

**The Department of Transportation's Consultant
Evaluations and Construction Project Administration
March 2004**

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**STATE OF TENNESSEE
COMPTROLLER OF THE TREASURY**

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John G. Morgan
Comptroller

March 30, 2004

The Honorable Phil Bredesen, Governor
and

Members of the General Assembly
State Capitol
Nashville, Tennessee 37243

and

The Honorable Gerald Nicely, Commissioner
Department of Transportation
Suite 700, James K. Polk Bldg.
Nashville, TN 37243

Ladies and Gentlemen:

Transmitted herewith is the performance audit of the Department of Transportation's Consultant Evaluations and Construction Project Administration. This audit was conducted at the request of the commissioner of the Department of Transportation and pursuant to the authority granted in Section 4-3-304, *Tennessee Code Annotated*.

Sincerely,

John G. Morgan
Comptroller of the Treasury

JGM/dww
03-078

State of Tennessee

Audit Highlights

Comptroller of the Treasury

Division of State Audit

Performance Audit

**The Department of Transportation's Consultant
Evaluations and Construction Project Administration**

March 2004

AUDIT OBJECTIVES

The objectives of the audit were to (1) review the system for evaluating engineering consultants, determine the extent to which other department consultants are evaluated, and make recommendations to improve the process; (2) evaluate the administration of highway road construction projects including reviewing the processes for evaluating bids, use and administration of incentives, approval of change orders and contract extensions, assessment of liquidated damages, and project oversight; and (3) make recommendations to improve these processes.

FINDINGS

Several Divisions Are Not Complying With the Department's Policy for Consultant Evaluations, and the Policy Needs to Be Improved

Department policy requires staff to evaluate all consultants on the timely completion of work, conformity with contract cost, and quality of work, but not all consultants have been evaluated. Also, evaluations are not always made available to staff in other divisions who may work with the consultants or consider them for future work (page 12).

The Department Should Analyze Data From the Construction Process to Identify Areas in Which to Strengthen Controls, Improve Timeliness, and Control Costs

To minimize construction time and costs, the department should analyze and use information available to identify trends and areas of improvement. Identifying trends and systematically evaluating causes for cost increases could result in cost-saving measures for future projects (page 18).

OBSERVATIONS AND COMMENTS

The audit also discusses the following issues: emergency purchases (page 5) and bid analysis (page 6).

Performance Audit
The Department of Transportation’s Consultant
Evaluations and Construction Project Administration

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Performance Audit
The Department of Transportation's Consultant
Evaluations and Construction Project Administration

INTRODUCTION

PURPOSE AND AUTHORITY FOR THE AUDIT

This audit of certain contracting procedures of the Tennessee Department of Transportation was conducted at the request of the Commissioner of the department and pursuant to the authority granted in Section 4-3-304, *Tennessee Code Annotated*. In April 2003, the Commissioner requested that the Office of the Comptroller of the Treasury review the department's policies and procedures regarding consultant evaluations, project bid evaluation, and construction project administration.

OBJECTIVES

The objectives of the report were

1. to review the system for evaluating engineering consultants, determine the extent to which other department consultants are evaluated, and make recommendations to improve the process;
2. to evaluate the administration of highway road construction projects including reviewing the processes for evaluating bids, use and administration of incentives, approval of change orders and contract extensions, assessment of liquidated damages, and project oversight; and
3. to make recommendations to improve these processes.

SCOPE AND METHODOLOGY

The audit reviewed the above activities of the Tennessee Department of Transportation from April 2003 to June 2003. The audit was conducted in accordance with the standards applicable to performance audits contained in *Government Auditing Standards* issued by the Comptroller General of the United States. The methods included

1. a review of the department's policies, procedures, and files with a focus on procedures in effect during fieldwork (April 2003 to June 2003);

2. interviews with department staff and Federal Highway Administration staff; and
3. a review of audit reports of other states.

ORGANIZATION AND RESPONSIBILITIES

The Tennessee Department of Transportation is responsible for planning, designing, constructing, and maintaining the state highway network. The department also has planning and/or regulatory responsibilities for other modes of transportation such as aeronautics, public transit, railroads, and waterways.

The department is headed by a Commissioner; a Chief of Administration, who oversees department offices such as Finance, Human Resources, and Information Technology; a Chief of Environment and Planning, who oversees environmental issues related to highway projects; and a Chief Engineer, who oversees the department's highway planning, design, and operations function. The department has four regional field offices—one each in Knoxville, Chattanooga, Nashville, and Jackson. Those offices report directly to a transportation director at each office who is responsible for the regional office and who reports to the Chief Engineer.

PROJECT DEVELOPMENT AND CONSTRUCTION

Department staff and consultants design construction projects. In the planning phase, department staff develop and review environmental studies, determine a project's location, complete a preliminary project design, and solicit public comments on the project. In the design phase, a project's final design plans are prepared, right-of-way is purchased, and all required permits are obtained. During the construction phase, department staff let contracts for transportation construction projects while private contractors perform actual construction and maintenance tasks.

Only prequalified bidders may be awarded a contract. The department has an application package for contractors to complete—including information regarding the ownership and experience of the company—for inclusion on the prequalified list. All contractors must be bonded before they are permitted to bid on a contract. The department relies on a contractor's ability to obtain a performance bond as evidence that the contractor meets its pre-qualification requirements.

Prior to bidding, the department provides prospective bidders with plans and specifications for the individual project. The department estimates the cost of a project based on site condition, specified materials and processes, and other factors. This estimate is not disclosed to the public before bidding but is used by the department to assess the reasonableness of the bids received. Section 54-5-116, *Tennessee Code Annotated*, authorizes the department to award construction contracts through a competitive bid process to the lowest responsible bidder.

DEPARTMENT OF TRANSPORTATION USE OF CONSULTANTS

The department retains consultants for various phases of project planning, development, and construction. The Design, Structures, Environment, Planning, Maintenance, Materials and Tests, and Construction divisions each use consultants for some aspect of their project responsibilities. According to the department's Standard Procurement Policy for Engineering and Technical Services (dated January 14, 2002, and effective February 27, 2002), three conditions determine the necessity of retaining a consultant:

- the extent of the work compared to the available staff,
- the complexity of the work, and
- the time frame in which the work is to be completed.

Consultant Pre-Qualification Process

The 1972 federal Brooks Act requires consultant contracts for engineering- and design-related services financed with Federal Highway Administration funds to use qualification-based selection procedures. The Department of Transportation Procurement Policy applies to consulting contracts for engineering services and for technical services. The policy lists project management, construction management and inspection, planning studies, preliminary engineering, design engineering, surveying, mapping, geotechnical studies, environmental assessments and related studies, right-of-way acquisition and related services, and architectural services as engineering services. Technical services are inspection of structural steel fabrication, sub-surface exploration/drilling, laboratory testing, inspection of welds on existing bridges, and underwater inspection.

Consultants are required to submit completed departmental forms for inclusion on a pre-qualified list. The department reviews the forms submitted for professional, technical, and financial qualifications. Firms who successfully meet the criteria are placed on the list for two years. The consultant is responsible for applying for renewal.

Consultant Selection

When a consultant is needed for a specific project, the department advertises for letters of interest from pre-qualified firms. A selection committee chooses firms from those who submit letters of interest and asks those firms to submit proposals. The evaluation committee—the Chief Engineer, the Assistant Chief Engineers, and the Division Director requiring the services—evaluates the proposals and recommends to the Commissioner a list of at least three firms. The Commissioner ranks the firms in order of preference based on established criteria, and the department negotiates a price with the most qualified firm. The division using the services is responsible for monitoring the consultants' work and preparing a performance evaluation annually and/or at project close. Per the procurement policy, an evaluation includes scoring on

timely completion of work, conformance with contract cost, and quality of work. Policy states that a copy of the evaluation is shared with the consultant.

CONSTRUCTION CONTRACTS

A contractor is expected to complete the construction work according to the plans, specifications, and terms of the contract. When adjustments to the contract are needed, supplemental agreements may be used for adjusting material specifications and quantities, correcting design errors or omissions, unfavorable weather conditions, and other reasons. These agreements may increase, decrease, or have no effect on the total contract amount.

The department has two categories of supplemental agreements. Major supplemental agreements (Category 1) require approval from the Director of Construction and the Commissioner. The regional Transportation Director approves minor supplemental agreements (Category 2). Both major and minor supplemental agreements must also be approved by the Federal Highway Administration on federal aid projects requiring its oversight.

A major supplemental agreement is defined as contract changes

- to the working time or completion date of the contract, or
- that increase a unit price or modify the total original contract amount by more than \$100,000 or 10 percent, whichever is less.

A minor supplemental agreement includes changes other than those defined as a major supplemental agreement.

BID ANALYSIS

Department of Transportation staff develop a confidential construction cost estimate for each project using the project design plans, which specify work items including the quantity of materials, labor, and equipment necessary to complete the project. The department reviews bids submitted by contractors for errors in quantities and prices. In order for the lowest bidder to be awarded the contract, the bid cannot be materially unbalanced (i.e., contain unrealistically high or low unit prices that may not result in the lowest cost to the department).

OBSERVATIONS AND COMMENTS

The issues discussed below did not warrant a finding but are included in this report because of their effect on the operations of the Department of Transportation.

EMERGENCY PURCHASES

The department does not have policies and procedures in place to identify emergency situations or to ensure repair work, as a result of an emergency, is quickly awarded at a competitive price. The department's required four-week advertisement prior to bid letting would not be suitable in an emergency situation.

The Department of General Services defines emergency purchases as purchases made without following the normal purchasing procedure in order to obtain goods or services quickly to meet an emergency. Emergency repairs are those required to save lives, to protect or restore public health and safety, to protect property, or to provide temporary facilities to restore essential public services. Department staff indicated that the identification of work to be performed on an emergency basis is subjective and is based on situational assessments as determined by senior staff.

At one time, in the event of an emergency purchase, department staff would write a short description describing the work to be done. Then three or four contractors would bid, and the lowest responsible bid would be selected. The entire process was completed in a day or two. However, the department stopped using this method several years ago.

Currently, in the event of an emergency and the resulting necessity of repair work, the department determines contracts currently in effect in the area. Existing contracts are then supplemented to reflect any emergency repair work performed by those contractors. Generally, prices for emergency repairs are negotiated before work is done at the prices already in the contract for similar work. Approval is required by the Commissioner if the supplement will be over \$100,000 (Category One). Approval is required by the regional director in the event that the supplement will be under \$100,000 (Category Two). Prior to the addition of emergency supplements, verbal approval is received from senior staff.

The lack of pertinent policies and procedures regarding emergency contracts and the authority to promulgate these policies and procedures diminishes the department's ability to ensure a competitive bid process and quickly perform work required to save lives, protect or restore public health and safety, protect property, and provide temporary facilities to restore essential public services.

The department should request statutory change from the General Assembly to give it the authority to promulgate policies and procedures detailing the process by which emergency

situations are identified and an expedited process in which the integrity of the competitive bid process is ensured.

Management Comment:

We concur. The General Counsel has drafted legislation requesting emergency contracting authority. This legislation will be submitted as part of the department's legislative packet.

BID REVIEW AND ANALYSIS

Current Bid Review Process

Section 54-5-116, *Tennessee Code Annotated*, requires the Tennessee Department of Transportation to award construction contracts to the lowest responsible bidder. After each bid letting, bids are reviewed for legal completion (i.e., signatures) and pricing (i.e., line item prices are not high compared to the estimate). If a bid is found to be materially unbalanced, a situation in which the apparent low bidder is no longer the low bidder after any errors in quantity are adjusted, all bids for the project are rejected, the bid quantity is corrected, and the project is rebid.

