design and materials, traffic volume and axle loads). Small contractors may be unable to bond many construction projects. Warranties are popular in Europe, where a few huge, often government-controlled, companies dominate the construction industry. The situation is different in America, where the highway industry consists of nearly 9,000 small construction companies employing more than 255,000 people. The states and industry need to work cooperatively in developing any warranty provisions.

Agencies: The present use of warranties in the highway industry is shown in the table on the following page.

Product	Range of Warranties	States
Asphaltic Concrete / Rubberized Asphalt	3-8 Years	AL, CA, CO, FL, IN, ME, MI, MO, MS, OH, NM (20-yr), UT, WI
Asphaltic Crack Treatment	2 year	MI
Portland Cement Concrete Pavement	5 years	ME, MI, UT, WI
Bridge Components	5-10 years	WA, ME
Bridge Painting	2-10 years	IN, MA, MD, ME, MI, NH
Chip Sealing	1-2 years	CA, MI
Concrete repairs	3 years	MI
Hot-in-place recycling	3 years	MI
ITS Components / Buildings	2-3 years	VA, NC
Landscaping, Irrigation	1 year	WY, FL
Microsurfacing	2 years	CO, MI, NV, OH
Pavement Marking	2-6 years	FL, MT, OR, PA, UT, WV
Sign Sheeting	7-12	WV
Roofing	10 years	HI

In 1999, the Ohio Legislature passed House Bill 163 which requires Ohio DOT to utilize construction warranties on at least one-fifth of its capital construction projects. At least one-tenth of all pavement projects must include a warranty. For new pavements, the warranty must be at least seven years. For resurfacing and rehabilitation projects, a minimum five-year warranty is required. For all other products, a warranty of at least two years is required.

In spring 1999, the Illinois Legislature passed a bill which requires the Illinois DOT to use construction warranties on 20 projects over the next five years. The warranty on these projects must be a minimum of five years in duration.

Michigan enrolled Senate Bill 303 of 1997 included the following provision for development of warranties on state trunk line construction projects: "Of the amounts appropriated for state trunk line projects, the department shall, where possible, secure warranties of not less than 5-year full replacement guarantee for Contracted Construction Work." In response to this, Michigan DOT has worked in partnership with the road building and surety industries to develop warranty specifications "where possible." This includes: Major Pavement Reconstruction (5 Year Warranty) - 3 projects totaling $25.2 million; Preventative Maintenance Program (2-3 Year Warranties) - for statewide program including - bituminous overlay, microsurfacing, chip seal, concrete joint repair, joint seals, dowel bar retrofit, crack sealing, (estimated total program cost $50 million).

In August 2001, the FHWA Midwestern Materials and Pavement Engineers developed a table summarizing the current use of pavement warranties in the Midwest. This table is provided in Appendix Q. For additional details, contact Monte Symons, FHWA, MWRC Infrastructure Team Leader, 708-283-3549, monte.symons@fhwa.dot.gov.

See Appendix B - Innovative Contracting Technical Provisions from NCHRP 20-7, Task 109, for sample technical provisions for general warranties and plant mix asphalt pavement warranty technical provisions.

Contacts: For general information–Jerry Yakowenko, FHWA, (202) 366-1562; or Carol Jacoby, FHWA, (202) 366-1561.

References: (5)

Wrap-Up Insurance

Description: Some contracting agencies have utilized an insurance program called "wrap-up" or "owner controlled insurance" to meet their insurance needs on large projects. The Boston Central Artery Project and the Utah I-15 design-build project are two Federal-aid highway projects that have utilized this technique.

The promoters of this type of insurance claim the following benefits of wrap-up policies:

- Lower overall insurance costs through reduced bid prices,
- Elimination of contractor's mark-up on insurance premiums,
- Improved engineering and loss prevention services controlled by one insurer, and
- On-site medical treatment to handle injuries.

Administrators who have expressed concerns with the potential disadvantages of wrap-up policies question it's cost effectiveness for average or smaller projects. The purported "instant savings" of lowered bid prices are not easily verifiable. Firms with established safety records are not always rewarded for their diligence, while average or below average firms may be mixed in with other firms in the project policy.

Florida DOT has a wrap-up insurance pilot project underway. It includes seven construction projects with a total estimated construction of $210 million for the Suncoast Parkway. This is a 71 km (44-mi) facility on new alignment. The concept of wrap-up insurance will be evaluated upon completion of these projects. The 1999 Florida Legislature deleted OCIP from the Florida Statutes to prevent further pilot projects.

The Colorado DOT has implemented a "Partner Controlled Insurance Program" for the Southeast Corridor design-build project. CDOT partnered with the design-builder in the evaluation and selection of insurance providers. This innovative program offers has the potential to result in significant savings to the design-builder if the actual claims are within certain target levels.

FHWA is currently contracting with an insurance consultant for the development of an OCIP informational report which will serve as a basis for the agency's policy on OCIP.

NCHRP Project 20-5, Synthesis 32-12 (currently under development), "Owner Controlled Insurance Programs," will provide owners with information regarding the history and use of OCIPs in the design and construction of transportation projects. It will document the literature and the practice from both the owner and contractor perspectives.

Agencies: MA, UT, MI, WMATA (Washington, DC, subway system), LACTC (Los Angeles subway system)

Contacts: For general information–Edwin Okonkwo, FHWA, (202) 366-1558; Carol Jacoby, FHWA, (202) 366-1561; George Tinker, Colorado DOT, (303) 757-9579.

APPENDIX A

References

1. *Contract Management Techniques for Improving Construction Quality*, FHWA-RD-96-067.
2. FHWA Technical Advisory TA 5080.10.
3. 23 CFR 630.302 (h).
4. *FHWA Contract Administration Core Curriculum Manual*, FHWA, 1997.
5. FHWA SEP-14 Briefing.
6. *Design-Build RFQ/RFP Guide for Public Sector Projects*, Design-Build Institute of America (DBIA), 1995.
7. FHWA's Study Tour of the Northumberland Strait Crossing Project, FHWA Scanning Program, July 1996.
8. FHWA "ITS Procurement Informational Paper."
9. NCHRP Project 10-42, *Constructibility Review Process for Transportation Facilities*, Texas Transportation Institute, December 1996.
10. NCHRP 10-49, *Improved Contracting Methods for Highway Construction Projects*, final report, December 1999.
11. "The Selective Use of Shadow Tolls in the United States," URS/ Greiner Report for FHWA, March 1998.
12. "Guidelines for Establishing a Technician Training and Certification Program," September 1997, National Quality Initiative Steering Committee.
13. "1999 Construction Quality Management Database Survey," August 3, 1999, Quality Construction Task Force, AASHTO Subcommittee on Construction.

APPENDIX B

Innovative Contracting Technical Provisions from NCHRP Project 20-7, Task 109

At its August 1998 meeting, the AASHTO Highway Subcommittee on Construction identified the need for technical provisions for innovative contracting methods. These provisions were developed in conjunction with NCHRP Project 10-49, "Improved Contracting Methods for Highway Construction Projects." The objective of this task was to prepare draft technical provisions for the following contracting methods:

- warranties;
- cost-plus-time (A+B) bidding;
- incentives/disincentives;
- lane rental; and
- nighttime construction.

These provisions, outlined in Appendices B-1 through B-8, were developed in sufficient detail and in a format such that the AASHTO Highway Subcommittee on Construction could incorporate them into the *Guide Specifications for Highway Construction* (1998 edition).

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APPENDIX B-1

Generic Warranty

Part I: Technical Provision

Note: The references to specifications included in this technical provision are to the *Guide Specifications for Highway Construction,* 1998, published by the American Association of State Highway and Transportation Officials (AASHTO).

1XX.01 Description/Summary

When specified in the plans, warrant the indicated product for the period specified. Perform any required remedial work to correct deficiencies identified in periodic evaluations and, when specified, maintain the product during the warranty period.

Provide acceptable warranty bonds for the warranty period. (Refer to Section 1XX.02 Warranty Bond)

Develop remedial action(s) for those parts of the warranted product that do not meet specified standards of performance. The remedial action will be subject to the approval of the Agency. Complete the approved remedial work at no additional cost to the Agency. (Refer to Section 1XX.03 Warranty Provisions, Paragraph D)

When specified, maintain the warranted product during the warranty period at no additional cost to the Agency. (Refer to Section 1XX.03 Warranty Provisions, Paragraph E)

A Conflict Resolution Team will be formed to resolve any disagreements associated with the warranty work. (Refer to Section 1XX.06 Conflict Resolution Team)

1XX.02 Warranty Bond

A. Provide a warranty bond effective for the period of the warranty, to include time periods required for remedial actions that may extend beyond the end of the warranty period. These bonds are intended to insure completion of required warranty work, including payments for all labor, equipment, and materials used for all maintenance and remedial work resulting from these warranty provisions.

B. These bonds will meet all of the requirements specified for the construction period bonds in Section 103.05 Contract Bond except that the amount of the warranty bonds will be as shown in a supplemental specification.

1XX.03 Warranty Provisions

A. *Term.* The warranty period shall be as stated in the plans, or the special provisions, or supplemental specifications for the warranted product. The beginning date of the warranty period is the date of final acceptance of the construction phase of the project.

B. *Performance Requirements.* The parameters used to measure performance of the warranted product are listed in the special provision or supplemental specification for the warranted product.

C. *Performance Evaluation.* Each parameter will be measured at least annually. More frequent measurements may be made when considered necessary by the Agency. The Agency will conduct these evaluations at no cost to the Contractor.

The Agency will notify the Contractor of the evaluation date. The Contractor may have a representative present during the evaluation.

The evaluation results will be provided to the Contractor within [14] days of the completion of the evaluation.

If the evaluation results are disputed, provide written notification to the Agency within 30 days following the receipt of the evaluation results. If the Contractor and Agency cannot resolve the dispute within the following 30 days, the dispute will be presented to the Conflict Resolution Team.

D. *Remedial Action*. If the annual evaluation results exceed the established threshold levels, develop a remedial action that will correct the inadequate condition. Within 30 days of the receipt of the evaluation results, submit the proposed remedial action for the Agency's approval. If the Agency does not approve the proposed action, or negotiate a mutually agreeable remedial action with the Contractor within 30 days, the issue will be presented to the Conflict Resolution Team for resolution.

1. *Remedial Action Requirements.* Use materials and construction methods, which conform to the specification requirements, included in the project for which the warranty applies and which correspond to the remedial action employed. Where no corresponding specification exists, submit appropriate specifications to the Agency for approval.
2. *Schedule for Remedial Work.* Begin the remedial work within 30 days following approval of the remedial action unless a later date is mutually agreed upon with the Agency.
3. *Warranty on Remedial Work.* Warranty for all remedial work will be limited to the period of the original contract warranty.

E. *Maintenance*. When specified in the special provisions or supplemental specifications for the warranted product, maintain the product for the warranty period.

1. The respective maintenance responsibilities of the Contractor and the Agency are outlined in the special provisions or supplemental specifications for the warranted product.
2. Use materials and construction methods which conform to the specification requirements included in the *Guide Specifications for Highway Construction, 1998* and which correspond to the maintenance action employed. Where no corresponding specification exists, submit appropriate specifications to the Agency for approval.

1XX.04 Emergency Work

If, in the opinion of the Agency, conditions require immediate attention for the safety of the traveling public, and the Contractor cannot perform the required work on a timely basis, the Agency can have the work performed, at the Contractor's expense, with Agency personnel or through an Agency procurement. Any work thus performed will not alter the requirements, responsibilities, or obligations of the warranty.

1XX.05 Exceptions

The Agency will be responsible for repairing conditions of the warranted product that are caused by factors beyond the control of the Contractor. Included are conditions resulting from major accidents, major flooding, and other acts of God.

1XX.06 Conflict Resolution Team

A Conflict Resolution Team for Warranty Work (CRT) will be established prior to the initiation of the warranty period to resolve any conflicts regarding the warranty requirements. This team will be composed of two representatives appointed by the Contractor, two representatives appointed by the Agency and an independent party mutually agreed upon by the Contractor and the Agency. Decisions of the CRT will be based on a simple majority vote. The expenses of the independent party will be shared by the Contractor and the Agency. Any disputes involving the warranty provisions will be initially processed through the Conflict Resolution Team for Warranty Work. If resolution is not achieved the Agency's claims procedure specified in Section 105.18, Claims for Adjustment, shall be invoked.

The following modification should be made to the Guide Specifications.

XXX. Contractor's Responsibility for Work

The provisions of Section 104.12, Contractor's Responsibility for Work, are supplemented by the following:

A. For the specified warranty period following final written acceptance of the construction phase of the project, remain responsible for the warranted product to the extent specified herein.

B. The Contractor will be released from further warranty work or responsibility at the end of the warranty period, or when previously required warranty work has been completed, which ever occurs last.

XXX. General Provisions

During the period of execution of any maintenance and remedial action, and limited to the segments where the work is being performed, the provisions of Division 100. General Provisions, except as herein modified, shall remain in effect.

Part II: Considerations

Note: These "Considerations" list options and alternate approaches to the technical provisions.

The references to specifications included in this technical provision are to the *Guide Specifications for Highway Construction,* 1998, published by the American Association of State Highway and Transportation Officials (AASHTO).

