An Audit Report on

Improving the Construction Process

Office of the State Auditor
Lawrence F. Alwin, CPA

November 1994

Report No. 95-031

OFFICE OF THE STATE AUDITOR
TWO COMMODORE PLAZA
206 EAST NINTH ST., SUITE 1900
AUSTIN, TEXAS 78701

MAILING: P.O. BOX 12067
AUSTIN, TEXAS 78711-2067

PHONE: (512) 479-4700 FAX 479-4884

LAWRENCE F. ALWIN, CPA
State Auditor

SHARON W. COBB, CPA
First Assistant

November 23, 1994

Members of the Legislative Audit Committee:

Controls over the $4.3 billion construction process in Texas state agencies are more essential than ever, considering scarce capitol budget funds in an ever increasing environment of budget shortfalls. We believe that savings may be achieved by implementing the recommendations in this report. If the savings realized were one percent of construction costs, the State could potentially save over $40 million. For this reason, we looked at the practices and procedures of five Texas state agencies and universities that administer construction contracts on a regular basis to see what works best. The agencies we visited included: the Department of Transportation, General Services Commission, Parks and Wildlife Department, The University of Texas System, and Texas A&M University System. In addition to agency practices, criteria from other sources were included in this project.

The following recommendations, developed from reviewing procedures followed by the above state agencies and by the other sources, will help to improve controls:

- Constructability programs should be implemented early in the planning process to reduce costly project re-designs and re-bids.
- An effective change order review process could produce significant savings over a period of time.
- Insurance certificates provided to state agencies should be reviewed to ensure that they are providing the level of protection needed.
- Alternative disputes resolution measures should be included in all contracts for construction.
- Documentation of professional services selection and the construction bidding and award process are essential to avoid the appearance of improprieties.
- Strong right to audit clauses should be included in all construction and professional services contracts.

We appreciate the assistance of the agencies and universities during this project.

Sincerely,

Lawrence F. Alwin, CPA
State Auditor

LFA/rmn/enclosure

Key Points Of Report

Improving the Construction Process

November 1994

Key Facts and Findings

- Construction costs can be more effectively controlled by ensuring that constructability review programs are in place, that there is an effective and thorough change order review process, that certificates of insurance are carefully reviewed, and that alternative disputes resolution measures are used in all contracts for construction.

- Quality control and quality assurance in the construction process can be enhanced by ensuring that inspectors are adequately trained and that architects/engineers are held accountable for their design errors and omissions.

- Aggressive schedules can result in projects that are more expensive than anticipated, are not completed on time, and increase the costs of long-term maintenance. Agencies should prepare attainable schedules, determine realistic liquidated damages, and resolve quality control issues immediately.

- Agencies should conduct post-construction reviews that include contract audits and written assessments of completed projects. Contract audits should be periodically conducted to ensure that all contract changes align with the contract terms. Completed projects should be assessed to determine whether design objectives were met.

Contact:
Paul Garner, Audit Manager (512) 479-4765

This report was conducted in accordance with Government Code, Section 321.0133.

Table of Contents

Table of Contents, concluded

Appendices

Executive Summary

Over $4.3 billion in capitol budget construction expenditures are projected for fiscal years 1994 and 1995. This does not include federal dollars for highway construction. Adequate controls must be in place to ensure the efficient use of these scarce resources. This report identifies opportunities to improve the use of those resources on construction projects in their cost, quality, time required, and evaluation and review of the process.

Controlling Construction Costs

Costs can be more effectively controlled by ensuring that basic procedures are in place. Primary areas where additional cost can occur include inadequate insurance protection, inadequate change order reviews, lack of construction planning reviews, and construction claims. Strong controls in these areas are essential. Agencies can lower the risk of increased cost by considering these recommendations:

- Constructability programs should be implemented at the earliest stages of planning a project. Constructability is the optimum use of construction knowledge and experience in planning, design, procurement, and field operations to achieve overall project objectives. Maximum benefits occur when people with construction knowledge and experience become involved at the very beginning of a project (Construction Industry Institute, *Constructability*, 1986).

- Change order procedures should include a high degree of analysis and documentation to minimize overcharges by contractors.

- Certificates of liability and workers' compensation insurance furnished by contractors should be reviewed to ensure that they are providing the maximum protection state agencies require.

- Alternative disputes resolution measures should be used by all state agencies involved in administration of construction contracts to minimize claims and reduce project costs.

Improving Construction Quality

Quality control and quality assurance in the construction process can be enhanced by assuring that inspectors are qualified and that design consultants' errors are documented. Agencies should consider these recommendations:

- Inspection staffs should consider on-going training programs and building code certifications for inspectors.

- Hold architects/engineers accountable for design by documenting gross errors and omissions in plans and specifications which result in significant change orders to the agency.

Managing the Schedule

Aggressive schedules can result in projects that are more expensive than anticipated, are not completed on time, and increase the costs of long-term maintenance. Risk exposure can be minimized by considering these recommendations:

- Design and use an effective project management system that prepares attainable schedules.

- Determine realistic liquidated damages.
- Resolve quality control issues immediately.

Post-Construction Reviews

Agencies should periodically conduct audits to ensure that all contract changes align with contract terms. In order to do this, agencies need to have access to all documentation relating to construction contracts as well as professional and consulting services contracts.

The agencies should evaluate the projects to determine if design objectives were met and to ensure that each step of the planning and construction process is thoroughly documented. In order to perform these reviews, agencies should consider these recommendations:

- Include strong right to audit clauses in both the contracts for construction and the contract for professional and/or consulting services.
- Make formal, written assessments of all completed projects.
- Professional services selection procedures should be in writing and fully documented.
- The construction bidding and contract award process should be fully documented.

We would like to thank the following construction administration and internal audit departments for their assistance in this project: The University of Texas System Administration Office, Texas A&M University System Administration, Texas Department of Transportation, Texas Parks and Wildlife Department, and General Services Commission. These agencies and universities generously offered their time to explain to us how their planning and construction processes work.

Section 1:
Controlling Construction Costs

Section 1-A:
Establish A Constructability Review Program Early In Project Planning

The feedback from a constructability review program should ideally result in minimized building costs and schedule delays. The cost benefits from a constructability program implemented early in the planning process can be substantial. Paybacks ranging up to 15 to 1 over the cost of implementation have been reported, according to the Construction Industry Institute (Institute). The Institute says this is an area that offers major cost and schedule benefits for the owner. Both large and small projects alike stand to benefit, and the cost savings will be realized many times over the cost of implementing such a program (Construction Industry Institute, *Guidelines*, 1990). Making maximum use of construction knowledge and experience throughout the entire planning process helps to increase the likelihood that the project will meet all of its design objectives.

What Is The Construction Industry Institute?

The Construction Industry Institute is a research organization who's mission is "improving the total quality and cost effectiveness of the U.S. construction industry, thereby improving the competitive position of U.S. business in world markets," according to the Institute. It is a ". . . unique consortium of owners, designers, constructors and the academic community who are committed to working together toward a common goal: the improvement of the U.S. construction industry from project conception to start-up and maintenance." Members of the Institute include: AT&T, Shell Oil Company, Dow Chemical U.S.A., General Electric Company, Bechtel Group, Brown & Root, Inc., CRS Sirrine Engineers, Inc., Fluor Daniel, Inc., H.B. Zachry Company, and The M.W. Kellog Company.

Constructability review programs should be implemented at the earliest planning stages of a construction project. A constructability review program uses people with construction knowledge to review each stage of the planning and design of a project. Generally, the stages of project planning include: conceptual planning and design, schematic design, design development (where plans, specifications, and contracts are developed), and construction plans. The Institute defines constructability reviews as the optimum use of construction knowledge and experience in planning, design, procurement, and field operations to achieve overall project objectives. Maximum benefits occur when people with construction knowledge and experience become involved at the very beginning of a project (Construction Industry Institute, *Constructability*, 1986).

Constructability reviews are a generally accepted part of the construction planning process. A constructability reviewer or team offers ideas on construction methods and materials to use and generally offers insights to the designer as to whether the project can be built as designed. The reviewer may offer ideas for alternative methods and materials for the design team to consider using in the plan. The reviewer analyzes each phase of the design from the contractor's point of view and, because of specific construction knowledge and experience, can offer valuable insights and observations for the design team to consider in plan development.

Opinions differ as to when constructability reviews should be implemented. It is not uncommon to implement constructability reviews at various stages of the construction plan development process after the conceptual design stage has been completed. However, the greatest influence on a project's cost is at the earliest stage of development; therefore, much of the cost savings benefit will be increasingly lost as the project advances in design.

When construction personnel are only invited to review plans after they move from one stage of construction design to another, the architect/engineer has already determined what the primary design will be and has "ownership" in this design. At this stage, criticisms of the design from the constructability reviewers could result in the development of an adversarial relationship between the reviewers and the design team. In addition, funds and time expenditures will have already been made at this point which, if changed, would require rework. As a result, the effectiveness of the construction reviewer is minimized.

Agencies should implement constructability review programs using these guidelines offered by the Construction Industry Institute (Construction Industry Institute, *Guidelines*, 1987):

- Start the review program as soon as the project is conceived.
- Assess where the organization is now in terms of constructability programs. Ask some of these questions: What will it cost? What are the returns? Are you willing to make a strong and open commitment to constructability?
- Develop a constructability policy statement. Goals and objectives of the program should be spelled out in writing. Make a statement of managements' commitment to the program. Responsibilities should be assigned at the sponsor and project levels.
- Executive management should sponsor the constructability review program.
- Assign specific responsibility to members of executive management to play an active, participative role in the constructability review process. Assign a constructability manager who, ideally, should have extensive knowledge of the construction process. Assign a data base manager whose responsibility will be to maintain a "lessons learned" data base.
- Periodically evaluate the effectiveness of the constructability review program.

Section 1-B:

The Change Order Process Should Include A High Degree Of Analysis And Documentation

Risk exposure to overcharges is high when change orders occur if comprehensive controls are not in place to verify and analyze the proposed changes. A change order is written to change the original contract by adjusting the contract price and/or the contract time limit for specified deliverables. Key areas where management should ensure that adequate controls are in place to analyze change orders include: verify all labor overhead rates to ensure that the agency is not being overcharged by the contractor; labor overhead is adequately defined in the contract documents to identify all allowable charges; all change order pricing submittals should be fully supported in detail to permit adequate analysis; the cause and source of all change orders should be identified and categorized. These are typical areas where overcharges can occur (Thompson, et al., *Effective Auditing*, 1993, Sec. 1-13 to 1-14):

- Labor rates billed exceed cost of actual wages.
- Labor burden rate exceeds cost of actual labor burden.
- Change order price proposals are improperly inflated.
- Items that should have been included in the original base contract are presented as change orders.
- Material prices used to calculate change order pricing are higher than actual cost due to contractor trade discounts not being passed on.
- Quantity estimates used to price change orders are in excess of what is actually required.

Labor Overhead Rates Charged By Contractors Should Be Verified To Ensure That Actual Costs Are Being Used

In the *Uniform General Conditions For State Of Texas Building Construction Contracts*, Article VI addresses the administrative procedures for change orders. Texas State agencies may modify these conditions and we recommend that labor overhead, or labor burden, be defined further to include workers' compensation insurance. In addition, provision should be made to require a breakdown of and verification of the components of the labor burden cost factor. These modifications should be made to strengthen the process.

