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May 8, 2009

Mr. Paul M. Bintinger
Senor Port Counsel
Port of Seattle
P.O. Box 98111
Seattle, Washington 98168

Dear Paul,

We appreciate the opportunity to provide input on revisions to the Port of Seattle's errors and omissions (E&O) policy. We commend the Port for soliciting the input of the Airport Consultants Council (ACC) and other industry groups as you revisit your E&O policy.

In general, ACC supports E&O policies that are fair to both the sponsor and the consultant, and include provisions that ensure a collaborative approach to solving problems when they inevitably occur during projects. A collaborative approach helps to promote a partnering relationship and results in better projects.

Rather than providing a specific policy or recommendation, I have attached some resources that you may find useful in your discussions. They include:

- *Best Practices in the Management of Design Errors and Omissions:* National Cooperative Highway Research Program (NCHRP). This report provides an overview of state Department of Transportation E&O policies and practices. While this pertains to highway projects, many of the themes and recommendations contained herein can certainly be applicable to any public agency contracts.

  I would turn your attention to the last chapter on Recommendations. In this section the author includes a model E&O process that was produced based on the research results and findings. We find this template to be very reasonable, balanced and fair, and would recommend that you take this into consideration as you draft your policy.

- *Cost Recovery Policy Issues for Departments of Transportation*: This document was produced while I worked at the American Council of Engineering Companies (ACEC) in 2005. This is a simple matrix of recommended components of a model E&O policy. You will see that the suggestions here are closely reflected in the NCHRP report recommendations.

- *Risky Business*: This article appeared in the Fall 2007 edition of our quarterly magazine, Airport*Consulting*, regarding the risk of having broad form indemnification language in contracts. One point raised in the article is the issue of "professional care" and the fact that insurance policies will normally not cover losses from an E&O unless the design professional was negligent in their services.

- *The Cost of Perfection in Public Works Projects* – ACEC: This paper discusses the problems associated with attempting to attain perfection in designs.

We hope you find these resources useful in your deliberations. We would also welcome reviewing any draft policies or documents, as appropriate, as you undertake this process.

Sincerely,

T.J. Schulz
Vice President
Airport Consultants Council

Attachments

BEST PRACTICES IN THE MANAGEMENT OF DESIGN ERRORS AND OMISSIONS

Requested by:

American Association of State Highway
and Transportation Officials (AASHTO)

Standing Committee on Highways

Prepared by:

Michael J. Markow, P.E.
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Teaticket, Massachusetts
March, 2009

The information contained in this report was prepared as part of NCHRP Project 20-07, Task 225,
National Cooperative Highway Research Program, Transportation Research Board.

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DISCLAIMER

The opinions and conclusions expressed or implied are those of the research agency that performed the research and are not necessarily those of the Transportation Research Board or its sponsors. The information contained in this document was taken directly from the submission of the author. This document is not a report of the Transportation Research Board or of the National Research Council.

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AUTHOR ACKNOWLEDGMENTS

The research reported herein was performed under NCHRP Project 20-7, Task 225, by Michael J. Markow, P.E., of Teaticket, MA. Mr. Markow, an independent consultant, was the Principal Investigator and author of this report.

Special thanks are due to Gerald Yakowenko and Jon Obenberger for providing information on FHWA E&O policy. Thanks are also due to those state DOT members who provided information on their agency's E&O policies and practices: Nigel Blampied, Mohsen Sultan, and Jon Tapping, California DOT; Chuck Hasty, Georgia DOT; Tom DiPaolo, Massachusetts Highway Department; and Camille Thomason and Janice Mullenix, Texas Department of Transportation.

The author also acknowledges with sincere thanks the time and information provided by Abbie Goodman, The Engineering Center, Boston; Thomas S. Novak, Esq., Sills Cummis & Gross; and Grant H. Weaver, Jr., Oakholm Consulting, LLC.

ABSTRACT

State DOT procedures regarding errors and omissions (E&O) by design consultants and related recovery of damages historically have reflected more a case-by-case approach rather than a systematic process. While that situation is beginning to change, published information on the current state of practice nationwide is spotty and it is difficult to identify best practices. This study has reviewed twelve state DOT E&O processes that have been recently developed or updated. It distills each of these to a consistent description, then compares them in drawing conclusions on the current state of practice. It applies these conclusions to recommend a template for future E&O process development. This template responds to FHWA policy, regulatory requirements, and current AASHTO guidelines, and is generally consistent with a model process recommended by the American Council of Engineering Companies (ACEC). It reflects current agency thinking on best practices to address errors and omissions fairly while keeping the project on track. This process entails several steps that a) provide early notification to the consultant of a design problem, b) engage the consultant in advising on a potential solution, c) allow for an analysis of the benefit of potential cost recovery versus the administrative cost of obtaining that recovery, including non-monetary effects when appropriate, d) establish multiple levels of negotiation, review, decision, and appeal, e) provide for alternative dispute resolution if desired, and f) stress documentation of key events, decisions, and communications.

AUTHOR'S DISCLAIMER

This report presents information on current policies and practices of transportation agencies regarding errors and omissions by consultant design professionals, and associated methods of cost recovery. Based on this information, the report recommends a best-practice approach that the research sponsors, their member agencies, and other interested parties could consider in establishing or revising their own errors-and-omissions processes. While errors-and-omissions policies and procedures have a legal dimension, aspects of which are discussed in this report, this report is not a legal analysis and does not purport to provide legal opinion or advice.

EXECUTIVE SUMMARY

All of the U.S. state DOTs have been determined to have written procedures regarding errors and omissions by consultant design professionals, as required by federal regulation. Nonetheless, as of 2005, the FHWA noted that implementation and enforcement of these procedures was more a case-by-case approach rather than a systematic process. At about the same time, AASHTO found that in more than one-quarter of the states, the written procedures appeared to be limited to contract provisions and professional liability insurance requirements.

The review performed in this study indicates, however, that this situation is beginning to change. Since 2005, there have been several new E&O processes put into place as well as updates of previous policies and procedures. These current developments have gained from past DOT experience as well as from industry recommendations for improved practice. As a result, they share a number of important principles in common: e.g., defined objective and procedures, a focus on problem solution as the first priority, early engagement of the consultant design professional, access to impartial technical experts when needed, maintenance of a process fair to both agency and consultant, effective documentation and communication throughout, and clear decision points for review and analysis, problem resolution, appeal, and internal and external communication of findings and decisions. This is not to say that state DOTs are becoming uniform in their E&O policies and procedures. Variability in current practice stems from different management, legal, and institutional approaches to addressing design errors and omissions by consultants. Most of these differences, however, are in procedure and detail rather than in fundamental principles. These recent developments thus establish a basis for describing the evolving state of practice in errors and omissions processes and recommending a best-practice template for future process development.

FHWA guidance on the subject focuses on two considerations: 1) the philosophy that consultants should not be held responsible for additional construction costs resulting from errors and omissions unless gross negligence or carelessness are involved; and 2) the need for each DOT to have a written procedures, approved by the FHWA, for determining the cost-related liability of consultants that results from their design errors and omissions. [23 CFR 172.9 (a) (6)] Current AASHTO guidance recommends several practices, including contracting language that clearly spells out consultant responsibilities for professional work performance, early involvement of the consultant when a design problem arises, giving the consultant the opportunity to help resolve the matter and mitigate effects on project cost and time, and allowing for alternate methods of dispute resolution to reduce the time and cost burdens of litigation. The American Council of Engineering Companies (ACEC) has developed a model E&O process that likewise recommends preferred practices, many of them similar to the AASHTO recommendations.

This study reviewed the E&O processes of 12 state DOTs: those in Arizona, California, Florida, Georgia, Illinois, Massachusetts, New Jersey, New Mexico, North Dakota, Oregon, Texas, and Washington State. These processes have been developed or updated since 2005, thus reflecting current thinking on the subject. The state DOT descriptions of their E&O policy, procedures, contract provisions, insurance requirements, and linkages to consultant evaluation were distilled to produce synopses of each of the 12 cases. These synopses were then compared, topic by topic, to develop conclusions and recommendations of a best-practice approach. The recommendation is presented as a template or framework to establish key concepts and methods, but also to allow considerable flexibility by agencies in tailoring this template to their engineering, legal, and institutional setting.