Bid Analysis Management System

The department has contracted with Infotech for a bid analysis software package, Bid Analysis Management System (BAMS), that compares bids to estimates and identifies patterns. This is an initiative of the American Association of State Highway and Transportation Officials (AASHTO), and the department is one of 35 state highway departments that will use this program. (Infotech is a software development and consulting company located in Gainesville, Florida.) Currently, BAMS is used by the Construction Division in the awards analysis to generate line-item profiles for certain materials on received bids and by estimators to help in the preparation of the state's project estimates. However, to adequately perform analyses, the department needs five years of history on bids. To accomplish this, the department must convert older data to a new format for use with BAMS. According to the Construction Division, the data conversion is complete and the department's consultant (Infotech) will present its study to the department in November 2003. The bid analysis system will be used to analyze asphalt paving bids and later grading and concrete bids.

The line-item profiles, introduced in February 2002, supplement the bid analysis process and provide a visual representation of differences in the cost of various line items. The line-item profile models produce graphic displays that can be used to identify the bid items most responsible for a vendor's bidding deviations on a specified contract. Bid items that exceed the low bid by 0.5% will be displayed by one or more of the bidders. Department management has used these profiles for analyzing some asphalt resurfacing bids.

Project Estimates

The department does not have written guidelines governing the methodology used to formulate estimates for construction projects. According to department management, estimates are formulated to reflect a fair market value for the state. Estimates are first compiled using historic data, then refined based on the materials to be used such as bituminous material, base stone, concrete, and earthwork. It is unclear whether the formulation process for estimates is uniform across the state. The department should develop written guidelines for preparing estimates and ensure they are implemented uniformly across the state.

Management Comment:

We concur. The department is presently reviewing the estimation procedures of other states' Departments of Transportation in order to improve our own process. Once documented, this process will improve feedback between the Construction Division and the estimators and reinforce consistency statewide. This will be completed by June 30, 2004.

Auditor Analysis of Bid Information

Auditors analyzed bid-letting information for 14 bid lettings for the period February 1, 2002, through May 2, 2003. We compared bids received and contracts awarded to the state estimate.

Comparison of Projects With Single Bids to Those With Multiple Bids

According to department staff, the department has not conducted any analyses or assessments comparing bid prices for single-bid (non-competitive) projects to those with multiple bids. Our analysis revealed that the average variance between the department's estimate of the cost of the contract and the bid amount for bids received and contracts awarded in non-competitive situations was higher than the average variance of bids received and contract awards in competitive situations.

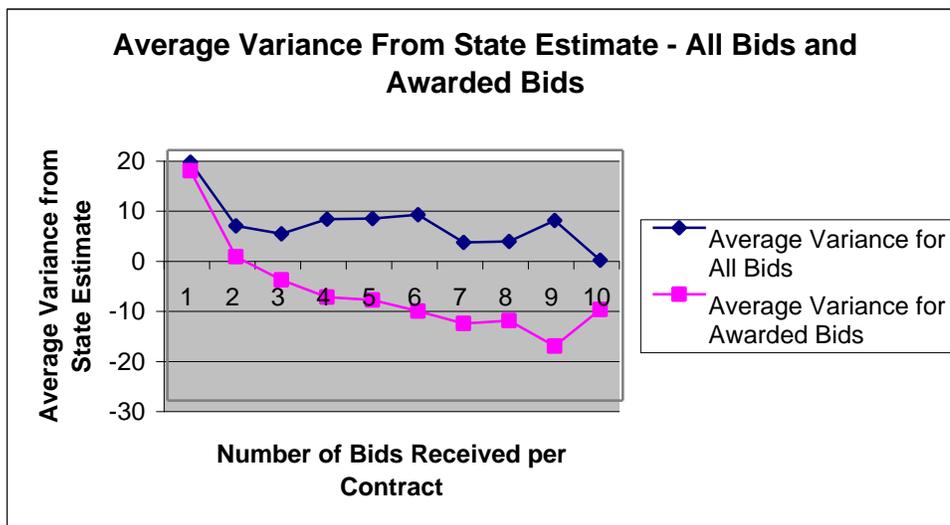
Table 1
Average Variance by Number of Bids
Bid Lettings February 1, 2002, to May 2, 2003

Number of Bids Received for the Project	Average Variance From State Estimate for All Bids	Average Variance From State Estimate for Awarded Bids
1	17.61%	15.90%
2	4.91%	-1.30%

3	3.31%	-5.95%
4	6.23%	-9.36%
5	6.31%	-9.91%
6	7.10%	-12.16%
7	1.55%	-14.65%
7	1.75%	-14.06%
9	5.97%	-19.15%
10	-1.98%	-11.85%

In general, the more bids received for a project, the lower the cost of the awarded bid is relative to the state's estimate.

Graph 1
Tennessee Department of Transportation
Average Bid Variance From Estimate



Projects With One or Two Bids

The department reported that there are areas within the state that consistently receive only one or two bids per project. Projects with one bid are generally located away from urban areas and are driven by the local market, which may only support one asphalt supplier or quarry. Price is driven by the contractor closest to the project.

When projects with only one or two bids come in well over the state estimate, the department will check the estimate to determine whether errors have been made. The urgency of the project is also examined to determine if there is a dire need of repair that presents a hazardous condition to the motoring public. If the conditions warrant, the project may be awarded as long as the bid is not considered excessive. In some instances, projects are partially funded by local

agencies. If the local agencies need the project completed quickly, the project may be awarded based on the concurrence of the local agencies. For projects that are not considered urgent, other options such as other methods of construction, rebidding the project, or delaying or cancelling the project may be considered.

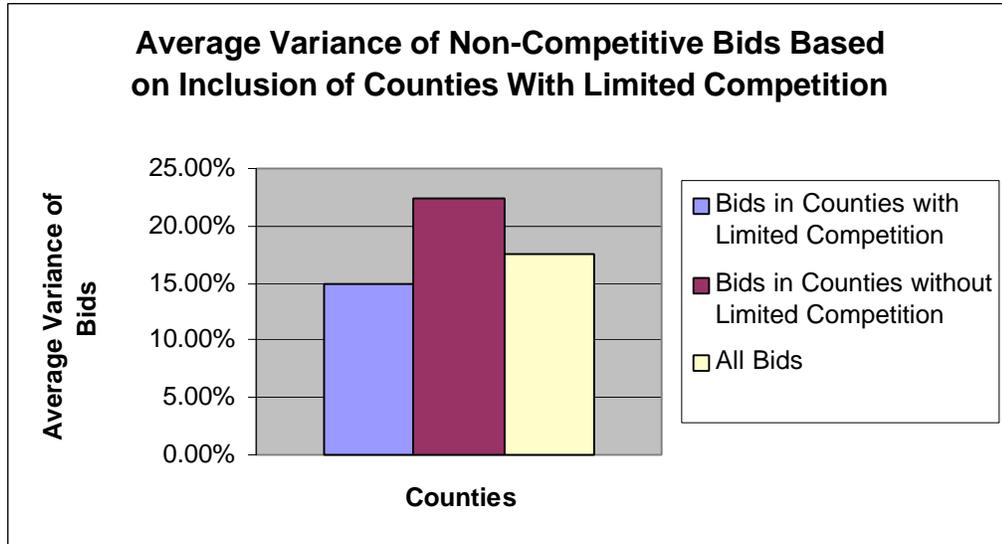
According to department management, if the department chooses to reject the bids and offer the project again at a subsequent bid letting, contractors could submit bids to perform the project at higher prices than the initial prices. The department does have the option of choosing not to let a project in an area where non-competitive bids are prevalent until contractors in those areas agree to bring down prices. However, this may result in a negative impact on the citizens in those areas as projects would not be performed until contractors choose to reduce their prices.

The average variance of non-competitive bids was examined from February 2002 through May 2003. Non-competitive bids were separated if they included work in counties identified by the department as having limited competition based on the location of quarries and asphalt plants. Of 107 non-competitive bids examined, 68 included counties that have limited competition due to the location of quarries and asphalt plants.

Table 2
Average Variance
Projects With One or Two Bids
Bid Lettings February 1, 2002, to May 2, 2003

	Number of Bids	Average Variance From State Estimate
Bids Which Include Counties With Limited Competition	68	14.85%
Bids Which Do Not Include Counties With Limited Competition	39	22.33%
All Bids	107	17.58%

The average variance of non-competitive bids in counties that have limited competition due to the location of quarries and asphalt plants was actually lower than the variance in bids in counties that were not marked by the department as having limited competition. This does not appear to support the department's assumption that variances in non-competitive bids are driven by and are larger in counties marked by a lack of competition due to limited asphalt suppliers or quarries.



Based on the department’s comments that the analysis should only include bids for resurfacing projects, we reviewed bid information based on whether the contract was or was not a resurfacing project. The department stated that the plants providing the material (e.g., asphalt) used in these projects must be located within 50 miles of the project because the material had to be kept at a certain temperature. Often there is a limited number of suppliers within this radius. Of the 107 non-competitive bids reviewed, 63 were for resurfacing projects. The average variance for non-competitive bids for resurfacing projects was 18.79%. Of the 44 non-competitive bids reviewed which were not resurfacing projects (41.1%), the average variance from the state estimate was 15.84%.

Table 3
Average Variance for Non-Competitive Bids
Resurfacing Projects Versus All Other Projects
Bid Lettings February 1, 2002, to May 2, 2003

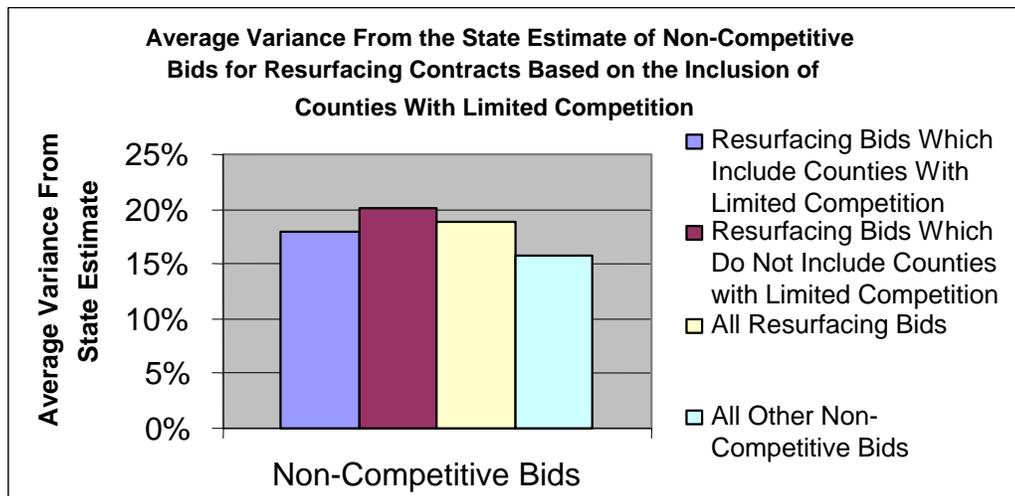
	Number of Bids	Average Variance
Bids for Resurfacing Projects	63	18.79%
Bids for Non-Resurfacing Projects	44	15.84%
All Bids	107	17.58%

Of the 63 non-competitive bids for resurfacing projects, only 38 (60.3%) were bids which included counties identified by the department as having limited competition due to the location of quarries and asphalt plants.