Labor overhead, or labor burden, should be defined. Typically, labor burden includes federal and state employment taxes, such as Federal Old Age Benefits (Social Security Tax), state and federal unemployment taxes, and workers' compensation insurance. In addition, it can include employer paid benefits such as holiday and vacation, medical, and retirement programs administered by the employer or others. All other overhead costs, such as insurance and bonds, generally are to be

covered by the overhead and profit mark-up percentage allowed by the contract. But, it is up to the agency to set these conditions. The cost of all of these benefits and taxes is usually expressed as a percentage of actual wages paid. Actual wages paid plus the benefits and taxes then become the true real cost of an employee, or labor burden.

There is a potential for overcharges and contract abuse to occur in this area of costs, since many contractors tend to take an average overhead burden cost and apply the percentage across the board, adjusting for workers' compensation classification rates, and apply it to all wages paid rather than using actual costs.

The risk is for overcharges by the contractor to occur on change orders on unverified rates. Figure 1 illustrates the potential cost impact of an unverified labor burden rate used in a hypothetical change order. Similarly, Figure 2 (on the following page) shows a breakdown of each labor burden rate in the hypothetical case.

Hypothetical Case

Assume a change request involving carpentry labor, at $12 per hour, requires 10 carpenters and 100 hours of work. The total number of labor hours is 1,000 x $12, or $12,000.

Figure 1
Labor Burden Overhead Rate For Change Order Pricing Hypothetical Case

	Unverified	Verified	Difference
Direct labor	$12,000	$12,000	$ 0
Burden rate*	46.38%	32.85%	13.53%
Labor burden	$5,566	$3,942	$1,624
Total	$17,566	$15,942	$1,624

* Labor burden rate: see Figure 2, on the following page, for a breakdown of these overhead percentage rates.

Figure 2
Breakdown Of Contractor's Labor Burden Overhead Rate For Use In Change Order Pricing - Hypothetical

CATEGORY	AS SUBMITTED	ACTUAL VERIFIED	AS VERIFIED EXPLANATION
Payroll Taxes:			
FICA	6.20%	6.20%	
Medicare	1.45%	1.45%	
Federal Unemploy.	0.80%	0.0%	Cap of $7,000 in annual wages exceeded.
State Unemploy.	2.70%	0.0%	Cap of $9,000 in annual wages exceeded.
Subtotal	11.15%	7.65%	
Fringe Benefits:			
Vacation/holidays	5.80%	0.00%	This benefit is only for contractor's supervisory personnel.
Subtotal	5.80%	0.00%	
Insurance:			
Workers' comp.	29.43%	25.2%	Experience modifier results in lower than book rate.
TOTALS	**46.38.%**	**32.85%**	Potential overcharge in labor overhead rate of **13.53%**.

This is an example of what one relatively small change could include. The risk of potential overcharges multiplies quickly when the total dollar amount of change orders is calculated on an annual basis.

Change Order And Contract Costs Should Be Fully Supported And Documented

In addition to the above steps, the change order analysis process should include:

- Standard forms for breakdown information relating to all of the costs associated with the change order - These forms should be required of the general contractor on all pricing submissions as well as all subcontractors' pricing submissions to the general contractor.

  Forms should include at a minimum: complete breakdown of all labor required, with actual pay rates of contractor's personnel; complete

breakdowns of all materials and equipment with all quantities itemized, showing the unit costs, and all trade discounts should be disclosed and passed on to the State; all subcontractors should be subject to these same documentation requirements on the same forms.

- Quantification of the change by identifying what initiated it, whether from the architect/engineer in the form of errors and omission or design improvements, unforeseen conditions, or design changes made at the request of the owner.

- Cost verification by the architect/engineer.

- Cost verification by qualified owner's staff person, as well as verification that the proposed change is not supposed to be included in the base contract.

The contractor should be made aware of all of the pertinent documentation required of it at the pre-construction conference. The pre-construction conference is where the State introduces the successful contractor to the administrative procedures that will be used on the project and lets the contractor know what the State expects. These requirements should be made a part of the agenda for this meeting.

Staff should also be made aware of the necessary documentation required from the contractors to verify the labor burden rates. A list of all of this documentation needed from the contractor and its subcontractors should be compiled for the preconstruction meeting. This list should then be given to the contractor or incorporated into the pre-construction agenda.

The Cause And Source Of All Change Orders Should Be Identified

Once the cause and source of a change order has been identified, it should be categorized and recorded for subsequent evaluation. Reasons why identification of the sources of change should be made include:

- For future planning purposes - a "lessons learned" data file should be kept to be used in the planning process for future similar buildings so that some of the same mistakes will less likely be repeated. (This will be discussed later.)

- Hold the architect/engineer accountable for gross errors and omission - track the total amount attributable to errors and omissions by the architect/engineer. When these amounts exceed 1 to 1.5 percent of the total construction contract, the contracting agency should consider backcharging the architect/engineer contract for the additional costs incurred. These could also include coordination errors.

- Track changes requested of the end-user, if applicable, to document additional costs and time expenditures not in the original project budget.

Change orders consist of two types: directed changes and constructive changes. Directed changes are easily identified, as the owner, or the State, directs the contractor

to make the change. It is generally a mutually agreed upon change. Also, it may result in an addition to the original contract, a deduction, or no change to the original contract, either in cost or in contract time. Sources of directed changes include design changes, obvious errors and omissions by the architect/engineer, improvement which improves the design, or request from the end-user.

Constructive changes are the result of . . .

> . . . an informal act authorizing or directing a modification to the contract caused by an act or failure to act. In contrast to the mutually recognized need for a change, certain acts or failure to act by the owner that increases the contractor's cost and/or time of performance may also be considered grounds for a change order (Fiske, 1988, page 444).

These types of changes could include:

- Defective plans and specifications; Architect/engineer errors and omissions.
- Architect/engineer interpretation of plans and specifications.
- Impossibility or impracticability of performance - it can not be constructed like the plans show (Fiske, 1988, page 444).

It is incumbent upon the contractor to initiate the request for a change order to be issued as a result of a constructive change condition.

When it is determined that a change order should be issued, it should be classified first, according to its source, and then put into the appropriate category. The source classifications would include owner-generated (initiated by the state agency) or architect/engineer-generated (initiated by the architect/engineer). Each classification could then be further broken down into categories.

Category breakdowns could include:

- *Owner-generated change order*: unforeseen conditions, design change request, function (or end-user), and miscellaneous changes.
- *Architect/engineer-generated change order*: errors, omissions, improvements, and coordination.

These categories are defined as follows:

- design change: changes requested by the owner, usually for design reasons
- unforeseen: things not anticipated or able to be anticipated, that were not visible or evident as the design was completed
- function: changes requested by the end users of a building or space

- errors: mistakes in the plans which must be corrected to adequately complete construction
- omissions: design elements which the architect/engineer failed to include in the plans but which are necessary to the successful completion of the project
- improvements: additions to the plans during the construction which improve the project
- coordination: errors resulting from failure by the architect/engineer to coordinate the design across disciplines (architectural, mechanical, plumbing, electrical, teledata, and communications, etc.), thus rendering the plans unconstructable without redesign

It is essential to quantify these areas in any major construction project in order to help evaluate the success of meeting the design objective of the project. Quantification of change orders will also identify gross errors and omissions in the design by the architect/engineer.

Section 1-C:

Getting Maximum Protection From Insurance Requirements

All State contracts for construction require contractors to provide proof of insurance. This protects the State against claims involving injuries and accidents as well as property damage that result from the work performed by the contractor and/or its employees, agents, subcontractors, or suppliers. Insurance coverage required by State construction contracts include: workers' compensation, employer's liability, comprehensive general liability (which includes bodily injury and property damage), comprehensive automobile liability, owner's protective liability, builders risk, or other insurance as specified. Proof of this insurance consists of certificates of insurance and policy endorsements furnished to the State by the contractors' insurance carriers.

Four areas of concern that warrant agency review are as follows:

- Certificates of insurance alone may not provide the level of protection the contracting agency presumes.
- Insurance coverage amounts required by the contract documents are not received by the contracting agency.
- Policy endorsements to the State are not received or required by the contracting agency.
- Insurance certificates and the policies they represent have expiration dates which must be consistently monitored.

Certificates Of Insurance: Are They Relied Upon Too Heavily?

Certificates of insurance should provide protection to the contracting agency. A certificate of insurance is the generally accepted method for demonstrating compliance with the insurance requirements in a contract. Contracting agencies usually depend upon the certificate to satisfy all contractual requirements for insurance protection.

During construction follow-up audits, the State Auditor's Office discovered that several certificates of insurance may not have been providing the level of protection expected by agencies. These certificates contained standard "boiler plate" language with reference to notification obligations of the insurance carrier. This "boiler plate" language was worded so that the insurance carrier could potentially be released from liability of providing notice of cancellation or material change to the policy to the owner or certificate holder.

A cancellation notice on a certificate of insurance, especially the ACORD form which is used by many insurance carriers, typically states:

> Should any of the described policies be cancelled before the expiration date thereof, the insuring company will *endeavor* (emphasis added) to mail _____ days written notice to the below named certificate holder, but failure to mail such notice shall impose no obligation or liability of any kind upon the company.

According to the Merritt Company, in *Non-Insurance Transfer of Risk* (1984) a certificate with this language should not be accepted. Merritt goes on to say that the certificate only guarantees "that as of the date it was issued the insurance coverage indicated was in force." The insurance carrier, with this wording, has no obligation to the contracting agency to notify it of cancellation or material change.

To strengthen these certificates, the Merritt Company recommends adopting this language, developed by Insurance Management Consultants, Inc., of Tampa, Florida, which reads:

> This is to certify that the insurance policies listed below have been issued to the insured and are in force at this time. It is agreed that none of these policies shall be cancelled or changed, so as to affect the insurance described by this certificate, until 30 days written notice of such cancellation or change has been delivered to the certificate holder at their address shown below. It is also agreed that 30-day written notice by the insurance companies listed above of their intent not to renew their policies listed below for the same coverages provided in this certificate will be given to the certificate holder at their address shown below.

The Texas Department of Transportation's (Department) certificate of insurance requirements, included in Appendix 3, provides a great deal more protection for

the State than the standard commercial carriers' certificates. It effectively binds the carrier to give written notice to the Department of any changes to or cancellation of the policy.

Insurance coverage amounts required by the contract documents should be verified by the contracting agency. All insurance certificates should be reviewed to verify the coverage provided to the contracting agency. It is essential that this seemingly simple task be accurately and consistently performed. The contracting agency should ensure that the person or persons responsible for this understand exactly what insurance limits and types of insurance the contract or contracts require and perform their duty accordingly.

Policy endorsements to the State should be required and reviewed by the contracting agency. Policy endorsements are the mechanism to name the contracting agency as additional insured, that is, insured in addition to the contractor. By including the contracting agency as additional insured, the insurance carrier must provide the same notifications to the agency as it does to their insured, the contractor. Endorsements should be required because certificates by themselves only provide information and are not contractually binding.

In addition to requiring policy endorsements, the agency must ensure that they are in fact receiving the proper endorsements. Again, the agency personnel responsible for insurance verification should be familiar with the contract requirements for endorsements. There should be an insurance checklist for each project identifying each type of insurance coverage required by the contract. Staff should initial each required coverage as it is received and filed in the contract file. This simple procedure should be incorporated into every construction administration system; nevertheless, it is often overlooked.

Monitor All Workers' Compensation And General Liability Policies

Insurance certificates and the policies they represent have expiration dates which should be consistently monitored. Since certificates expire when the policies they represent expire, monitoring of the policies is essential, not only of the prime contractor but also of all of the subcontractors.