The results indicate that there is no standard definition of "errors and omissions" used by these 12 state DOTs, but a number of definitions share common ideas. Many of these definitions incorporate concepts of standard of care and of negligence, although specific definitions of these terms can very by agency. Some agencies also blend a description of negligence (from tort law) with that of breach of duty (from contract law). One agency focuses exclusively on the breach of contract approach, avoiding standards of negligence entirely.

Whether they are short and succinct or comprehensive and detailed, state DOT policies and procedures documents accomplish several useful functions in guiding an agency's business processes and consultant relationships with respect to design errors and omissions.

- They can be used to define an agency's objectives and philosophy in managing errors, omissions, and resulting project risks, and to communicate these policies internally and externally among all interested parties.

- They help clarify relevant contract provisions, emphasize important priorities, and flesh out the procedures, milestones, evaluation criteria, and supporting documents that relate to managing errors and omissions.

- They consolidate and unify a variety of procedures -- e.g., pre-certification of design consultants; avoiding, identifying, and resolving errors and omissions; pursuing cost recovery; evaluating consultant performance; and integrating E&O mitigation and administration within overall project design and construction.

Several agencies have developed their guidelines and procedural requirements in conjunction with the private sector. Private sector experts may also be called upon to serve as consultants to an agency for projects of technical complexity, or as members of panels or committees in determining consultant liability and financial responsibility.

Based on these findings of current practice, the study has recommended a template for a best-practice E&O process. This template responds to FHWA and AASHTO guidance, is consistent with the model process recommended by ACEC, and reflects current agency thinking on methods to address errors and omissions fairly while keeping the project on track. This process is guided by stated goals and objectives, and entails several steps that 1) provide early notification to the consultant of a design problem, 2) engage the consulting in advising on a potential solution and mitigation of adverse effects on the project, 3) allow for agency analysis

of the problem while maintaining communication with the consultant, 4) allow for an analysis of the benefit of potential cost recovery versus the administrative cost of obtaining that recovery, including non-monetary effects on this decision when appropriate, 5) multiple levels of negotiation, review, decision, and appeal at different organizational levels and with potentially different panel composition, 6) a provision for alternative dispute resolution if desired, and 7) documentation of key events, decisions, and communications. Specific organizational, methodological, and contractual recommendations accompany this process framework:

- Discussion of the potential membership of panels and assignment of decision-making responsibility. Panels may include agency staff as well as outside personnel: e.g., from FHWA, the ACEC and other professional organizations in the design consultant community, the attorney general's office, and academia.

- Need to identify the decision-maker at each step, whether a senior individual or a panel.

- The desirability of appointing a facilitator to act as a point of contact for all parties, handle coordination and communication tasks, provide administrative support, and in general to make the process run smoothly and efficiently. Several different examples of this capability exist among the agencies reviewed.

- Insurance limits recommended to be flexible, reflecting project size and complexity. This recommendation is consistent with the AASHTO guidelines.

- Optional threshold values that serve as a guide in determining whether or not to pursue cost recovery. Such thresholds can be useful, but should be applied as a guide, not a rigid or arbitrary break point. Agencies should reserve the option to pursue a claim in any amount.

CHAPTER 1

BACKGROUND

INTRODUCTION

In the design of transportation projects, engineering consultants are expected to exercise an appropriate standard of care and to provide quality design products to their client agencies. When these products contain errors or omissions (E&O), the agencies must take steps to address the defective designs, plans, specifications, or information; identify corrective actions; and resolve the consequences of these design deficiencies. The requirement for written procedures to deal with design E&O on federal-aid highway projects is addressed in federal regulation [23 CFR 172.9]. As a result, the state DOTs as well as the Federal Highway Administration (FHWA) have developed policies for, and expectations of, a standard of quality for transportation project designs. While states may believe that they have good policies and procedures to deal with errors and omissions, published information on the current state of practice nationwide is spotty and there is no current effort to identify and share best practices or benchmarks.

This lack of good information is compounded by the lack of uniformity among state DOTs in how they deal with errors and omissions, different perspectives on the problem between public and private participants in the transportation design-construction market, and evolving contracting practices and legal theories. Agencies recently have sought to strengthen their management of design errors and omissions to accomplish several goals, among them to:

- Reduce the additional costs of design errors that result in plan revisions, construction inefficiencies, construction rework, and attendant contractor claims and agency administrative costs; and

- Promote quicker, smoother, and more efficient project and program delivery.

ROLE OF THIS STUDY

Objectives

This study reviews current E&O practices related to transportation project design, primarily for roads and bridges, and recommends best principles and practices based on this experience. The objectives of the study are:

- To identify and describe policies and practices now in place in transportation agencies nationwide that effectively manage design errors and omissions.
- To provide AASHTO's Preconstruction Engineering Management Technical Committee (under its Subcommittee on Design) source material and a point of departure to develop and publish recommended practices for AASHTO's membership.
- To assist state DOTs, other transportation agencies, and the private sector in understanding and adopting management and quality-based practices that minimize and mitigate design errors and omissions.

Scope

Accomplishing these objectives has entailed reviews of several dimensions of the E&O issue:

- Current FHWA policies regarding E&O practices and administrative requirements.
- Current agency policies and practices regarding errors and omissions, encompassing conventional procedures in common use as well as unique approaches. The study has compiled descriptions of agency policies and procedures. Interviews with selected agency personnel have elicited their views on the current state of practice and the most effective approaches. Attention has also focused on techniques used in particular activities or stages of E&O processes, including:
  - Identifying and mitigating E&O as early as possible, including immediate engagement of consultants in addressing the problem;
  - Properly evaluating the nature and impacts of E&O;
  - What principles and methods of cost recovery are applied;
  - Availability of review and appeals processes for E&O;
  - Potential role of arbitration in resolving E&O matters; and
  - Settlement procedures and processes in dealing with E&O.
- Methods regarded as "best practices" in managing E&O, and contractual provisions that underlie a strong E&O program.

- Perspectives of the private sector: what policies and practices consulting engineering representatives view as good, sound approaches in handling errors and omissions, and relevant legal and insurance aspects.
- Use of alternative dispute resolution approaches to try to resolve E&O issues short of litigation.

Approach

Accomplishment of these objectives and the compilation of the information above has been met through the following project tasks:

- Task 1 – Conduct an initial review of public agency and private sector E&O perspectives to provide a quick, overall picture of the current situation;
- Task 2 – Document in more detail federal and state transportation agency E&O policies and practices;
- Task 3 – Gather information from the engineering design community, including private sector firms and professional associations, in support of the study's objectives;
- Task 4 – Gather information from the legal and insurance community relevant to this study's objectives;
- Task 5 – Prepare a draft final report for review by the Project Panel, documenting work in Tasks 1 through 4 and recommending best practices for consideration by AASHTO through its Subcommittee on Design, Technical Committee on Preconstruction Engineering Management; and
- Task 6 – Revise and submit the final project report, incorporating and responding to the Panel's comments.

Information in Tasks 1 through 4 has been gathered through a literature review and Web searches, telephone interviews, attendance at industry conferences, and discussions with meeting presenters representing both public and private sector interests on relevant topics.

REPORT ORGANIZATION

Chapter 2 reviews policies established at the national level regarding design errors and omissions by consultants, and presents data collected by the FHWA and AASHTO. Chapter 3 describes E&O processes recently developed by 12 state DOTs of different sizes and locations. Chapter 4 presents information and the perspectives of private sector organizations involved in, or representing members involved in, transportation design. Chapter 5 presents conclusions. Chapter 6 develops a recommended process template for agencies to consider in formulating their own E&O policies and procedures, and proposes further research and information

gathering. There are three appendices: Appendix A compiles definitions related to errors and omissions that have been developed by several agencies; Appendix B describes a design quality initiative used by Michigan DOT; Appendix C presents recent research sponsored by the Massachusetts Highway Department on a quality-based framework for analyzing the project design process.