**Table 4
Non-Competitive Bids for Resurfacing Projects
Bid Lettings February 1, 2002, to May 2, 2003**

	Number of Bids	Percentage of All Resurfacing Non-Competitive Bids
Bids for Resurfacing Projects Which Include Counties With Limited Competition	38	60.3%
Bids for Resurfacing Projects Which Did Not Include Counties With Limited Competition	25	39.7%
All Bids for Resurfacing Projects	63	100%

The average variance from the state estimate for non-competitive resurfacing bids for contracts which include counties with limited competition was 17.95% and was 20.8% for contracts that did not include counties with limited competition. Our analysis of non-competitive bids for resurfacing projects does not support the department’s assumption that variances in non-competitive bids are driven by the level of competition of quarries and asphalt plants. However, because the software the department plans to use, BAMS, has the capability to analyze bid data by each work item in the bid, analysis results may indicate additional factors to consider once it is used.



Until the BAMS system is complete, the department should periodically analyze bid-letting data to determine trends regarding projects that receive multiple bids and those with non-competitive bids. Non-competitive bids should be examined to ascertain factors that may affect pricing.

Management Comment:

We concur. We presently analyze all bids (competitive and noncompetitive) to determine if the department is receiving the best value; however, with the BAMS system we will have access to more complex software analysis. In addition, we have requested additional personnel for the BAMS analysis.

If the department's analysis determines that projects with few bids and in certain areas are costing the state more, the department should examine other options for state projects.

Management Comment:

We will look at other alternatives when such changes could be beneficial to the department.

Because the BAMS system has the ability to analyze bids by work item and price, the department should make use of its capability and use it to determine if there are any irregularities in bidding, such as collusion between contractors.

Management Comment:

We concur. The department is currently reviewing the process for the Bid Analysis Module in terms of personnel, reporting, and locations within the department's organization.

FINDINGS AND RECOMMENDATIONS

1. Several divisions are not complying with the department's procurement policy regarding consultant evaluations, and the policy needs to be reviewed and improved

Finding

The department's Standard Procurement Policy for Engineering and Technical Services states that the department will prepare a performance evaluation report for all consultants that addresses timely completion of work, conformity with contract cost, and quality of work. During our review of consultant contracts and their evaluations, we found that some divisions in the department are not complying with the policy.

Consultant Evaluation Status by Division

Table 5 indicates the eight divisions in the department using consultants. Seven of the divisions had active consultant contracts in April 2003. Two of the divisions have evaluation procedures and are using them—the Survey and Design Division and the Planning Division. One division had performed a test evaluation of one consultant.

Table 5
Tennessee Department of Transportation
Consultant Evaluations by Division
April 2003

Division	Consultants With Active Contracts	Consultants With Evaluations	Status of Evaluations
Construction	1	0	No consultant evaluation in place
Environmental Compliance	4	0	No consultant evaluation in place
Environmental Planning & Permits	21	0	No consultant evaluation in place
Materials & Tests(1)	5	1	Early stages of implementing evaluations
Planning	11	11	Formal consultant evaluation in place
Right of Way	0	0	Developing consultant evaluation template
Structures	7	0	No consultant evaluation in place
Survey & Design	55	47	Formal consultant evaluation in place
Total	104	59	

(1) Evaluation was a test of their evaluation process.

According to the division management of the Division of Environmental Compliance, consultants are not given a formal evaluation. Due to the unique work of these consultants (environmental cleanup), they are informally evaluated on a continuous basis. The Environmental Planning and Permits and Structures divisions indicated that, because they do not use many consultants, they do not evaluate them.

The July 2002 Sunset Audit for the Department of Transportation stated that the Materials and Tests Division needed to implement an evaluation process for its consultants. The February 2003 six-month follow-up response from the department said the division would begin immediately using its evaluation form. When we reviewed evaluations for this audit (April 2003), the division had active contracts with five consultants but had only evaluated one consultant as a test.

The Right-of-Way Division did not have any active consultant contracts; however, the division does use Right-of-Way Consulting firms for some projects. It does not evaluate them.

Survey and Design Division Evaluation Process

Survey and Design Division staff prepare evaluations for each consultant annually at the end of the calendar year, and the division director reviews them. According to the director, the evaluations are used as a communication tool between the department and the consultant. Although individual consultant evaluations do not go to the selection committee, a summary of consultant ratings are provided to the procurement selection committee annually.

The evaluation form used by the Survey and Design Division has two scoring categories—Project Management and Quality and Accuracy. The Project Management category gives a score in five areas—schedule promptness, responsiveness, capability, preparedness, leadership, and budget. The Quality and Accuracy category gives one score based on the type of plan. Possible scores are one to four. The total score is then divided by the total possible points (28) to give an overall rating.

Planning Division Evaluation Process

The Planning Division also uses a grading scale of one to four. There are two scoring categories—Project Management and Product. The Project Management category gives a score in seven areas: schedules, responsiveness, capability, preparedness, leadership, budget, and subconsultant supervision. The Product category gives one score based on the type of report. The total score is then divided by the total possible points (32) to give an overall rating. The division meets with the consultant to discuss the evaluation.

Materials and Tests Division Evaluation Process

The evaluation forms developed by the Materials and Tests Division are similar to those used by the Survey and Design and Planning divisions. Possible scores are one to four per item evaluated. The consultant is scored in seven areas: schedules, responsiveness, capability, preparedness, field work, leadership, and budget.

Evaluation Process Improvements

One division indicated that the process could be improved if the evaluation criteria had more emphasis on schedule promptness and budget. Neither of the two divisions with a fully implemented evaluation process (Planning and Survey and Design) use weighted points to emphasize one or more tasks or provide directions to the staff person completing the form. States such as California, Maine, and Ohio have forms with more detailed instructions to the evaluator than those on forms used by the department divisions. These instructions include guidelines for scoring, weighted points for certain aspects of the work, and procedures for assuring the original evaluation information is available to the selection committee. Providing directions, including descriptions of what the ratings mean, the circumstances under which certain scores should be given, and assessing more weight to the most important categories would help avoid subjectiveness in the process and ensure that the consultant is evaluated on those areas most critical to each division.

Consultant Evaluation Scores

As of May 15, 2003, the department had 1,965 active consultant contracts. According to department management, the Standard Procurement Policy for Engineering and Technical Services was effective February 27, 2001. Although there were 774 consultant contracts with 102 firms that started on or after that date, only two divisions had evaluations for their active contracts. However, management in neither division had determined what is considered a low score. Therefore, we determined low scores for the two divisions for testing purposes.

The Survey and Design Division had 55 firms with active contracts on that list. We found evaluations for 47 of them. Some of the consultants had more than one evaluation, some as many as 11. The scores ranged from 2.23 to 4.0. Five of the 47 firms with evaluations had average scores below 3.0, or 75% of the total score. All five of these firms have since been given additional contracts.

The Planning Division had 11 firms with active contracts on the list. All had evaluations and the scores ranged from 3.04 to 3.87. The firm with the lowest score that had received additional contracts had a score of 3.29.

Additional Issues Regarding Consultants and Consultant Evaluations

Consultant Selection Committee

The selection committee does not take minutes when it meets; therefore, we could not determine whether consultant evaluations are used as part of the decision-making process.

Lapsed Pre-Qualifications

Based on a review of consultant contracts, although firms must pre-qualify before being selected, they do not have to remain qualified after the first phase of the selection process. If the selection process takes a long time or if a project goes on for several years, a consultant may no longer be qualified. Twelve of 82 consultant firms tested with active contracts beginning on or after February 27, 2002, were no longer on the pre-qualification list as of March 27, 2003. These firms had not resubmitted their pre-qualification information. Because the intent of the pre-qualification process is to ensure that the firms listed meet certain professional, technical, and financial qualifications, the department should not allow firms with active contracts to have lapsed pre-qualifications. For example, as part of their pre-qualification, consultants must list employees and their required licenses, any laboratory certifications, and provide financial statements showing that they can undertake the assignment. Allowing consultants to let their pre-qualification lapse during an active project has the appearance of discrediting the pre-qualification process.

Cost-Benefit Analysis

The department has not conducted any cost-benefit analysis of consultant use. Although the Brooks Act requires engineering- and design-related services (when FHWA funds are used) to be qualification-based, a cost-benefit analysis for the overall usage of consultants versus in-house staff should be performed to determine if the usage level of consultants is appropriate. Because the use of consultants is based on staffing issues, department management stated that it was more advantageous and cost less to have fewer staff and use consultants as needed, although this conclusion is not based on any formal analysis by the department. A cost-benefit analysis may indicate using state employees is less expensive in some cases. In addition, state employees may have a more vested interest in the work performed.

Recommendations

Department management should require all divisions to comply with the department's Procurement Policy to evaluate consultants.

Management Comment:

We concur. The Office of Contracts review has already implemented a process to ensure that all consultants are evaluated annually. This process includes approving all evaluation forms to be used and then receiving copies of all completed evaluations annually. The Office of Contracts Review also will provide any necessary assistance to aid divisions in completing their evaluations in a timely manner. All evaluations of consultants should be completed and received by the Office of Contracts Review by February 1, 2004.

The department should review its current processes and forms and determine if changes should be made. Improvements in the current consultant evaluation process should include

- revising forms to include descriptions of what the various ratings mean,
- providing directions to staff for completing the evaluation form,
- requiring the evaluator to include any documentation or explanation supporting the ratings,
- applying weighted scores to some items in order to emphasize tasks that are more important, and
- determining a “low score” which would indicate unsatisfactory work

Management Comment:

We concur. The Office of Contracts Review has met with the managers responsible for monitoring consultant agreements. All divisions have developed forms and procedures to evaluate their consultants. The forms include a description of what each point-value on a four-point scale means. Directions to the staff are to be included with the evaluation forms for the project-level managers. We have not applied weighted scores to items to emphasize importance nor have we determined a “low score” indicating unsatisfactory work. Once we have collected and analyzed the first year data, however, we may consider the addition of these components.

Because the department as a whole and the individual divisions have a responsibility to monitor the quality of the work of consultants, the department should make consultant evaluations available to all divisions via a central records area, such as the department’s Intranet. Large consulting firms provide more than one type of service (i.e., they may be used for engineering services in one division and for surveying services in another). Therefore, the department should make consultant evaluation scores available to all divisions.

Management Comment:

We concur. The Office of Contract Review will collect the completed evaluations and compile the results into a meaningful report. These results will be disseminated to managers, as well as the selection committee by March 15, 2004.

During its meetings, the selection committee should document the discussion and information presented regarding consultants chosen including any emphasis on past evaluations used for the selection.

Management Comment:

We concur. The selection committee will begin to record minutes of the committee meetings.

Management should consider requiring consulting firms to retain their pre-qualification status during the life of the contract in order to ensure the most qualified work possible.

Management Comment:

After careful consideration, we do not believe it is necessary to require consulting firms to retain the pre-qualification status during the life of the contract. The department views pre-qualification status as the obligation and prerogative of the pre-qualified firm and necessary only in order to be considered for new contracts. While the professional, technical, and financial information attained in the pre-qualification process provides initial insight into the firm's capabilities, it is not necessary once the actual performance of the consultant's work is being monitored by the department's managers.

The department should prepare cost-benefit analyses to determine the efficiency and other advantages of contracting with consultants. In its analysis, the department should consider the costs of state employee salary and benefits, consultant contract costs, type and duration of work by specific consultants, and the type of supervision required for consultants (i.e., whether supervision by state employee is required). Failure to make these assessments limits the department's ability to ensure it is receiving the most effective services at the best quality and using taxpayers' money sensibly.