Many contracting agencies only receive or require certificates of insurance from the prime contractor. The prime contractor is the contractor with which the State contracts directly and is generally referred to as the general contractor. To ensure maximum protection from claims against the policy and subsequent delays, agencies should require and keep on file current certificates of insurance from all of the prime contractor's subcontractors. This can easily be done by setting up a spreadsheet to include: names of all subcontractors as well as the general contractor, listing of required policies for each contractor, and noting all policy expiration dates. In most instances, this information will already be summarized by the general contractor, and a copy can be requested to monitor expiration dates. Thirty days prior to the expiration of each policy, the contracting agency should contact the general contractor and request a renewed certificate.

Section 1-D:

Alternative Disputes Resolution Measures Should Be Provided In All Contracts For Construction

Alternative Disputes Resolution (ADR) methods are increasingly being used in state contracts for construction to reduce the potential for disputes and resulting claims. These methods of dispute resolution and early claims avoidance measures have been successful in significantly reducing claims and the costs associated with settling those claims. The two basic methods being used are Partnering and Disputes Review Boards (DRB). Partnering should be used to some degree on all state contracts for construction. The Texas Department of Transportation, University of Texas Office of Facility Planning and Construction, and the Texas Department of Criminal Justice all provide for various combinations of these methods in their contracts for construction. Although results are not available, these agencies and universities report that they believe Partnering has helped to eliminate or lessen the traditional adversarial role between contractor and owner. This process focusses on a team-building concept to focus the owner and the contractor towards the same goal: successful completion of the project with minimal delays and expense caused by disagreements that result in claims.

Partnering Works For Construction Projects

Partnering is a means of early disputes settlement, before claims are actually made by the contractor. Partnering is easily implemented, inexpensive relative to the size of the project, and can be used on a project of almost any size. For this reason, state agencies who contract for construction on a regular basis should consider using this method in all significant contracts for construction as a means to reduce the potential for claims arising from disputes. It is a tool which can be used to manage disputes, not prevent them.

Partnering was pioneered by the Corps of Engineers. The Portland, Oregon District, with $200 million in construction contracts, reduced its number and dollar amount of claims from 18 claims totaling $27 million to 3 claims totaling $800,000 over a 2½ year period.

The typical format for a partnering session is an initial 1-day or 2-day workshop program, coordinated by a professional facilitator. The workshop should be held in an informal setting, away from the project and offices of the contractor and the owner. The Texas Department of Transportation keeps a current list of qualified facilitators which is updated periodically.

The Texas Department of Transportation (Department) includes the following components of a 2-day workshop in their Partnering process, which could be used as a basis for implementing a program (This program is used for larger projects; it can be scaled down according to the project size):

- supplemental, voluntary agreement for a Partnering arrangement between the prime contractor and the owner (the State)

- Contractor selects a third-party facilitator to conduct the workshop. The cost, which ranges from $3,000 to $7,000, including the facilitator's expenses, are paid by the contractor and invoices are submitted to the Department. The Department pays 50 percent of the expense.

- The Department and the contractor each exchange lists of their key personnel planning to attend, including subcontractors and suppliers, and comment as necessary.

- The contractor and the Department are each responsible for their own lodging, meal, and travel expenses.

- An arrangement for the "partnership" is to be worked out and agreed upon at the workshop. This agreement will contain mutually recognized goals and expectations of the Department and the contractor.

- Personnel of the Department and the contractor assigned to the workshop will remain involved with the project for the entire duration, unless otherwise notified in writing.

- Both parties agree to commit personnel at the project site to be actively involved in the achievement of the goals agreed upon.

- Both parties commit to process disputes in the manner agreed upon during the workshop.

- Follow-up workshops are to be held periodically throughout the project duration. Dates and time are to be mutually agreed upon.

- Either party may withdraw from the arrangement by written notice to the other.

- Claims or disputes settled during the partnership are agreed not to be revived.

- This is a non-binding agreement. The sole remedy for non-performance of the partnership is the termination of the partnership agreement.

For optimum success, the Partnering process should at least include these steps, according to FMI Corporation of Raleigh, North Carolina (FMI, *Partnering Challenge*, 1993, pages 2-3):

- *Preparation.* Executive management of both parties must understand the commitments and what the process involves. Expectations must be clearly established at the workshop session, and executive management must demonstrate their full support of the process.

- *Executive management's committed involvement.* Executive management must demonstrate their commitment by staying visibly involved in the

process throughout the duration of the project. In this way, they will reinforce the goals and objectives committed to.

- *Include all of the key players.* This not only includes the owner and the contractor, but the principal subcontractors and material suppliers must be involved in this process to make it successful.

- *Define the team leaders.* The contractor's representative should include the project manager, the superintendent, and a member of executive management. The owner's team should correspond in like manner.

- *Use the partnering tools developed in the workshop.* These include the goals, objectives, expectations, and the formal resolution process mutually agreed upon. Follow through with these throughout the project.

Use Disputes Review Boards For Large, Complex Projects

Disputes Review Boards are used for complex projects where the potential for claims is high. In the usual Disputes Review Board process, a board is formed just before the construction begins on a project. A board consists of three members: one appointed by the contractor, one appointed by the owner (the State), and a third member is appointed by the other two members. All members of the board should be familiar with the type of construction and methods used on the proposed project.

The board meets with the contractor and the owner on a regular basis, usually quarterly, at the construction site. In the interim, they are kept informed of the important events occurring on the project. DRBs are generally used on larger projects (some have suggested $10 million and up) or very complex projects where many unknowns exist and the potential for claims is high. Examples could include: underground utility or tunnel construction, heavy road and bridge construction, complex and extensive renovations, large prison projects, or commercial projects.

State agencies and universities involved in construction projects on a continuing basis should consider using Partnering on all construction contracts. Disputes Review Boards should be considered for complex projects where high potential for claims and disputes is evident.

Require Non-Collusive Statement Certification On All Bid Proposals

Although not required by law, non-collusion statements should be included in the proposal or bid form for all construction projects advertised for public bid by agencies and universities. This could be a tool to aid in enforcement of collusion laws should this situation occur.

A common form of collusion, or bid-rigging, occurs when an agreement between competing sellers of products or services agree to preselect a low bidder each time the bidding occurs. The Texas Attorney General's office says this situation is not unusual

and does occur in Texas. In the late 1970s and early 1980s in Texas, bid-rigging occurred among some highway contractors. Certain contractors were meeting and determining among themselves who would be low bidder on certain projects let for bid by the Texas Highway Department (now called Texas Department of Transportation).

The Attorney General recommends this non-collusive statement be used on the bid forms of all competitive bid proposals submitted to the State:

> The undersigned affirms that they are duly authorized to execute this contract, that this company, corporation, firm, partnership or individual has not prepared this bid in collusion with any other Bidder, and that the contents of this bid as to process, terms or conditions of said bid have not been communicated by the undersigned nor by any employee or agent to any other person engaged in this type of business prior to the official opening of this bid.

Another alternative to the Attorney General's non-collusive statement is this statement recommended by the National Institute of Governmental Purchasing, Inc., (NIGP) in *Public Purchasing and Materials Management* (NIGP, 1983):

> I certify that this bid is made without prior understanding, agreement, or connection with any corporation, firm, or person submitting a bid for the same materials, supplies, or equipment, and is in all respects fair and without collusion or fraud. I understand collusive bidding is a violation of State and federal law and can result in fine, prison sentences, and civil damage awards. I agree to abide by all conditions of this bid and certify that I am authorized to sign this bid for the bidder.

The language in each statement could be modified to accommodate the type of construction contract to be let. Bidders would perjure themselves if they falsely certified the above statement. NIGP emphasizes the serious consequences of collusion by making this statement:

> In addition to perjury charges, any bidder who does so would be guilty of fraudulent concealment which vastly increases the bidder's liability in treble damage suits by eliminating protection from the statute of limitations. The certification statement is the most potent tool available for preventing collusive bidding activity.

Section 2:

Improving Construction Quality

Section 2-A:

Emphasize Ongoing Training For Inspection Personnel

Consider comprehensive training of inspection staff to result in formal recognition of a level of competency achieved in a particular inspection category. The inspector is a vital member of the construction management team. He/she is the " . . . eyes and ears of the architect or engineer and the owner . . ." on the project (Fiske, 1988, page 21). Several training options are available, including various formal, in the classroom, and self-study courses from recognized organizations and institutions.

The following are suggestions to construction administration systems to consider relative to their inspection function:

- Assess the need for additional and continued training of inspection personnel. Identify the needs of the agency and of the inspection staff. Determine where the training is needed, what the trainee should learn in order to be more effective, and who needs what kind of training. Then, evaluate the training program for its effectiveness (Tenah, 1986, pages 24-27).

- Develop a training policy in writing and make it available to all employees. Include the purpose of training and the objectives to be obtained by the training.

- Consider self-study training programs for inspection personnel. The Bureau of Reclamation has developed the Comprehensive Construction Training Program, a self-paced, job-site focused training program that covers the full range of construction skills and knowledge for its field inspectors. This program has proven to be extremely cost effective compared to classroom training sessions. It has also been shown to be more effective in developing the inspectors' skills and knowledge than traditional classroom training methods (Pecarich, 1986, pages 32-33). The Southern Buildings Codes Congress, International (SBCCI) also offers a number self-study courses which lead to certification.

- Consider sending inspection personnel to attend training courses sponsored by the Texas Engineering Extension Service. Numerous training courses are offered in nearly all disciplines of the inspection field, and the costs are reasonable.

- Require annual formal training updates of all inspection personnel to ensure that they are informed of the latest technological developments in quality control.

- Establish written policies and procedures for the inspection process. A comprehensive manual should be developed, used, and periodically updated

to explain the expectations and job duties of the inspectors by the agency or university.

- Periodically (at least annually), all inspection staff should meet with the project managers and upper level management to discuss what was effective and what procedures could be improved. Discuss what the expectations of each group are towards the other. Use this session to suggest updates to the inspection manual. Follow up on all ideas and suggestions presented and communicate to staff. (The University of Texas System Office of Facilities Planning and Construction does this semi-annually with their construction administration staff.)

- Exchange information with other agencies that have similar inspection functions about inspection techniques, methods, and other processes that have proved effective. Do this on an annual basis.

- Evaluate inspection personnel on current code knowledge, construction methods and procedures, plan reading, and specification interpretation.

Consider code certification in one of the more commonly used model building codes. There are three basic models for building codes in the United States, but no one code is standard for use by state agencies. Generally, an agency, such as General Services Commission, will instruct the architect/engineer to design a project according to the building code in force where the proposed project is to be located, or, to the *Uniform Building Code* (UBC), whichever is more stringent. The State, however, is usually not subject to plan review, permitting, or inspections from code enforcers representing local governmental entities where the project is located.

The three basic building codes, referred to as the model code groups, include:

- International Conference of Building Officials (ICBO). This group, the oldest of the three, publishes the *Uniform Building Code* (UBC). Many of the larger cities in Texas use this code or base their codes on the UBC.

- Building Officials and Code Administrators International (BOCA). Many states in the Midwest and Northeast use this model code.

- Southern Building Codes Congress, International (SBCCI). This code is widely used in the South and southwestern parts of the United States. It is also used by many of the smaller municipalities in Texas.

Consider the following:

- Set career achievement goals for inspection personnel and include certification in his/her respective discipline. As inspectors move towards achievement goals, with appropriate incentives, they would be motivated to enhance their skills and knowledge. For example, the city of Austin requires all of its inspection personnel to become code certified in their particular area

within two years of starting the position. Incentives are provided for motivation.