CHAPTER 2

NATIONAL GUIDANCE ON E&O IN HIGHWAY TRANSPORTATION

INTRODUCTION

While primarily a state DOT administrative matter, E&O policies and practices in highway projects on the federal and state systems are governed by federal regulation and informed by national-level guidance. This chapter describes the relevant parts of the Code of Federal Regulations (CFR), guidance provided by the FHWA and AASHTO, and, for information purposes, corresponding guidance by the U.S. Army Corps of Engineers to its contracting officers.

CODE OF FEDERAL REGULATIONS

The Code of Federal Regulations embodies the rules that are published in the Federal Register by the executive departments and agencies of the federal government [home page index = http://www.gpoaccess.gov/CFR/INDEX.HTML . Titles and sections can also be accessed individually at http://www.access.gpo.gov/nara/cfr/cfr-table-search.html, from which printable document files can be obtained. The "Electronic CFR" website is located at http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=%2Findex.tpl].

Title 23: Highways

The federal role in overseeing engineering and design-related service contracts on federal-aid projects is established in Part 172 of Title 23 of the Code of Federal Regulations. This part focuses on policies and procedures for procuring consultant engineering and design services on federally funded highway projects. Its objectives are a fair process of consultant selection, the accomplishment of engineering and design services in a proper and timely fashion, and at a fair and reasonable cost. The requirement for state DOTs to have written procedures for cost recovery due to design errors and omissions states:

> ***(a)*** Written procedures***. The contracting agency shall prepare written procedures for each method of procurement it proposes to utilize. These written procedures and all revisions shall***

> ***be approved by the FHWA for recipients of federal funds. Recipients shall approve the written procedures and all revisions for their subrecipients. These procedures shall, as appropriate to the particular method of procurement, cover the following steps: …***
>
> ***(6) In determining the extent to which the consultant, who is responsible for the professional quality, technical accuracy, and coordination of services, may be reasonably liable for costs resulting from errors or deficiencies in design furnished under its contract.***
>
> Source: [23 CFR 172.9 (a) (6)] (emphasis added).

Title 48: Federal Acquisition Regulations

The Federal Acquisition Regulations (FAR) are codified in CFR Title 48. They provide a federal-level legal and regulatory framework for several aspects of agency contracting with architect-engineer (A-E) consultants. FAR provisions are compiled on the federal acquisitions website [www.arnet.gov/far]; they can also be referenced under Title 48 through the websites that are identified in the CFR introductory paragraph above. The summary and analysis of key FAR provisions below is provided by the U.S. Army Corps of Engineers (***Architect-Engineer Contracting***, May 2007, pp. 7-2 through 7-4).

- A-E consultant responsibilities. FAR clause 52.236-23, "Responsibility of the Architect-Engineer Contractor," provides that:
  - — The A-E consultant is responsible for "the professional quality, technical accuracy, and coordination" of all design products and services.
  - — The A-E firm shall correct or revise any discovered errors, omissions, or other deficiencies in its work without additional compensation.
  - — The government's approval or acceptance of A-E work does not waive the government's rights to redress problems and claim damages due to design deficiencies.
  - — The A-E consultant is liable for damages due to its negligent performance.

- Examples of A-E liability. A-E liability can be incurred through a) design error or deficiency that results in a change order during construction or design-related failure after construction; b) damages due to "failure to design within funding limitations [FAR 36.609-1 and 52.236-22] or to comply with the contract schedule or technical provisions."

- Direction to the contracting officer. In cases of consultant liability, FAR 36.608 directs the contracting officer to "consider the extent to which the architect-engineer may be reasonably liable," and to "enforce the liability and collect the amount due, if the recoverable cost will exceed the administrative cost involved or is otherwise in the Government's interest."

- Case-by-case economic consideration. FAR 36.608 allows an agency to consider the economic merits of a claim for damages when deciding whether to pursue cost recovery. Normally, an agency may decide to pursue a claim when the potential damages to be paid exceed the administrative costs of recovery. However, there may be cases where a claim is pursued even when the administrative costs exceed the anticipated recovery. Such a case

may occur if a relatively small claim arises from a potentially serious design error that could have led to severe consequences in terms of cost or personal injury. The bottom line is: Each case should be considered individually on its merits and particular circumstances.

FEDERAL HIGHWAY ADMINISTRATION POLICY AND DATA

Philosophy and Policy Guidance

Current FHWA policy on errors and omissions by consultant design and construction engineering professionals has evolved through a series of internal memoranda and technical advisories going back to 1956 and FHWA's predecessor agency, the Bureau of Public Roads. These documents have focused on the specific issue of federal funding participation in the additional project costs due to design errors and omissions or construction engineering mistakes, whether committed by the state highway / transportation agency itself or by its design or construction engineering consultant. Many of these documents are in the form of communications among FHWA headquarters offices, FHWA regional or division offices, and state agencies, seeking to clarify treatments of different types of errors and to resolve apparent inconsistencies. What has evolved is a general policy on federal participation in the additional costs of design and construction due to errors and omissions by consultants that is summarized below ("Briefing -- Issue: Participation in Design…," Jul. 1988):

- FHWA's general policy is that each errors-and-omissions issue should be considered on its own merits. In general, a consultant should not be held responsible for additional construction costs resulting from such errors, so long as they are not the result of gross negligence or carelessness. More specific elements of this policy follow.

- Unless the agency-consultant agreement holds otherwise, "federal-aid participation may be justified for the type of consultant errors that might occasionally occur despite the exercise of normal diligence" if:

  — The error is not due to gross negligence or carelessness; and

  — Carelessness, negligence, incompetence, or understaffing by the state agency are not contributing factors.

- Assignment of financial responsibility to the design consultant for additional, E&O-related construction costs is not FHWA's philosophy (subject to the qualifications above). However, such a provision may be included in federal-aid consultant agreements if the state agency feels it is needed. (Note: If design-consultant negligence has been determined, the resulting damages are explicitly declared to be federal-aid non-participating in policies and procedures used, for example, by Florida and Oregon. Refer to the descriptions in Chapter 3.) The FHWA does encourage contract provisions that require the following:

  - — The consultant shall perform additional work to correct design deficiencies promptly and at no additional cost to the owner agency; and
  - — Acceptance of design products by the state agency does not relieve the consultant of responsibility to correct errors that are subsequently found in its work.

- Determination of federal-aid eligibility for participating in the additional, E&O-related construction costs is a field office decision.

The considerations that underlie this policy are both philosophical and pragmatic. Philosophically, FHWA holds that engineers practice under a body of well-developed ethical principles and recognize their responsibilities to provide the "best and most economical design within their capabilities." In its organizational experience, FHWA has found that consultant design professionals generally do voluntarily accept responsibility for some types of errors and "willingly compensate a client for increased costs resulting therefrom." According to this view, it is unclear whether "a better quality of engineering and a reduction in errors" would occur if the consultant were unequivocally charged with the financial responsibility of its errors and omissions found during construction, and whether these benefits would offset the additional costs of such an approach. The underlying principle is that the consultant design firm "should be free to devote [its] time and energies in the exercise of sound professional analysis without having to exercise restraint and constraint to avoid errors because of the possibility of [its] having to pay damages during subsequent construction operations" (Maloney, Jul. 1971). An earlier document also referred to the "partnership" philosophy that exists between federal and state transportation agencies, accompanied by a desire "to help the States pay for unintentional engineering errors. …[This policy on construction engineering errors is comparable in principle] to Federal participation in design mistakes, which has been the policy for many years" (Taylor, Jan. 1956).

The practical implications of this philosophy consider the actual experiences agencies have had and the relative costs versus benefits of defending an alternate approach legally ("Briefing -- Issue: Participation in Design…," Jul. 1988):

- FHWA has noted that no major problem had yet occurred regarding the above policy and philosophy (as of 1988).

- It is unclear "how the courts would react to an assignment to the consultant of such financial responsibility since the designs are reviewed and approved by the State and the FHWA. It might cost more to defend this concept in court than would be spent correcting the design errors" (p. 2).

The most recent FHWA memorandum on this matter reviews the above topics, tracks their historical threads, and restates current FHWA policy essentially as that which has been described above (Rodriguez, Aug. 2004).