1XX.02 Warranty Bond

It may be difficult for the Contractor to obtain warranty bonds for long warranty periods.

This specification provides the bonds as the only means insuring that the Contractor will honor the warranty. A retainage, perhaps with scheduled payments to the Contractor based on compliance with the warranty provisions, may be desirable in some cases to provide additional assurance that the warranty provisions will be fulfilled.

A combination of bonds and retainage could also be specified.

The bonded amount should be at least equal to the highest probable costs to fulfill the warranty conditions. One state DOT based the bonded amount on the estimated cost to remove and replace 37 mm (1.5 in) of asphaltic concrete pavement.

1XX.03 Warranty Provisions

A. *Term.* The beginning of the warranty period may alternately be established as the date when all warranted pavement has been completed on all or portions of the project. For example, if a project involves completion of a main lane early in the project, it may be considered appropriate for the warranty period for that pavement to begin at that early date.

E. *Maintenance*. Due to the interrelationship of routine maintenance and potential remedial requirements, it appears desirable to assign pavement-related maintenance responsibilities to the Contractor for the warranty period. However, few contractors are familiar with maintenance activities and many may be geographically located such as to necessitate their subcontracting with a local contractor to address the maintenance requirements.

1XX.06 Conflict Resolution Team

Some warranty specifications state that the decision of the CRT is final. However, some states do not permit binding arbitration, in which case the decision of the CRT could not be considered as final.

It is recommended that the two members appointed by the Agency should be representatives of the central office and the local office, respectively. This could provide a more uniform Agency interpretation of the warranty requirements.

XXX. General Provisions

It is essential that those applicable portions of the General Provisions (e.g., Definitions, Maintenance of Traffic, Final Cleaning Up, Environmental Protection, Inspection of Work, Load Restrictions, Legal Relations, Insurance, Indemnity, and Responsibility to Public, etc.) must remain in effect for the period when the Contractor is performing warranty work. It may be desirable to specifically identify the portions of the General Provisions that remain in effect.

APPENDIX B-2

Plant-Mix Asphalt Pavement Warranty

Part I: Technical Provision

Note: This supplemental technical provision demonstrates how the generic warranty technical provision could be employed for a plant-mix asphalt pavement. It is a compilation of practices employed in several states. Since the experience is limited and none of the warranted projects studied have lives exceeding the warranted periods, this should not be considered to necessarily be best and proven practices.

The references to specifications included in this supplemental technical provision are to the *Guide Specifications for Highway Construction*, 1998, published by the American Association of State Highway and Transportation Officials (AASHTO).

4XX.01 Description/Summary

Construct a plant-mix asphalt pavement consisting of one or more courses of asphalt mixture constructed on a prepared foundation, as shown on the plans. Perform any required remedial work to correct deficiencies identified in annual pavement evaluations, as described in Section 4XX.06. Maintain the pavement during the warranty period.

4XX.02 Warranty Provisions

A. Warrant all pavement constructed in this project for a period of five years.

B. Provide warranty bonds in the amount of $_____.

4XX.03 Materials

Establish the mix formula and select all materials. All materials used for the construction of plant-mix pavements will conform to the requirements of Section 401.02 Material.

4XX.04 Construction

A. *General.* Construct all plant-mix pavements in conformance with the requirements of Section 401.03 Construction.

B. *Quality Control/Quality Assurance.* Develop a QC/QA Plan that meets the requirements of AASHTO R-9, *Acceptance Sampling Plans for Highway Construction*. Submit this plan to the Agency for approval prior to beginning of plant-mix pavement construction. Provide periodic reports to the Agency that demonstrate compliance with the approved plan, including test results.

4XX.05 Maintenance Requirements

A. *Contractor Responsibility*. During the warranty period, perform all required pavement-related maintenance except that listed in paragraph B of this section. Pavement-related maintenance includes, but is not limited to crack sealing, pot hole repair, correction of bleeding areas and isolated level-ups. May initiate pavement-related maintenance activities. Perform all required pavement-related maintenance work within [30] days of Agency notification unless a later date is mutually agreed upon with the Agency.

B. *Agency Maintenance Responsibility*. The Agency will perform routine maintenance during the warranty period, such as snow and ice removal, including application of de-icing chemicals; repairs to safety appurtenances; pavement markings; mowing, and sign maintenance. The Agency will not perform any routine pavement surface maintenance activities, such as crack sealing, pot hole repair, correction of bleeding areas and isolated level-ups during the warranty period, except for emergency conditions as stated in Section 1XX.04, Emergency Work. The Agency will advise the Contractor when pavement-related maintenance work is required.

4XX.06 Performance Requirements

A. *Performance Indicators.* The indicators used to measure performance of the pavement are listed in Section C, "Pavement Performance Indicators, Threshold Values, and Guide to Remedial Actions."

B. *Evaluation Parameters and Methods.* The Agency will conduct the pavement evaluation in accordance with the standard methods adopted by the Agency and described in *(the Agency's document that includes the pavement evaluation methods.)*

Annual pavement evaluation surveys will be conducted by dividing the warranted pavement into nominal 1.5-km (one-mile) sections. Two 150-m (0.1-mile) segments in each section will be evaluated for pavement distress. One segment will be from 450 m to 600 m (0.3 to 0.4-mile) from the start of the section. The second segment will be randomly selected from the nine remaining segments. The second segment to be evaluated will be reselected each year. Performance results for each nominal 1.5-km (one-mile) section are based on the evaluation of the two 150-m (0.1-mile) segments

Additional surveys may be performed, either on additional segments, or at additional times during the warranty period if the Agency has reason to suspect that threshold levels are exceeded.

The results of the pavement evaluation survey and the identification of segments where threshold levels have been exceeded, together with the identification of the deficiencies, will be reported to the Contractor within fourteen days of completing the survey.

C. *Pavement Performance Indicators, Threshold Values, and Guide to Remedial Actions*

Performance Indicator (1)	**Threshold Levels (2)**	**Guide to Remedial Action (3)**
Ride Quality	International Roughness Index - 2.10 m/km (133 in/mile)	Level-up, overlay, milling or combinations thereof to correct inadequacies.
Surface Friction	Skid Number must average 35 with no individual value less than 25	Milling, surface treatment, or overlay to correct inadequacy.
Alligator Cracking	1% of area in a segment.	Remove and replace distressed layer(s). Remove the distressed surface to a depth not to exceed the warranted pavement.
Block Cracking	1% of area in a segment.	Remove and replace distressed layer(s). Remove the distressed surface to a depth not to exceed the warranted pavement.
Edge Raveling	10% of segment length.	Remove and replace distressed layer(s).
Flushing	20% of segment length.	Remove and replace distressed surface mixture full depth of distressed layer.
Longitudinal Cracking	300 m (1000 ft) for cracks which average 13 mm (0.5 inch) or less in width.	Rout and seal all cracks with rubber crack filling material, or agreed upon equal.
	150 m (500 ft) for cracks which average greater than 13 mm (0.5 inch) in width.	Rout and seal all cracks with rubber crack filling material, or agreed upon equal.
	Either of the above plus 25% of length having band cracking or dislodgment.	If over 300 m (1000 ft), remove pavement and replace for the affected depth. If less than 300 m (1000 ft), apply a patch 0.6 m (2 ft) in width and 0.6 m (2 ft) longer than the crack length, for the affected depth.

Performance Indicator (1)	Threshold Levels (2)	Guide to Remedial Action (3)
Rutting	6 mm (0.25 in) in depth	Mill surface with fine-toothed mill to remove ruts, overlay or micro-surface.
	13 mm (0.5 in) in depth	Remove and replace distressed layer
Surface Raveling	Existence	Apply a chip seal coat or partial depth repair to the distressed areas.
Transverse Cracking	25 cracks per segment.	Rout and seal all cracks with a rubberized crack filler, or approved equal.
	25 cracks per segment with 25% of the linear meters of cracking having band cracking or dislodgment	Remove and replace distressed layer(s) to a depth not to exceed the warranted pavement.
Patching	45 m (150 ft) of patching per segment (excluding longitudinal cracking remedial action).	Remove and replace surface layer or place a 32-mm (1.25-in) overlay).
Potholes, slippage areas, other disintegrated areas.	Existence	Remove and replace distressed area(s). The removal area will be equal to 150% of the distressed area to a depth not to exceed the warranted pavement.

4XX.07 Remedial Work

Submit a plan, as required in Section 1XX.03. Warranty Provisions, that includes proposed remedial actions for the pavement areas where the performance results indicate that threshold levels have been exceeded.

Apply the remedial work to the entire pavement area identified as exceeding the threshold levels unless otherwise noted in 4XX.06, Section C, "Pavement Performance Indicators, Threshold Values, and Guide to Remedial Actions." Restore the design thickness where the pavement thickness is reduced as part of the remedial work.

4XX.08 Pavement Markings

Restripe and/or reinstall raised pavement markers damaged or obliterated due to your maintenance and/or remedial work.

4XX.09 Measurement

Warranted plant-mix asphalt pavement for each type specified will be measured as specified in Section 401.04 Measurement.

4XX.10 Payment

All work performed and measured as described above will be paid for as provided below for each type specified. Only that work included in the construction of plant mix pavement will be paid for directly. All work and materials included in maintenance and remedial work for warranted plant-mix asphalt pavement will not be paid for directly.

Pay Items	Pay Unit
Asphalt Cement (Warranted)	Megagram or liter (Ton or gallon)
Plant mix—Type___ (Warranted)	Megagram or square meter (Ton or square yard)

Part II: Considerations

Note: These "Considerations" list options and alternate approaches to the technical provisions.

This supplemental technical provision demonstrates how the generic warranty technical provision could be employed for a plant-mix asphalt pavement. It is a compilation of practices employed in several states. Since the experience is limited and none of the warranted projects studied have lives exceeding the warranted periods, this should not be considered to necessarily be best and proven practices.

The references to specifications included in this supplemental technical provision are to the *Guide Specifications for Highway Construction, 1998*, published by the American Association of State Highway and Transportation Officials (AASHTO).

4XX.02 Warranty Provisions

A. The Agency may be more specific in the work that is to be warranted, e.g., all pavement constructed on the main lanes, or the main lanes and adjacent shoulders, etc.

B. The bonded amount should be at least equal to the highest probable costs to fulfill the warranty conditions. One state DOT based the bonded amount on the estimated cost to remove and replace 37 mm (1.5 in) of asphaltic concrete pavement.

4XX.04 Construction

A. *General.* The Contractor's responsibility includes the construction of the pavement as would normally be required. During the warranty period, the Contractor is also responsible for maintaining the pavement (e.g., repairing pavement failures, crack sealing, pothole repairs, treating flushed pavement areas, aggregate shelling, etc.) These maintenance responsibilities are further defined in Section 4XX.04. For pavement deficiencies identified by annual or special evaluations, the Contractor is responsible for developing and performing remedial actions to correct the deficiency. Essentially, the Contractor is responsible for all pavement-related construction, maintenance and remedial action during the construction and warranty periods of the contract.

B. *Quality Control/Quality Assurance.* The required QC/QA plan could be AASHTO R-9, an Agency's plan, or some other acceptable plan.

4XX.06 Performance Requirements

B. *Evaluation Parameters and Methods.* It is suggested that the evaluation be conducted using the same parameters, equipment, methods, procedures, and staff (to the extent possible) employed as part of the Agency's pavement management system.

C. *Pavement Performance Indicators, Threshold Values, and Guide to Remedial Actions.* The table of performance indicators, threshold levels, and guide to remedial action is adapted from the Indiana DOT and Wisconsin DOT warranty specifications. It provides a format for presenting the specific requirements.

It is recommended that the Agency review information in their pavement management system and consult with industry prior to establishing the requirements.

It is suggested that the Agency's pavement performance data on similar type highways be researched to select significant performance parameters and to establish realistic threshold values that parallel performance of quality pavements in the area.

Some states have set threshold values that change during the warranty period in recognition of the normal pavement deterioration with age and traffic.

Some states also provide a varying threshold for some traffic-related parameters (e.g., rutting) based on traffic volumes (or truck volumes) which grossly exceed the design traffic.

APPENDIX B-3

A+B with Incentives/Disincentives

Part I: Technical Provision

Note: The references to specifications included in this technical provision are to the *Guide Specifications for Highway Construction, 1998,* published by the American Association of State Highway and Transportation Officials (AASHTO).

XXX.01 Description/Summary

A. Bid the time in calendar days that the Bidder proposes to use to substantially complete specified segment(s) of the project, subject to any minimum and/or maximum number of days which may be specified for each segment.

B. Incentive/disincentive (I/D) values are listed for each specified segment of the project.

C. The bids will be adjusted, for bid comparison purposes only; to include consideration of the days bid and the I/D value for each specified contract segment.

XXX.02 Contract Segments, Incentives/Disincentives

The contract segments for this project, the maximum and minimum number of days which may be bid for each segment, and the corresponding incentive/disincentive amounts are as shown on the plans or in a special provision to this section.

XXX.03 Progress Schedule

Prepare a Critical Path Method schedule as defined in Section 108.02.B, Contractor-Prepared Critical Path Method (CPM) Schedule. Clearly indicate the plans to complete the work described in each of the specified Contract Segments within the time bid for the segment.