- Code certification for inspectors is increasingly being recommended as an incentive to improve the quality of inspectors and, ultimately, the quality of the construction process. According to Lionel W. Vincent, P.E., M. ASCE, in his article *The Origin, Training, Evaluation and Status of Construction Inspectors* for the American Society of Civil Engineers publication *Quality of Inspectors - In Search of Excellence* (1986):

  > We need to recognize the practice of construction inspection in a higher context of professional activity. Mandatory certification of building inspectors should be actively pursued - on a national basis; it would be analogous to registration for architects and engineers.

  Similarly, the Business Roundtable reports that in reference to states that require code certifications of all inspection personnel "The model code organizations support the concept of certification as an essential step in upgrading the qualifications of code enforcement officers. Many states, too, have found that certification of code-enforcement personnel improves the level of service" (Business Roundtable, *Administration and Enforcement*, 1982, page 19).

Demonstrated competency in an area of the code most commonly used by the agency would help to ensure the effectiveness of the inspection function in the field. Although budget dollars for training always seem to be scarce, this critical area should not be neglected. It has far-reaching effects and financial implications in terms of future maintenance costs on buildings and facilities which the State must maintain for years to come.

Section 2-B:

Contracts With Architects/Engineers Should Ensure Accountability For Design

The professional design consultant should be held accountable for designing the project within the given budget. Project planning procedures at Texas A & M University require the architect/engineer to design within the agreed upon budget or be penalized. This policy could be modified and adapted to meet the needs of any agency or university with full-time construction planning and administration personnel. The policy includes the basic procedures:

- Construction planning staff develops a Program of Record for a proposed project. This is the program planning stage of the project where staff, with the end-user, determines what the end-user's facility needs are.

- When the needs for the physical plant (building and equipment) and site are determined, staff prepares a budget. The cost estimate is based on historical cost data and staff expertise.

- After the Program of Record is approved by the Board of Regents, staff are authorized to solicit proposals from architect/engineers for design services.

- The contract agreement with the successful design professional states that the design firm will design the project within 90 percent of the dollar amount available for construction.

- For purposes of determining whether the project bids fell within the budget, an average of the project bids submitted, minus the lowest and the highest, is calculated. If this average of the construction bids exceeds 105 percent of the 90 percent target budget, the design firm is required to redesign the project, at its own expense, to fall within the budget. (The lowest qualified bidder is awarded the contract if the average falls below the target budget.)

- If the average of the construction bids is less than 90 percent of the 90 percent target budget, the design firm is required to refund a portion of their fee relative to a percentage of the difference. For example, if the negotiated fee for basic services is six percent of budget cost, that fee would be reduced by the same percentage of the amount the bid average came in under the budgeted amount.

This method of cost control works in both directions. It helps to keep the project from going over the budget. On the other hand, it helps to prevent the professional designer from deliberately under-designing a project to ensure that it will come in under budget. The result of a project significantly under budget would be that the end-user was deprived maximum incorporation of their actual needs.

This policy assumes that the agency or university planning staff intending to implement the policy has sufficient expertise in construction project planning. In addition, the agency or university must have maintained an accurate historical data base relative to construction cost information.

Section 3:

Managing The Schedule

Section 3-A:

Negative Impacts On Construction Schedules

Prepare Attainable Schedules And Reasonable Liquidated Damages

Unrealistic completion dates, coupled with exorbitant liquidated damages charges against the contractor for failure to meet such requirements, impose severe financial burdens and undeterminable risks on the contractor. Furthermore, the owner, as a direct result,

pays more than the building is worth with no guarantee that the job will be completed by the stipulated deadline (Fiske, 1988, pages 270-271).

Construction schedules should be prepared to allow a realistic time period within which to complete the project. Contingencies for weather conditions typical to the geographical area where the project is to be located should be reflected in the schedule. The projected start dates relative to the weather conditions typical to each month should be considered as well. Soil conditions need to be taken into consideration. Delivery dates of specified equipment and materials should be considered also.

Calculation of liquidated damages should be made to reflect reasonable losses the owner will incur as a result of not receiving the building or facility by the date set. Liquidated damages should not be used as a punitive measure against prime contractors to induce performance, but, as the courts have ruled, actual damages and loss should be able to be demonstrated. A prime contractor is the contractor with which the State directly contracts with for performance of the work. A prime contractor, generally referred to as the general contractor, may have any number of subcontractors working for it under a contract for construction with the State.

Providing for liquidated damages in the contract for construction at milestones in the schedule should only be done if the milestones are critical to another prime contractor completing its work. Courts have generally held that this measure is acceptable and represents actual damages to the owner.

On the other hand, liquidated damages have been considered punitive and courts have ruled in the contractor's favor when the owner (the State for this discussion) could not demonstrate a reasonable loss. An example would be assessing liquidated damages at milestones when no other prime contractors' schedules are affected. If liquidated damages are assessed at milestones in addition to being assessed for exceeding the aggregate number of days allowed, the milestone liquidated damages could be considered punitive. Further weakening the owner's case would be if the contractor finished the project within the aggregate number of days allowed, but was still assessed liquidated damages for not meeting milestones.

Some of the effects of unrealistic schedules and high liquidated damages could include the following:

- The contractor adds contingencies to its bid in anticipation of liquidated damages, thus increasing the cost of the project. If liquidated damages are not assessed, the owner, the State, does not receive the benefit of the contingencies.

- The contractor will inundate the agency with paperwork in an effort to gain and justify extensions of time. It is not uncommon on a large project for the contractor to generate 1,000 to 2,000 requests for information to the owner and architect for endless clarifications of the work to be performed. When the owner cannot respond quickly, the "delay" is factored into the contractor's

critical path method (CPM) schedule to demonstrate a negative schedule impact. If this is demonstrated, the contractor may be able to justify schedule extensions.

- As paper work mounts for the contractor to build a case for schedule extensions, claims could inevitably result.
- Valuable time of both the owner and the contractor is lost due to posturing in anticipation of potential claims.
- The schedule will not be attained.

Agencies and universities should carefully consider the factors they use in setting schedules and the methods they use in calculating liquidated damages.

Resolve Quality Control Issues Immediately

Construction schedules can potentially be delayed if outstanding issues are not quickly resolved if they affect critical work. Uncorrected deficiencies can have a cumulative effect of delaying milestones which, in turn, can delay the overall construction schedule. In addition, the cost of future maintenance may be increased if deficiencies are not corrected.

Quality control issues that develop during the course of construction are recorded in a log typically referred to as a Non-Conformance or Non-Conforming Report. The Non-Conformance Report is the written record of the contractor's work that is out of compliance with the construction plans and specifications. The typical procedure is to record defective or unacceptable work when it is observed, assign a log number to it, and follow up on the disposition of the issue in question.

Quality control assurance is made by visual inspection, tests, certifications required from manufacturers and/or fabricators, or reports. Inspections and reviews are conducted periodically throughout the construction duration. These responsibilities are usually performed by the project inspector or other designated project representative.

An example might be plumbing or mechanical systems in ceilings, foundations, or walls that are determined by the project inspector to be out of compliance with the specifications. Before other tasks can be accomplished, such as installation of ceilings, foundations, and walls, the deficiency must be corrected.

Measures to help prevent or minimize schedule delays from quality control issues include the following:

- Regularly monitor the disposition of issues on the Non-Conformance Report. All open issues should be tracked weekly.

- Set a specific time period (5 days, for example), preferably in the specifications, within which time the contractor must respond to either resolve the deficiency or come up with a plan of action to correct it.
- Reduce pay applications of the contractor by the amounts of work in question.
- Notify the contractor in writing that it is not in compliance with the contract.
- Have the architect/engineer address the respective issues in writing to the contractor, notifying it of non-compliance.
- Require the contractor to respond to the open issues in writing.
- Go over all open issues at the regular project progress meetings and request resolution or a plan of action to resolve the issues.
- Regularly review the progress of the disposition of the open items.
- If partnering is used on the project, agree at the first workshop session how Non-Conformance issues will be resolved. During the course of construction, put the open issues on the Partnering meeting agenda.

Section 4:

Post-Construction Reviews

Section 4-A:

Include Strong Right To Audit Clauses In All Contracts

With hundreds of millions of dollars in construction projects being planned, built, or completed each year by state agencies, there is a potential that the State will be overcharged for some portion of these contracts and the resulting change orders. Auditing of construction, consulting services, and professional services contracts by state agencies is not typically done, except by the Texas Department of Transportation and Texas Department of Criminal Justice. The Department of Transportation audits all of its professional services contracts (architect/engineer) as a matter of policy and procedure. (Generally, they do not audit construction projects.) The Texas Department of Criminal Justice periodically audits construction and architect/engineer contracts on a limited basis. Both of these agencies have strong right to audit clauses in their contracts: the Department of Transportation in their professional services contracts, and the Criminal Justice Department in contracts for construction and professional services.

Construction auditing firms report that overcharges on construction contracts, as well as professional services (architect/engineer) contracts, can add up to a significant portion of the contract value. Courtenay Thompson & Associates and R. L. Townsend & Associates, both of Dallas, Texas, report that these overcharges can run from 1 to 2 percent of the total project cost. Similarly, CCM Consulting Group of

Arlington, Texas, reports that their experience in conducting over 300 construction audits has resulted in average findings or exceptions to the contracts of 1.8 percent. CCM goes on to report that actual cost recoveries to the client from the auditee average about 1.2 percent of the total project cost.

External audit statistics from the Texas Department of Transportation indicate that exceptions to consulting engineering contracts in fiscal year 1993 amounted to approximately .7 percent of the consultants' total contracts. We would expect this to be below that reported in the private sector because of two factors:

- Simply having the right to audit clause in the contract is in itself a deterrent.
- The Department of Transportation has been regularly auditing all of their engineering consultants' contracts for a number of years.

Section 4-B:

Make Formal, Written Assessments Of All Completed Projects

A "lessons learned" data base should be maintained for use in planning and designing future projects. Each project should be evaluated to determine if the project design objectives were met. The evaluation should be in writing and should be performed some time after the facility has been occupied. Historical data including costs, schedule completion time, methods, designs, problems encountered, and resolutions should be maintained for all completed projects. This data should be regularly updated and accessible for use in planning future projects.

A model for the evaluation of a facility could be adapted from using the *Guide for School Facility Appraisal* (Hawkins, et al., *Guide*, 1992). This document is published by the Council of Educational Facility Planners, International (CEFPI), Columbus, Ohio. The purpose of this publication is to objectively evaluate public school facility design; nevertheless, we think the principles in this model apply to most types of facility construction. This criteria could be modified as necessary to evaluate the design effectiveness of the particular category of building to be constructed. The usefulness of a document such as this depends upon whether or not the type of facility planned, or a similar type of facility, will be duplicated in the future. It may not be an effective tool for the planning and construction of a one-of-a-kind facility.

According to the authors, the purposes of the guide are (Hawkins, et al., *Guide*, 1992, pages 2-3):

- To perform a post-occupancy review. This should be done six months to one year after the facility has been occupied. It is also to grade the facility on whether or not the design objectives were achieved and construction materials are functioning as intended.
- To formulate a permanent record. This record is used in the planning and development of future, similar facilities *so that problems encountered will not be repeated.* Subsequent evaluations over the next several years can be

performed to see how effectively the design is functioning for its intended use. This is also useful in providing trend information on defects and deterioration of specified materials and equipment.

- To highlight specific appraisal needs. Each area of the appraisal criteria can be used separately from the others as needed. Separate reports can then be made as necessary.

- To examine the need for new facilities. It could serve as an indicator of the adequacy or inadequacy of present facilities.

- To evaluate the need for renovation. Depending on the rating from grading the facilities, it can be a tool to indicate whether the facility should be renovated or abandoned.