Management Comment:

We concur. A task force was established in July 2003 to perform a compensation study. Included in the task force's charge was completing a cost comparison analysis for a sample of strategically identified positions. An analysis of technical functions being

conducted internally (by staff) versus externally (by consultants) found that slight increases in staff may lead to significant cost savings in several divisions. The task force, however, recommended increasing the utilization of current staff before adding additional staff in the future. Due to the importance of this issue, we plan to contract with an expert to perform a productivity study for the department. This productivity study will allow us to look at this issue more broadly and identify gaps in productivity by looking at organizational structures, as well as processes within and between divisions. We anticipate that the contract will be executed by June 30, 2004.

2. The department should analyze data from the construction process to identify areas in which to strengthen controls, improve timeliness, and control costs.

Finding

To minimize construction time and costs, the department should analyze and use information available to identify trends and areas for improvement. Better oversight and management of the pre-award construction phase (planning and development) as well as the construction process could avoid many supplemental agreements, reduce construction costs, and result in more efficient use of funds available to the department.

We evaluated the department's use of supplemental agreements, liquidated damages, and incentives/disincentives. Table 6 indicates the original, final, and average dollar amount of contracts as well as dollar amounts and percentages of contracts with liquidated damages, supplemental agreements, and incentive/disincentive agreements for contracts closed between May 1, 2000, and April 30, 2003.

**Table 6
Summary of Closed Contracts
May 1, 2000, Through April 30, 2003**

	Total \$	Average	
Original Contract Amount	\$1,650,084,750	\$	1,187,966
Final Contract Amount	\$1,806,543,513	\$	1,300,607
		# of Contracts	% of Contracts
Liquidated Damages*	-\$1,891,757.00	161	12%
Supplemental Agreements	\$41,393,354.00	531	38%
Incentives/Disincentives	\$5,010,100.00	45	3%

* The figure for liquidated damages is negative because they are deducted from the contract.

The closed construction contract listing included 451 contracts for the 12-month period of May 1, 2002, through April 30, 2003. Table 7 shows the 451 closed construction contracts by contract amount and the number of contracts from each category. We selected 55 files for analysis.

Table 7
Tennessee Department of Transportation
Sample of Closed Contracts
May 1, 2002, to April 30, 2003

Contract Amount	Number of Contracts	Sample Size
Less than \$100,000	43	7
Between \$100,000 and \$249,999	117	8
Between \$250,000 and \$499,999	113	7
Between \$500,000 and \$999,999	88	7
Between \$1,000,000 and \$4,999,999	59	7
Between \$5,000,000 and \$9,999,999	19	10
Over \$10 million	12	9
Totals	451	55

Supplemental Agreements

Over half of additional contract costs resulted from supplemental agreements classified as plans modification. In addition, the Construction Division compiles information on the agreements and the reasons for them, but does not share it with the other divisions. The 55 contracts had a total of 183 supplemental agreements (see Appendix) and 546 individual line items at a total dollar amount of \$11,556,923.13—an average of 3 supplemental agreements and line items per contract and \$210,188 in additional costs per contract. The Construction Division classifies supplemental agreements into ten categories based on the reason the change was needed. Those categories are

- Design Omission – a change that should have been foreseen and included in the plans
- Plans Modification – a change that was not anticipated and required a revision to the plans
- Traffic Control – a change to the traffic control plan that was originally included in the contract
- Time Adjustment – a change to the contract regarding completion dates or intermediate milestones
- Value Engineering – a proposal by the contractor to offer savings to the department by changing a design feature of the contract

- Environmental – any change to the contract involving environmental permits, erosion, and sediment
- Soils and Geology – any change to the contract involving geo-technical issues such as sinkholes, slides, soil stabilization, etc.
- Utilities – any change to the contract involving utility relocations (water, sewer, gas, electricity, cable, or telephone)
- Price Adjustments – any change to the contract that involves changing the price of a current bid item
- Miscellaneous – used when items do not fit into the other categories

Based on management’s classifications, we analyzed the reasons for the 183 supplemental agreements in our sample. The department applied dual classifications to some supplemental agreements that resulted in an additional seven categories. Table 8 indicates the results.

As shown in the table, 43.2% of the total number of supplemental agreements and 62.3% of additional costs were the result of plans modification. However, because five of the dual-category classifications include plans modification, a larger percentage and dollar amount than that can be attributed to plans modification.

Table 8
Tennessee Department of Transportation
Contract Sample
Supplemental Agreement (SA) Classifications

Classification	Total SA	Total SA Dollars	% of SA	% of Dollars
Design Omission	20	\$ 308,788.97	10.9%	2.67%
Plans Modification	79	\$ 7,199,537.67	43.2%	62.30%
Traffic Control	6	\$ 154,598.64	3.3%	1.34%
Time Adjustment	18	\$ 114,288.94	9.8%	0.99%
Value Engineering	2	\$ (37,113.53)	1.1%	-0.32%
Environmental	8	\$ 142,198.00	4.4%	1.23%
Soils & Geology	9	\$ 755,471.75	4.9%	6.54%
Utilities	2	\$ 48,917.29	1.1%	0.42%
Price Adjustments	0	\$ -	0.0%	0.00%
Miscellaneous	25	\$ 936,013.00	13.7%	8.10%
Design Omission / Plans Modification	2	\$ 42,462.40	1.1%	0.37%
Environmental / Plans Modification	2	\$ 974,388.10	1.1%	8.43%
Soils & Geology / Plans Modification	1	\$ 591,150.00	0.5%	5.12%
Time Adjustment / Plans Modification	4	\$ 174,648.94	2.2%	1.51%
Traffic Control / Plans Modification	3	\$ 150,097.59	1.6%	1.30%
Environmental / Miscellaneous	1	\$ 1,475.37	0.5%	0.01%
Time Adjustment / Utilities	1	\$ -	0.5%	0.00%
No Classification	0	\$ -	0.0%	0.00%
	183	\$ 11,556,923.13	100.0%	100.0%

We reviewed the supplemental agreement classifications for reasonableness. We questioned the categories for 68 of the 183, or 37%. For example, one supplemental agreement stated that there was no channel excavation originally estimated, but there were 11 box bridges to be constructed on the project that required channel excavation. The department classified this as Plans Modification, and therefore, unavoidable. However, if the box bridges were in the original plans, this could be classed as a design omission, which would have been an avoidable change. If the change is not classified appropriately, the department cannot determine whether the change was avoidable or unavoidable.

Although the Construction Division is identifying reasons for supplemental agreements, the information is not shared with other department divisions in order to identify trends and determine whether changes should be made in the planning and design phases of projects. The department does not categorize supplemental agreements by whether they are avoidable or unavoidable.

Incentive/Disincentive Provisions

Incentive/Disincentive provisions were included in 12.7% of contracts reviewed. Per department guidelines, incentive/disincentive provisions may be included in any contract where temporary road or lane closures, due to construction/maintenance activities, cause long delays, increase the distance traveled, or cause hazardous conditions that result in increased cost to road users. Incentive/disincentive provisions should only be included in contracts where working time can be decreased through the allocation of additional resources to the project. The amount of incentive/disincentive should be comparable to the estimated additional cost that road users incur because of delays caused by construction work. However, department guidelines also indicated several limitations of incentive/disincentive provisions. For example, generally any project where the completion date is dependent on factors beyond the department’s control, such as extensive utility relocation, should not normally be considered for these provisions. Also, certain phases of projects should be excluded from incentive/disincentive provisions when permit conditions limit access to the worksite or require monitoring or approval of the work by a regulatory agency before work can proceed. Therefore, according to the department, not all projects lend themselves to these provisions.

We found that 7 of 55 contracts (12.7%) had provisions permitting the award of incentives and assessment of disincentives. Six contracts received incentive payments, totaling \$1,083,000. (See Table 9.) We reviewed calculations for all incentive payments and determined that payments were correct based on specifications in the contract. Overall, contracts with provisions in the original contract for incentives and disincentives, whether or not they were paid or assessed, were completed an average of 59 days earlier than their original contracted completion date.

**Table 9
Incentives Awarded**

Contract Number	Contract Amount	Date Completed	Date Due	Days Completed Early	Incentive Paid
CNA057	\$ 213,405	6/17/2002	7/1/2002	14	\$ 18,000
5854	\$11,569,518	8/31/2000	11/1/2000	62	\$ 150,000
5349	\$14,676,271	8/21/2001	12/1/2001	102	\$ 35,000
5392	\$14,699,115	7/28/2000	11/30/2000	125	\$ 250,000
4017	\$17,984,403	11/30/1997	5/15/1998	166	\$ 500,000
4359	\$12,924,570	6/25/1998	6/25/1998	0	\$ 130,000
Total	\$72,067,282				\$1,083,000

Liquidated Damages

The department assessed liquidated damages in 14.5% of contracts reviewed. The department’s *Standards for Specifications for Road and Bridge Construction* includes Specification 108.07 – Failure to Complete the Work on Time. Specification 108.07 provides that, for each working day or calendar day over and above the completion date stipulated in the contract proposal, the engineer will deduct a sum from monies due the contractor. (See Table 10.) The department may add Specification 108B to the proposal to specify additional liquidated damages over and above those provided by Specification 108.07. Per department management, additional liquidated damages are generally included in the same manner disincentives are applied, such as for intermediate work dates or restrictions of traffic that are not related to the final completion date. However, no written policies or guidelines exist that stipulate when it is appropriate to include additional liquidated damages in the contract. We found 18 of 55 contracts (32.7%) with additional liquidated damages stipulated in Specification 108B.

Table 10
Specification 108.07 Liquidated Damages Assessment Table

Original Contract Amount		Daily Charge	
<i>From More Than</i>	<i>To and Including</i>	<i>Calendar Day or Fixed Date</i>	<i>Work Day</i>
\$ 0	\$ 100,000	\$ 80	\$ 270
100,000	500,000	190	410
500,000	1,000,000	300	710
1,000,000	2,000,000	460	1,080
2,000,000	5,000,000	810	1,690
5,000,000	10,000,000	950	2,260
10,000,000	--	1,200	2,850

Of 55 contracts reviewed, 21 (38.2%) were not completed within the original contract period. (See Table 11.) However, we noted that 16 of the 21 contracts had supplemental agreements that granted time extensions. (See Table 12.) We reviewed the reasons for extensions and determined that all appeared reasonable. We also determined that four extended contracts were not completed within their extended time frame, and liquidated damages were assessed on only three of these contracts. According to department management, damages were not assessed on the fourth contract because work items for slide repairs were added after original work was accepted as completed by the department within the extended time frame.