Modifications to Sections 101.03, 102.07, 103.01, 108.02.B, and 108.07 of the Guide Specifications would be necessary

XXX.XX Definitions

The following definitions are added to Section 101.03, Definitions.

Contract Segment. A specifically identified portion of a project. Examples are a bridge, a roadway segment, or an interchange.

Maximum Days. This is the maximum number of calendar days specified for a specific contract segment. It is the maximum number of days that the Bidder may bid for the subject contract segment.

Substantial Completion. The point at which the project is complete such that it can be safely and effectively used by the public without further delays, disruptions, or impediments. For the conventional bridge and highway work, it is the point at which all bridge deck, parapet, pavement structure, shoulder, permanent signing and markings, traffic barrier, and safety appurtenance work are complete.

XXX.XX Irregular Proposals

The following is added to the conditions listed in Section 102.07, Irregular Proposals, under which proposals are considered irregular and may be rejected.

G. When A+B bidding is specified, the proposal does not contain the number of days bid to complete each of the listed Contract Segments, or the number of days bid is outside the range specified for the Contract Segment.

XXX.XX Consideration of Proposals

The following replaces Section 103.01, Consideration of Proposals.

When A+B bidding is specified, after proposals are opened and read, they will be compared based on the adjusted bid, which is determined as follows:

$$\textbf{Adjusted bid} = A + [B_1 \times (I/D)_1] + [B_2 \times (I/D)_2] + \ldots [B_n \times (I/D)_n]$$

where:

A = Sum of the estimated unit quantities x the respective unit prices bid;

B_1 = Number of calendar days bid to complete contract segment No. 1

$(I/D)_1$ = The listed I/D value for segment No. 1

B_2 = Number of calendar days bid to complete contract segment No. 2

$(I/D)_2$ = The listed I/D value for segment No. 2

n = Number of contract segments

The adjusted bids will be used only for the comparison of proposals and to determine the low bidder. Payment for work accomplished will be in accordance with the pay provisions of the specified items of work. Payment for incentives and disincentives will be as specified in Section XXX.XX, Incentive/Disincentive for Early Completion.

Bid results are public information.

Unit prices govern if discrepancies exist between unit bid prices and extensions. The number of days bid govern if discrepancies exist between the number of days bid and the extensions for the A+B bid comparison. The agency can reject proposals, waive technicalities, or advertise for new Proposals.

XXX.XX. Incentive/Disincentive for Early Completion

The following replaces Section 108.07, Incentive/Disincentive for Early Completion.

It is in the public's interest that the specified contract segments be substantially completed at the earliest possible date. An incentive/disincentive is provided to encourage the early completion of the contract segments described in Section XXX.03.

The beginning date for charging calendar days to a contract segment will be the day when traffic on the contract segment, or traffic affected by work on the contract segment, is initially negatively impacted by the construction, unless the beginning date is otherwise stated in the plan notes or specifications. Calendar days will continue to be charged until the segment is determined to be substantially complete. The Engineer will determine the beginning date and the date of substantial completion.

For each of the contract segments that are substantially completed in fewer days than bid by the Contractor, the Contractor will earn an incentive. This incentive payment will be calculated by multiplying the listed I/D value for the subject segment by the difference in the number of days used by the Contractor to substantially complete the segment and the number of days bid for the segment.

Correspondingly, for each of the contract segments that are not substantially completed within the days bid by the Contractor, the Contractor will be charged a disincentive. This disincentive will be calculated by multiplying the listed I/D value for the subject segment by the difference in the number of days used by the Contractor to substantially complete the segment and the number of days bid for the segment.

Incentives or disincentives will be paid or deducted, as appropriate, in the current progress payment and in the final payment.

Total incentives paid shall not exceed [10] percent of the amount of the contract. There is no limit on the amount of disincentives deducted.

Liquidated damages under Section 108.08, Failure to Complete on Time, may be assessed concurrently with disincentives if they are not based on duplicate costs.

If a progress or final estimate, including incentives and disincentives indicates that the agency has overpaid the Contractor an amount exceeding the retainage, submit a certified check to the agency for the difference between retainage and the amount of the overpayment. Submit check within [30] days of payment notice.

Request time extensions only for documented industry-wide labor disputes, industry-wide material delivery delays, acts of God, inordinate periods of inclement weather or other events beyond the control of the Contractor.

Part II: Considerations

Note: These "Considerations" list options and alternate approaches to the technical provisions.

The references to specifications included in this technical provision are to the *Guide Specifications for Highway Construction, 1998,* published by the American Association of State Highway and Transportation Officials (AASHTO).

XXX.02 Contract Segments, Incentives/Disincentives

Example:

Segment No.	Description	Max Days	Min Days	Incentive/ Disincentive (I/D)
1	(Note: A segment could be the entire project.)	(Optional)	(Optional)	$
2				
etc.				

If the agency elects to establish the maximum or minimum days for a contract segment(s), the proposed construction should be sufficiently analyzed to ensure the practicality and reasonableness of the limit.

The incentive/disincentive (I/D) value is ideally established by evaluating the costs to the traveling public resulting from traffic congestion (and possibly other costs such as lost tolls) during the construction operations on the contract segment. If the I/D is not significantly high in relationship to the contract amount, the I/D provisions may be a less than meaningful incentive for early completion.

Some agencies have included a statement that the I/D is substantially less than the estimated road user costs. It is assumed that the strategy was to improve the agency's posture in the event of litigation.

Some agencies also include engineering and administrative costs in the I/D value.

XXX.XX Consideration of Proposals

Example:

Item	Unit	Estimated Quantity	Unit Bid Price	Extension
Asphalt Cement	Megagram	1,000	$125.00	$ 125,000
Plant mix – Type ___	Megagram	20,000	75.00	$ 1,500,000
Base Bid (A)				**$1,625,000**

Segment	Days Bid (B)	I/D	B x I/D
1	125	$2,000	$250,000
2	60	1,500	90,000
3	75	3,000	225,000
Total Bid Adjustment			**$565,000**

Adjusted Bid $= A + [B_1 \times (I/D)_1] + [B_2 \times (I/D)_2] + \ldots [B_n \times (I/D)_n]$

$= \$1,625,000 + \$565,000$

$=$ **$2,190,000**

XXX.XX Incentive/Disincentive for Early Completion

Paragraph 4:

The current Section 108.07 uses the term "Unrestricted continuous traffic" as the condition of completion. This is further defined as follows: "Unrestricted continuous traffic" means that the affected lanes are open to unrestricted traffic flow with the specified striping and safety features in place.

The term "substantial completion" as used herein is considered to be more generally applicable for potential project segments.

Paragraph 7:

Some agencies have elected to eliminate liquidated damages when the I/D provisions would result in additional charges for the same time overruns.

Paragraph 9:

For design modifications or changes in quantities requiring a contract modification and/or a change order, appropriate modifications to the time bid for affected contract segments could be included in the negotiations.

APPENDIX B-4

Incentives/Disincentives

Part I: Technical Provision

Note: The references to specifications included in this technical provision are to the *Guide Specifications for Highway Construction, 1998,* published by the American Association of State Highway and Transportation Officials (AASHTO).

XXX.XX Incentive/Disincentive for Early Completion

The following replaces Section 108.07.

Meet Contract incentive/disincentive provisions.

Incentive/disincentive (I/D) amounts per calendar day for each contract segment are specified on the plans or in a special provision.

The beginning date for charging calendar days for a contract segment will be the day when traffic on the contract segment, or traffic affected by work on the contract segment, is initially negatively impacted by the construction, unless the beginning date is otherwise stated in the plan notes. Calendar days will continue to be charged until the segment is determined to be substantially complete. The Engineer will determine the beginning date and the date of substantial completion.

For each of the contract segments that are substantially completed in fewer days than bid by the Contractor, the Contractor will earn an incentive. This incentive payment will be calculated by multiplying the listed I/D value for the subject segment by the difference in the number of days used by the Contractor to substantially complete the segment and the number of days bid for the segment.

Correspondingly, for each of the contract segments that are not substantially completed within the days bid by the Contractor, the Contractor will be charged a disincentive. This disincentive will be calculated by multiplying the listed I/D value for the subject segment by the difference in the number of days used by the Contractor to substantially complete the segment and the number of days bid for the segment.

Incentives or disincentives will be paid or deducted, as appropriate, in the current progress payment and in the final payment.

Total incentives paid shall not exceed [10] percent of the amount of the contract. There is no limit on the amount of disincentives deducted.

Liquidated damages under Section 108.08, Failure to Complete on Time, may be assessed concurrently with disincentives if the following conditions exist.

A. Disincentives and liquidated damages are not based on duplicate costs; and

B. The costs included in disincentives and liquidated damages are stated in the contract documents.

If a progress or final estimate, including incentives and disincentives indicates that the agency has overpaid the Contractor an amount exceeding the retainage, submit a certified check to the agency for the difference between retainage and the amount of the overpayment. Submit check within [30] days of payment notice.

Request time extensions only for documented industry-wide labor disputes, industry-wide material delivery delays, or acts of God that the Contractor cannot control.

Modifications to Sections 101.03 of the Guide Specs would be necessary, or alternatively, these definitions could be incorporated into the technical provision.

XXX.XX Definitions

The following definitions are added to Section 101.03 Definitions.

Contract Segment. All or a specifically identified portion of a project. Examples are a bridge, a roadway segment, an interchange, or the entire project.

Substantial Completion. The point at which the project or a contract segment is complete such that it can be safely and effectively used by the public without further delays, disruptions, or impediments. For conventional bridge and highway work, it is the point at which all bridge deck, parapet, pavement structure, shoulder, signing and markings, traffic barrier, and safety appurtenance work are complete.

Part II: Considerations

Note: These "Considerations" list options and alternate approaches to the technical provisions.

The references to specifications included in this technical provision are to the *Guide Specifications for Highway Construction, 1998*, published by the American Association of State Highway and Transportation Officials (AASHTO).

XXX.XX Incentive/Disincentive for Early Completion

Paragraph 5:

The current Section 108.07 uses the term "Unrestricted continuous traffic" as the condition of completion. This is further defined as follows: "Unrestricted continuous traffic" means that the affected lanes are open to unrestricted traffic flow with the specified striping and safety features in place.

The term "substantial completion" as used herein is considered to be more generally applicable for potential project segments.

Paragraph 10:

For design modifications or changes in quantities requiring a contract modification and/or a change order, appropriate modifications to the time bid for affected contract segments could be included in the negotiations.

APPENDIX B-5

Lane Rental

Part I: Technical Provision

Note: The references to specifications included in this technical provision are to the *Guide Specifications for Highway Construction, 1998,* published by the American Association of State Highway and Transportation Officials (AASHTO).

1XX.01 Description

When specified in the plans or in the specifications, lane rental will be charged as described in this technical provision.

The lane rental period will begin when a traffic lane is closed to traffic and will end when the closure is discontinued. The Engineer will determine the beginning and ending time of the lane closure for lane rental purposes.

Unless otherwise noted in the plans or in a special provision to this section, the following shall apply:

A. The lane rental provision will be applicable without regard to the length of lane closed to traffic.

B. For multiple work areas requiring the independent closure of the same or alternating lanes, the lane rental will be based on the reduction in the number of lanes open to traffic.

Close the traffic lane when construction operations require the reduction of the width of the traffic lane to less than [3.0 m (10 ft.)], when adjacent, subsurface or overhead activities create a traffic safety hazard, and/or when specified in the plans or special provisions to this section.

1XX.02 Time Units

The time unit(s) for lane rental is (are) specified in the plans or in a special provision to this section. Time units may be as follows or as otherwise specified in the plans or in a special provision to this section.

A. *Calendar Day.* Any day or portion of a day on the calendar including Saturdays, Sundays and legal holidays, beginning and ending at midnight.

B. *Hour.* Any continuous 60-minute period or portion of a continuous 60-minute period.

C. *Quarter Hour.* Any 15-minute period or portion of a 15-minute period. Fifteen-minute periods will start either on the hour, or fifteen (15) minutes past the hour, or thirty (30) minutes past the hour, or forty-five (45) minutes past the hour.

1XX.03 Lane Rental Rate

The lane rental rate(s) per time unit is (are) specified in the plans or in a special provision to this section

1XX.04 Lane Rental Limitations

Unless otherwise specified on the plans or in a special provision to this section, travel lanes will be unavailable for rental between 12:00 midnight on the day preceding legal holidays and 12:00 midnight on the day following legal holidays. For the purposes of this section, legal holidays are as follows:

- New Year's Day (Jan. 1)
- Memorial Day (last Monday in May)
- Independence Day (July 4)
- Labor Day (first Monday in September)
- Thanksgiving Day (fourth Thursday in November)
- Christmas Day (Dec. 25)

When a holiday falls on Sunday, the following Monday shall be recognized as a legal holiday. When a holiday falls on Saturday, the preceding Friday shall be recognized as a legal holiday.

1XX.05 Rental Time Extensions

Request time extensions only for documented industry-wide labor disputes, industry-wide material delivery delays, acts of God, inordinate periods of inclement weather or other events beyond the control of the Contractor.

1XX.06 Basis of Lane Rental Charges

Lane rental charges or incentives will be deducted or paid, as appropriate, in the current progress payment and in the final payment.