FHWA Data on Errors and Omissions

In October 2003 the USDOT's Inspector General began an audit of FHWA's and state DOTs' actions to recover costs resulting from design E&O ("Notification of the Audit…" Oct. 14, 2003). The audit originally focused on major projects (total project cost of $1 billion or more) but was later expanded to cover all federal-aid highway projects ("Revised Notification of the Audit…" Mar. 4, 2004). While the audit was subsequently discontinued in 2005 ("US DOT Inspector General Drops One Audit,…." Nov. 18, 2005; "US DOT Inspector General Update," Dec. 2005), the preliminary findings that had been gathered to date were reported in a FHWA briefing to the AASHTO Highway Subcommittee on Construction (Beatty, 2005). These findings were based on surveys of the 50 state DOTs plus those of the District of Columbia and Puerto Rico, with data compiled in September 2004. Additionally, onsite audits had been conducted of DOTs in Florida, Illinois, Texas, and Virginia, also completed by September 2004. The preliminary findings were reported as follows (Beatty, 2005):

- All states have written procedures on recovering costs due to design errors and omissions, and have received approval from their respective FHWA Division offices.

- The majority of states have a database containing information on construction change orders. Approximately 60 percent of states include in their database a change order coding system that allows them to identify change orders attributable to design errors and omissions.

- Less than 40 percent of states have recovered costs that are due to design errors and omissions.

- Practices among state DOTs are inconsistent with respect to tracking and identifying additional costs due to errors and omissions, recovering costs, and crediting recovered dollars to the appropriate federal-aid highway program.

In a separate effort, the FHWA in 2003 conducted informally canvassed DOTs in the 50 states plus District of Columbia and Puerto Rico to characterize the type of written guidelines for addressing errors and omissions. The results shown in Figure 2-1 indicate variability in method, comprising the following types of written guidelines:

- Detailed procedures prescribe a formal, standing process for identifying and resolving E&O issues across projects.

- General directions and guidelines include, for example, reporting instructions and guidance for documenting errors and omissions.

- Case-by-case procedures include, for example, language in contracts and agreements spelling out consultant responsibilities in dealing with errors and omissions on a project.

Examples of different types of written guidelines and procedures developed by state DOTs are given in Chapter 3.

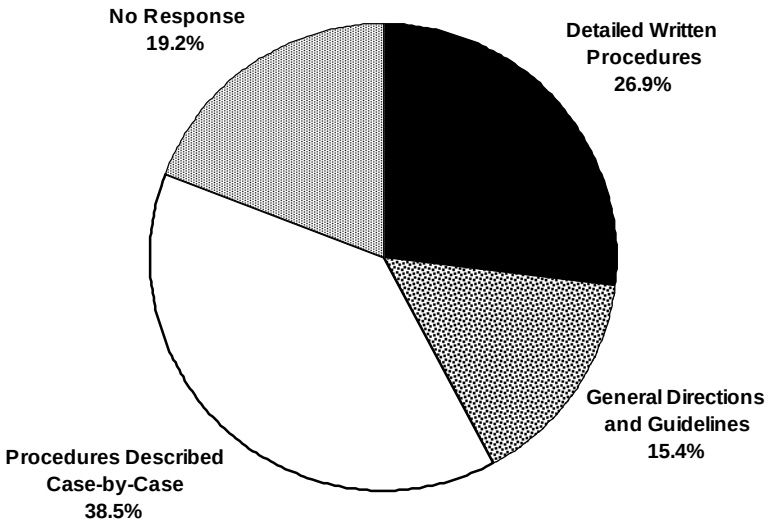

Figure 2-1. Types of written guidelines used by state DOTs (Source: FHWA).

AASHTO GUIDANCE AND INFORMATION

AASHTO 2006 Survey

In 2006 a survey of state DOTs and FHWA offices was conducted by AASHTO's Standing Committee on Quality to document current agency practices and ongoing initiatives in managing project cost and in improving the quality of the project plan package. The quality aspect encompassed constructibility and reducing design errors and omissions. Contributions from responding states were as follows (***Managing Project Cost and Quality***…, 2006):

- Alabama DOT plans to involve contractors to a greater extent in reviewing project plans at an early stage to advise on constructibility.

- Indiana DOT is improving plan quality and reducing cost overruns by charging consultant designers for errors and omissions.

- The Maine DOT highway program has been reorganized to include a Production Support and Construction Support group that will check plans at different project milestones to eliminate plan errors, evaluate constructibility, and look for ways to cut costs.

- Virginia DOT has implemented a new program to reduce the risk of errors and omissions.
- Wisconsin DOT has initiated a constructibility review process by encouraging public and private group recommendations.

AASHTO Consultant Contracting Guide

In March 2008 AASHTO released its Guide for Consultant Contracting (***Guide for Consultant Contracting***, Mar. 2008). This ***Guide*** covers a broad range of topics including agency preparations for engaging consultants, consultant selection, negotiating and contracting guidelines and procedures, and managing consultants, including a section on dealing with errors and omissions. One of the objectives of this current NCHRP project is to provide AASHTO with information and recommendations that could serve as source material for a more comprehensive guide on E&O and related cost recovery. This project has therefore developed recommendations that are consistent with the ***Consultant Contracting Guide***. The AASHTO ***Consultant Contracting Guide*** discusses errors and omissions in the following contexts (***Guide for Consultant Contracting***, Mar. 2008, relevant pages noted below):

- Anticipation of a possible future document addressing errors and omissions is stated at the end of the Executive Summary:

  > ***…accountability in terms of dealing with errors and omissions is of considerable interest to the transportation agency officials. While agencies generally have a plan of action for dealing with errors and omissions made by consultants, many are addressed on a case by case basis. A document outlining best practices in dealing with errors and omissions may be the focus of a future assignment for the Preconstruction Engineering Management Technical Committee.***
  >
  > (p. xiii)

- The ***Guide*** notes that consultant firms generally are required to have several forms of insurance when performing project design for state agencies, including General Liability (which may cover subsequent failure of the facility being designed, among other mishaps) and Errors and Omissions coverage (p. 16). More than 80 percent of agencies require professional liability (E&O) insurance coverage, although the amount of coverage varies, often depending on the type and size of project (which is a practice recommended by the ***Guide***). While minimum coverage starts at $250,000, almost 60 percent of the states that require E&O insurance specify a standard coverage of at least $1,000,000. AASHTO further recommends that the E&O insurance remain in effect during the project plus a "reasonable" time following completion (pp. 39, 67).

- The ***Guide*** advises that consultant design contracts should have clauses protecting the owner agency from design errors and omissions by providing that (p. 38):

  — The consultant's work should meet "sound, prudent, appropriate, and required professional standards and practices," and

  - — The consultant will promptly redo work that does not meet agency criteria, at no additional cost to the agency.

- Forty-three responses to AASHTO's survey of state transportation agencies (summarized in Appendix A of the ***Consultant Contracting Guide***, separate from the 2006 survey described earlier) indicate that 71 percent have an E&O policy, and a corresponding number have defined procedures for specific types of consultant agreements. Others are progressing toward an E&O policy. Some states noted that their contracts contain an E&O clause and / or require E&O insurance, but they do not otherwise have an errors-and-omissions policy (pp. 38, 66).

- Also as part of the responses to the survey, state agencies reported several practices in common, but also a degree of variability (pp. 38-39, 51, 67). The ***Guide*** includes a number of recommended practices based on this experience (p. 51):

  - — A number of states noted the importance of immediate notification of the consultant when an E&O issue is identified, providing an opportunity for the consultant to correct the design error. Notwithstanding any correction, however, the consultant's potential liability for any related increases in construction cost remains.
  - — The ***Guide*** recommends that the consultant should also generally be given an opportunity to help resolve problems that arise in project construction, whether due to possible errors or omissions or to other reasons such as unforeseen conditions.
  - — Agencies may seek to recover the additional costs that are due to design errors and omissions. These costs result from factors such as delays in construction and any premium on costs of items that had to be added to the project after the original bid. The cost of items that would have been part of the project anyway, had the error or omission not occurred, are usually not included in the restitution sought from the design consultant.
  - — While many states have experience with E&O-related claims, this experience varies in terms of the ways that consultants are allowed to provide restitution, and the degree of success in achieving solutions by methods short of litigation.