These uses can be applied to all types of facilities, not just primary and secondary educational buildings.

The authors state that a written report could be made for any of the above uses and that this should be done " . . . to help administrators and board members make decisions regarding the future of the specific facility" (Hawkins, et al., *Guide*, 1992, page 4).

The *Guide's* appraisal criteria is broken down into several categories. We will discuss five here: site, plant maintainability, building safety and security, and environment. Selected criteria from each of these areas from the *Guide* will be briefly discussed as follows (Hawkins, et al., *Guide*, 1992, pages 7-51). A considerable amount of additional criteria is included in the *Guide*. Numerical weighted values are assigned to each criteria item. The categories each have a maximum number of points; the closer the scores are to the maximums, the more successful the design is considered to be.

Site. Site selection and development is of the highest importance, not only in an educational facility but in nearly every type of facility. Considerations should be given to these areas:

- Is the size and the accessibility adequate?

- Is it large enough for future expansion, if that is a consideration for the future?

- Is the site well drained and free of soil erosion?

- Is it suitable for special outdoor needs?

- Is there sufficient on-site parking?

Plant maintainability. This includes the structural and mechanical features of the building. Consideration should be given to these areas:

- Does the building meet all of the barrier free requirements, including the *Americans with Disabilities Act of 1990* (ADA)?
- Are roofs weather tight, and do they have positive drainage?
- Are foundations stable with no visible cracks?
- Is there sufficient expansion joints in interior and exterior walls?
- Does the building provide energy conservation?
- Is the built-in equipment accessible?
- Is lighting economical and efficient?
- Are the floor, wall, and ceiling finishes easily maintainable and durable?
- Is adequate storage space provided, including custodial storage?
- Are plumbing fixtures of commercial quality, wall mounted type?
- Is the number of electrical outlets adequate?
- Is the finish hardware durable and adequate?
- Are fire alarms, smoke detectors, and sprinkler systems properly maintained, and do they meet the requirements?
- Is the exterior water supply sufficient for normal use?

Building safety and security. For risk management, safety and security of the public must be designed into all facilities. An assessment could include some of these conditions:

- configuration of vehicular traffic patterns, if they are well segregated from pedestrian walkways
- safety and adequacy of vehicular traffic entrances and exits at the site
- location of mechanical and electrical equipment in the building
- emergency lighting placement
- flooring types and locations relative to non-slip conditions
- inside pedestrian traffic areas terminate at exits

- location of adequate fire safety equipment
- fire resistance of materials used in construction and finishes
- adequacy of interior space provided for natural disasters
- visible adequacy of the fire and smoke alarm system

Environment. The overall appearance of a building, both interior and exterior, affect its inhabitants productivity. In the same way, air quality and physical comfort will affect productivity. These general areas should be evaluated, as well as others considered applicable:

- overall aesthetics of the facility
- landscaping (if applicable)
- exterior noise levels, audible form inside
- entrances and walks protected from the weather
- adequate ventilation system with circulation of clean air
- adequacy of lighting system
- adequacy and number of drinking fountains and restrooms
- adequate traffic flow in corridors and foyers
- sound control of interior finish materials

Additional criteria could be developed specifically for other areas applicable to the planned project.

In addition to the above criteria, construction administration departments should consider including a user satisfaction survey after the project is completed. This would give the user an opportunity to provide written, formal feed-back that could be used to improve or maintain a high level of service.

Section 4-C:

Professional And Consulting Services Selection Procedures Should Be In Writing And Fully Documented

An objective ranking and selection process should be used to reduce the risk of errors or improprieties occurring in the process.

This process should include the following:

- Every step of the Request for Qualifications (RFQ) and selection process should be fully documented with all original documentation included in the file, as far as is practical.

- Procedures should be developed for formation of the selection team, including provisions for different selection teams for each stage of the selection process. Generally, one team should be assembled to review written material from respondents to the RFQ. This first team assesses and ranks the respondents according to the respondents' reasons as to why they are qualified for the particular project. After assessments have been made, the first team develops a "short list" of respondents the team considers qualified to do the design or consulting work according to the agency's needs.

- The second selection team would perform oral interviews with the firms selected by the first team. In this way, maximum objectivity could be ensured.

- All grading and ranking should be done on grading forms developed by the agency to fit its particular needs. The team members should be required to make all comments about the respondents or interviewees in writing and on these forms. The forms should be signed by the team member and initialed by the team leader.

- An independent estimate of the expected fees should be prepared by the agency prior to any fee negotiation with the top-ranked firm.

- When the top-ranked firm is finally selected, and fee negotiations begin, all records of this negotiation should be documented. The agency should prepare a work sheet to document how the agreed upon fee basis was determined.

- Provisions for a conflict of interest disclosure statement should be made in the selection process. The request for qualifications (RFQ) should include the requirement for the respondents to disclose any potential conflicts of interest (State Auditor's Office, *Prison Construction*, 1993, page 21).

- Disclosure of any financial interest which may present a conflict of interest.

- Include a clause in the contract for services that would discourage conflict and would invalidate the contract in the event that an actual conflict occurred.

- Make a provision in the process for the evaluation team to state that they found no potential conflict of interest.

- Require that the selection process be voided if it is found that the staffing and qualifications of the first-ranked firm significantly change after the selection process. Another process should then be started to ensure that the appropriate

selection is made. The members of the selection team should sign a conflict of interest statement.

In addition to the process above, agencies should ensure that:

- The file for this process contains a written recommendation to the board, governing body, or other applicable authority that will be making the decision to enter into contract with the firm.

- There is a data base of qualified architect/engineer or consulting services firms, including complete Historically Underutilized Business (HUB) listings for these same types of services from which to send initial Requests for Qualifications (RFQ).

Section 4-D:

The Construction And Bid Award Processes Should Be Fully Documented

The project bidding and contract award files should contain key documents. Complete documentation of the bidding and award process is necessary to ensure maximum accountability in case a contract award is ever challenged. Procedures should include all documentation of activities related to the pre-bid, bidding, and bid award stages of the process.

At a minimum, the contract award files should contain the following documentation:

- checklist of all documentation required to be placed in the front of each contract award file

- documentation of the project authorization and board approval to expend the funds on the project

- project budget, signed and approved by the appropriate department contract administration official

- bid advertisement, in accordance with state bidding for construction laws

- list of qualified potential prime bidders requesting bidding documents

- correspondence with potential bidders

- official presiding officer designated at each bid opening; other department officials present serve as witnesses and attest to the bid opening proceedings

- provide original sign-in sheet of all attendees at the public bid opening; this document should be signed and certified by the designated department official at the bid opening

- original documentation of attendee list of any pre-bid conferences, if applicable, and notation whether mandatory attendance was required or not
- bidder proposal submittals, each one initialed by the presiding department officer
- original bid tabulation sheet, signed and certified by the presiding official
- recommendation to the board for award of contract
- board action documenting authorization to enter into contract with the recommended bidder
- notification letter to apparent successful bidder
- develop written procedures for all of the above

Appendix 1:

Objective, Scope, Methodology, And Background

The objective of this project was to develop criteria to evaluate the effectiveness of construction administration systems in the State which control significant amounts of construction dollars. This was not an audit or a review of management controls of the administration systems. The scope and methodology included the following:

- Select five state agencies and universities which had full-time construction administration staff and perform a significant amount of construction activity. Agencies selected were: Department of Transportation, General Services Commission, University of Texas System Office, Texas A&M University System, Texas Parks and Wildlife Department.

- Visit agencies' and universities' construction administration departments.

- Collect criteria from each organization on the methods they use to plan construction projects, select design professionals (architects and engineers), bid, manage and close out the construction projects.

- Research criteria from Construction Industry Institute publications, Construction Industry Cost Effectiveness (CICE) Report by the Business Roundtable, reference material from R. L. Townsend & Associates for the Institute of Internal Auditors for construction auditing, the Office of the Attorney General of Texas Construction Law Conference, previous State Auditor's Office reports, and various other reference material on construction management systems.

- Select criteria in the areas that had the most influence on cost in the planning and construction process.

This review was performed by the following members of the State Auditor's staff:

- Lucien E. Hughes (Project Manager)
- Paul T. Garner (Audit Manager)
- Deborah L. Kerr, Ph.D. (Audit Director)

Appendix 2:

Considerations For Internal Auditors In Preparing Audit Programs For Construction Activity

The following is intended as supplemental information for internal auditors of state agencies to use in preparation of audit programs. The information could aid the auditor in areas to review in construction administration systems.

I. GENERAL OBJECTIVES OF CONSTRUCTION AUDITING (Thompson, et al., *Effective Auditing*, 1993, Sec. 1-1)

A. Determine that capital expenditures are properly controlled

B. Identify potential overpayments to contractors

C. Identify potential overcharges by contractors

D. Identify potential overcharges by Architect/Engineer and/or Consultant

E. Develop audit findings that result in cost recoveries for the State

F. Identify control weaknesses that provide opportunities for contract fraud, deficiencies, and abuse

G. Recommend internal controls that will detect potential problems and/or prevent recurrence of previously identified problems

II. GENERAL CONSTRUCTION AUDIT CONCERNS (Thompson, et al., *Effective Auditing*, 1993, Sec. 1-50)

A. Initial project definition and approvals

B. Architect/Engineer and consultant selection process

C. Development of plans and specifications

D. Development of contract documents

E. Solicitation of appropriate bidders

F. Construction contract award process

G. Contract administration controls over payments to contractors and architect/engineer, consultants

H. Change order review, analysis, and approval process

I. Adequacy of the management team, including quality control team

J. Adequacy of the on-site approvals

K. Proper audit trails - documentation of each step in the process

III. POTENTIAL AUDIT FINDINGS (Thompson, et al., *Effective Auditing*, 1993, portions adapted)

A. Right of audit provision in the contract is non-existent or needs strengthening.

B. Controls over selection process for professional and consulting services is poor, documentation is lacking.

C. Formal conflict of interest policies have not been developed.

D. There is no evidence of fee negotiations with professional and/or consulting service providers - the agency may be paying too much in fees compared to other agencies.

E. Equipment/furnishings provided in the construction contract are not capitalized.

F. No written procedures exist for the competitive bidding process.

G. Controls over competitive bidding are poor, documentation is lacking and does not include each step of the process.

H. Material, equipment, and labor costs are not properly (accurately) recorded on in-house remodeling and construction projects (projects performed by the agency's maintenance staff).

I. Process for selecting contractors to bid is poor, there is no prequalification process.

J. Contract definitions and terminology are not written adequately to protect the State's interests.

K. Contract administration is inadequate or poor: daily reports are incomplete, inspections are not recorded.

L. Change order authorization, analysis, and review process is weak.

M. Labor burden overhead rates are not verified on change orders for construction.

N. Labor burden overhead rates are not verified on architect/engineer or consultant's billings for additional services when performed on a time and materials basis.

O. Change orders are not processed in accordance with the contract provisions.

P. Construction product or method substitutions are approved without verifying if credits are due to the agency.

Q. Relationships with contractors or professional/consulting service could be a basis for conflict of interest.

R. Specifications contain restrictive requirements for the source of products which could lead to potential sole-source purchasing violations

S. Billings for additional services and/or reimbursibles from the architect/engineer or consultant lack supporting documentation or are not in accordance with the contract provisions.

T. Unresolved contract deficiencies negatively impact the construction schedule.

U. Workers' compensation policy coverage is not adequately monitored.

V. Workers' compensation, general liability, auto and/or other insurance coverage amounts required by the contract are not being provided by the contractor or architect/engineer.