Table 11
Tennessee Department of Transportation
Contract Sample
Contract Completion by Original Contract Amount

Original Contract Cost	Completed Within Original Contract Time	Over Original Contract Time	Total Number of Contracts	Percent Completed Within Original Contract Time	Liquidated Damages (subtracted from final payment)
< \$100,000	4	3	7	42.9%	\$ (480)
\$100,000 – 249,999	6	2	8	25.0%	\$ (26,220)
\$250,000 – 499,999	4	3	7	42.9%	\$ (6,719)
\$500,000 – 999,999	4	3	7	42.9%	\$ (5,000)
\$1,000,000 - 4,999,999	5	2	7	28.6%	\$ -
\$5,000,000 - 9,999,999	6	4	10	40.0%	\$ -
>= \$10,000,000	5	4	9	44.4%	\$ (242,100)
Overall	34	21	55	38.2%	\$ (280,519)

Table 12
Tennessee Department of Transportation
Contract Sample
Completion of Extended Contracts

Original Contract Cost	# With Time Extensions	Percent of Contracts With Extensions	Not Completed Within Time Extension	Percent of Contracts Not Completed Within Extended Time
< \$100,000	2	66.7%	0	0.0%
\$100,000 – 249,999	2	100.0%	1	50.0%
\$250,000 – 499,999	3	100.0%	1	33.3%
\$500,000 – 999,999	2	66.7%	0	0.0%
\$1,000,000 - 4,999,999	2	100.0%	0	0.0%
\$5,000,000 - 9,999,999	4	100.0%	1	25.0%
>= \$10,000,000	1	25.0%	1	100.0%
Overall	16	76.2%	4	25.0%

Cost Overruns

For contracts closed between May 1, 2000, and April 30, 2003, we determined that cost overruns for all contracts was 6.8%. (See Table 13.) To estimate the actual cost overrun or

underrun for each original contract cost classification, we subtracted the sum of all incentives and liquidated damages from final contract costs.

Table 13
Summary of Closed Contracts
For the Period May 1, 2000, Through April 30, 2003

Original Contract Cost	Total Original Cost	Total Final Cost	Total Liquidated Damages	Total Supplemental Agreements	Total Incentives	Percentage Overrun
< \$100,000	9,931,021	10,423,765	-45,020	211,875	0	3.3%
\$100,000 - 249,999	58,135,378	63,341,095	-238,155	1,051,890	54,600	7.5%
\$250,000 - 499,999	139,984,848	147,554,457	-266,020	1,774,923	218,400	4.2%
\$500,000 - 999,999	181,278,271	189,823,456	-294,037	3,357,489	262,500	2.9%
\$1,000,000 - 4,999,999	392,435,270	421,055,788	-436,785	9,335,955	951,600	4.8%
\$5,000,000 - 9,999,999	312,862,763	351,496,131	-100,990	14,285,004	1,341,000	7.4%
>= \$10,000,000	555,457,199	622,848,821	-510,750	11,376,218	2,182,000	9.8%
Overall	1,650,084,750	1,806,543,513	-1,891,757	41,393,354	5,010,100	6.8%
Percent Over Original Contract Cost		9.5%				

Further analysis indicated that the larger the contract, the higher percent of cost overrun on a dollar basis. As shown in Table 13, contracts in the over \$10 million category have the highest percentage overrun on a dollar basis (9.8%). Of the 55 contracts in our sample, we determined that cost overruns exceeded original costs by approximately 12.04% on a dollar basis.

Recommendations

The department should analyze data from the construction process to identify areas in which to strengthen controls, improve timeliness, and control costs. Identifying trends and systematically evaluating causes for cost increases could result in cost-saving measures for future projects.

Management Comment:

We concur. The analysis of data and identification of trends in order to strengthen controls, improve timeliness, and control costs is discussed in the responses to the next two recommendations.

We have included the following discussion of our contracting process. Highway projects are not awarded based upon a “lump sum” low bid like State Building Commission projects where the contractor agrees to complete the project for a definite amount. The nature of highway construction does not lend itself to a lump sum since there are a variety of unknowns that significantly affect the cost of a project. Since many variables are difficult, if not impossible, to predict we ask contractors to bid unit rates for items of

work. These unit rates remain constant throughout the contract. We select the “low” bidder by multiplying the unit rates bid by the contractor by the quantities we expect to encounter on the job. Therefore, the “contract amount” is simply an estimate of what the job will cost if our estimated quantities are correct. In effect, “estimated quantities” is part of our model to select the low bidder.

It is important to note that for highway projects if the project cost ultimately exceeds the original contract amount that alone does not necessarily mean that there was an unacceptable cost overrun. There are categories of costs that may exceed the original estimated contract amount but are not cost overruns. For example, when we encounter quantities that are different than the estimated quantities, the contractor must perform the work at its bid price – the unit rate – but the project cost may be greater. This is not an unnecessary or avoidable expense but is required to complete the job. A simple example of this is the quantity for erosion check or hay bales. If extremely wet weather occurs we would be required to replace the erosion checks more frequently than originally expected. We would pay for the additional erosion checks at the contract price. This type of situation could apply to excavation, base and paving quantities or several other items that would be contingent on unknown or unforeseen conditions.

Modifying the supplemental agreement classification system would help to better identify contributing factors and assist staff in the analyzing trends. The department should use only one classification per supplemental agreement or categorize the individual line items in an agreement. The department should ensure that it collects and evaluates supplemental agreement information to identify trends in changes to original contracts and to determine if it needs to make changes to improve the planning, design, and construction of future highway construction projects. In addition, the department should further analyze classifications to determine if supplemental agreements were avoidable or unavoidable. By separating unavoidable classifications from review, management could identify and focus on areas for improvement within the department in an effort to reduce the number of changes to contracts. This information should then be evaluated and communicated to the appropriate staff in order to better control future contract cost increases and time extensions. Reducing the number of supplemental agreements would help ensure that the maximum amount of construction costs is subjected to competitive bidding procedures and would reduce administrative time and effort in processing change orders.

Management Comment:

We concur in part. The Construction Division has found that adding additional supplemental agreements for the purpose of classifications is not practical since supplemental agreements may actually cover two categories (e.g., plan modification and environmental reasons) and should be noted as such. Forwarding the information regarding the supplemental agreements to appropriate divisions, however, will communicate trends that could lead to improvement in our development process. Since this work will be costly and we have limited personnel, a risk-management approach that addresses the areas that tend to be most problematic may be most effective, such as the

design omission category. The Construction Division will begin forwarding all of the necessary information, including the supplemental agreements themselves, to the Design and Structures divisions for their process review. It will be the responsibility of the Design and Structures divisions to ensure that this information is distributed to the proper in-house staff and/or consulting firm for their review.

To reduce supplemental agreements resulting from design omissions, the department should ensure that the performance evaluations of both in-house staff and consultants include whether plan errors or omissions by the consultant had an impact on construction costs and schedules. The department should analyze its design review process and determine how to strengthen it. For serious design omissions, the department should review the project to determine who was at fault and whether the department should take further action. In addition, the information on supplemental agreements for a particular firm or designer should be made available to staff in making future consultant selections.

Management Comment:

We concur. Prior to the approval of any contract, the department must have on file a Certificate of Insurance for the consultant. The insurance certificate shall confirm that the consultant has professional liability insurance for errors and omissions in the minimum amount of one million dollars and that the policy shall be maintained for the life of the contract. It is understood that plans and other contract documents may contain minor deficiencies that do not materially affect the cost of the project. However, the department will analyze its current project development process to determine areas that can be strengthened including timely feedback from construction when plan errors and/or omissions may result in substantial additional cost to the State. As part of this review process, the department will assess the current procedure used in cases where the department personnel have reason to believe that, in their professional judgement, a design consultant did not adhere to recognized professional standards of care in the performance of their duties. Following this review, the department will consider the need to establish a detailed procedure for identifying errors or omissions found in consultant prepared plans and contract documents that have been let to contract and for determining the extent of any consultant responsibility for the cost of plan revisions and any added construction costs or claims resulting from such errors or omissions. This procedure would be used by the department to document the errors, omissions and added costs for future consultant selection purposes, and to make a recommendation regarding whether to pursue the recovery of any added costs from a consultant who has contracted with the department.

Project cost evaluation results need to be communicated timely to planners, designers, construction managers, and others who can use the information to minimize costs of future projects. How that information is used in the selection process should be well documented.

Management Comment:

We concur. The Construction Division will provide the necessary information pertaining to project results to the Design Division. This additional information will help the Design Division in their evaluation of the consultants. The ratings from the evaluation process will then continue to be used in the consultant selection process.

Once the factors that contribute to cost increases have been collected and classified, management needs to review this information to determine future construction process improvements. Department management does not require post-construction reviews to identify problems and determine causes of project overruns including supplemental agreements. Such review could help the department avoid similar problems on future projects. Although some staff indicated that this had been discussed, it is not clear whether staff view these as beneficial and not a waste of time. The department should review this matter to determine if post-construction reviews are beneficial, focusing on the large contracts with the most potential for high-dollar overruns. Any such reviews should be adequately documented.

Management Comment:

We concur. The department has discussed post-construction review and the many factors involved. In general, the larger problems are associated with the larger projects; therefore, it would appear that conducting a post-construction review on all of the approximately 550 projects per year would not be cost effective nor do we have the personnel available to perform this task on all projects. Therefore, the Construction Division, the Regional Construction offices and/or the project managers, along with the project designer, will begin meeting with consultants to conduct post-construction reviews of all large projects (defined as greater than \$10 million) where the more significant problems occur. This meeting will also include discussion of supplemental agreements, when applicable. We will begin implementing the post-construction review process on July 1, 2004.

We recommend that the department continue its efforts to minimize construction time by expanding the use of incentive/disincentive provisions and liquidated damages. The department should determine if they should be included in a higher percentage of contracts to expedite completion. The department should specify in policy or guidelines the conditions in which liquidated damages should be included in contracts in addition to failure to complete work on time (Specification 108.07).

Management Comment:

We concur. We will continue to minimize construction time through the use of incentive/disincentive provisions and liquidated damages. The department currently has the following guideline in place: "Incentive/disincentive payments should be

independent of and additive to any liquidated damages on projects where the incentive/disincentive applies only to certain phases or specific work within the project. Incentive/disincentive payment amounts should include and replace liquidated damages where the incentive/disincentive applies to completion of all work on the project.”

In addition, the department should evaluate and consider non-traditional and innovative contracting methods identified by the Federal Highway Administration (FHWA) through its Special Experimental Projects No. 14 (SEP-14) study. Department management indicated that some of these non-traditional methods could not be used in Tennessee because of the department’s legal requirement to use the lowest responsible bidder. In order to take advantage of all opportunities to reduce project completion times, the department should consider seeking statutory changes to permit it to use innovative methods on a trial basis.

Management Comment:

We concur. This study identified four techniques for improving the efficiency of delivering transportation improvement projects. The objective was to evaluate project specific innovative contracting practices that have the potential to reduce life cycle costs, while maintaining product quality. While these methods generally reduce construction times they also increase costs. If the department has a project where use of these methods is deemed appropriate, we will seek the necessary statutory changes.

RECOMMENDATIONS

ADMINISTRATIVE

The following areas should be addressed to improve the efficiency and effectiveness of the Department of Transportation's operations.

1. The department should request statutory change from the General Assembly to give it the authority to promulgate policies and procedures detailing the process by which emergency situations are identified and an expedited process in which the integrity of the competitive bid process is ensured.
2. The department should develop written guidelines for preparing estimates for construction projects and ensure they are implemented uniformly across the state.
3. Until the Bid Analysis Management System is complete, the department should periodically analyze bid-letting data to determine trends regarding projects that receive multiple bids and those with non-competitive bids. Non-competitive bids should be examined to ascertain factors that may affect pricing. If the department's analysis determines that projects with few bids and in certain areas are costing the state more, the department should examine other options for state projects.
4. Because the Bid Analysis Management System has the ability to analyze bids by work item and price, the department should make use of its capability and use it to determine if there are any irregularities in bidding, such as collusion between contractors.
5. Department management should require all divisions to comply with the department's Procurement Policy to evaluate consultants.
6. The department should review its current consultant evaluation processes and forms and determine if changes should be made. Improvements in the current consultant evaluation process should include: (1) revising forms to include descriptions of what the various ratings mean, (2) providing directions to staff for completing the evaluation form, (3) requiring the evaluator to include any documentation or explanation supporting the ratings, (4) applying weighted scores to some items in order to emphasize tasks that are more important, and (5) determining a "low score" which would indicate unsatisfactory work.
7. Because the department as a whole and the individual divisions have a responsibility to monitor the quality of the work of consultants, the department should make consultant evaluations available to all divisions via a central records area, such as the department's Intranet. Large consulting firms provide more than one type of service (i.e., they may be used for engineering services in one division and for surveying services in another).