- The ***Guide*** recommends a careful review of the facts surrounding an alleged E&O issue by both the agency and the consultant design professional. A review committee should be established, if needed, to determine consultant liability for any additional costs as an official determination of the agency. There should also be an opportunity for the consultant to appeal a finding of liability (p. 51).

- Because litigation is expensive and time-consuming, the ***Guide*** encourages agencies to build other methods of dispute resolution into their contracts. These methods should encourage a) bringing together all parties quickly, b) focusing on fixing the design problem first, then addressing cost responsibility and recovery, c) consulting a state Attorney General's office for information on appropriate alternative dispute resolution procedures, and d) instituting a process that is fair and moves quickly to resolution (p. 40).

- The ***Guide*** describes an example process for dealing with errors and omissions. The major actions included in this process include the following (pp. 51-52):
  - — Alert both the next higher level of agency management about the potential E&O issue, and the subordinates involved in project management regarding the need for more detailed documentation than normally required on the work already performed.
  - — Notify the consultant design professional of the E&O issue and provide the firm the opportunity to assist in resolving the problem.
  - — Review available information on the project to assess the "appropriateness" of recovery of the additional costs due to the error or omission. Deliberate the facts to establish whether the consultant is responsible for the alleged error or omission; if so, whether reimbursement of additional cost should be pursued; and if so, the appropriate amount of reimbursement. Request legal assistance if needed. If liability is not established, or if it is not appropriate to pursue reimbursement from an economic standpoint, drop further action.
  - — Notify the consultant of the decision. If cost recovery is determined, inform the consultant of options for restitution, as well as options to appeal the decision.
- The appendices to the ***Guide*** include a compilation of the agency survey responses, example consultant design contracts used by state DOTs, examples of consultant evaluation processes used by state DOTs, and descriptions of training programs for DOT personnel in A-E consultant procurement, negotiation, project development, and project and contract management.

CORPS OF ENGINEERS GUIDANCE

The Corps of Engineers consultant contracting manual provides guidance to its contracting officers in managing consultant design professionals. These contractual guidelines can inform the handling of errors and omissions on federally funded transportation projects as well. Within this legal and contractual framework, the tests that must be satisfied for a design consultant to be liable for damages are as follows (***Architect-Engineer Contracting***, May 2007, pp. 7-3 and 7-4):

- Did the consultant make an error or omission in its design?
- Did the error or omission result from the consultant's negligence or breach of contractual responsibility?
- Has the government incurred damages as a result of the error or omission?

Relevant legal principles in considering consultant liability and potential cost recovery include the following:

- Negligence: The failure to meet the standard of reasonable care, skill, and diligence that an A-E professional would ordinarily exercise under similar circumstances.

- Comparative negligence: The doctrine that holds that the Government may still recover damages even if it is also negligent, but these damages are proportioned according to the relative fault of the parties involved.

- Burden of proof. To successfully pursue a claim for cost recovery, the government must prove that a) the consultant design professional was negligent and b) the consultant's design error or omission was the cause of the damages.

- Mitigation. The government agency has a responsibility to minimize the damages due to design errors or omissions. The consultant must be notified promptly of the design defect and be given a reasonable opportunity to correct its work.

- Government assumption of risk. The consultant design professional may be relieved of responsibility for design error or omission if the defective design results from actions by the government taken without the concurrence of the consultant.

The Corps of Engineers manual cites practices and prerogatives that strike a balance in government's approach to consultant errors and omissions in project designs (p. 7-4).

- The government may seek recovery of damages "from any type of negligence, non-performance, or breach of contract…". To recover these costs, the government must show only that it has incurred damages or will incur them in the future. Its eligibility for cost recovery does not depend on whether the consultant has corrected the design defect.

- It is not in the government's interest, however, "to be overly zealous" in pursuing claims based on consultant liability. This guideline is particularly true if relatively small damages would not be judged by a board or court to result from negligence. The adverse outcomes of such an overly stringent approach would likely be a) an increase in the cost of design services as the consultant community interprets these claims as a "cost of doing business" with the agency; b) a diminishing of the agency's professional image; and c) a decline in the number of firms willing to do business with the agency.

CHAPTER 3

STATE TRANSPORTATION AGENCY POLICIES AND PRACTICES

INTRODUCTION

This chapter presents a review of E&O policies and processes in 12 state DOTs. These processes have been developed or updated since 2005, and thus represent current thinking on how such processes should be formulated. While an attempt has been made to discuss these 12 approaches in a consistent way, in fact procedures, criteria, and perspectives on the problem differ across agencies. Their methods of documentation also differ. Therefore, every agency will be described by a somewhat different number or focus of sections below. Nonetheless, the correspondence in information among agencies is sufficient to develop conclusions and recommendations of a "best-practice" template in Chapters 5 and 6, respectively.

EXISTING AGENCY IMPLEMENTATIONS

Arizona Department of Transportation

Policy/Guidelines

Arizona DOT's Intermodal Transportation Division (ITD) has issued a memorandum that defines ADOT's policy on errors and omissions by design consultants. "The purpose of this policy memorandum is to develop and implement a Division Claims process for resolution of consultant errors or omissions" ("MGT 00-2…," Nov. 3, 2000, p. 1). This memo establishes as background the importance of claims avoidance as a first consideration. The focus is on a clear scope of work contributing to a quality design. Supporting actions during project performance should include effective field reviews, complete product submittals, daily documentation of project status during construction, obtaining the design consultant's input before any significant change order, timely processing of construction claims, and implementation of quality control and consultant evaluation programs.

Process/Procedures

If an error or omission is identified, the memo outlines procedural steps entailing review, notification to the consultant, ADOT decision on whether a claim is justified, content of the claim, and procedures for consultant administrative review if the matter cannot be resolved. A summary of these procedures follows ("MGT 00-2…," Nov. 3, 2000, pp. 2-3).

- Errors and omissions are normally identified at the project level during construction. This discovery triggers the gathering of information on the scope of the problem, actions and responsibilities of the various parties, and the potential validity and extent of any claim that may arise. The ADOT Project Manager and the consultant must be notified immediately of the E&O issue. Oral notifications must be followed up in writing. It is important to involve the consultant immediately in considerations of corrective measures to try to mitigate their cost. "Responsiveness by the Consultant is crucial to this process."

- ADOT will estimate the additional cost associated with errors and omissions as they arise, based upon the amount above what would have been expected in the contractor's bid had the error or omission not occurred. ADOT will also compute a threshold value to be compared to the cumulative cost of errors and omissions to date: five percent of the construction contractor's bid or $20,000, whichever is less. If the additional cost attributable to errors or omissions exceeds this threshold, ADOT may file a formal claim. The amount of the initial claim will be the additional cost as determined by ADOT less the threshold value computed above. Any additional E&O claims on the project in the future will not be subject to this reduction by the threshold value. ADOT's Engineering Consultant Section will maintain documentation of all E&O issues for possible future claims.

- The ADOT Project Manager and the Resident Engineer will review the available information and tally the additional costs to determine if ADOT should pursue a claim. If the decision is affirmative, the claim will include, at a minimum, the following documentation:

  — A statement of circumstances: i.e., a brief description of "who, what, where, when, and why."

  — ADOT's claim of damages: the dollar amount of the consultant's alleged liability.

  — A copy of the construction force account and/or construction change order.

  — An explanation of the Department's administrative review process.

- The consultant may choose either to pay the claim or to request an administrative review. There are two levels of administrative review that must be taken in order:

  — The first level involves the Project Manager, the Resident Engineer, the Assistant State Engineer – Construction Group, and an Assistant State Engineer from Development.

  — If the first-level review is unsuccessful, ADOT will appoint a panel for the second-level review. The panel Chairman will be the Deputy State Engineer for Development. Its membership will comprise the Deputy State Engineer for Operations and a third member selected by the Chairman. This panel will review relevant documents, conduct

interviews, and perform other investigations needed to determine the validity and extent of the claim. The Engineering Consultants Section will provide administrative support for this process.