Total incentives paid shall not exceed [10] percent of the amount of the contract. There is no limit on the amount of lane rental charges that may be deducted.

Liquidated damages under Section 108.08, Failure to Complete on Time, may be assessed concurrently with lane rental charges if they are not based on duplicate costs.

If a progress or final estimate, including lane rental charges and incentives, indicates that the agency has overpaid the Contractor an amount exceeding the retainage, submit a certified check to the agency for the difference between retainage and the amount of the overpayment. Submit check within [30] days of payment notice.

The lane rental charge will be based on one of the following options as designated in the plans or a special provision to this section.

A. *Option 1*. The lane rental charge is based on the total time that traffic lanes are rented. The lane rental charge will be calculated by multiplying the listed segment rental rate by the total rental time for that segment.

B. *Option 2*. A contract rental time for each segment will be shown on the plans or the special provision to this section. If the lane rental time for a segment exceeds the segment contract rental time, the lane rental charge will be calculated by multiplying the listed segment rental rate by the difference between the actual rental time and the contract rental time for the segment.

   Correspondingly, for each segment where, upon completion of the segment, the actual rental time is less than the contract rental time, the Contractor will earn an incentive. This incentive will be calculated by multiplying the listed segment rental rate by the difference between the actual rental time and the contract rental time for the segment.

C. *Option 3*. When Section XXX, A+B with Lane Rental Technical Provision, is specified, the contract rental time for each segment will be the lane rental time bid. If the lane rental time for a segment exceeds the segment contract rental time, the lane rental charge will be calculated by multiplying the listed segment rental rate by the difference between the actual rental time and the contract rental time for the segment. Correspondingly, for each segment where, upon completion of the segment, the actual rental time is less than the contract rental time, the Contractor will earn an incentive. This incentive will be calculated by multiplying the listed segment rental rate by the difference between the actual rental time and the contract rental time for the segment.

Part II: Considerations

Note: These "Considerations" list options and alternate approaches to the technical provisions.

The references to specifications included in this technical provision are to the *Guide Specifications for Highway Construction, 1998*, published by the American Association of State Highway and Transportation Officials (AASHTO).

It has been suggested that lane rental should be used for projects with short term (i.e., daily, hourly, or shorter), intermittent lane closures. Longer duration closures should probably use A+B bidding, Incentive/Disincentive, or liquidated damages. Therefore any time period longer than a calendar day (e.g., week, month) would probably not be used for a lane rental project.

1XX.01 Description

A. For example, a 30 m (100 ft) lane closure would be charged the same rental as a 2 km (1.2 mile) closure.

B. For example, if a three-lane roadway is reduced to two lanes with independent closures in different lanes, lane rental will be charged for one lane. If multiple, independent lane closures are made to the same lane, lane rental will be charged for one lane. The basis of the lane rental will thus be the net reduction in the number of travel lanes open to traffic.

1XX.02 Time Units

A half-day increment may also be used as a time period (12:01 a.m.–12 p.m.) and 12:01 p.m.–12:00 a.m.). Any lane closure over 12 hours in length could be considered a full day for calculation of the rental fee.

Shorter time periods should be used for projects where the opening of the roadway is extremely critical. Hourly rental may be more appropriate than daily rental for certain situations such as moving operations that require one lane for part of the day and two lanes for part of a day. Hourly rentals are also more appropriate if there are restrictions on the project stating that the Contractor may only work at certain hours of the day. Since renting by the hour requires a fraction of an hour to be charged as a full hour, this may not be suitable for certain jobs. For certain activities, such as bridge beam erection or bridge demolition, shorter duration closures may be feasible. For these jobs, if the rental fee is charged by the hour there is no incentive for the Contractor to open the roadway as soon as possible, as any portion of an hour will be charged as a full hour.

1XX.03 Lane Rental Rate

Example of specifying the time units and the rental rates follows. This could be included in the plans or in a Special Provision to Section 1XX, Technical Provisions for Lane Rental.

Example: Lane Rental Provisions

Option	Roadway Segment	Description	Limits	Time of Day	Day of Week	Time Unit	Rental Rate per Time Unit	Contract Rental Time*
1	A	Main Lanes	From Jones Road to State 69	Peak	Mon-Fri	Hour	$2,000	
				Non-Peak	Sun-Sat	Hour	$500	
	B	Frontage Roads	Limits of Project	All	Sun-Sat	Day	$6,000	
	C	Connector Roadway	SB Main Lane of State 69 to EB Main Lane of IH 810	Peak	Mon-Fri	Hour	$1,500	

* Contract Rental Time must be specified if Option 2 in Section 1XX.05 is designated.

Definitions:

- Peak Period: 6:00 a.m. to 10:00 a.m. and 4:00 p.m. to 7:00 p.m. on Monday through Friday
- Non-Peak Period: Other than peak period described above

The values given above are presented only as an example, and are not recommended values of lane rental fees. They are provided for illustrative purposes only. The lane rental rate charged for each time unit for which a lane or lanes is obstructed should be established by the SHA. This would normally be related to the average daily cost of interference and inconvenience to the road user. Rental rates should be determined by the SHA for each project based on actual user costs for that project. Information on the determination of construction engineering costs, traffic control costs, detour costs, and road user delay costs is included in the FHWA Technical Advisory T 5080.10.

Another example of lane rental fees taken from an example cited by Herbsman and Glagola ("Lane Rental—Innovative Way to Reduce Road Construction Time," ASCE Journal of Construction Engineering and Management, September/October 1998) is given below. This example gives the Contractor the option of closing the entire roadway for the weekend, and charges a rental fee for detouring traffic. This also illustrates a method for charging different fees for different times of day and different days of the week.

Work Time	Work Duration	Lane Closure Fee
Weekday	9:00 a.m. to 3:00 p.m.	$6,000 per day for each lane closed
Weekday	6:00 p.m. to 6:00 a.m.	$1,000 per day for each lane closed
Weekend	6:00 p.m. Friday to 6:00 am Monday	$10,000 for each lane closed
Weekend	6:00 p.m. Friday to 6:00 a.m. Monday	$50,000 for whole project detour

Herbsman and Glagola also give the fee rates suggested by the Federal Highway Administration in the following table:

Closure Type	Daily Fees ($/day)	Hourly Fees (6:30 a.m.–9:00 a.m.) ($/hr)	Hourly Fees (3:00 p.m.–6:00 p.m.) ($/hr)
One lane	20,000	2,000	500
One shoulder	5,000	500	125
One lane and shoulder	25,500	2,500	625
Two lanes	45,000	4,500	1,250
Two lanes and shoulder	50,000	5,000	1,375

Once again, the values in both these tables are presented as examples, and each individual State Highway Agency should calculate the road user cost for specific projects to determine lane rental fees.

Generally, if a time period shorter than a half day is used, there should be different rental fee values for off-peak traffic hours as opposed to peak traffic hours, or for daytime versus nighttime hours.

The following restrictions were include in a project to limit lane closures during holiday periods.

"Travel lanes will be unavailable for rental between 3:00 p.m. on the day preceding legal holidays or holiday weekends and 12:00 midnight on legal holidays or the last day of holiday weekends. For the purposes of this section, legal holidays are as follows:

- *New Year's Day (Jan. 1);*
- *Memorial Day (last Monday in May);*
- *Independence Day (July 4);*
- *Labor Day (first Monday in September);*
- *Thanksgiving Day (fourth Thursday in November); and*
- *Christmas Day (Dec. 25).*

When a holiday falls on Sunday, the following Monday shall be recognized as a legal holiday. When a holiday falls on Saturday, the preceding Friday shall be recognized as a legal holiday."

There may be projects for which it would be impractical for all lanes to be open for legal holidays. This is a project-specific consideration. Generally lane rental is chosen for those projects on which road user delay is considered a major issue, and therefore these would often be roadways on which a great deal of delay would be caused by lane closures during holiday travel times. It may be acceptable for the Contractor to occupy shoulders during holiday travel times, although it has been suggested that "occupy" be limited to barricaded shoulder with no work activities occurring during the holiday period.

It may also be appropriate for the State Highway Agency to specify additional special events during which the lanes may not be closed (e.g., state fair, professional sporting events, large conventions, etc.).

The following provisions were included in a project to provide for complete closure of the roadway.

"Some construction activities may require a complete closure of the roadway to traffic. Prior to any complete closures, the Contractor shall submit to the Engineer for approval and review the proposed method,

work to be performed, date, and times of anticipated closures. The Contractor shall provide advance notification to the Engineer a minimum of 72 hours prior to the anticipated closures. For activities approved by the Engineer the lane rental fees will be waived for nighttime closures which require the total closure of the roadway in both directions beginning at 10:00 p.m. Lane rental fees remain applicable on those same nights if lanes are not open to public traffic by 5:30 a.m. This waiver of lane rental fees will be applicable only to the specific activities approved by the Engineer. For those nights during which total closure of the roadway is necessary, the Contractor will implement a detour plan approved by the Engineer."

There should be a listing of the specific activities for which all traffic lanes may be closed to traffic (e.g., bridge construction or demolition).

It is suggested that a *Pre-bid Conference* be conducted by the DOT so that all prospective bidders will have an extensive knowledge of the project, the maintenance of traffic requirements, and the lane rental contract structure.

1XX.05 Rental Time Extensions

The following provisions have been found in some lane rental contracts.

"When work is adjusted that affects lane rental time, consideration will be given to modifying the lane rental bid amount for the performance of this portion of work. When a contract extension of time is granted, consideration will be given to modifying the lane rental bid amount for the performance of work to which lane rental applies. When outside interference (e.g., utility conflicts) affects the Contractor's ability to perform work as scheduled, consideration will be given to modifying the lane rental bid amount for the performance of this portion of work. The Engineer may not charge the fee for lane closure days for additional work not covered in the scope of this project, or for any work stoppage or extenuating circumstances, excluding weather. No lane rental fee will be charged for each weather day after the second (2nd) consecutive weather day."

1XX.06 Basis of Lane Rental Charges

Some agencies have elected to eliminate liquidated damages when the lane rental charges would result in additional charges for the same time overruns or, as an alternate, charge the Contractor the greater of the two.

APPENDIX B-6

A+B with Lane Rental

Part I: Technical Provision

Note: The references to specifications included in this technical provision are to the *Guide Specifications for Highway Construction, 1998,* published by the American Association of State Highway and Transportation Officials (AASHTO).

XXX.01 Description/Summary

A. The provisions of Section 1XX, Technical Provisions for Lane Rental, will apply.

B. Bid the lane rental time subject to any minimum and/or maximum times that may be specified for each segment.

C. Lane rental rates are listed for each specified segment of the project.

D. The bids will be adjusted, for bid comparison purposes only to include consideration of the time units bid and the rental rates for each specified roadway segment.

E. The basis of payment will be as specified in Option 3 under Section 1XX.06, Basis of Lane Rental Charges. The contract rental time will be the lane rental time bid for each contract segment.

XXX.02 Contract Segments

The contract segments for this project, time units, lane rental rates, and the maximum and minimum lane rental time that may be bid for each segment are as shown on the plans or in a special provision to this section.

XXX.03 Progress Schedule

When specified in the plans or a special provision to this section, prepare a Critical Path Method schedule as defined in Section 108.02.B, Contractor-Prepared Critical Path Method (CPM) Schedule. Clearly indicate the plans to complete the work described in each of the specified Contract Segments within the time bid for the segment.

Modifications to Sections 101.03, 102.07, 103.01, 108.02.B, and 108.07 of the Guide Specs would be necessary

XXX.XX Definitions

The following definitions are added to Section 101.03, Definitions.

Contract Segment. A specifically identified portion of a project. Examples are a bridge, a roadway segment, or an interchange.

Minimum Time. This is the minimum lane rental time specified for a specific contract segment. It is the minimum number of lane rental units that may be bid for the subject contract segment.

Maximum Time. This is the maximum lane rental time specified for a specific contract segment. It is the maximum number of lane rental units that may be bid for the subject contract segment.

XXX.XX Irregular Proposals

The following is added to the conditions listed in Section 102.07, Irregular Proposals, under which proposals are considered irregular and may be rejected.

G. When A+B bidding is specified, the proposal does not contain the number of lane rental units bid for each of the listed Contract Segments, or the number of lane rental units bid is outside the range specified for the Contract Segment.

XXX.XX Consideration of Proposals

The following replaces Section 103.01, Consideration of Proposals.

When A+B bidding is specified, after proposals are opened and read, they will be compared based on the adjusted bid, which is determined as follows:

$$\textbf{Adjusted bid} = A + [B_1 \times L_1] + [B_2 \times L_2] + \ldots [B_n \times L_n]$$

where:

A = Sum of the estimated unit quantities x the respective unit prices bid;

B_1 = Number of lane rental units bid for segment No. 1

L_1 = The listed lane rental rate for segment No. 1

B_2 = Number of lane rental units bid for segment No. 2

L_2 = The listed lane rental rate for segment No. 2

n = Number of segments

The adjusted bids will be used only for the comparison of proposals and to determine the low bidder. Payment for work accomplished will be in accordance with the pay provisions of the specified items of work. Lane rental charges and incentives will be as specified in Section 1XX.06, Basis of Lane Rental Charges, Option 3**.**

Bid results are public information.