W. Language in the insurance certificates may not obligate the carriers to notify the agency of cancellation or material changes to the policy.

X. Contract language regarding insurance notification needs to be strengthened.

Y. Policy endorsements naming the agency/state as additional insureds are not required.

Z. Contract requires policy endorsements naming the agency/state as additional insureds, but agency doesn't monitor or enforce receipt of these provisions.

AA. Non-conformance report or quality control log is not kept up to date.

BB. Quality control issues are not being resolved in a timely manner and may cause schedule delays by interfering with the completion of other scheduled work.

IV. PHASES OF THE CONSTRUCTION PROCESS (Thompson, et al., *Effective Auditing*, 1993, Sec. 1-5)

A. planning and design phase

B. contract document development phase

C. bid phase

D. construction phase

E. contract closeout phase

AREAS TO REVIEW IN EACH PHASE OF THE CONSTRUCTION PROCESS (The following information is included to assist in developing an audit program for the internal auditor. It is not a complete listing of every facet of the process):

I. PLANNING AND PROJECTION DESIGN

A. Project Conception

1. Was a needs assessment performed?

2. Does the needs assessment of the proposed project align with:

a. agency strategic plan?

b. agency master plan?

3. Is there a prioritization process in the planning - has management presented the long range as well as the short range needs of the agency/university to the governing body so that a decision based on most pressing needs with the available resources can be made on what to build and when?

a. Are projects ranked according to priority and is this documented?

4. How was the initial budget prepared - what criteria was used?

5. Was a complete and thorough project budget prepared prior to any legislative requests for funding, including:

a. best and most current estimate unit prices prepared

b. program needs with reasonable space requirements, allowing for sufficient circulation and mechanical square footage

c. site development costs included

d. land and utility needs identified

e. architectural/Engineering and/or other consulting fees included

f. project contingencies included

6. What factors are considered in site selection - were the costs of site development (excavation and fill, drainage, availability of utilities) compared with and weighed against the cost of locating to another site?

7. Were adequate geotechnical investigations made of the proposed site before commitments to acquire the land were made?

8. For agencies acting in an oversight role - was technical assistance given to the client/user-agency in order to accurately reflect dollar amount needed for appropriation request?

B. Project Development

1. Professional services procurement - distinguish between professional services procurement requirements (Art. 664-4, V.T.C.S.) and private consultants (Art. 6252-11c)

a. Request For Qualifications (RFQ) preparation

(1) Are RFQs for professional services and consulting services prepared and treated consistently in accordance with state law? (Example: RFQs for construction management consulting services have been prepared under 6252-11c. The criteria used in the evaluation process for selection does not require that the respondents be professional engineers as 6252-11c requires.)

(2) Is compliance with the article verified and monitored?

(3) Defining the qualifications necessary for the design professional - has the agency outlined and listed the specific experience, staffing, etc. requirements it feels necessary for the responding firms to have to be qualified to do the project?

b. Selection process

(1) Is there a written policy and procedure for the process?

(a) Verify that the fee structure complies with the maximum limits of state statute.

(b) Ranking process for selection of professional services or consulting services.

i) The evaluation team that ranks respondents' written response and qualification submittals and recommends firms to interview should not be composed of the same members who do the oral evaluations from the respondent interviews.

(c) Selection teams should include representatives from the end-user and construction or project management personnel.

(d) The grading and ranking system should be weighted with points assigned to each question or observation.

(e) Include adding machine tapes from the ranking score totals and attach to each grading form.

(f) Were the firms with the highest rankings selected for the interview process?

(g) Was the firm with the highest ranking negotiated with first?

(h) If negotiations failed with the highest ranked firm, did the negotiations then go to the next highest ranking firm?

(2) Fee negotiation - Is the State getting the best deal possible?

(a) Is an estimate of fees for that particular project prepared by competent agency personnel prior to fee negotiation? Is there a written record of this for the files?

(b) How do the fees being paid compare with other agencies/universities for similar projects?

(c) Is there written documentation showing how the fees negotiated were and arrived at?

(3) Complete documentation of the whole process - is this in order, step by step?

c. Professional's accountability definition - spell out in the contract for services.

(1) risk assignment to the A/E for omissions and errors

(2) effects of errors and omissions - added costs to the State through:

(a) simple omission - retrofit only, minimal cost

(b) redesign - requires full cost of construction to correct

(c) delay of project

(d) claims from contractor may result

(e) loss of quality/life expectancy of the facility

(3) Does the agency measure and quantify the cause of change orders?

(a) owner generated and requested

(b) architect/engineer (A/E) error

(c) unforeseen conditions

(4) Warning sign during construction process - change orders exceed 1 to 1.5 percent of the construction contract for errors and omissions due to architect/engineer design.

(5) How much physical rework has been required through the construction process due to design change by the architect/ engineer?

(6) Is the agency backcharging the professional for the cost of gross errors and omissions that result in change orders (for additional cost and time delays)? Is there a provision in the contract for this?

(7) Has a conflict of interest policy been established?

d. Are payment vouchers properly coded with Comptroller's code numbers?

(1) private consultants

(2) professional services

2. What is the level of client/user involvement in the planning process? This is a critical element and should be documented carefully.

3. Is there a constructability program early in the design process?

a. Constructability defined: the optimum use of construction knowledge and experience in planning, design, procurement, and field operations to achieve overall project objectives; maximum benefits occur when people with construction knowledge and experience become involved at the very beginning of project design.

b. Cost Influence Curve - the ability to have the greatest influence on cost is the highest at the planning stage of the project.

c. Constructability team consists of:

(1) design professional

(2) owner's assigned staff, including high level management and construction project manager who will be assigned this project

(3) contractor/estimator/consultant - hire this function out if the expertise doesn't exist in-house.

(4) client agency (if applicable)

d. Is there a formal policy and procedure in writing? (This gives legitimacy and credibility to the process.)

e. How is this implemented and monitored?

f. How are decisions made determining the design criteria for materials to be used in the construction of the project?

(1) Were considerations given to the long term cost of maintenance and operation of the structures?

(2) Were alternatives to different designs evaluated and quantified?

4. Plan and specification development

a. Constructability reviews should be performed at each of the basic stages of plan development, i.e.:

(1) conceptual planning and design

(2) schematic design

(3) design development

(4) construction plans

b. cost estimates

(1) prepared in-house, depending on owner staff capability, or by the design professional

(2) verified by outside consultant such as construction estimating firm or hire a general contractor on a consulting basis for larger projects or projects of a complex nature

(3) cost estimates to be done at each stage of the design development process

c. Could any product or equipment being specified be considered "sole-source"?

d. If so, what is the justification and how is it critical to the application?

e. End-user input - Are these people invited to planning meetings, and has the plan which directly affects their area been explained in detail to them?

f. How is this implemented and monitored?

g. Are all plan reviews and inputs documented?

5. *Americans with Disabilities Act* (ADA) considerations - Have the plans been checked and signed off by the Department of Licensing and Regulation?

6. Environmental issues addressed? Note: The State is exempt from most local building and development codes. Areas that need to be addressed in the contract documents include:

a. storm water runoff protection

b. tree protection

c. restoration of vegetation of disturbed areas after the construction is complete

7. Historical buildings, Texas Antiquities Code - Has this been researched, if applicable?

a. State law requires a permit from Historical Commission or the Antiquities Committee to demolish or modify any building 50 or more years old - An historical assessment must be made of the structure.

II. CONTRACT DOCUMENTS DEVELOPMENT

A. Claims Avoidance Measures - should be included in the contract documents.

1. Disputes and claims process used now by most agencies

2. Alternative disputes resolution (ADR)

a. Partnering - Is there a process to measure and record the results of Partnering?

b. Disputes Review Boards (DRBs) - Are the result measured and recorded?

3. Documentation and records necessary to protect against claims - Are these maintained accurately, and are they current and complete (Thompson, et al., *Effective Auditing*, 1993, Sec. 1-57)?

a. daily inspection reports
b. job meeting minutes
c. job photographs/videos
d. updated schedules
e. material and equipment delivery schedules
f. drawing revisions
g. daily job progress reports/logs
h. documentation of settlement meetings and resolutions
i. steps in resolving contractor claims - have all of these steps been taken to resolve the claim? (Use with or without partnering)

(1) Establish a claims review team, consisting of project management, legal and audit staff.
(2) Thoroughly review the basis for the claim.
(3) Thoroughly review contract documents.
(4) Are all claimed costs properly supported with documentation?
(5) Check the arithmetic on claim documentation.
(6) Prepare chronological analysis of the sequence of events.
(7) Interview the appropriate job personnel.
(8) Develop a negotiating strategy and plan.

B. Right To Audit Clause - Is there a strong right to audit clause in the contract for construction as well as the architect/engineer and consultant services contracts?

1. Contracts should include language that allows access to all books and records of the contractor, its subsidiaries, and affiliates (Thompson, et al., *Effective Auditing*, 1993, Sec. 2-32).

2. Contracts should include language that requires the contractor to bind all of its subcontractors and suppliers to this requirement.

3. Contracts should include the contractor's insurance agents to comply with this requirement.

C. Non-Collusion Certification - Is there a provision on the bid form for a non-collusion certification statement by all bidders submitting a bid on proposed project?

1. Certification statement should be prepared for use on all bid forms.

2. The agency should have a written policy and procedure for dealing with anticompetitive practices.

D. Insurance Requirements and Protection

1. Verification of contractors and subcontractors coverage - What is the process to ensure required coverages are in force?

2. Periodic monitoring of the coverage - How is this accomplished? Are policy expiration dates set up in a "tickler" file or some similar method to alert the agency to check coverage?

3. Monitoring of subcontractors' policy (accuracy of reporting volume of work and worker classification to insurance carrier) - How does the agency accomplish this?

4. Are policy endorsements naming the agency/state as additional insured required?

5. Is the agency actually receiving the endorsements, and does it check them against the contract requirements?

6. Verify the amount of coverage required by the contract with the amount of coverage furnished on the certificate of insurance. Are they at least the same?

7. Does the agency accept certificates of insurance with policy notification wording from the carrier such as "the issuing company will *endeavor* to mail 30 days written notice . . . but

failure to mail such notice shall impose no obligation of any kind upon the company, its agents or representatives." Language on a certificate of insurance like this should not be accepted by the agency as it does not ensure any notice of material change or cancellation of a policy by the carrier.

8. Does the agency require disclosure of the contractor's modifier as a condition of bidding on the project? (This could be an optional contractor prequalification measure.)

E. Prevailing Wage Rate Compliance

1. Wage rate classification set up and updated

2. Monitoring of the payroll reports

   a. spot checks by interviews with the contractor's employees

   b. spot check contractors weekly payroll

3. Enforcement of the statutory penalty to the contractor or the subcontractor - $60 per day per employee

   a. if these funds are being collected against the contractor, are the funds going directly to the agency? (Required by the new law, V.T.C.S.A. Art. 5159a, effective September 1, 1993.)

F. Historically Underutilized Businesses (HUBs)

1. House Bill 2626 sets state goal at 30 percent.

2. What is the procedure to monitor and track the progress on each project?

3. Determine if they are meeting their goals.

4. Document why they are not meeting the goals.

5. Are these reports tied to the contractors' monthly pay applications?

6. Is the agency/university obtaining assistance from General Services Commission?

G. Sureties

1. Types of bonds

a. Bid bond - bid security is usually required such as certified check, cash, or bid bond.

b. Performance bond is required by statute of all construction projects over $100,000.

c. Payment bonds are required by statute of all construction projects over $25,000.