- If the dual-level reviews cannot resolve the E&O issue, the Department may pursue the claim further through arbitration or litigation.
  - — For unresolved claims of $100,000 or less, the Construction Group will file a Demand for Arbitration with the American Arbitration Association. Arbitration will follow the guidelines set forth in the latest version of the ADOT Construction Manual at the time of the contract.
  - — Unresolved claims exceeding $100,000 will be forwarded by the Construction Group to the Office of the Attorney General.
- When the claims are resolved, the Engineering Consultants Section will notify all parties in writing.

California Department of Transportation

California DOT (Caltrans) has a policy, procedures, insurance requirements, and contract language governing consultant design errors and omissions and associated cost recovery. The following definitions apply (Leonardo 2004, p.1-2).

Definitions

- Error: an incorrect or insufficient plan detail.
- Omission: an instance where plans are silent on an issue.
- Other design flaws:
  - — An engineer may produce specifications that are "flawed by being contradictory, ambiguous, omitting material, or by being 'canned' and not properly tailored to the particular project circumstances."
  - — An engineer may also commit breaches of contract administration through "untimely reviews of submittals, [and] untimely and inadequate responses to requests for information."
  - — There may also be issues regarding preparation of cost estimates and conduct of construction inspections.

Policy/Guidelines

Caltrans' guidelines for consultant design professional liability are set forth in internal agency guidance issued by the acting chief engineer (Leonardo 2004). These guidelines cover design deficiencies detected during construction. (Those detected prior to construction are covered in the design contract language, discussed below.) Design deficiencies may include, but are not limited to, errors, omissions, or negligence in Plans, Specifications, and Estimates (PS&Es) and other project documents. These guidelines focus on and encourage administrative solutions to consultant design problems. While some number of minor design problems or changes is expected during project delivery, these guidelines are intended to promote more uniform procedures statewide to assess accountability for the additional costs due to these problems/ changes. The objectives are clearer benchmarks for consultant design performance, a timely and equitable dispute-resolution process, improved project and program management, and long-term improvement in design quality.

The performance of a consultant designer is assessed according to two professional legal duties (Leonardo 2004, p.1-2):

- In performing professional services, a consultant designer has the duty to have the "degree of learning and skill ordinarily possessed by reputable design professionals, practicing in the same or a similar locality and under similar circumstances."

- A consultant designer has a further duty to "use the care and skill ordinarily used in like cases by reputable members of the same profession practicing in the same or a similar locality under similar circumstances, and to use reasonable diligence and best judgment in the exercise of professional skill and in the application of learning, in an effort to accomplish the purpose for which the professional was employed."

The second criterion is referred to as a "standard of care" requirement. The Caltrans guidance includes several examples of ways in which a consultant design engineer can fail to meet the requisite standard of care, as noted in the Definitions above. Once a breach of these professional legal duties has been determined, the resulting damages must be assessed. The Caltrans guidance notes that damages based on negligence vary, and may include property damage or loss, costs of repair and construction rework, administrative costs, delay damages, and liquidated damages.

Process/Procedures

Caltrans' resolution and cost recovery process tries to achieve an administrative solution before resorting to legal action. The guidance assigns specific responsibilities to key members of the construction project team and district and central office managers. For brevity, the process is summarized below, omitting some of the detail on these roles and responsibilities. The process consists of the following steps:

- Caltrans staff compile a list of significant design changes and Contract Change Orders (CCOs) on consultant designed projects and provide the list to the consultant design professional quarterly. Any Potential Design Breaches (PDBs) that are identified are provided to the Region Design Chief / Deputy District Director, Construction; the Project Manager is also kept up to date. As a guideline, CCOs greater than $200,000 that are related to design changes, conflicts, ambiguities, errors, and omissions, and cumulative CCOs exceeding 10 percent of the construction project bid price, likely warrant further review.

- The Region Division Chief / Deputy District Director, Construction confers with other Region Division Chiefs / Deputy District Directors, Design and Program / Project Management, to review the PDBs according to these guidelines. If the deputies feel that further review and action are warranted, the matter is forwarded to the Chairperson of the Management Review Panel (MRP).

- The MRP comprises two members: a Chairperson (the Headquarters Construction Coordinator assigned to the pertinent district) and the Headquarters Design Coordinator and / or State Bridge Engineer assigned to the pertinent district. The MRP reviews the facts of the case in light of these guidelines to assess potential design liability. The MRP submits its recommendation to the Chief Engineer, recommending either that no action be taken, or that further action should be pursued against the consultant design professional.

- If the Chief Engineer approves further action, he or she will appoint a representative or team to provide notice to the consultant designer and enter into informal discussions to try to resolve the matter. Caltrans' Legal Division and the Chief Engineer will be kept apprised of the status of discussions. Alternative dispute resolution methods, such as non-binding dispute review boards and facilitated dispute resolution, may be considered and if agreeable to both parties, will be submitted to the Chief Engineer for approval and implementation. The consultant should be allowed to take part in discussions of additional costs due to design liability, and to review and comment on project changes that will increase the cost and for which the consultant may be held liable. If a mutual resolution is not attained, the representative will consult with the Legal Division and recommend to the Chief Engineer whether additional action should be taken.

- If the Chief Engineer approves legal action, the Legal Division will obtain a certificate of merit: i.e., a certification through an impartial third party that there is fundamental basis for the complaint (***Certificate of Merit***…, 2006), a step required by California state law to reduce unnecessary lawsuits. State law also requires the plaintiff (in this case, Caltrans) to retain a consultant in the same discipline as the defendant, and to present the facts of the case to that consultant for review and analysis. The consultant retained by Caltrans must also come to the opinion that the consultant design professional was negligent.

Contract Provisions

Contract provisions governing the treatment of errors and omissions are covered in Caltrans' standard agreement with consultant design professionals, Section XX of Exhibit D, Special Terms and Conditions, reproduced as follows:

> ***A. Architect-Engineer Consultants shall be responsible for the professional quality, technical accuracy, and coordination of all services required under this Agreement. A firm may be liable for Department costs resulting from errors or deficiencies in designs furnished under its Agreement.***
>
> ***B. When a modification to a construction contract is required because of an error or deficiency in the services provided under this A&E Agreement, the contracting officer (with the advice of technical personnel and legal counsel) shall consider the extent to which the A&E Consultant may be reasonably liable.***
>
> ***C. Department's contracting officer shall enforce the liability and collect the amount due, if the recoverable cost will exceed the administrative cost involved or is otherwise in the Department's interest. The contracting officer shall include in the Agreement file a written statement of the reasons for the decision to recover or not to recover the costs from the firm.***
>
> Source: State of California Standard Agreement, rev. May 7, 2008.

Insurance Requirements

Insurance requirements are listed in Caltrans' standard agreement with consultant design professionals, Section XIX of Exhibit D, Special Terms and Conditions, with the following paraphrased excerpts related to errors and omissions (State of California Standard Agreement, rev. May 7, 2008):

- The consultant design professional must provide certificates of insurance for the minimum coverage below. The consultant is responsible for all deductibles and any self-insured retention.
- Professional liability insurance is required in an amount not less than $1 million per claim and $1 million in the aggregate.
- The consultant is required to maintain the insurance in effect throughout the term of the Agreement. The consultant shall maintain, or make a good faith effort to maintain, the Professional Liability insurance for 3 years after completion of work under the Agreement.

Design Consultant Evaluation

Caltrans evaluates consultant design professionals at the completion of PS&E at the "Draft Contract" stage and at the "PS&E Ready" stage. An evaluation may also be performed if there are addenda to the bid package during the advertisement period. The Caltrans guidance notes that "an addendum can inadvertently cause erroneous or contradictory changes to a project. Therefore, addenda are issued only to correct significant errors, omissions, or conflicts in the bid documents" (Plans, Specifications and Estimates Guide, Mar. 2001, p. 1-9). Addenda are used only prior to bid opening. After bid opening, the only courses of action to correct problems in the project design are to reject all bids and re-advertise as a new project, or to issue a contract change order (CCO) during construction.