Therefore, the department should make consultant evaluation scores available to all divisions.

8. The consultant selection committee should document the discussion and information presented during its meetings regarding consultants chosen including any emphasis on past evaluations used for the selection.
9. Management should consider requiring consulting firms to retain their pre-qualification status during the life of the contract in order to ensure the most qualified work possible.
10. The department should prepare cost-benefit analyses to determine the efficiency and other advantages of contracting with consultants. In its analysis, the department should consider the costs of state employee salary and benefits, consultant contract costs, type and duration of work by specific consultants, and the type of supervision required for consultants (i.e., whether supervision by state employee is required).
11. The department should analyze data from the construction process to identify areas in which to strengthen controls, improve timeliness, and control costs. Identifying trends and systematically evaluating causes for cost increases could result in cost-saving measures for future projects.
12. Modifying the supplemental agreement classification system would help to better identify contributing factors and assist staff in the analyzing trends. The department should use only one classification per supplemental agreement or categorize the individual line items in an agreement. The department should ensure that it collects and evaluates supplemental agreement information to identify trends in changes to original contracts and to determine if it needs to make changes to improve the planning, design, and construction of future highway construction projects. In addition, the department should further analyze classifications to determine if supplemental agreements were avoidable or unavoidable.
13. To reduce supplemental agreements resulting from design omissions, the department should ensure that the performance evaluations of both in-house staff and consultants include whether plan errors or omissions by the consultant had an impact on construction costs and schedules. The department should analyze its design review process and determine how to strengthen it. For serious design omissions, the department should review the project to determine who was at fault and whether the department should take further action. In addition, the information on supplemental agreements for a particular firm or designer should be made available to staff in making future consultant selections.
14. Project cost evaluation results should be communicated timely to planners, designers, construction managers, and others who can use the information to minimize costs of future projects. How that information is used in the selection process should be well documented.

15. Once the factors that contribute to cost increases have been collected and classified, management needs to review this information to determine future construction process improvements. Department management does not require post-construction reviews to identify problems and determine causes of project overruns including supplemental agreements. Such review could help the department avoid similar problems on future projects. Although some staff indicated that this had been discussed, it is not clear whether staff view these as beneficial and not a waste of time. The department should review this matter to determine if post-construction reviews are beneficial, focusing on the large contracts with the most potential for high-dollar overruns. Any such reviews should be adequately documented.
16. The department should continue its efforts to minimize construction time by expanding the use of incentive/disincentive provisions and liquidated damages. The department should determine if they should be included in a higher percentage of contracts to expedite completion. The department should specify in policy or guidelines the conditions in which liquidated damages should be included in contracts in addition to failure to complete work on time (Specification 108.07).
17. The department should evaluate and consider non-traditional and innovative contracting methods identified by the Federal Highway Administration (FHWA) through its Special Experimental Projects No. 14 (SEP-14) study. Department management indicated that some of these non-traditional methods could not be used in Tennessee because of the department's legal requirement to use the lowest responsible bidder. In order to take advantage of all opportunities to reduce project completion times, the department should consider seeking statutory changes to permit it to use innovative methods on a trial basis.

Appendix
Department of Transportation
Sample of Supplemental Agreements (SA), Classifications, and Comments
May 2002 Through April 2003

Contract #	SA #	Classification	Does the classification assigned appear reasonable?	Comments
3863	1	Design Omission	Y	States item was left out of original contract.
	2	Design Omission	Y	States plans inadvertently left out this item.
	3	Design Omission	Y	States the items are required for slopes and were not included in the original contract.
	4	Miscellaneous	N	It appears this could be considered a design omission or a plans modification. SA states whereas, certain items of construction encountered are not covered by the original contract, the contractors desired to submit the additional items of construction to be performed by the contractor and paid by the state at the price scheduled. Added special provision 407G.
	5	Environmental	Y	States the SA is being executed in order to add two Individual Aquatic Resource Alteration permits for a channel change and box culvert and a Nationwide Section 404 permit from the Corps of Engineers.
	6	Design Omission / Plans Modification	Y	SA states the plans require the replacement of concrete driveways, but they were omitted from the plan quantities.
	7	Plans Modification	Y	States the asphalt mix will be utilized to correct voids within the binder course.
3718	1	Miscellaneous	Y	States the SA is due to partnering agreed upon in spec 105p.
	2	Plans Modification	Y	States changing one type of anchor for another for installation on National Highway System and the Interstate System based on a memorandum 8-1996 dated February 12, 1996.
	3	Soils and Geology	Y	Excessive unsuitable material was encountered which had to be undercut, and geotextile fabric was installed.
	4	Traffic Control	Y	The additions of temporary flexible tubular delineators were needed to meet MUTCD standards.
	5	Time Adjustment	Y	Requests extension from 400 to 450 days. Twenty-eight days were needed for revision of ramps, 7 days were needed for the addition of catchbasins, and 15 days were needed for additional work and undercutting required on ramps.
	6	Plans Modification	Y	Stated adding items not covered by original contract in order to substitute another item for some type 16 guardrail end terminals that were not compatible with roadway conditions.
	7	Plans Modification	Y	Substituting one type of catch basin for another.

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	8	Time Adjustment	Y	Requests extension from 527 working days to 539 working days. The department agreed to waive 43 days of liquidated damages and will add 12 days to the contract due to a department-requested schedule alteration.
	9	Plans Modification	N	It appears this was a design omission. SA states it is to add items not originally bid in the contract but necessary to complete the project.
4017	1	Time Adjustment	Y	Changes the original statement in SPEC 108B to say calendar days instead of a specific date. Spec 108B reviewed by the auditors matched this.
	2	Plans Modification	N	This could be a design omission because the materials added were to use when temporary paving is needed.
	3	Plans Modification	Y	Changing the type of fencing used and adding additional cost for removing old fencing.
	4	Design Omission	Y	States items were inadvertently left out of the original contract.
	5	Plans Modification	N	It appears this could be a time adjustment and a design omission. This SA states there is a time adjustment of 24 days and addition of items to the original contract because the department agreed with NES to have the roadway lighting installed by means of this contract.
	6	Plans Modification	N	It appears to be a price adjustment rather than a plan revision. Plan revisions resulted in adjustments to the contract bid price for certain items.
	7	Plans Modification	N	It appears this is more of a design omission since no materials are being replaced. However, there is no dialogue on the SA stating why it was needed.
	8	Plans Modification	N	It appears this could be a price adjustment and a plans modification. The numbers of units are being changed as well as price changes for others.
	9	Plans Modification	Y	This was added at the request of Opryland.*
	10	Plans Modification	Y	Substituting one product for another.
	11	Plans Modification	N	It appears there was a design omission because TDOT decided to add a traffic lane. Could be design omission or plans modification.
	12	Plans Modification	N	This could be attributed to a design omission. The SA was to add items to the original contract because the original fence was removed during the construction of a retaining wall on the project.
	13	Miscellaneous	Y	Added an item necessary to pay for repairs to cantilever sign which was damaged by a tornado.
	14	Utilities	Y	SA to add item to the original contract to compensate the contractor for materials ordered and delivered to the project and eliminated prior to installation at the request of Metro Water Services.
	15	Plans Modification	Y	SA to add costs for additional work for adding video cameras to signal alarms.
	16	Miscellaneous	N	This item is adding additional work. Previous additional work was listed as plans modification.

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5349	1	Environmental	Y	Addition of Aquatic Resource Alteration Permits omitted from the original contract and needed for the project.
	2	Plans Modification	N	It appears this could be a design omission. SA states there was no channel excavation originally estimated and there are 11 box bridges to be constructed on the project that require channel excavation.
	3	Environmental / Plans Modification	Y	It appears the contractor is adding materials that are related to environmental factors. The auditor would classify this as Environmental only. The SA states it is establishing some items not covered by the contract except for the side roads that cross the project to all the project to be completely covered with material and finish graded. Gravel would serve as erosion protection as well as expedite the completion of the new highway for use by the public.
	4	Value Engineering	Y	To implement a value engineering proposal on a bridge redesign.
	5	Plans Modification	N	It appears this could have been classified as is a soils and geology error. The geotechnical studies should have indicated there were wells and therefore included their removal in the design.
	6	Plans Modification	N	Other instances listed this as a design error. The SA stated there was an item for build in the original design, but it was left out of the proposed contract.
	7	Plans Modification	Y	The SA will allow a slope to be built as originally designed but was changed due to plans revision.
	8	Design Omission	Y	The SA was to add an item number that was in the original design but was left out of the contract.
	9	Design Omission	Y	The Regional Traffic Engineer requested this item to be added to the signal system.
	10	Design Omission	Y	SA stated item was inadvertently left out of the contract and is needed on an existing bridge.
	11	Plans Modification	Y	Required to comply with a new standard regarding elastomeric concrete as per a memo from TDOT.
	12	Plans Modification	N	It appears this would be environmental rather than plans modification. The SA was executed to add a new Erosion Control Blanket, which was needed to fill slopes at a bridge.
5110	1	Environmental	Y	SA needed to add Individual Aquatic Resource Alteration Permits and an additional Clearing and Grubbing and an Erosion Control Blanket.
	2	Miscellaneous	N	It appears this should be a plans modification at the fault of the contractor. The contractor proposed changing the type of asphalt cement required due to limited storage capacity at its asphalt plant.
	3	Time Adjustment / Plans Modification	N	It appears design error should also be added as a reason for the SA. Contract plans called for work to be performed, but it was omitted from the contact proposal. There was a time adjustment due to circumstances requiring the contractor to close a bridge and add additional days. The contractor requested a material substitution that the department approved. A fence required removal and replacement and was not in the original design plans.

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	4	Plans Modification	Y/N	It appears this is a plans modification but that it was an error on the part of design. Investigation of an existing catchbasin that was to be connected to the new ones constructed revealed it was not made of RCP as the original plans stated. Therefore, the materials from the contract proposal needed to be changed to match the existing catchbasin.
	5	Traffic Control	N	It appears this should be a plans modification and a design omission. The SA was to replace the original contract guardrail items. In addition, plans failed to provide an item for pavement markings warning motorists of several railroad crossings within the project's limits.
	6	Time Adjustment	Y	The Phase I repair work was constructed per notes on the plans sheet. However, further investigation by the department found that the original depth shown in the plans was sufficient and the plan sheet notes should be disregarded. Therefore, the contractor felt he should be compensated for extra work required due to problems with the bridge, and TDOT agreed. This SA extended the contract from 12/15/99 to 3/6/00.
5850	1	Design Omission	Y	Items were inadvertently left out of the original contract.
	2	Plans Modification	Y/N	It appears design omission should also be added to this. A catchbasin was inadvertently left out of the original plans. The addition of fence materials was due to the poor condition of the existing fence.
	3	Plans Modification	N	This could be considered a design omission. The SA states the added item was necessary to ensure the proper draining of the pavement in conjunction with another item in the contract.
	4	Plans Modification	N	Based on other instances, this may be considered a design omission and traffic control. Some items were inadvertently left out of the original project plan, such as work to remove existing deteriorated surface and warning lights and arrow boards for added traffic control.
	5	Plans Modification	Y	The materials added were to be used at existing bridges failing to have enough vertical distance to attach guardrail at bridge end. In addition, one item from original contract was eliminated.
	6	Plans Modification	N	This could be considered a design omission. The addition of reflective markers to provide better lane delineation during low visibility because the plans did not include lighting the roadway within the Mt. Pleasant and Columbia city limits.
	7	Design Omission	Y	Item was inadvertently left out of the original contract and was needed to complete the project according to plans and drawings.
	8	Soils and Geology	Y	Soils and Geology was asked to investigate a pavement settlement problem and make a recommendation on how to correct the settlement problem.
	9	Design Omission	Y	Item was inadvertently omitted from the original contract and was needed to complete the project according to plans, layout drawings, and for uniform traffic control devices.