2. Verification of the suretys' ability to conform to the state requirements - 10 percent capitalization requirement - is this verified with the Department of Insurance? (Art. 6.16 of Insurance Code)

3. Verify that the surety is authorized to do business in Texas.

4. Riders on the bid bond bid form - these need to be looked at carefully for the wording and exclusions.

5. Does the agency do a verification of the bond's authenticity, like calling the surety?

6. Attorney General's signature is required by statute on all executed performance and payment bonds.

7. Are all required performance and payment bonds executed and on file with the agency before the contractor is allowed to start any work?

8. Notification to the surety of contractor performance periodically throughout the contract period helps keeps the contractor in line.

H. Incentives for Early Completion - On time sensitive projects, are incentives offered to the contractor for early completion? Are the incentives weighed against the cost of not completing on time?

I. Update General Conditions of the Contract - Are the general conditions and supplemental general conditions reviewed and updated periodically?

III. BID PHASE

A. Bid Analysis and Award

1. Consideration of the lowest and best bidder - does not necessarily mean the low bid always has to be accepted. If there is any question about the ability of the contractor to

perform, was this discussed, and were alternatives proposed to take the next bid?

2. If only one bid is received, bid should be rejected and returned to bidder, unopened, and project should be rebid.

3. Tie bids should be reported to the Attorney General's office as a measure to discourage potential collusion between bidders.

4. If the project is determined to be overbudget after bid openings, and the agency chooses to negotiate cost with the lowest and best bidder rather than rejecting bids, ensure that scope changes and price changes do not exceed 25 percent of the original base bid. Although there is no law regulating this for state agencies, ethical considerations may indicate that if a project decreases or increases in scope and/or cost at the contract negotiations stage by more than 25 percent, the project may no longer be able to be considered the same project for bidding purposes. Therefore, rejection of all bids would be in order. The agency should then rebid the project after consultations with the governing board and the contracted design consultant or architect/engineer.

5. If project scope is reduced due to budget constraints, were the remaining items prioritized and absolutely necessary to meet program needs?

B. Contract Documentation Needed Prior to Construction - All of this information should be in the contract file (except for the plans or other extremely large items).

1. Presiding official or contracting official should be designated for each project to sign and approve as authentic all documents received from bid openings or pre-bid meetings.

2. Invitation to bid and bid advertisement as required by statute - all documentation of the process.

3. List of all potential qualified bidders.

4. Instruction to bidders - usually found in the specifications.

5. Correspondence with bidders.

6. Bid set of drawings/blueprints.

7. Specifications.

8. Contract addendum and/or addenda.

9. Record of attendees at pre-bid conference, if required (original sign-in sheet), signed by presiding agency official.

10. Record of attendees at bid opening, original sign-in sheet document, signed by agency contracting official.

11. Successful and unsuccessful bidders proposals, initialed by the contracting official.

12. Bid tabulation, original, signed and certified by the contracting official.

13. Recommendation of bid award by staff.

14. Documentation of authorization by the appropriate governing body to award contract to recommended bidder.

15. Construction contract, original executed document.

16. General conditions, supplementary general conditions - usually in the specifications.

17. Modifications, exhibits, attachments, etc.

IV. PROJECT ADMINISTRATION

A. Contract-Related Documentation Needed During the Construction Process

1. Records showing all project-related expenditures

2. Change orders with supporting documentation

3. Contractor's payment application with supporting documentation

4. Architect/engineer bulletins, supplemental instructions

5. On-site representative Daily Job Report

6. Record drawings (As-builts) - should be updated monthly and tied to progress payments to the contractor and the architect/engineer

7. Cut sheets, submittals, shop drawings, etc. (Field verification - Did the inspector sign off on these? Were they installed according to the submittals?)

8. Partial and final lien waivers from contractors/subcontractors

9. Correspondence

10. Scheduling documentation (CPM/Pert Charts)

11. Contractor/subcontractor warranties

B. Contractor Selection Process

1. Prequalification of contractors - some form of qualifying of contractors should be performed.

   a. Are audited financial statements required (for contracts over $500,000)?

   b. Are references checked and verified, recorded and documented?

   c. Evaluate contractor's capability.

   d. Evaluate experience of contractor's proposed project manager and supervisory personnel.

2. Bid advertisement procedures - Are they followed?

3. Bid award procedures in writing? - Were they followed?

4. Is the selection/award process fully documented?

C. Documentation/Record-Keeping

1. Is there a written policy and procedure for record-keeping - What are the expectations of management?

2. Are daily reports and records of all inspections kept? This is a must!

3. What is the procedure to follow up on and ensure corrective action is taken on contract deficiencies?

4. Are project files kept up to date and reviewed for completeness for purposes of claims resolution and defense/protection?

5. Is use made of video and still cameras for any aspect of the inspection and documentation process?

6. Construction record plans on the job site - must reflect all changes current and up to date - keep in perfect condition, because these will be the permanent project record.

   a. Tie contractors' monthly pay request into updated as-builts.

   b. Tie architect/engineers' monthly pay requests into updated as-builts.

7. All testing and lab reports should be documented and filed.

   a. What non-compliance issues that resulted from test reports remain open?

   b. How are non-compliance issues planned to be resolved, and is there a time frame within which to do this?

8. Is there a process to report and follow up on deficiencies and corrective action needed and taken?

D. Submittal Process

1. Are submittals, as required by the specifications for materials, methods, and equipment recorded and tracked? A submittal log should be kept and all submittals recorded and tracked until returned to the contractor.

2. What is the prescribed submittal turn around time in the specifications and is it being adhered to?

3. Are submittals taking an unnecessarily long period of time to be processed?

4. Interview contractor.

5. Interview architect/engineer.

E. Inspection and Quality Assurance

1. Is there a written manual for all of the procedures required in the inspection process?

2. Qualifications and backgrounds of inspectors should include a combination of these: contractor experience, education, training, certification, inspection experience.

3. Is ongoing training provided - Is there a written policy for training? What are the expectations for inspector training?

4. Is there an expectation that a portion of the inspection staff will become certified in one of the building code compliance administrations?

5. Is there a written training program sponsored by the agency?

6. What is the current workload of the inspectors? How much time are they spending on the projects?

7. What determines full-time or part-time assignment to a project? Inspection is vital to project quality, and the lack of it can have costly long-term effects.

8. Interview the contractor to get their perspective and comments.

9. Is the contract non-conformance log kept up to date?

10. What is the backlog of unresolved items in the non-conformance log?

11. Has an agreed-upon time period been set for the resolution of quality control issues that are outstanding with the contractor on the non-conformance log? Is this time period being adhered to? (5 days should be allowed for the contractor to either correct the problem or respond in writing what plan of action it intends to take to correct the problem.)

12. What steps has management taken to resolve outstanding issues on the non-conformance report?

13. Are unresolved issues on the non-conformance log holding up any other part of the construction work, which in turn could jeopardize the schedule?

14. Does any aspect of the inspection process unnecessarily delay the contractor? Interview the contractor and major subcontractors.

15. Is the inspection staff responsive to the contractors' request for information (RFI)? Is information processed in a timely manner?

a. Look at the RFI.

b. Interview the contractor.

16. How does the inspection process for off-site inspections of materials/equipment and fabricated items work, and how are these inspections verified and certified?

a. Review daily job reports.

b. Interview the contractor and major subcontractors.

F. Project Manager's Role

1. Is there a written policy and procedure for the job expectations and dimensions of this position?

2. Do all of the project managers follow the prescribed procedures with consistency?

3. Qualifications and backgrounds of project managers should include contracting experience, certifications, professional training.

4. Workload allocation

a. How many projects is a project manager expected to handle at one time?

b. How much time are they able to spend on the projects they are working on?

5. Interview the contractor to get its perspective.

G. Requests for Information (RFIs)

1. Does the contract call for a certain maximum turn around time in which the agency must respond to the contractor? (A set time period, such as five days, should be spelled out in the specifications.)

2. Is the time for response and resolution measured and does it fall within the contract time?

3. This is a major source of contractor delay claims.

H. Pay Application Process

1. Are all projects summarized and costs tracked for cash flow projections, i.e. monthly reports showing status of all projects?

2. Who reviews and approves the applications for payment?

   a. architect/engineer or consultant

   b. inspectors

   c. project manager

3. Summarize all of the contract alternates and allowances that were accepted by the contracting agency and verify their inclusion in the payment process.

   a. Were credits given to the State where due?

   b. Were all of the allowances used up and is there documentation to support the costs charged against the contract?

   c. Are there any unused balances on the allowances?

   d. Do the approved alternates plus the base contract amount reconcile with the total the contract-to-date amount on the payment application?

4. Are progress payments tied to the monthly up-dates of the "as-builts"?

5. How are material and equipment not delivered to the job site that are billed by the contractor paid for or what is the process by which these requests for payment are verified?

6. Is material and equipment that has been delivered and stored at the job site, but not immediately needed, properly protected (Same for any material or equipment stored off-site)?

I. Change Order Process

1. Is the internal process in writing?

   a. Is there a dollar limit to the management level of approval authority?

b. Is there a mechanism in place that will require board/commission approval for changes initiated that result in a change from the original design?

c. Is a justification for the scope change documented on the change order?

2. Assignment of the source and monitoring of change orders - are they analyzed and is the cause recorded in the appropriate category? Sources of change orders:

a. owner

(1) end-user request to add or delete from scope of work

(2) improvement of the project

(3) afterthoughts

b. architect/engineer

(1) improvement of the project

(2) miscoordination of drawings with other disciplines (architectural floor plan doesn't fit with the electrical plan for that same area)

(3) errors and omission

c. Unforeseen

3. Is the procedure that is spelled out in the general and supplemental conditions followed? Check change order pricing format with requirements in supplemental general conditions

4. cost analysis and verification

a. Architect/engineer verification.

b. Owner staff verification.

c. Labor burden rate breakdowns and verification from the contractor and all subcontractors.

d. Is there sufficient supporting documentation from the contractor for the additions/deletions to the cost of the work?

e. Is there a written record showing how the construction administration staff analyzed the cost proposal or change order?

f. Check the arithmetic on a sampling of subcontractor pricing estimates and billings.

5. What levels of staff are required to review change order pricing analysis and what are their qualifications to do cost analysis?

6. Is the labor burden overhead rate verified?

7. Are all allowance items in the original bid quotation accounted for and properly analyzed to ensure the State has received what it paid for or received a credit for work that was not performed? Is someone responsible to verify this? Spot check allowance items in the contract to be sure these have been accounted for and the proper amount of detail work has been performed to ensure the reasonableness of the costs or credits.

J. Schedule Monitoring

1. Monthly updates by the contractor (directly tied to contractor's monthly progress payments)

2. Are quantities of work in place measured?

a. materials placed

b. man-hours expended by contractor and subcontractors

3. Submittal logs - is the construction administration staff tracking all submittals and taking appropriate action with the contractor to resolve any potential delays?

a. Is the agency returning submittals to the contractor within a reasonable amount of time? Has this time period been set in the contract?

4. Is schedule information quantified in monthly reports?

5. Is someone given responsibility for monitoring the schedule?

6. Have equipment and material deliveries been coordinated with the construction schedule? Is equipment that is not

needed left out in the weather for unnecessarily long periods of time?

7. Is the scheduled number of days for completion set in the construction contract reasonable?

   a. What is the percentage of projects completed within the original schedule?

   b. On what basis or what are the factors used to set construction duration?