Unit prices govern if discrepancies exist between unit bid prices and extensions. The lane rental time bid governs if discrepancies exist between the lane rental time bid and the extensions for the A+B bid comparison. The agency can reject proposals, waive technicalities, or advertise for new Proposals.

Part II: Considerations

Note: These "Considerations" list options and alternate approaches to the technical provisions.

The references to specifications included in this technical provision are to the *Guide Specifications for Highway Construction, 1998*, published by the American Association of State Highway and Transportation Officials (AASHTO).

XXX.02 Contract Segments

Example Table for Plans or Special Provisions: Lane Rental Provisions

Option	Contract Segment	Description	Limits	Time of Day	Day of Week	Time Unit	Lane Unit Rental Rate	Min Time	Max Time
3	1	Main Lanes	From Jones Road to State 69	Peak	Mon–Fri	Hour	$5,000	400	600
	2			Non-Peak	Sun–Sat	Hour	$2,000	1000	1500
	3	Frontage Roads	Limits of Project	All	Sun–Sat	Day	$6,000	60	80
	4	Connector Roadway	SB Main Lane of State 69 to EB Main Lane of IH 810	Peak	Mon–Fri	Hour	$1,500	125	200

Definitions:

- Peak Period: 6:00 AM to 10:00 a.m. and 4:00 p.m. to 7:00 p.m. on Monday through Friday
- Non-Peak Period: Other than peak period described above

If the agency elects to establish the minimum and/or maximum time units for a contract segment, the proposed construction should be sufficiently analyzed to ensure the practicality and reasonableness of the limit.

The lane rental rate is ideally established by evaluating the costs to the traveling public resulting from traffic congestion (and possibly other costs during the construction operations on the contract segment). If the potential lane rental charges are not significantly high in relationship to the contract amount, the lane rental provisions may be a less than meaningful incentive for minimizing lane closures.

XXX.XX Consideration of Proposals

Example:

Item	Unit	Estimated Quantity	Unit Bid Price	Extension
Asphalt Cement	Megagram	1,000	$125.00	$ 125,000
Plant mix—Type ___	Megagram	20,000	75.00	$ 1,500,000
Base Bid (A)				**$1,625,000**

Contract Segment	Lane Rental Units Bid	Time Unit	I/D	B x I/D
1	500	Hour	$2,000	$1,000,000
2	1400	Hour	500	700,000
3	75	Day	6,000	450,000
4	150	Hour	1,500	225,000
Total Bid Adjustment				**$2,375,000**

Adjusted Bid $= A + [B_1 \times (I/D)_1] + [B_2 \times (I/D)_2] + \ldots [B_n \times (I/D)_n]$

$= \$1,625,000 + \$2,375,000$

$=$ **$4,000,000**

APPENDIX B-7

Nighttime Construction

Part I: Technical Provision

Note: The references to specifications included in this technical provision are to the *Guide Specifications for Highway Construction, 1998,* published by the American Association of State Highway and Transportation Officials (AASHTO).

1XX.01 Applicability

When nighttime construction activities are performed, whether required by contract or elected by the Contractor, comply with the following requirements.

1XX.02 Nighttime Construction Plan

Develop a plan for nighttime construction activities. Submit the plan to the Agency a minimum of [7] days prior to beginning date of nighttime construction. No nighttime construction shall begin until the plan is approved and implemented. The plan shall include the following elements:

A. *Illumination of Work Zone.* Indicate minimum illumination levels that will be maintained; plans for mounting lights on construction equipment; mounting, aiming, and positioning of both fixed and moveable lights to reduce glare; plans for movement of light devices to keep pace with construction operations; and provisions for minimizing shadows and glare for construction workers.

B. *Traffic Control*. Provide for the safe movement of traffic and the safety of the work zone, including Contractor and inspection personnel during nighttime construction activities. Supplement the project traffic control plan to include special considerations for nighttime construction activities.

C. *Special Safety Considerations.*

   1. *Equipment Warning Devices*. Install high visibility flashing beacons/strobes on all mobile powered equipment used on nighttime construction activities. Install flashing beacons/strobes so they have 360-degree visibility. Mount flashing beacons/strobes as high as possible on vehicles. All equipment shall have a minimum of 0.5 m^2 (5 ft^2) of high intensity retroreflective sheeting toward the extremities of each side of the equipment. A minimum of 0.1 m^2 (1 ft^2) of the sheeting shall be visible from each direction.

   2. *Personnel Protective Clothing*. Provide workers involved in nighttime construction activities with safety vests (fluorescent orange or fluorescent lime/green) with high visibility reflective strips that are visible from all directions and other personal protective clothing as required by safety regulations.

D. The plan for nighttime construction activities shall also include the following elements.

   1. Abatement of Construction Noise. See Section XXX.05, Abatement of Construction Noise.

   2. Abatement of Construction-related Vibrations. See Section XXX.06, Abatement of Construction-related Vibrations.

   3. Abatement of Construction-related Fugitive Dust. See Section XXX.07, Abatement of Construction-related Fugitive Dust.

1XX.03 Illumination of Work Zone

Properly illuminate all operations that are performed during nighttime hours to allow for the complete performance and inspection of the work.

A. A minimum illumination of 55 lx (5 foot-candles) shall be maintained throughout the entire area of operation except for the set-up and removal of lane closures. The area of operation is a work area that is a minimum of 20 m (65 ft) ahead and behind the employee, where an employee is on or near the roadway, and shall include all work performed by the Contractor's personnel, including layout and measurements ahead of the actual work. Illumination for specific tasks should meet the minimum illumination levels shown in Table 1.

Table 1. Illumination Guidelines

Category	Types of Work	Minimum Illumination Level
I	General illumination in the work zone and areas where crew movement takes place	55 lx (5 ft-candles)
II	Illumination on and around construction equipment	110 lx (10 ft-candles)
III	Illumination on tasks that require increased attention	215 lx (20 ft-candles)

B. Design, install, maintain, and operate all illumination fixtures to:

1. Avoid glare that interferes with traffic on the roadway or that causes annoyance or discomfort for residences adjoining the work area;
2. Provide the required level of illumination and uniformity in the work area. Design all mountings so that lights can be aimed and positioned as necessary to reduce glare while providing the required level of illumination. Locate, aim, and adjust the illumination fixtures to face away from oncoming traffic; and
3. Reduce lighting losses by performing timely maintenance of the lighting systems. This shall include lamp replacement, cleaning of accumulated dirt from lamps and luminaires, and proper orientation of the lights. Provide a sufficient number of replacement parts and knowledgeable personnel to maintain and repair the illumination units.

C. Vehicle headlights or existing streetlights will not suffice as the required illumination.

D. The Contractor shall provide such screening devices as necessary to reduce the objectionable levels of glare beyond the work site.

XXX.04 Traffic Control

Implement approved traffic control plan consistent with the provisions of Section 618. Traffic Control.

Use high intensity reflective sheeting for all signing and traffic control devices. Maintain signs and traffic control devices to meet reflectivity requirements. Replace signing and traffic control devices that have been removed without authorization, damaged or that do not meet reflectivity requirements.

Use flashing arrow boards to warn traffic of lane closures. Adjust flashing arrow boards to lower intensity during nighttime work to avoid blinding drivers.

Consider the following in developing the traffic control plan:

1. Changeable message signs;
2. Warning signs;
3. Channelizing devices;
4. Sight distances;
5. Arrow boards;
6. Emergency enforcement controls;
7. Deterrent controls;
8. Special controls;
9. Flagging operations and worker visibility;
10. Police patrols; and
11. Moveable barriers.

Use flashing beacons/strobe lights on all vehicles used for the set-up and removal of lane closures during nighttime conditions. In addition, use flashing arrow boards and truck-mounted attenuators as necessary to provide adequate advanced warning to motorists and to protect construction personnel.

XXX.05 Abatement of Construction Noise

Control the noise intensity caused by construction operations and equipment, including but not limited to equipment used for drilling, pile driving, paving, bridge demolition, blasting, excavating and/or hauling not only on the site but also at approved disposal locations.

A. Allowable noise levels are:
   1. At sensitive noise receptors, L_{10}—Background level plus [10] dBA or [85] dBA, whichever is less.
   2. Equipment, L_{max}—Measured 15 m (50 ft) from equipment at full load
      a. Impact equipment (e.g., pile drivers, jackhammers)—[95] dBA
      b. Other than impact equipment—[85] dBA

B. Use an Acoustical Engineer to oversee the requirements of this section. The Acoustical Engineer will have the following minimum education and experience:
   1. Bachelor of Science or higher degree from a qualified program in engineering, physics, or architecture offered by an accredited university or college, and five years experience in noise control engineering and construction noise analysis; or current enrollment as a full Member or Board-certified Member in the Institute of Noise Control Engineering (INCE).
   2. Demonstrated substantial and responsible experience in preparing and implementing construction noise controls and monitoring plans on construction projects conducted in an urban setting, calculating construction noise levels, and designing and overseeing the implementation of construction noise abatement measures.

C. Prior to commencement of nighttime construction activities, perform a survey of noise levels at and around the proposed construction site to establish a mean for background noise levels for nighttime operations. Be cognizant of the composition of the surrounding area and the impact upon it as a result of construction activities.

D. Establish mitigation criteria if the anticipated noise levels exceed the allowable levels listed in Section XXX.05(A).

E. Submit a noise abatement and monitoring plan to the Agency within forty-five [45] days of award of the contract. The plan shall be prepared by the Acoustical Engineer, if required in the plans. Include in the plan the noise monitoring and reporting procedure to be used prior to and during construction. Identify and describe the following in the plan:
   1. Construction Equipment to be used (include registration or equipment number).
      a. Measured noise level (L_{max}) of equipment at 15 m (50 ft) under full load.
      b. If noise level (L_{max}) at 15 m (50 ft) exceeds the allowable levels, list the noise reduction measures that are to be taken to reduce the noise levels to at least the specified allowable levels.
   2. A sketch of the construction site showing equipment locations, receptor locations, noise-sensitive locations, noise monitoring locations, noise mitigation measures to be used, and hauling routes to be used during nighttime activities.
   3. The noise monitoring methods, procedures, and data reporting methods to be used.
   4. Complaint response and resolution procedures.

F. Provide construction equipment in good operating condition with required noise reduction measures in place and operating. Provide equipment with manufacturer approved intake and exhaust mufflers, noise shields and shrouds.

G. Minimize noise from the use of back-up alarms using measures that meet OSHA regulations. This includes the use of self-adjusting or manually adjustable back-up alarms, observers, and scheduling of activities such that alarm noise is minimized. Self-adjusting alarms shall be set to 5dBA above the surrounding nighttime background noise levels, and manually adjusted alarms shall be set to the lowest setting required to be audible above the surrounding noise.

H. Use haul routes to and from the work area that minimize the impact on residents and other sensitive noise receptors during nighttime hours.

I. Perform all “impact” work (i.e., jackhammer, pile driving, hydraulic ram, etc.) only between the hours of 7 a.m. and 10 p.m.

J. Monitor noise levels during nighttime operations and submit a weekly report to the Engineer. In the event that levels exceed allowable limits, the Agency shall be notified immediately and corrective measures implemented.

K. Provide temporary noise barriers and/or curtains, meeting the requirements of Section XXX, Temporary Noise Suppression Devices, at locations shown on the plans and where L_{10} noise levels at sensitive noise receptors exceed background levels by more than [10] dBA. Install temporary noise barriers with noise absorptive surfaces facing the noise source. Immediately plug any gaps and holes that develop in the temporary barrier.

L. Immediately notify the Agency when a complaint is received from the general public regarding construction noise. Within 24 hours of receipt of complaint, perform noise measurements at a complainant’s location during activities representative of the offending activities, and submit the measurements to the Agency. If the measured noise level exceeds allowable limits specified in the contract, immediately cease operations until such time as the methods are in place to reduce the noise levels to acceptable levels as required by the specifications.

1XX.06 Abatement of Construction-Related Vibrations

Develop a vibration-monitoring plan. The plan shall, at a minimum, identify historic and other sensitive locations in the immediate vicinity of the construction activities, identify locations at which the vibrations will be measured, and the types of equipment to be used in this monitoring process. Provide the Engineer with vibration data on a weekly basis. Inform any affected residents and/or businesses adjoining the construction area prior to execution of construction activities that are expected to produce vibrations with peak particle velocities (PPVs) greater than 0.12 inches/second. Should PPVs greater than 0.12 inches per second be caused, such that vibration becomes a nuisance to adjoining residences or other sensitive locations, cease the activity causing vibrations until: a) Daylight hours; or b) A means is found to mitigate the vibrations. This may be done by re-working the project layout and access routes, sequences of work, or by using alternative construction methods.

1XX.07 Payment

Except where otherwise provided (e.g., Traffic Control, etc.), include within the overall contract bid price all costs to comply with this section.

The following modification should be made to the Guide Specs.

XXX. General Information, Definitions, and Terms

The provisions of Section 101.03 Definitions, are supplemented by the following:

L_{10}. The sound level exceeded 10 percent of the time for a specified monitoring period.

L_{max}. The maximum measured sound at any instant in time.

dBA. The sound level (in decibels referenced to 20 micro-Pascal’s) as measured using the A-weighting network on a sound level meter, in accordance with ANSI S1.4 Standards.