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4359	1	Plans Modification	Y/N	It appears some of these are due to design errors. The SA states it is necessary to add several new items of construction and to increase, reduce, or delete several of the existing items already included in the contract. Some of the changes are due to revisions and/or errors in the original plans.
	2	Traffic Control	Y	To add a uniformed police officer and wrecker for the one-lane work zone on this project. The police officer is to enforce traffic laws and respond to incidents/accidents within the construction work zone.
	3	Environmental / Plans Modification	Y	Due to damage by the contractor to cables supplying the roadway lighting system. It was found the existing electrical circuits were not of sufficient depth to adequately grade the shoulders, and from a safety standpoint, the depth was considerably less than the accepted minimum.
	4	Plans Modification	Y	Several areas of additional work were necessary based on standards, studies, and further investigation, and the contractor is seeking compensation. Special provision 411S was inadvertently omitted.
	5	Plans Modification	Y	Due to complaints from commuters, the contractor requested using another type of concrete to expedite construction and to minimize lane closures. Other items dealt with Additional Work, Outside Shoulder Paving, Bores Under Ramps, Removal of Pavement Markings, Grinding Concrete Pavement at Ramps and Type IV, Separations, and High Survivability.
	6	Miscellaneous	N	This appears to be time adjustment and price adjustment. The contractor did not stockpile enough topsoil to adequately cover and was unwilling to provide the necessary topsoil due to added expense involved in acquiring this material from outside sources. The problem required quick resolution to avoid a possible environmental citation. Contractor requested a lump-sum compensation. The local police informed the contractor that they were going to have to charge more than originally quoted. There was a contract settlement for increases in incidental costs, work not measured for payment, disagreements in pay quantities, and an extension of contract time.
2876	1	Plans Modification	N	It is possible this could be a Soils and Geology problem. The SA was to provide payment for the removal of underground tanks.
	2	Environmental	Y	To establish contract unit price for the excavation of contaminated materials.
	3	Traffic Control / Plans Modification	Y	Costs to cover 24-hour flagging, lights, guardrails, etc. This was in response to an emergency repair to ensure the safety of the traveling public after the collapse of an old extension to an existing box culvert.
	4	Soils and Geology	Y	To repair areas of sub-grade failure on phase one of the project, which occurred after fill material and aggregate cement material were placed. The repair will include undercutting.
	5	Plans Modification	Y	Changing from concrete piles to steel piles because soil conditions would not allow for drilling the concrete piles.

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	6	Miscellaneous	Y	Changing the cement from the 1981 standard spec to the 1995 standard spec.
	7	Soils and Geology / Plans Modification	Y	To establish a price for latex-modified cement that should provide greater strength and durability. A contractor requested redesign performed by the Structural Division because the footing and column were poured three inches out of alignment. Established price for borrow excavation to use in areas where subgrade is unsuitable for original pavement structure.
	8	Miscellaneous	N	This appears to be a plans modification. Contractor requested to use recycled material in the asphalt.
	9	Plans Modification	N	It appears this should be Traffic Control. Item added was on an adjoining contract but was unable to be completed while safely transitioning traffic from one project to another.
	10	Plans Modification	Y	Items requested to properly repair various slides on the project.
	11	Time Adjustment	Y	To extend the contract time from 325 working days to 456 working days.
5536	1	Plans Modification	Y/N	This could be a traffic control issue. To add removable pavement markings in lieu of painted markings during phase 1 of the project.
	2	Soils and Geology	Y	To establish item Borrow Excavation. Unsuitable materials were encountered during excavation, and undercutting was required.
	3	Plans Modification	Y	To establish the removal of rigid pavement at locations where the concrete pavement is located below the sub-grade elevation.
	4	Plans Modification	N	This appears to be environmental. To establish item needed for erosion control.
	5	Plans Modification	Y	Establish a force account for the adjustment of elevations of the top of the riser blocks on the new bridge that was constructed.
	6	Plans Modification	Y	Establish items to obtain a level, safe riding surface. Due to crossovers used during the winter months, which resulted in grade differentials.
	7	Plans Modification	Y/N	This could also be a design problem. To add item as per Standard drawing with revision date 7/31/00 to prevent cracks in asphalt paving.
	8	Plans Modification	N	It appears this is related to traffic control. The items added were needed for safety purposes, at the end of the project, in the transition area from a four-lane roadway with median to a two-lane roadway.
1047	1	Soils and Geology	Y	Due to encountering wet, soft soil, the Geotechnical Section recommended that the areas be mitigated.
4384	1	Environmental	Y	Addition of the Aquatic Resource Alteration Permit and General Permit for Minor Road Crossings. These permits require the planting of trees, and therefore the cost was added to this SA. The contractor used additional encasement pipe and requested compensation.

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	2	Plans Modification	Y	After project completion, the existing ditch could not carry the storm water. Owner of adjacent property asked the department to build an earth berm between the existing ditch and his field. Plan sheet called for an existing box bridge be extended, but a guardrail rather than fill was needed. Motorists needed additional advance warnings of new alignments, and STOP AHEAD was written on the travel lane.
4779	1	Miscellaneous	N	Appears to be a plans modification. Replacing an item in contract.
	2	Time Adjustment / Plans Modification	Y/N	Appears to be only a plan modification. Exchanges one item for another because larger pipes were needed to handle drainage at some driveways.
	3	Plans Modification	Y	Proposed replacing sediment traps with temporary sediment filter bags, material, plastic, and riprap at outlets.
	4	Miscellaneous	N	This could be considered plans modification. TDOT was under court order to clean out a ditch in Obion County which was not in the original contract.
	5	Plans Modification	Y	To replace guardrail anchors with tangent energy absorbing terminals that should save the state money in the long term and be safer for the public.
	6	Time Adjustment	Y	Should also be a plans modification. Time adjustment of 152 calendar days due to utilities. Problems were encountered while driving piling, and Structures directed the contractor that steel piles should be driven.
	7	Plans Modification	Y/N	To add plastic pavement marking that TDOT is requiring on all major four-lane roadways. If this decision had been made before the beginning of this contract, it would be a Design Omission. Likewise, if this decision had been made after the beginning of this contract, it would be a Plans Modification.
	8	Plans Modification	Y/N	Barricade required at an intersection, but the SA does not state why. This could be for traffic control, a design omission, or plans modification.
5141	1	Miscellaneous	N	Could be plans modifications and price adjustment. It appears to be a price adjustment due to a price increase of \$30 per ton of the asphalt cement. Substitution of superpave mixes for a portion of the binder and surface courses.
	2	Miscellaneous	N	Could be plans modifications and price adjustment. It appears to be a price adjustment due to a price increase of \$30 per ton of the asphalt cement. Substitution of superpave mixes for a portion of the binder and surface courses.
	3	Miscellaneous	N	It appears to be a plans modification. To set up a hot mix asphalt where 100% passes the 3/8" sieve. This is not necessary for a variety of maintenance reasons when tying in detours and other transitions to be used without raveling or flaking.
	4	Plans Modification	Y	To establish unit prices for modified catch basins and a special poured-in-place manhole designed by headquarters special design office.

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	5	Design Omission	Y	To set up pavement marking items that were left off the plans.
5854	1	Plans Modification	Y/N	It appears design omission could also be added. Apparently, the contract called for removing an existing bridge deck, but there was no guidance given regarding removal precautions. Therefore, the contractor made plans for the removal, and TDOT felt additional precautions should be taken. The contractor seeks compensation. In addition, some items were substituted for others allowing some other items to be deleted. Also added removable pavement marking line because there would be problems due to an adjacent project.
	2	Plans Modification	Y	Addition of crack sealant that is expected to help stabilize the existing joint between the shoulder and the roadway due to excessive wear and separation.
	3	Design Omission / Plans Modification	Y	SA adds items for compensation for additional work performed. Also, a change was made to cross-section heights on bridges to alleviate a "roller coaster" effect. Concrete was inadvertently omitted from the original contract bid items but was called for in bridge repair details in the contract plans.
	4	Miscellaneous	Y	Revision of Supplemental Specifications 300.
	5	Traffic Control	Y	Due to plan revisions that were unable to be included when the contract was let. Gave the contractor the option to use several different types of attenuators, and therefore, the SA was needed when the contractor decided how to meet current crash test criteria in a time sensitive project.
	6	Plans Modification	Y/N	This does appear to be a plans modification but could probably be attributed to a design error. The project included items to build a 51" tall concrete wall, but in the field, they determined the cross-slope of the interstate varied from the cross-section description in the plans. Therefore, the plans required modification.
4858	1	Plans Modification	Y	Additional borrow excavation needed to complete phase 1 and to allow completion to the final grade on the roadway and final slopes.
	2	Miscellaneous	N	This appears to be a plans modification because new materials were exchanged for the old materials. However, there was no indication why this was necessary.
	3	Miscellaneous	N	This appears to be a plans modification because of the substitution materials. However, the contractor requested the change due to storage problems. Price Increase of \$30/ton.
	4	Plans Modification	Y	To set up a hot mix asphalt where 100% passes the 3/8" sieve. This is necessary for a variety of maintenance reasons.
	5	Design Omission	Y/N	This is shown as a design omission but could also be termed environmental. SA was to add the item for erosion control blanket needed on final graded slopes where it is likely to wash out.
4444	1	Environmental / Miscellaneous	Y	Reimbursement due to contractor attending a partnering workshop and to add Aquatic Resource Alteration Permits.

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	2	Soils and Geology	Y	There was no measure for pumping in the plans, and the SA adds item for Temporary Sediment Filter bags required for erosion control. In addition, undercutting was required.
	3	Time Adjustment / Utilities	Y	A delay in construction is necessary until utility conflicts have been eliminated from approximately one-half of the project.
	4	Plans Modification	Y	SA to add item required for phase construction because of the drop-off policy and the phasing of traffic, all existing road and drainage cannot be used. Item added to allow drainage of drives in phase one and two where temporary ramps are required.
	5	Miscellaneous	Y	Adds special provision 407G at a lump sum price negotiated between the contractor and the department.
	6	Design Omission	Y	Original plans stated a concrete pipe was at one location. While removing the pipe, the contractors also found a box requiring removal. This SA requests compensation for its removal. After removing a single barrel structure, it turned out to be twice as large as the original plans specified. The SA is requesting additional compensation for its removal.
	7	Plans Modification	Y	One item exchanged for another due to the condition of existing pipe.
	8	Soils and Geology	Y/N	Should also be a time adjustment. The SA sets up a force account needed per the ARAP permit. Also, material was required to repair several large wet areas on the project, which were made according to recommendations of the Geology division. An additional 10 days were required to perform this work.
	9	Plans Modification	Y	Due to problems during excavation, the contractor requested replacing one contract item with another item resulting in savings to the department.
	10	Plans Modification	Y	The contractor erroneously used a silt fence rather than a filter barrier and wanted to swap the items in the contract at the same price.
	11	Time Adjustment	Y	SA to waive liquidated damages for the period of time 12/7/99 through 4/21/00 per section 108.07 of the specifications due to the project being opened to unrestricted traffic on 12/6/99.
4833	1	Miscellaneous	N	It appears this could be plans modification. Additional work. After discussion with the department, contractor decided to use scaffolding stairway method rather than a crane for constructing two tall piers. Epoxy injection covers to repair crack that formed in pier 3. Contractor seeking compensation.
	2	Environmental	Y	Additional work for treatment of slurry water. Determined sediment filter bags specified were not going to protect the federally endangered species freshwater mussels. Two innovative solutions were used, and the contractor is seeking compensation.