The work of design consultants is evaluated by Caltrans Engineering Services -- Division of Office Engineer on a zero-to-five scale (5 = best, 0 = worst), considering the type and quality of the PS&E overall. The criteria for the various rating intervals are as shown in Table 3-1. These criteria reflect errors and omissions that are identified during design review, but do not relate to design errors and omissions that are identified during construction.

Table 3-1. Caltrans criteria for consultant evaluation.

Rating Interval	PS&E Quality Rating Criterion
4.1 to 5.0	PS&Es that require minor revisions such as spelling corrections, SSP (Standard Special Provisions) updating, and other incidental revisions to plans.
3.1 to 4.0	PS&Es processed under Project Reviewers Guide. Qualified major projects and most Minor A Projects can be classified within this range.
2.1 to 3.0	PS&Es that require listing of PS&E comments and responses. Generally, most major projects will fall under this range.
1.1 to 2.0	PS&Es with extensive listing of PS&E comments and responses. The normal allotted review time for these types of projects is not sufficient.
0.0 to 1.0	PS&Es with major errors, omissions, and inconsistencies. These types of PS&Es should be returned to the District for corrections.

Source: Plans, Specifications and Estimates Guide, Mar. 2001.

Caltrans has devised a plan checklist as part of its quality control on design. It lists a number of detailed items to check, which help avoid basic mistakes and ambiguities. The checklist items are organized in the following categories, with examples of requirements for each.

- DESIGN: Design calculations, check calculations, and supporting documentation are bound and properly identified; all differences have been properly resolved, and registration seals and signatures are affixed.

- PLANS: Plans conform to Caltrans drafting standards and requirements (e.g., standard plans are listed; standard abbreviations and symbols are used; spelling is correct; trade names and proprietary items are not shown; staged construction and traffic control are shown as applicable), are consistent in details and cross-references among sheets, are readable when reduced, and are properly signed and sealed.

- SPECIAL PROVISIONS: Requirements for conformity, consistency, legibility, proper sealing and signatures similar to those listed above; plus inclusion of complete, correct information for all items covered in the Special Provisions.

- ESTIMATE: Quantity calculations and independent checks are bound, properly identified, and within allowable tolerances; estimates are appropriately rounded; quantities on forms are consistent with those in calculations; standard units of measure are used; reasonable unit prices and a working day schedule are included; and format and presentation requirements similar to those in above items are met.

- LATE PLAN CHANGES: Design calculations, independent checks, and supporting documentation have been prepared and submitted; road plans and bridge plans are consistent in details; Special Provisions have been modified as necessary; and quantities and estimates have been revised as necessary.

- GENERAL: Typical cross-sections, layouts, profile grades, superelevations, contour grades, and structure plans are consistent with approved project geometrics and current road plans; on structure projects with PS&Es produced by two or more consultants, elements of plans and details are coordinated and consistent; railroad requirements are coordinated; Justification for non-standard items of work is provided.

Florida Department of Transportation

Definitions

Florida Department of Transportation (FDOT) defines the following terms and provisions in its E&O procedural guidelines ("Identifying and Assigning Responsibility…," Oct. 21, 2004, pp. 3-4):

- ERRORS AND OMISSIONS: Acts of negligence committed by the Engineer of Record (EOR) in the performance of engineering design service or creative work, and acts of negligence committed by the Consultant Construction Engineering and Inspection (CCEI) personnel in the performance of construction engineering inspection services. (In this procedure, the Engineer of Record is understood to be a professional consulting engineer retained by FDOT to provide design services or creative work, and who is in responsible charge for preparing, signing, dating, sealing, and issuing the resulting engineering documents.)

- NEGLIGENCE: The failure by a professional engineer to utilize due care in performing in an engineering capacity or failing to have due regard for acceptable standards of engineering principles.

- PREMIUM COSTS: The additional cost of a contract change that would not have been incurred if the work had been included in the original contract. More specifically, premium costs are dollar amounts paid for non-value added work. Delays, inefficiencies, rework, or extra work as shown below, other than those caused by the contractor or his or her subcontractors or suppliers, will be considered as non-value added work. Non-value added work can occur in three distinct situations:

  - — Work delays or inefficiencies. The premium costs are the total delay / inefficiency damages paid to the contractor.
  - — Rework. The premium costs are the dollar amounts paid for the original items of work that have to be removed plus the cost to remove these items.
  - — Extra work. The premium costs are the net difference between the final, agreed-upon price paid to the contractor and the Engineer's Estimate – i.e., what the cost would have been had the extra work been included in the original bid at letting.

- Premium costs associated with EOR and CCEI Errors and Omissions shall be Federal-aid Non-Participating.

Policies/Guidelines

FDOT guidelines on use of consultants for project design are stated at the beginning of the Department's document on errors, omission, and contract breaches ("Identifying and Assigning Responsibility…," Oct. 21, 2004, p. 4).

- The agency recognizes that it employs consultant design professionals to assist in design and construction engineering.

- While these design professionals are responsible for the accuracy and quality of their work, mistakes nevertheless can occur in the form of errors or omissions. These defects may cause additional cost and time on the construction project. Problems may also arise due to a breach in the consultant's administration of a contract for construction engineering and inspection.

- When consultant errors, omissions, or contractual breaches rise to the level of negligence, the Department shall pursue recovery for certain added project costs.

Florida Statute Section 337.015(3) obligates the Department to pursue claims against consultants for substandard work products: "To protect the public interest, the department [FDOT] shall vigorously pursue claims against contractors and consultants for time overruns and substandard work products." [http://leg.state.fl.us/Statutes/index.cfm, Chapter 337, Section 015, Paragraph (3), acc. Sep. 15, 2008]. Substandard work products in this context are errors, omissions, and contractual breaches, which for purposes of this procedure are referred to collectively as "Errors and Omissions."

Process/Procedures

Florida DOT has established "a procedure to identify, investigate, and document errors, omissions, and contractual breaches in consultant-prepared construction plans and contract documents…" The procedure determines "the extent of consultant responsibility for the cost of plan revisions and certain added construction costs or claims resulting from errors, omissions, and contractual breaches…" It calls for a "recommendation to pursue recovery of certain added

project costs" ("Identifying and Assigning Responsibility…," Oct. 21, 2004, p. 1). In addition to this primary reference, a summary of the process is available (Timp, Jul. 2005).

The FDOT process addresses the responsibilities of both the consultant Engineer of Record (EOR) and the Consultant Construction and Engineering Inspection (CCEI) personnel, as defined earlier. For simplicity, the following discussion will focus on the EOR, which is the position identified with a design consultant. The process entails several steps: discovery; construction contract modification, including assessment of consultant responsibility and the premium cost impact of consultant errors and omissions; coding of contract change, which identifies the party responsible for causing the need for a change order and signals whether the agency intends to recover premium costs; notification to the EOR of the Department's assessment of project issues (premium costs, contract time or cost, EOR responsibility) and request for EOR response; decision on pursuit of cost recovery, which depends on a number of factors including the anticipated amount of recovery, likelihood of success, administrative and legal costs, and consultant's performance history; and attempt at resolution. If resolution cannot be reached at the project level – e.g., if the consultant has valid reasons to dispute the Department's assessment of project issues -- the final decision is made by the District Consultant Evaluation Committee (CEC).

- The CEC comprises three voting members (District Directors of Operations and of Production, respectively, and the District Design Engineer) and two non-voting members (a Departmental legal representative and the Design Project Manager).

- The CEC makes the final determination of consultant E&O responsibility and liability for corresponding premium costs.

- The consultant may accept the CEC determination, appeal the decision to a Consultant Claims Review Committee (CCRC), or litigate the matter.

The CCRC comprises three members:

- The Florida Institute of Consulting Engineers (FICE) selects one member from the consultant community, with FDOT's approval.

- The FDOT State Highway Engineer selects one Department professional engineer employed in the area in which the E&O issue is based, with the approval of FICE.

- FDOT and FICE shall mutually agree on a third member, selected from FDOT's Dispute Resolution Board (DRB), who adequately represents the discipline in question in the dispute. The DRB representative, who cannot have been associated with any other DRB action on the same project, chairs the committee.