Nighttime. The period of time between 30 minutes after sunset and 30 minutes before sunrise.

Sensitive noise receptor. A location where particular sensitivities to noise exist, such as residential areas, institutions, hospitals, and parks.

Part II: Considerations

Note: These “Considerations” list options and alternate approaches to the technical provisions.

The references to specifications included in this technical provision are to the Guide Specifications for Highway Construction, 1998, published by the American Association of State Highway and Transportation Officials (AASHTO).

1XX.01 Applicability

Although the use of the nighttime provision will likely be in high-traffic urban conditions, it is possible that it may be used in areas where the adjoining property use would not mandate the abatement of construction-related noise and/or vibration. In those cases it would be prudent for the Agency to appropriately modify these requirements.

1XX.02 Nighttime Construction Plan

A. *Illumination of Work Zone*. In some circumstances the agency may want to specify the number, position, and intensity of lights used on the project. This may be necessary when extremely sensitive neighboring businesses or residents are known to be present, or when the construction activity is a unique or critical type. This should only be done when the agency possesses enough information to adequately specify lighting requirements, or retains the services of a lighting engineer.

B. *Traffic Control*. A very effective way to control motorist speeds in the work zone is to have a staffed police vehicle with flashing lights at the beginning of the work zone. Many states have also enacted legislation to double speeding fines in the work zone.

C. *Special Safety Considerations*.

   2. *Personnel Protective Clothing.* A more stringent protective clothing requirement that has been used is as follows: Provide all workers with high visibility protective clothing. All workers shall wear full-length, high-visibility reflective clothing (tops and bottoms) during nighttime construction activities.

1XX.03 Illumination of Work Zone

A. The New York DOT has adapted the work from the Ellis and Herbsman Guidelines (Table 1) and placed various construction activities in each Illumination Category. These activities and minimum illumination levels are shown in the following table, "Minimum Illumination Level Guidelines."

The New York DOT also has recommendations regarding the amount of area to be illuminated around various types of construction equipment. The recommendations for illuminated areas for construction equipment are shown in the subsequent table, "Recommended Illuminated Areas for Typical Construction Equipment."

Example: Minimum Illumination Level Guidelines (Source: New York DOT)

Tasks	**Min Illumination Level**	**Areas of Illumination**
Embankment, fill, and compaction	55 lx (5 ft-candles)	General illumination throughout area of operation
Excavation—regular, lateral ditch, and channel	55 lx (5 ft-candles)	
Landscape, grassing, and sodding	55 lx (5 ft-candles)	
Maintenance of earthwork embankments	55 lx (5 ft-candles)	
Mechanical sweeping and cleaning	55 lx (5 ft-candles)	
Reworking shoulders	55 lx (5 ft-candles)	
Subgrade stabilization and construction	55 lx (5 ft-candles)	
Bituminous concrete milling*	55 lx (5 ft-candles)	General illumination throughout area of operation—minimum of 60 m (200 ft) ahead and 60 m (200 ft) behind equipment
Bituminous concrete paving operation*	55 lx (5 ft-candles)	
Bituminous concrete roller operation*	55 lx (5 ft-candles)	General illumination throughout area of operation—minimum of 30 m (100 ft) ahead and 30 m (100 ft) behind equipment
Placement of barrier walls and traffic separators	110 lx (10 ft-candles)	General illumination throughout area of operation—minimum of 8 m (25 ft) ahead and 8 m (25 ft) behind equipment
Base course construction	110 lx (10 ft-candles)	
Bituminous concrete milling*	110 lx (10 ft-candles)	

(continued)

Tasks	Min Illumination Level	Areas of Illumination
Bituminous concrete paving operation*	110 lx (10 ft-candles)	
Bituminous concrete roller operation*	110 lx (10 ft-candles)	
Bridge deck work	110 lx (10 ft-candles)	
Bridge painting	110 lx (10 ft-candles)	
Concrete paving operation	110 lx (10 ft-candles)	
Drainage structures, culverts, storm sewers	110 lx (10 ft-candles)	
Guard rail and fencing	110 lx (10 ft-candles)	
Highway signs installation	110 lx (10 ft-candles)	
Removal of pavement	110 lx (10 ft-candles)	
Concrete structures	110 lx (10 ft-candles)	
Pavement marking/painting	110 lx (10 ft-candles)	
Pothole filling	110 lx (10 ft-candles)	
Repair/patching of concrete pavement	110 lx (10 ft-candles)	
Resetting guide rail and fencing	110 lx (10 ft-candles)	
Sidewalks	110 lx (10 ft-candles)	
Surface treatments	110 lx (10 ft-candles)	
Waterproofing and sealing	110 lx (10 ft-candles)	
Riprap	110 lx (10 ft-candles)	
Any operation not listed in this table	110 lx (10 ft-candles)	
Crack filling, saw cutting, joint sealing	215 lx (20 ft-candles)	Illumination on task
Electrical work	215 lx (20 ft-candles)	
Highway street lighting	215 lx (20 ft-candles)	
Traffic signals	215 lx (20 ft-candles)	
Intelligent transportation system installation	215 lx (20 ft-candles)	

* Both requirements of 55 lx (5 foot-candles) and 110 lx (10 foot-candles)

Example. Recommended Illuminated Areas for Typical Construction Equipment (Source, NY DOT)

Type of Equipment	Illuminated Area (Front and Back)
Fast-Moving Equipment	
Paver	16 ft. (4.9m)
Milling Machine	
Slow-Moving Equipment	
Backhoe Loader	58 ft. (17.7 m)
Wheel Loader	
Wheel Tractor	
Scraper	
Compactor/Roller	
Motor Grader	

B. The following lamp characteristics are recommended for highway construction tasks:

- Incandescent Tungsten halogen lamps for task-oriented lighting, equipment-mounted lights, small areas, and lights mounted at a low height.
- Metal Halide lamps for medium-sized areas when color rendition is not important, and lights mounted at varying heights.
- High pressure Sodium lamps for large areas when color rendition is not important, and when lights are mounted at varying heights.

D. The New York DOT also gives recommendations for the orientation and height of tower lights, to control glare. Tower lights are to be oriented such that the angle of the centerline of the beam is not greater than 50 degrees with the vertical, and the maximum tower height for the beam should not exceed 30 ft. (9m). A beam angle of 60 degrees or less is recommended for lights mounted on equipment. These and other more detailed guidelines may be included in the nighttime construction specifications, or may be used by the SHA to evaluate lighting plans submitted by Contractors.

XXX.05 Abatement of Construction Noise

D. This noise level may also be set at 5 dBA above the background noise, not to exceed 80 dBA, particularly for projects of a long duration. The City of Boston, on its Central Artery/Tunnel project, limits nighttime noise to baseline level plus 5 dBA if the baseline is less than 70 dBA, and baseline plus 3 dBA if the baseline is greater than 70 dBA. These are energy-average (L_{10}) sound levels, meaning they may be exceeded 10% of the time.

J. Agencies may elect to include specific noise limits for equipment in the technical provisions. An example is included in the following table, 15 m (50 ft) Noise Emission Limits. If used, the agency should ensure that the information is updated to provide for the current technology in noise-suppressed equipment. These type requirements could reduce the number of contractor's who could bid on a project due to the condition of a contractor's equipment. Enforcement of the table requirements could also be an issue for agencies.

Example. 15 m (50 ft) Noise Emission Limits

Equipment Category	L_{max} (dBA)[1,2]	Impact/Continuous
Arc Welder	73	Continuous
Auger Drill Rig	85	Continuous
Backhoe	80	Continuous
Bar Bender	80	Continuous
Boring Jack Power Unit	80	Continuous
Chain Saw	85	Continuous
Compressor[3]	70	Continuous
Compressor (other)	80	Continuous
Concrete Mixer	85	Continuous
Concrete Pump	82	Continuous
Concrete Saw	90	Continuous
Concrete Vibrator	80	Continuous
Crane	85	Continuous
Dozer	85	Continuous
Excavator	85	Continuous
Front End Loader	80	Continuous
Generator	82	Continuous

Equipment Category	L_{max} (dBA)[1,2]	Impact/Continuous
Generator (25KVA or less)	70	Continuous
Gradall	85	Continuous
Grader	85	Continuous
Grinder Saw	85	Continuous
Horizontal Boring Hydro Jack	80	Continuous
Hydra Break Ram	90	Impact
Impact Pile Driver	95	Impact
In situ Soil Sampling Rig	84	Continuous
Jackhammer	85	Impact
Mounted Impact Hammer (hoe ram)	90	Impact
Paver	85	Continuous
Pneumatic Tools	85	Continuous
Pumps	77	Continuous
Rock Drill	85	Continuous
Scraper	85	Continuous
Slurry Trenching Machine	82	Continuous
Soil Mix Drill Rig	80	Continuous
Street Sweeper	80	Continuous
Tractor	84	Continuous
Truck (dump, delivery)	84	Continuous
Vacuum Excavator Truck (vac-truck)	85	Continuous
Vibratory Compactor	80	Continuous
Vibratory Pile Driver	95	Continuous
All other equipment with engines larger than 3700 W (5 HP)	85	Continuous

Notes:

[1] Measured at 15 m (50 ft) from the construction equipment, with a "slow" (1 sec.) time constant.

[2] Noise limits apply to total noise emitted from equipment and associated components operating at full power while engaged in its intended operation.

[3] Portable air compressor rated at 0.35 m^3/s (75 cm) or greater and that operates at greater than 350 kPa (50 psi).

L. Additional specific noise reduction techniques that may be specified include:

- Use of: (1) Concrete crushers or pavement saws for concrete deck removal, demolitions or similar activities; (2) Pre-auguring equipment to reduce duration of impact or vibratory pile driving; and (3) Local power grid to reduce the use of generators.
- Attaching: (1) Intake and exhaust mufflers, shields, or shrouds; (2) Noise-deadening material to inside of hoppers, conveyor transfer points, or chutes.
- Maintaining: (1) Equipment mufflers and lubrication; (2) Precast decking or plates; (3) Surface irregularities on construction sites.
- Limiting: (1) The number and duration of equipment idling on the site; (2) The use of annunciators or public address systems; (3) The use of air or gasoline-driven hand tools.

- Configuring, to the extent feasible: (1) The construction site in a manner that keeps loud equipment and activities as far as possible form noise-sensitive locations; (2) Barrels or signage to detour traffic away from plated trenches.
- Scheduling of construction events and limiting usage times to minimize noise.
- Constructing noise barriers and/or noise curtain systems.
- Minimizing noise by the use of backup alarms using measures that meet OSHA regulations. This includes the use of self-adjusting ambient-sensitive backup alarms, manually-adjustable alarms on low setting, use of observers, and scheduling of activities so that alarm noise is minimized.
- Where practical and feasible, configuring construction sites to minimize backup alarm noise. For example, construction site access should be designed such that delivery and dump trucks move through the site in a forward manner without the need to backup.
- Using only variable message and signboards that are solar powered or connected to the local power grid.

1XX.06 Abatement of Construction-Related Vibrations

Vibrations may only be a serious issue if pile-driving or demolition operations will take place on a nighttime construction site. If possible, avoid vibration-causing activities all together during nighttime hours. If this is impossible, some methods to reduce vibrations include re-routing of heavy trucks away from residential streets or from sensitive locations, placing the vibration-causing equipment as far as possible from vibration-sensitive receptors, use of alternative construction methods, and scheduling of vibration-causing activities to occur at different times. Vibration levels caused by multiple operations may add together and produce a vibration level higher than each operation may cause individually. Some alternative construction methods that may be used to mitigate vibrations include: (1) Drilled piles or the use of a sonic or vibratory pile driver; (2) Use of demolition methods not involving impact (e.g., saw bridge decks into sections for removal); and (3) Avoid use of vibratory rollers and tampers near sensitive areas.

The following modifications should be made to the Guide Specifications.

XXX. General Information, Definitions, and Terms:

As an alternate to modifying Section 101.03, Definitions, these definitions could be incorporated into the technical provision. This may be a more appropriate strategy since these terms are likely used only in the nighttime construction technical provision. Other definitions of nighttime or non-daylight hours are as follows:

- The period of time between sunset and sunrise.

  Relating nighttime hours to sunset and sunrise may be too restrictive. Time periods of up to one-half hour or more before sunrise and following sunset permit normal activities without a decline in quality or a threat to safety. An advantage to this definition, however, is the specificity of the time period, the definite time limits, and the ready availability of the sunset and sunrise times.
- The period of the day when natural light conditions are less than _____ lux.
- The periods of the day when natural light conditions prevent the safe conduct of work and/or hinder the performance of work without artificial illumination.

As another approach to defining nighttime activities, three specific time periods may be specified: (1) Daytime, (2) Evening, and (3) Nighttime. This may be particularly useful for around-the-clock operations. The Boston Central Artery/Tunnel Noise Control Specification defines these three time periods as follows:

Daytime—The period from 7am to 6pm local time daily, except Sundays and Federal holidays.

Evening—The period from 6pm to 10pm local time daily, except Sundays and Federal holidays.

Nighttime—The period from 10pm to 7am local time daily, as well as all day Sunday and Federal holidays.