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	3	Plans Modification	N	Appears to be environmental and plans modification. The Structures division recommended a change due to sandstone being encountered. Additional erosion control measures were needed due to accommodate unusually large volumes of storm water run-off.
	4	Plans Modification	Y	Appears to be plans modifications, but one sounds attributable to the contractor. The contractor had completed excavation work for a pier but found a misalignment and had to further excavate. The contractor was seeking compensation. An additional work item was needed to rectify a safety problem caused by the installation of a straight headwall on the inlet end of a pipe as shown in the plans.
	5	Plans Modification	N	This appears to relate to Traffic Control issues, but plans modification also appears correct because some material was substituted. The SA discussed transitioning the connector, to move traffic in another direction. Therefore, additional markers and signs were needed to warn motorists.
	6	Miscellaneous	Y	The contractor intended to remove old pavement and sell it for profit. However, National Park Personnel representing the Big South Fork National River and Recreational Area disallowed the use of standard construction practices. The contractor is requesting the state to compensate him for the exclusion of this work and the loss of the salvageable asphalt material.
	7	Miscellaneous	Y	This was a negotiated reimbursement between the department and the contractor due to the National Park representatives disallowing the use of standard concrete removal practices. The contractor was compensated for the rental of equipment left idle during the negotiations.
	8	Miscellaneous	N	This appears to be plans modification at the request of the department. The department requested the contractor to use special nylon covers for the overhang jacks to protect the beams.
5392	1	Traffic Control	Y	To remove conflicting marking lines caused by marking lines of a newly constructed adjoining project.
	2	Design Omission	Y	Item inadvertently omitted from the original contract items.
	3	Plans Modification	Y	Added an item deemed necessary by the Structures Division due to field review.
	4	Soils and Geology	Y	Items for sinkhole repairs for which the Soils and Geology Section provided detailed drawings.
	5	Plans Modification	Y	It appears this is a plans modification at the request of the Structures Division.
	6	Plans Modification	Y/N	Add items to retrofit the joints at bridge ends. Could be considered a design omission.
	7	Plans Modification	Y/N	Add items to retrofit the joints at bridge ends. Could be considered a design omission.
5214	1	Plans Modification	N	It appears this should be environmental. To establish Erosion Control Blanket to be used on very steep slopes.
5214	2	Plans Modification	Y	To establish items required by a plans revision dated 1/8/99.
5214	3	Miscellaneous	Y	To establish a force account for drilling and pressure grouting into foundation.
5214	4	Soils and Geology	Y	To add items added to the contract by Plan Revision determined by the Geotechnical Section.

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5214	5	Time Adjustment	Y	To add 132 calendar days to the project because the Geotechnical Section determined the original footing designs were inadequate.
5214	6	Plans Modification	Y	To substitute one item for another.
5214	7	Time Adjustment	Y	To extend completion date of on or before 1/11/01 to on or before 4/13/01. Contractor was delayed 92 days due to archeological investigations.
5214	8	Plans Modification	Y	To add strut bracing recommended by the Structures Division.
CN2029	1	Traffic Control / Plans Modification	Y	TDOT determined that advance warning lights and signs are needed. A safety assist light system, which was preferred over other systems due to the ability to reset the lights by remote control.
	2	Traffic Control	Y	To add energy absorbing material to meet the requirements of the NCHRP 350 design for protection at the end of a barrier rail in construction work sites.
	3	Design Omission	Y	Plans called for the extension of an existing corrugated metal pipe, but the location in the plans was not included in the tabulated or estimated quantities.
	4	Time Adjustment	Y	Time extension due to extended legislative session. Highway construction and maintenance projects were not considered essential, and all projects were suspended July 1 through July 4, 2002.
CN2030	1	Plans Modification	Y	To add bridge deck sealant instead of bridge deck repair. Due to the timing differences in performing the asphalt paving versus the PMC. The PMC work could not begin until all paving work was completed. SA stated there would be substantial cost savings changing out these items.
	2	Plans Modification	N	This appears to be traffic control. SA was to add temporary pavement markings to cover existing markings and to establish a clear and concise path for safe vehicle operation.
	3	Plans Modification	Y/N	Appears to also be traffic control. Addition of uniformed police officers for the safety of motorists and workers on the project. Scratch mix was needed because the surface was milled to 1 1/4" and had existing cracks.
C4896	1	Environmental	Y	Contractor requested to construct a temporary stream crossing.
	2	Value Engineering	Y	Contractor realized there was a better way to widen the existing piers than was shown on the plans. This did not create savings.
	3	Plans Modification	Y/N	This appears to also be related to traffic control. SA added plastic pavement marking and replaced another pavement marking. Uniformed trooper needed for traffic control when single-lane traffic work zones are being set up and removed.
	4	Traffic Control / Plans Modification	Y	Additional work and traffic control needed due to several holes developing requiring repair.
	5	Design Omission	Y	Item inadvertently left out of the contract.
	6	Plans Modification	Y	Extra work necessary to correct the elevation of the bridge seats and drill holes in the cross frames.

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	7	Time Adjustment / Plans Modification	Y	Other work was required due to the previous problems in SA #6. Emergency work items were added due to holes developing in the existing bridge deck in SA #4, and the department decided they could not meet the 35-day window to complete the eastbound lane. Additional work required to correct a safety problem and the revision of structural steel. Completion date changed from on or before 11/1/99 to on or before 4/7/00.
	8	Miscellaneous	N	It appears this is a plans modification. Additional work necessary due to unforeseen difficulties resulted in much higher costs than originally provided. The bridge was collecting water, which was causing it to rut under the heavy loads placed on it by traffic. This required excavation to install drains to give the subsurface water an outlet.
CN1283	1	Design Omission	Y	Item elastometric concrete omitted from the original plan.
CN1523	1	Miscellaneous	N	This appears to be a plans modification. The contractor requested to substitute tack types due to a recommendation of the TDOT Materials and Tests Section.
	2	Plans Modification	Y	Structures added to the contract for Cumberland County were added by the Bridge Inspection and Repair section, and due to the increase in riding surface elevation, the approach guardrail attachment to the bridge railing required an adjustment to meet federal standards. In addition, due to subsurface water, a draining system was needed to direct water to an acceptable exit location.
	3	Time Adjustment	Y	Extra time needed due to alterations and additions to the original contract due to department personnel surveying entrance and exit ramps and determining that the sections needed to be overlaid with asphalt to minimize future maintenance problems (5 working days). Original plans did not include the sealing of the bridge ducts for dual structures as determined by the bridge repairs section (12 working days). To eliminate subsurface water, drains needed to be installed (10 days). The correct attachments were not addressed in the original plans and the changes were necessary to accommodate the field conditions (4 days). A ROW clearing crew working under a state maintenance contract was attempting to work in the same area as the paving company and hampered proper scheduling (6 days). TOTAL of 37 working days.
CN1633	1	Design Omission	Y/N	This could also be a traffic control issue, but since the SA states this was not addressed in the original contract, it is most likely a design omission.
CN1435	1	Plans Modification	Y	To add the removal and reset of existing fencing.
	2	Plans Modification	Y/N	Could also be considered a design omission since the contractor had to remove an existing retaining wall not shown on the plans. Some Bituminous materials substituted for others.
	3	Utilities	Y/N	This appears to be a time adjustment from on or before 5/1/01 to 7/20/01 due to conflicts with NES.
CNA135	1	Time Adjustment	Y	Time extension due to extended legislative session and suspension of work of non-essential personnel.

Contract #	SA #	Classification	Does the classification assigned appear reasonable?	Comments
C5954	1	Miscellaneous	N	Appears to be plans modification, and soils and geology. Addition of construction stakes, lines, and grades to contract due to the heavy work load that is assigned to the local field construction office. Also added water well abandonment and Portland cement grout for treatment of a well discovered during construction.
	2	Time Adjustment	Y/N	Contractor worked until conflicts with utilities. A water main was relocated, and the contractor returned to work. There was also a conflict with CSX railroad, which was required to raise two tracks running parallel to the road and prevented the contractor from completing fill in this area. Time adjusted to on or before 12/12/00.
CN1260	1	Plans Modification	Y	Items added as requested by the TDOT Structures Division to repair two overhead signs.
CN1810	1	Time Adjustment	Y	Received a request from Rivergate Mall merchants to delay resurfacing until after Christmas. Department and contractor agreed to postpone beginning work on the project until 4/1/02.
CNA089	1	Plans Modification	Y/N	Could also be traffic control. To add temporary pavement marking, which is essential to maintain the safety of motorists.
	2	Time Adjustment	Y	Due to extended legislative session, nonessential personnel were furloughed.
CNA057	1	Environmental	Y	To add General Aquatic Resource Alteration Permit.
	2	Plans Modification	Y/N	Appears this could be traffic control, time adjustment, and plans modifications. Additional work for the removal and replacement of parapet end-posts that were deteriorated. Additional work to remove and reset portable barrier rails in Phase II for the Memorial Day weekend. Two attenuators were required by MUTCD Manual, portable changeable message sign units were also utilized. An amendment to Special Provisions 108B is required due to the additional work to replace a second bridge, approach slab that was cracked, and settling. Changes provision from 12 consecutive calendar days to 20.
CN1524	1	Design Omission	N	Appears to be a plans modification. Plans for project failed to take into consideration existing field conditions. As work began, it was realized that the abutments of the bridge being repaired were partially constructed and covered with what appeared to be hand-cut and laid stone. Substitution of materials was required.
CN1015	1	Time Adjustment / Plans Modification	Y/N	Appears to be a time adjustment, design omission, and plans modification. Revised contract completion date from on or before 8/1/00 to on or before 9/2/00. Added plastic pavement marking items to replace worn markings. Changes from the plans because the contract failed to provide necessary items to perform the work. At the request of TDOT, the contractor provided prices for radio frequency data system which would be most cost beneficial at savings of approximately \$7,585.00.

Contract #	SA #	Classification	Does the classification assigned appear reasonable?	Comments
CN1247	1	Time Adjustment	Y/N	Should also include Utilities. To extend completion date of on or before 10/31/00 to on or before 11/27/00 due to Powell-Clinch Gas Company's gas line and North Anderson County Utility District's waterline being located within the entire excavation limits of the box bridge. Excavation could not begin.
CNA184	1	Design Omission	N	Should probably be traffic control and plans modification. TDOT and contractor determined the need for two message boards to warn motorists of construction. Materials and Tests required that an alternate asphalt sealant be used.
CNA184	2	Time Adjustment	Y	Due to extended legislative session, non-essential workers were furloughed.
CNA166	1	Time Adjustment	Y	Due to extended legislative session, non-essential workers were furloughed.
No. of Classifications Auditors Questioned			68	
Percentage of Total			37%	

* This does not appear to be an adequate description of why the supplemental agreement was required. However, the auditors did agree with the department's classification.