K. Monthly Project Reports - Are these prepared for each project and summarized? These should include:

1. project budget summary - current costs compared to original budget
2. schedule status, showing milestones
3. problems encountered that haven't been resolved yet or significant events that transpired on the project
4. change order summary and status
5. contingency consumption
6. cash flow projections
7. request for information (RFI) log status
8. field orders approved
9. change proposals pending and rejected
10. submittals log status
11. safety report, injuries, accidents

L. Monthly Project Report Summary - Who receives this information?

1. Who needs to receive this information?

2. Does anyone on the governing board receive the information and how is it used in planning and decision-making?

M. Safety - Project safety procedures and expectations should be in writing and at least address the following:
[NOTE: Quality is related to a contractor's safety record.]

1. Is a safety program required of the contractor?

2. Is a designated safety officer required of the contractor?

3. Are there daily or weekly safety inspections or periodic audits, and are written reports issued?

4. Are weekly safety meetings required?

5. Are the OSHA laws monitored and violations brought to the contractor's attention or reported to OSHA?

6. Are subcontractors required to submit safety plans to the general contractor?

N. Liquidated Damages - Are Liquidated Damages (LDs) being enforced and collected?

1. Are they reasonable and how are they arrived at?

2. Can the agency demonstrate actual damages it would incur as a result of the project not finishing within the prescribed time?

3. LDs at milestones should not be assessed unless the milestone date is critical for another prime or general contractor the State has hired to perform their work and that work, if not able to be performed at the milestone date, will have a negative impact on the overall schedule.

4. Do contractors that bid on the agency's projects add contingencies to their bids in anticipation of liquidated damages? Interview contractors that bid the work.

V. CLOSEOUT PHASE

A. Written Procedures - Is this process spelled out in writing? (check list provided)

B. Warranties - are they all listed in one package for the client agency?

1. How is the complete warranty package information and instructions transmitted to the client/user agency?

2. If training of client users staff for equipment operation was included in the specifications, was this provided and is there documentation of it?

3. Are one year back-checks required and performed by the agency managing construction?

a. Verify that all equipment is functioning properly.

b. Verify architectural finishes (woodwork, doors, windows, paint, carpet, tile, flooring, wall coverings, ceilings, structural items, etc.) and other work is or intact and functioning as designed.

c. Have any expenditures been made by the user-agency that should have been covered by the warranties?

d. Is there written documentation of all of this?

e. Are agency maintenance personnel included in the warranty back checks?

4. Has the accuracy of the "As-builts" been verified throughout the construction period? Vital component of closeout - this can be very expensive in the future if not accurately put together.

a. "As-builts" - The project record set of construction plans that reflect all changes made from the plans during the course of construction. Nothing is ever built exactly like the plans show, so the as-builts reflect all deviations from the plans, i.e. they are most useful for future maintenance purposes in determining where water, sewer, electrical, gas, etc. lines are located and for future construction.

b. "As-builts" should be verified monthly and tied to the contractor's and the professional consultant's pay requests.

C. Project Design Assessment and Evaluation

1. Feedback during the project - should be on-going and recorded in a data file for future use in other project designs.

2. Team assessment at the end of the project - determining if the design accomplished what was intended - team consisting of:

a. the end-user

b. designer

c. agency project management personnel, department design team

3. Team assessment should take place six months to one year after user has moved in - assess at this point also.

4. Written format and evaluation of the project to determine if the design goals were met.

5. Implementation of evaluation into future planning - Is this recorded?

6. Customer satisfaction survey - End-user to evaluate the agency responsible for planning and construction on smaller projects; this is an important source of information indicating whether the system was effective or not.

7. Interview client users to determine satisfaction regarding the quality of design, planning, construction time schedule, and level of customer service received.

8. Is there a data base kept for accumulating specific design problems encountered and how they were resolved?

9. Is this information updated regularly and used in project planning?

10. Check repair and rework expenditures on project one or more years after closeout.

    a. What is the scope of the repairs?

    b. What is the cause of the repairs?

D. Ask the Big Questions

1. Is the managing agency department's service a duplication of other services provided?

2. Is its existence justified?

3. Is it providing a cost effective service?

4. Does the department make sense?

Appendix 3:

Certificate Of Insurance Forms

TxDOT Form No. 20.102 (Rev. 12-91) Previous editions of this form may not be used.

NOTE: Copies of the endorsements listed below are not required as attachments to this certificate.

TEXAS
DEPARTMENT OF TRANSPORTATION

CERTIFICATE OF INSURANCE

The named contractor shall not commence work until he/she has obtained the minimum insurance specified in Section II, below, and obtained the following endorsements: the Texas Department of Transportation as an Additional Insured for coverages 3 and 4, and a Waiver of Subrogation in favor of the same department under coverages 2, 3 and 4. Only certificates of insurance published by this department are acceptable as proof of insurance. Commercial carriers' certificates are unacceptable.

SECTION I - IDENTIFICATION DATA

1.1 Insured Contractor's Name

1.2 Street/Mailing Address

1.3 City	1.4 State	1.5 Zip

1.6 Phone Number
Area Code ( )

SECTION II - TYPE OF INSURANCE

Type	Policy Number:	Effective Date:	Expiration Date:	Limits of Liability Not Less Than:
2. WORKERS' COMPENSATION	2.1	2.2	2.3	Statutory - Texas

Endorsed with a Waiver of Subrogation in favor of the Texas Department of Transportation.

3. COMMERCIAL GENERAL LIABILITY				
Bodily Injury/Property Damage	3.1	3.2	3.3	$325,000 combined single limit each occurrence and in the aggregate

Endorsed with the Texas Department of Transportation as an Additional Insured and endorsed with a Waiver of Subrogation in favor of the Texas Department of Transportation.

4. TEXAS BUSINESS AUTOMOBILE POLICY				
A. Bodily Injury	4.1	4.2	4.3	$100,000 ea. person $300,000 ea. occurrence
B. Property Damage	4.4	4.5	4.6	$25,000 ea. occurrence

Endorsed with the Texas Department of Transportation as an Additional Insured and endorsed with a Waiver of Subrogation in favor of the Texas Department of Transportation.

5. UMBRELLA POLICY (If Applicable)				
	5.1	5.2	5.3	$

SECTION III - CERTIFICATION

This Certificate of Insurance neither affirmatively or negatively amends, extends, or alters the coverage afforded by the above insurance policies issued by the insurance company named below.

Cancellation of the insurance policies shall not be made until THIRTY DAYS AFTER the undersigned agent or his/her company has sent written notices by certified mail to the contractor and the Texas Department of Transportation.

THIS IS TO CERTIFY to the Texas Department of Transportation, acting on behalf of the State of Texas, that the insurance policies above meet all the requirements stipulated above and such policies are in full force and effect.

6.1 Name of Insurance Company			7.1 Name of Authorized Agent		
6.2 Company Address			7.2 Agent's Address		
6.3 City	6.4 State	6.5 Zip	7.3 City	7.4 State	7.5 Zip
7.6 Authorized Agent's Phone No. Area Code ( )			Original Signature of Authorized Agent		Date

1 of 2
Figure 3

TxDOT Form No. 20.102 (Back)

Texas Department of Transportation
Certificate of Insurance Requirements:

Only the TxDOT's certificate of insurance forms are acceptable as proof of insurance.

The named insured on the certificate and the name of the contractor, as it appears on the contract with the TxDOT, must be the same. (**Note:** In a case where the contract is in the name of a party such as "John Jones dba Jones Construction Company," the named insured on the C.O.I. may be "Jones Construction Company" and vice versa. Also the abbreviations of "Co." for "Company" and "Inc." for "Incorporated" are acceptable.)

Over-stamping and/or typed entries made on the certificate of insurance by the agency/insuring company are unacceptable if such entries change the provisions of the certificate in any manner.

The following requirements apply to **Workers' Compensation** coverage:

- If a contractor has *any* employees, in addition to himself/herself, then the contractor is required to have workers' compensation insurance.
- The word **STATUTORY**, under limits of liability, means that the benefits allowed under the Texas Workers' Compensation Law will be paid by the insurer.
- Relatives of the contractor (spouse, sons, daughters) must be covered by workers' compensation insurance.

GROUP HEALTH insurance may not be substituted for WORKERS' COMPENSATION insurance.

Commercial General Liability insurance is usually sold in only Combined Single Limit coverage. In the event the coverages are specified separately, they must be *at least* these amounts:

Bodily Injury	–	$300,000 each occurrence
Property Damage	–	$ 25,000 each occurrence
		$ 25,000 aggregate

Note: This coverage was previously known as Comprehensive General Liability insurance. Some older policies may still carry this identification. This is acceptable.

MANUFACTURERS' AND CONTRACTORS' LIABILITY insurance is not an acceptable substitute for COMMERCIAL GENERAL LIABILITY insurance.

The coverage amount for a TEXAS BUSINESS AUTOMOBILE POLICY or Comprehensive Automobile Liability may be shown as a minimum of $325,000 Combined Single Limit by a typed or printed entry and deletion of the specific amounts listed for Bodily Injury and Property Damage.

BASIC AUTOMOBILE LIABILITY insurance is *not* an acceptable substitute for a TEXAS BUSINESS AUTOMOBILE POLICY or COMPREHENSIVE AUTOMOBILE LIABILITY insurance.

The signature of the agent must be original in ink; stamped/typed/printed signatures are unacceptable.

This form may be reproduced. Any color paper is acceptable.

The certificate of insurance, once on file with the department, is good for subsequent contracts *provided* adequate coverage is still in effect. With an original on file, other TxDOT offices will accept copies.

2 of 2

Appendix 4:

Reference List

The books, articles, reports, etc., listed below are relevant to the criteria and recommendations outlined in this report:

Courtenay Thompson & Associates and R. L. Townsend & Associates. *Effective Auditing of Construction Activity.* Dallas, 1993.

Fiske, Edward R., P.E. *Construction Project Administration.* Third edition, New York: John Wiley & Sons, 1988.

FMI Corporation. *Partnering Challenge.* 1993.

Hawkins, Harold L., Ed.D., Texas A&M University and Lilley, Edward H. Lilley, Ph.D., West Virginia University. *Guide For School Facility Appraisal.* Council of Educational Facility Planners, International, Columbus, 1992.

Pecarich, Frank J. *A Breakthrough In Training Construction Inspectors.* From *Quality of Inspectors - In Search of Excellence.* New York: American Society of Civil Engineers, 1986.

State of Texas. State Auditor's Office. *Prison Construction in Texas*, SAO Report Number 3-033, January 1993.

Tenah, K. A., Ph.D., M.ASCE. *How Is An Excellent Inspector Developed?* From *Quality of Inspectors - In Search of Excellence.* New York: American Society of Civil Engineers, 1986.

The Business Roundtable. *Administration And Enforcement Of Building Codes And Regulations.* Report E-1, New York, 1982.

The Construction Industry Institute. *Constructability, A Primer.* Austin, July 1986.

The Construction Industry Institute. *Guidelines For Implementing A Constructability Program.* Third printing, Austin, 1990.

Copies of this report have been distributed to the following:

Legislative Audit Committee

Honorable James E. "Pete" Laney, Speaker of the House, Chair
Honorable Bob Bullock, Lieutenant Governor, Vice Chair
Senator John Montford, Chair, Senate Finance Committee
Senator Kenneth Armbrister, Chair, Senate State Affairs Committee
Representative Robert Junell, Chair, House Appropriations Committee
Representative Tom Craddick, Chair, House Ways and Means Committee

Governor of Texas

Honorable Ann W. Richards

Legislative Budget Board

Sunset Advisory Commission

Pertinent personnel at the following entities:

General Services Commission
Texas A&M University System
Texas Department of Transportation
Texas Parks and Wildlife Department
The University of Texas System