Communication with the public is the key to successful implementation of the nighttime construction program. While information dissemination is very project-specific, it is imperative that affected residents and business-owners be aware of the nighttime construction activities in advance and have a means for

communicating complaints to a knowledgeable representative of the Contractor. Timely, comprehensive communications will decrease the complaints received on a nighttime construction job. Door to door visits are the most effective information distribution strategy, but television, radio and newspaper seem to be more commonly used methods.

The following Public Information and Complaint Policy requirement may be applicable for some projects. In some agencies, all or parts of this policy would be developed and implemented by the agency.

Public Information Program and Complaint Policy. Develop and implement, at the onset of nighttime construction activities, a complaint policy, and a public information program. The complaint policy shall include preactivity notification; public education campaign; noise monitoring; a plan for receiving, handling, and responding to complaints; and investigation and implementation of methods to reduce construction impacts. Distribute information regarding construction-related nuisances to affected residents and businesses. This information shall include:

- Work hours;
- Type of work;
- Type of equipment to be used;
- Type of nuisance to expect;
- Reason for work resulting in nuisance;
- Expected duration of nuisance;
- Where to find more information; and
- Process for voicing complaints.

Distribute the information through any combination of one or more of the following methods:

- Door to door visits;
- Neighborhood letters or fact sheets;
- Local media (newspaper notices, press releases, news conferences);
- Information kiosks in public areas; and
- Brochures or newsletters.

Provide a process for receiving and handling construction-related nuisance complaints to operate during the hours of construction operations.

APPENDIX B-8

Temporary Noise Suppression Devices

Part I: Technical Provision

Note: The references to specifications included in this technical provision are to the *Guide Specifications for Highway Construction, 1998,* published by the American Association of State Highway and Transportation Officials (AASHTO).

XXX.01 Description

Construct temporary noise suppression devices.

XXX.02 Material

A. *Temporary Noise Barriers.* Construct noise suppression barriers of material such as ¾ inch medium density overlay (MDO) plywood sheeting, or other acceptable material with a sound transmission class STC-30 rating or greater as defined by ASTM Test Method E90. Line the material on one side with glass fiber or mineral wool type sound absorbing material at least 2 inches thick. Protect the sound absorbing material with wire mesh or perforated sheets that are corrosion resistant and that have at least 30 percent open area with provision for water drainage. Provide materials that are sufficiently weather resistant to last for the duration of the project.

B. *Temporary Noise Curtains.* Construct noise curtains of material consisting of a durable, flexible composite medium that has a noise barrier layer bonded to a sound absorptive material on one side. The noise barrier layer shall consist of a rugged, impervious material with a surface weight of at least one pound per square foot. The sound absorptive material shall include protective facing and shall be securely attached to one side of the flexible barrier over its entire surface. Noise curtain materials shall be abuse resistant, corrosion-resistant, fire-retardant, mildew-resistant, vermin-proof, non-hygroscopic, and shall have superior hanging and tear strength. Meet the following criteria:

1. Curtain Material
   a. Minimum breaking strength of 120 lb./in. per FTMS 191 A-M5102.
   b. Minimum tear strength of 30 lb./in per ASTM D117.
2. Curtain Absorptive Material
   a. Minimum breaking strength of 100 lb./in per FTMS 191 A-M5102.
   b. Minimum tear strength of 7 lb./in. per ASTM D117.
3. Noise Curtain
   a. Sound transmission class rating of STC-25 or greater based upon certified sound transmission data according to ASTM test method E90.
   b. Noise reduction coefficient rating of NRC 0.70 or greater based upon certified sound absorption coefficient data taken according to ASTM test method C423.

XXX.03 Construction

A. *Submittals.* Provide a copy of the support frame plans and design calculations, sealed by the Professional Engineer, to the Agency prior to the installation of the noise suppression devices. Support frames shall be designed by a Professional Engineer licensed in the State of (state name) to withstand an 80-MPH wind load plus a 30 percent gust factor.

B. *Temporary Noise Barriers Installation.* Attach noise barrier panels to support frames constructed in sections to provide a moveable barrier where necessary. Construct the mating surfaces of the barrier sides to be flush with each other. Seal all gaps between barrier units, and between the bottom edge of the barrier panels and the ground with material that will completely close the gaps and be dense enough to attenuate the sound. Construct barriers to a height not less than 8 feet nor greater than 15 feet.

C. *Temporary Noise Curtains Installation*. Install noise control curtains in vertical segments extending the full curtain height and with a minimum joint and seam overlap of 2 inches. Seal seams using Velcro or double grommets. Design curtain details to conform to the manufacturer recommendations. Secure curtains at ground level and/or at intermediate points by framework and supports.

XXX.03. Measurement

Subsection 109.01 and as follows:

A. The length shall be the horizontal length from beginning to end of the barrier or curtain.

B. The height shall be the distance between the ground and the top of the noise barrier panel or curtain.

XXX.04. Payment

Pay Item	Pay Unit
Temporary Noise Barrier	m^2 (sq. ft.)
Temporary Noise Curtain	m^2 (sq. ft.)

Part II: Considerations

None.

APPENDIX C

Summary of Innovative Contracting Use

	SEP-14								Other than SEP-14			
State	**Cost-Plus-Time (A+B)**	**Lane Rental**	**Warranty**	**Design-Build**	**Design-Build-Warrant**	**Design-Build-Maintain**	**Design-Build-Operate-Maintain**	**Other**	**Cost-Plus-Time (A+B)**	**Lane Rental**	**Warranty**	**Other**
Alabama				X					X		X	
Alaska				X	X		X					
Arizona				X	X		X			X		
Arkansas	X								X	X		
California	X		X	X					X		X	
Colorado	X	X		X					X	X	X	
Connecticut												
Delaware	X			X					X			
District of Columbia	X			X			X		X			
Florida				X					X	X	X	Bid Averaging, Lump Sum Bidding, No Excuse Bonus
Georgia	X			X					X			
Hawaii				X							X	
Idaho	X								X			
Illinois									X	X	X	
Indiana	X	X	X	X	X				X	X	X	
Iowa	X								X	X		
Kansas									X			
Kentucky	X							X	X			Consructability Review, System Integrator
Louisiana									X	X		
Maine	X	X		X	X				X	X	X	
Maryland	X			X					X		X	
Massachusetts				X		X						
Michigan	X		X	X	X		X	X	X		X	ID/IQ
Minnesota	X			X					X			
Mississippi	X								X			
Missouri	X		X				X		X		X	Life Cycle Cost, Alt. Pavement Types
Montana			X								X	
Nebraska	X								X			
Nevada	X								X		X	
New Hampshire											X	
New Jersey				X					X			
New Mexico								X	X	X	X	
New York	X								X	X		
North Carolina	X		X	X	X		X		X	X	X	
North Dakota	X								X			
Ohio	X			X					X		X	
Oklahoma	X	X							X	X		
Oregon		X		X				X	X	X	X	Price/Qual Bidding

(continued)

	SEP-14								Other than SEP-14			
State	**Cost-Plus-Time (A+B)**	**Lane Rental**	**Warranty**	**Design-Build**	**Design-Build-Warrant**	**Design-Build-Maintain**	**Design-Build-Operate-Maintain**	**Other**	**Cost-Plus-Time (A+B)**	**Lane Rental**	**Warranty**	**Other**
Pennsylvania	X			X					X		X	
Puerto Rico												
Rhode Island												
South Carolina	X			X					X			
South Dakota				X					X	X		
Tennessee									X			
Texas	X								X		X	
Utah	X			X	X				X		X	
Vermont									X			
Virginia	X			X		X			X	X		
Washington			X	X						X	X	
West Virginia											X	
Wisconsin	X		X						X		X	
Wyoming										X	X	
TOTALS	**29**	**5**	**8**	**25**	**7**	**2**	**6**	**4**	**40**	**17**	**24**	

APPENDIX D

Summary of State DOT Bidding Information Available on the Internet

State	Web Page	Letting Info	Bid Tabs Total Bid	Bid Tabs Unit Prices	Average Unit Prices	Plan-Holders List	DBE List	DOL Wage Rates	Electronic (diskette) Bidding Use	Electronic (internet) Bidding Pilot Projects
Alabama	Y	Y	Y			Y			Y	
Alaska	Y	Y	Y	Y		Y	Y			
Arizona	Y									
Arkansas	Y	Y	Y	Y	Y	Y	Y		Y	
California	Y	Y	Y		Y	Y	Y			
Colorado	Y	Y	Y	Y		Y	Y		Y	
Connecticut	Y	Y	Y							
DC										
Delaware	Y	Y								
Florida	Y	Y	Y			Y		Y	Y	Y
Georgia	Y	Y	Y	Y	Y	Y	Y		Y	
Hawaii	Y									
Idaho	Y	Y	Y			Y				
Illinois	Y	Y	Y	Y		Y	Y			
Indiana	Y	Y	Y		Y	Y		Y	Y	
Iowa	Y								Y	Y
Kansas	Y	Y	Y	Y		Y			Y	
Kentucky	Y	Y	Y	Y	Y	Y				
Louisiana	Y	Y	Y	Y						
Maine	Y	Y	Y	Y		Y	Y			
Maryland	Y	Y	Y	Y		Y				
Massachusetts	Y									
Michigan	Y	Y	Y	Y						
Minnesota	Y									
Mississippi	Y	Y	Y						Y	
Missouri	Y	Y	Y	Y	Y	Y	Y		Y	
Montana	Y	Y	Y	Y	Y	Y	Y		Y	
Nebraska										
Nevada	Y									
New York	Y	Y	Y						Y	
New Hampshire	Y	Y								
New Jersey	Y	Y	Y							
New Mexico	Y									
North Dakota	Y	Y	Y				Y		Y	
North Carolina	Y	Y				Y	Y		Y	

(continued)

State	Web Page	Letting Info	Bid Tabs Total Bid	Bid Tabs Unit Prices	Average Unit Prices	Plan-Holders List	DBE List	DOL Wage Rates	Electronic (diskette) Bidding Use	Electronic (internet) Bidding Pilot Projects
Ohio	Y	Y	Y	Y		Y	Y		Y	
Oklahoma	Y	Y	Y			Y			Y	
Oregon	Y	Y	Y			Y				
Pennsylvania	Y	Y	Y	Y		Y	Y		Y	
Puerto Rico	Y	Y								
Rhode Island	Y	Y	Y		Y	Y	Y			
South Carolina	Y	Y							Y	Y
South Dakota	Y	Y	Y			Y	Y			
Tennessee	Y									
Texas	Y	Y	Y		Y	Y	Y		Y	
Utah	Y	Y	Y			Y	Y		Y	
Vermont	Y	Y	Y							
Virginia	Y	Y	Y			Y				
Washington	Y	Y	Y	Y	Y	Y	Y		Y	
West Virginia	Y	Y	Y						Y	
Wisconsin	Y	Y	Y	Y					Y	Y
Wyoming	Y	Y	Y		Y	Y	Y		Y	
Total	**47**	**36**	**27**	**12**	**9**	**21**	**15**	**2**	**25**	**4**

APPENDIX E

Internet References for Construction Contract Administration

- Best Practices for Innovative Contracting, Utah State University (http://www.ic.usu.edu)
- 1998 Symposium on Innovative Contracting, conference summary and individual presentations (http://www.technautics.com/Orlando98/)
- AASHTO Journal (http://www.transportation.org/publications/journal.nsf)
- FHWA Home Page (http://www.fhwa.dot.gov/)
- FHWA Contract Administration Group Home Page (http://www.fhwa.dot.gov/programadmin/contracts/index.htm)
- The Federal Register (http://www.access.gpo.gov/su_docs/aces/aces140.html)
- Federal Suspension and Debarment list (http://www.arnet.gov/epls/)
- National Partnership for Highway Quality (http://www.nphq.org/)
- Thomas - The Library of Congress, Legislation Update (http://thomas.loc.gov/)
- Transportation Research Board (http://www.nas.edu/trb/index.html)
- Workzone Safety Clearinghouse (http://wzsafety.tamu.edu/)
- Best Practices in Workzone Safety from the FHWA Office of Program Quality Coordination report titled, “Meeting the Customer's Needs for Mobility and Safety During Construction and Maintenance Operations," (http://safety.fhwa.dot.gov/fourthlevel/pdf/bestprac.pdf)

APPENDIX F

Summary of Pavement Warranty Activities in MRC Area

	IL	IN	IA	KS	MI	MN	MO	NE	ND	OH	SD	WI
1. Experience with Warranty												
A. Number of Projects (#)	6	8	0	1[1]	300+	10	2	0	0	70	1[1]	28
HMA	3	8[1]	-	-	35[1]	-	-	-	-	66		24
PCC	3	-	-	1	10[1]	-	-	-	-	4	1	3
Pavement Preservation					300[1]	10[1]	2[1]			5		1
B. Project Completed (#)	6	8		1	300+	10	-	-	-	25		28
HMA	3	8	-	-	35[1]					21		24
PCC	3			1	10[1]					1		3
Pavement Preservation					300[1]	10				0		1
C. Initial Bid Cost Diff. of Warranty Projects (%)						15%				+10%		
HMA	Unk	Unk		Unk[2]	Nil					+9%		-3%
PCC	Unk				Nil					+12%	Unk	?
Pavement Preservation				Unk[2]	Nil					?		
D. Total Cost per Warranty Period (%)												
HMA	IL[1]	Unk		Unk	Unk							-11%
PCC	IL[1]			Unk	Unk						Unk	
Pavement Preservation				Unk	Unk							
E. Initial As-Built Performance Difference (Y, N)	N	Y		N		N				N		Y
HMA	IL[2]	Y[2]			Unk					N		
PCC	IL[2]			N	Unk					N	N	
Pavement Preservation					Unk					N		
F. Repairs Done (Y, N)	N	Y[3]		N	Unk	N	Y[2]			N	Y[2]	N
G. Disputes on Projects (Y, N)	N	N		N	Unk	N				N	N	N
H. Warranty Project Selection Guidelines (Y, N)	N	N[4]		N	Y[2]					Y	N	Y
I. Has any Increased Cost of Const. Changes been Identified (Y, N)	Y	N		N	N					Y		N
2. New Warranty Projects expected within the next 3 years (# or N)	15	Y	N	N	Y[3]	2	N		N	95	5[3]	25
a. Legislative mandate? (Y, N)	Y	N		Y	Y	N	N			Y	N	N
3. Typical Warranty Period (Yrs)	5	5		15		2	3			2-3-5-7	5	
HMA	5	5		15	3 or 5[4]	5	3			3-5-7		5
PCC				15	3 or 5[4]					7	5	5
Pavement Preservation					2-3					2-3		2
4. Are Longer Periods (10-15 yr) being Considered (Y, N)	N	N		Y	Y 10yrs					N	Y	Y
A. Who will do Mix Design or JMF (A)	A	C		C	C					C	C	C
B. Who will do Thickness Design (A)	D	D		C	D					D	C	D

	IL	IN	IA	KS	MI	MN	MO	NE	ND	OH	SD	WI
5. Typical Bond Amount ($/Mi)	Varies	Varies[5]		$9K	$8K					Varies[1]	SD[4]	$35K
A. Bond for all Repair or Replacement Costs (Y, N)	Y	Y		N[3]	N						Y	Y[1]
B. Ability to Obtain Bonding an Issue (Y, N)	N	N		N	N					Y	Y	N
C. Affects on Number and/or Type of Bidders that Participate (Y, N)	Unk	N		N	N					Y Minor	N	N
6. Performance Criteria (X Applicable)												
A. Ride	X	X		X	X					X	X	
B. Cracking (Transverse)	X	X		X	X					X	X	X
C. Cracking (Longitudinal)	X	X		X	X					X	X	X
D. Rutting	X	X		X	X					X		X
E. Faulting				X						X		X
F. Visual Distress					X	X				X	X	X
G. Other				KS[4]						X[2]	X[5]	
7. Performance Measurement Freq. (Yrs)	0	1		1	MI[5]	MN[2]				1	1	1-2[2]
8. Who Gathers Perform. Data (A)	D	D		D	D	D				DRT[3]	D	D
9. Reduces Standard Specs & Procedure Requirements	N	IN[6]		Y	Y[6]					N	N	Y
10. General Information - If yes, please provide details on separate sheet (Y, N)		IN[7]		KS[5]						Y[4]		Y[3]
A. Contact Point for Information	IL[3]	IN[8]		KS[6]	MI[7]	MN[3]				OH[5]		WI[3]
B. Reasons for not Using												
C. Advantages Identified		IN[9]			Pending					Y		
D. Disadvantages Identified					Pending					Y		

General Notes:

C = Contractor
D = DOT
P = Private
Unk = Unknown

Illinois Notes:

IL[1] - Varies
IL[2] - Subject to Opinion
IL[3] - Bill Sunley, ILDOT

Indiana Notes:

IN[1] - Indiana's projects, to date, have been mainly on high volume Interstate routes over cracked and seated or rubblized PCC pavements. One full depth high volume HMA Interstate project is being completed in 2001. Beginning in 2001, candidate projects on multilane NHS routes are now eligible for selection.

IN[2] - Currently tracking a number of warranty projects vs regular projects. Initial results to date are minor, but the PCR rating for the warranted pavements is higher than regular projects.

IN[3] - Two projects had to have the surface course removed and replaced in accordance with the warranty provisions due to lower than acceptable (warranted) friction numbers.

IN[4] - A joint DOT/FHWA/APAI (Industry) Team guides the updating of the specifications and the selection of projects. Final selection is made by the DOT.

IN[5] - Bond amount is determined by the estimated cost to completely remove and replace the warranted surface course.

IN[6] - DOT establishes the minimum aggregate requirements, minimum grade of binder, and minimum mixture requirements (rutting, cracking, friction, and smoothness). The DOT has eliminated all field inspection requirements on the warranted pavement other than the IA verification.

IN[7] - Indiana is currently developing a PCC warranty specification for FY2002 construction.

IN[8] -	FHWA	Lee Gallivan	317-226-7493	victor.gallivan@fhwa.dot.gov
	DOT	Richard Smutzer	317-232-5529	rsmutzer@indot.state.in.us
		Tim Bertram	317-232-5502	tbertram@indot.state.in.us
		Dave Andrewski	317-232-5280 x-212	dandrewski@indot.state.in.us
	APAI	Lloyd Bandy	317-632-2441	lloydapai@aol.com

IN[9] - We have found that the contractors have raised the quality bar on the warranted projects to the extent that they now have not only the responsibility to complete a project but they are also responsible for the condition of the pavement during the warranty period. Contractors have the opportunity to initiate new techniques, equipment, and/or processes on their own.

Kansas Notes:

KS[1] - Alternate Bid (Concrete vs. Asphalt)
KS[2] - Converted to standard concrete pavement QC/QA project after letting
KS[3] - Warranty cap of 50% of the cost of mobilization and roadway bid items
KS[4] - Other warranty criteria (bumps, potholes, delamination)
KS[5] - Eliminated materials sampling and testing requirements, materials specifications and equipment requirements
KS[6] - Michael Herzog (785) 296-3576, Field Construction Engineer

Michigan Notes:

MI[1] - Approximate Numbers
MI[2] - All Pavement Maintenance treatment are potential candidates
All Hot-mix overlays with ESAl above 10M are potential candidates
All reconstruction projects are potential candidates
MI[3] - Hundreds
MI[4] - 3 years for Preventive Maintenance, 5 years for 4 R
MI[5] - Unspecified
MI[6] - Inspection
MI[7] - Steve Bower, (517) 322-5198, MIDOT Pavement Engineer

Minnesota Notes:

MN[1] - Micro Surfacing Projects
MN[2] - Once at the end of the performance period
MN[3] - Roger Olson
MnDOT
Engineering Services
1400 Gervais Avenue
Maplewood, MN 55109
(651) 779 5517

Missouri Notes:

MO[1] - Two (2) SAMI projects were tried to prevent reflective cracking
MO[2] - Both projects failed and contractor failed to make repairs after second failure.

Ohio Notes:

OH[1] - **Bonding Requirements & Warranty Period:** **Warranty Period (Years)**

Item 825-Crack Sealing, Hot Applied: 100% of bid item, but not< $10,000.00 ……	2
Item 880-Asphalt Concrete – 2” or less 90% of bid item ……	3
>2”-4” 60% of bid item ……..……..	5 or 7
>4” 30% of bid item ……....	5 or 7
Item 881-Microsurfacing: 75% of bid item ……..	3
Item 882-Chip Seal: 75% of bid item ……..	2
Item 884-Concrete Pavement: 40% of bid item ……	7
Item 886-Hot-in-Place Recycling: 75% of bid item …….	3

OH[2] - 6G - Other Warranty Criteria

Asphalt Concrete - Disintegrated Areas--Mix delamination, potholes & raveling
Microsurfacing - Bleeding/Flushing, Surface loss and raveling
Chip Seal - Surface patterns--lines/streaks over pavement surface, patches of aggregate loss, & bleeding/flushing
PCCP - Joint sealant deformation, loss or movement from intended location & faulting

OH[3] - DRT - District Review Team

OH[4] - ODOT has developed guidelines for project selection and written a report to the State Legislature summarizing the State fiscal year 2000 program.

OH[5] - Points of Contact:

Guidelines for Project Selection - Aric Morse, Pavement Design Coordinator, 614-995-5994
& Andrew Williams, Pavement Management Coordinator 614-752-4059
Warranty Coordinator - Specifications & Construction, Bill Christensen 614-644-6634
Asphalt Construction - Bill Christensen 614-644-6634
Asphalt Materials - Dave Powers 614-275-1387
Concrete Construction - Keith Keeran 614-644-6622
Concrete Materials - Bryan Struble 614-275-1385
Preventive Maintenance Treatments - Aric Morse or Bill Christensen

South Dakota Notes:

SD[1] - Under design-build concept $34 million CRC pavement
SD[2] - Redesign terminal and joints during construction
SD[3] - Or Less Anticipated
SD[4] - $4,000,000 for Entire Project
SD[5] - Joint Materials

Wisconsin Notes:

WI[1] - Bond amount based on cost for 1.5" overlay, which is considered worse case scenario.

WI[2] - Initially, warranty projects have been monitored annually. WI is moving to monitoring them every other year, which is consistent with their PMS condition survey schedule. The exception to this schedule would be that all projects would be monitored in year 5.

WI[3] - General Information
Contact Points:

FHWA	Wes Shemwell	608.829.7521	wesley.Shemwell@fhwa.dot.gov
WISDOT	Tom Brokaw (Asphalt Warranties)	608.246.7934	thomas.brokaw@dot.state.wi.us
	Jim Parry (PCC Warranties)	608.246.7939	james.parry@dot.state.wi.us
	Steve Krebs (Warranty Performance)	608.246.5399	steven.krebs@dot.state.wi.us

Advantages Identified:

- The warranty process allows WisDOT to define the final product in terms of condition and performance.
- Enhanced pavement quality
- More cost effective pavement
- Lower WisDOT project delivery costs by reduced testing, supervision and staff involvement in the construction process.
- To progress from method specifications and from the QC/QA concept to end result, performance-based specifications
- Contractor has more freedom to be innovative and creative while maintaining state performance standards
- Shifts product responsibility from WisDOT to contractor.

APPENDIX G

Summary of Current Use of Qualification and Past Performance Information

(From 1999 Transportation Research Board Paper #156, "Contractor Performance Rating – Where Are We Now?" Professor R. Edward Minchin Jr., Pennsylvania State University, and Professor Gary R. Smith, Iowa State University, Table 3)

	AK	CO	CT	DE	FL	GA	ID	IL	IN	IA	KS	KY	LA	MA	MD	ME	MI	MN	MO
Pre-Qualification	X	X	X		X	X	X	X	X	X	X	X	X	X			X		
Post-Qualification																			
License	X				X		X						X						
Incentives																		X	
Cyclical Contr. Perf. Rating																			X
Past Performance																B			
Process																			
Cooperation			D	D		D		D	D	D	D	D		D	D	B	D		D
Equipment	C	C		D	D	B		C	B	B		B		B			D		D
Organization & Mgmt		C		D	D			B	B	B		B		B		B	D		D
Schedule			B	D	D	D		D	D	D		D		D		B	D		D
Timely Submission of Reports			D		D				D					D	D	B			D
Safety				D		D										B			
Job Cleanliness			D		D														
Experience																			
Past Projects	C	C			B	C		C	B	B	C	B		C					
On-going Projects	C				B	C					C	C							
Default	C	C				C		C		C	C								
Pre-qualification in other states											C								
Product				D		D		D	D	D	D	D		D	D		D		D
Finance	C	C			C	C		C	C	C	C	C							
Current Indexing system		M														X			

Notes:
X: Yes
M: Materials only
C: Contractor fills out self report
D: DOT evaluates contractor
B: Both

(From 1999 Transportation Research Board Paper #156, "Contractor Performance Rating – Where Are We Now?" Professor R. Edward Minchin Jr., Pennsylvania State University, and Professor Gary R. Smith, Iowa State University, Table 3)

(continued)

	MT	NE	NJ	NY	NC	ND	NV	PA	SC	SD	TX	UT	VT	VA	WA	WV	WI	WY
Pre-qualification		X	X		X	X	X	X	X		X	X	X	X	X	X	X	X
Post-qualification				X														
License					X	X			X									
Incentives																		
Cyclical contr. Perf. Rating										X								X
Past performance																		
Process																		
Cooperation		D			C		D	D			D	D	D	D	D	D	D	D
Equipment		D	C	D	C	C	D	B	C			D	D	C	B	D	B	B
Organization & mgmt		B			C		D	B	C	D		D	D	D	B		D	D
Schedule		D	D		D		D	D		D		D	D	D	D			D
Timely Submission of Reports			D									D	D		D			D
Safety		D					D											D
Job cleanliness																		D
Experience																		
Past projects		C	C	C	C	C	C	B	C	D		B	C		B	C		C
On-going Projects				B	C	C	C		C					C				C
Default		C	C	D			C	C	C				C		C	C		C
Pre-qualification in other states		C			C								C			C		
Product		D			B		D	D					D		D	D	D	D
Finance		B	C	C		C	C	C	C		C	C	C	C	C	C	C	C
Current Indexing system					X		X					X				X	X	

Notes:
X: Yes
M: Materials only
C: Contractor fills out self report
D: DOT evaluates contractor
B: Both

APPENDIX H

Main Contacts for the Transportation Curriculum Coordination Council

October 2001

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