The participation of the FICE member is at the consultant's expense. The participation of the Department members is at FDOT's expense.

If the dispute remains unresolved or the consultant has chosen not to request a CCRC review, litigation may be the only remaining option. FDOT's Office of General Counsel assesses

recoverability based on the applicable statute of limitations and assumes a stronger role in reviewing the project record and recommending a course of action to, and seeking concurrence from, the District Secretary.

If the dispute is resolved or if the Department prevails in litigation, the claim is collected from the consultant. The E&O process outlines the coordination among FDOT's Design Project Manager (DPM), the Office of Comptroller – General Accounting Office (OOC-GAO), and the Office of General Counsel (if the claim is resolved through litigation) to collect and process the payment. The OOC-GAO maintains a system to track recovery of funds received from consultants due to errors and omissions. The DPM provides information to the OOC-GAO that guides the disposition of recovered monies, including the financial project number, the federal-aid project number, project description, and amount and date of cost recovery. In July of each year, the OOC-GAO Cashier's Office reports the amount collected for design errors and omissions in the preceding year by district and by fund. In mid-September, the Program and Resource Allocation Office allocates the collected amounts back to the appropriate district and statewide program.

FDOT also permits services in-kind as restitution for E&O damages. The value of these services must be equivalent to the amount of damages incurred by FDOT. The District Design Engineer will determine the scope of equivalent services needed to satisfy the consultant's obligation for reimbursement and the number, level, and compensation rate of consultant personnel to accomplish these services. These services will be stipulated in a settlement agreement between FDOT and the consultant. The DPM will monitor and document the receipt of these services in-kind and report them quarterly to the OOC-GAO. When the restitution is completed, the DPM will so notify the consultant EOR and the OOC-GAO.

To facilitate this E&O process, each District Design Engineer will designate an Errors and Omissions Liaison to serve as a central point of contact. This Liaison will be responsible for the status of the cost recovery efforts across all District errors and omissions issues. The Errors and Omissions Liaison will promote communication among FDOT disciplines, provide prompt responses to questions or inquiries from FDOT management, and prepare a statistical summary of all recorded instances of E&O in the District. For purposes of quality assurance, the E&O Liaison will coordinate this summary with the District Design Engineers, District Construction Engineers, State Roadway Design Office, State Construction Office, OOC-GAO Accounts Receivable Section, and the consultant community.

FDOT offers training in this E&O resolution process through its Project Management, Research and Development Office. Both FDOT staff and the consultant community may attend this course.

FDOT's Project Management, Research & Development Office and its Office of Information Systems have established a web-based Resolution Tracking System to monitor the errors and omissions process from initial discovery of the E&O issue through final determination (Murphy, Aug. 2006). FDOT offers training to its staff in the use of this system ("Resolution Tracking System", und.; "Errors and Omissions Training," Oct. 2005).

Design Consultant Evaluation

Design consultant performance is evaluated by FDOT using a process designed for professional services consultants (***Professional Services Consultant***…, Jun. 2006). Evaluation of design consultants is completed by the respective FDOT project manager for the consultant contract or by a technical reviewer with the concurrence of the project manager. The evaluations focus on the following topics:

- Schedule: performance in meeting the project schedule. This rating is completed only for the design phase.

- Management: performance in managing the contract, including contract administration, management of issues and resources, communication / documentation / coordination, execution of work, and post-design services (included with the constructibility evaluation). This rating is completed for both the design and the construction phases.

- Quality: performance in adhering to the established quality assurance plan and producing a quality product. Quality evaluations will be conducted for each major type of work that is advertised when the Department announces its intention to contract for project design services. This rating is completed only for the design phase.

- Constructibility: performance in providing practical, accurate, complete, and cost-effective construction plans. Constructibility evaluations are provided for different design features: e.g., roadway design plans and details, signing and pavement marking features, drainage features, and so forth. These ratings are completed during and following project construction. Comments will be entered by the Construction Project Manager based upon input from the construction contractor. The Construction Project Manager will also complete a Management evaluation for the construction phase. These comments will be reviewed by the DPM for concurrence.

Ratings for all evaluations above are made on the following scale:

- 5: Outstanding performance

- 4: Above Satisfactory performance

- 3: Satisfactory performance

- 2: Below Satisfactory performance

- 1: Unacceptable performance

Comments must be entered to explain ratings of 5 or 1. The evaluation guidelines specify the schedule for evaluations during design and construction and the weights to be given to each evaluation when computing an overall score.

Georgia Department of Transportation

The Georgia Department of Transportation (GDOT), in partnership with the FHWA Division Office, recently reviewed and recommended updating its E&O cost recovery procedures (***Process Review on: Consultant Design***…, Sep. 2006). The recommendations were accepted and adopted within two revised guidelines: one regarding policy ("Errors and Omissions," Aug. 10, 2007), and the second outlining procedures ("Errors and Omissions Cost-recovery… Aug. 10, 2007).

Definitions

The revised errors and omissions terminology used by GDOT is as follows ("Errors and Omissions," Aug. 10, 2007):

- ERRORS: Items in plans or other contract documents that are shown incorrectly.
- OMISSIONS: Items in the plans or other contract documents that are not shown or included.
- ERRORS AND OMISSIONS: Design deficiencies in the plans and specifications, which must be corrected in order for the project to function or be built as intended.
- DEGREE OF CARE: The level of caution, prudence, or forethought legally required to avoid causing harm or loss to another person.
- DILIGENCE: The degree of care and caution required by the circumstances of a person.
- ENGINEERING NEGLIGENCE (applying to the practice of engineering): The failure of a professional engineer to utilize due care in performing in an engineering capacity or failing to have due regards for acceptable standards of engineering principles.

Policy/Guidelines

GDOT's policy to recover E&O-related damages are expressed in a document under its Transportation Online Policy & Procedure System (TOPPS). This document defines terms related to E&O as discussed above, and roots its policy in the federal regulatory requirement ([23 CFR 172.9(a)(6)], refer to Chapter 2) "to have written procedures in determining the extent to which the consultant, who is responsible for the professional quality, technical accuracy, and coordination of services, may be reasonably liable for costs resulting from errors or deficiencies in design…" ("Errors and Omissions," Aug. 10, 2007). This document also discusses FHWA's policy on federal-aid participation in the cost of design and construction errors (refer to FHWA E&O policy in Chapter 2). It summarizes design policy as follows: "the consultant should only be held accountable for the costs of the new design – not for additional construction costs

resulting from such errors – unless the errors or omissions are a result of gross negligence or carelessness."

Process/Procedures

GDOT's E&O process is described in its online Manual of Administrative Procedures ("Errors and Omissions Cost-recovery…, Aug. 10, 2007; also ***Process Review on: Consultant Design***…, Sep. 2006). Excerpts of this process below focus on procedural matters. GDOT's financial accounting instructions that are also included in the Manual are excluded from this description.

- When a problem arises in project construction, the Construction Project Manager determines whether the cause is due to a design error or omission. If so, the Design Project Manager is notified to begin working on a response. This response will determine what should be done to correct or mitigate the problem, and apparent responsibility for the problem. If the correction requires additional funds for redesign, an Allotment will be requested and net design costs will be estimated. If a Supplemental Agreement is needed for construction as the result of the error or omission, the Project Engineer will contact the District Construction Engineer to request that net additional E&O-related costs be calculated. These costs will be added to the Supplemental Agreement. Data on Supplemental Agreements and Allotment Requests are compiled and distributed in a quarterly report.

- Based upon information in the quarterly report, the GDOT Office Administrator evaluates the E&O-related redesign and construction costs on each project against threshold values: $20,000 for a single occurrence, and $50,000 for cumulative occurrences. These threshold values reflect estimated GDOT administrative expenses to pursue an E&O claim. (Notwithstanding these threshold values, GDOT has the option of proceeding with cost recovery even at a loss. See further discussion below.) If the project costs attributable to redesign will exceed these thresholds, a detailed report must be completed by the Office Administrator (or designee) that includes general contract information, a summary of the E&O problem, a summary of the solution implemented in the field, GDOT's accountability related to the error or omission, and a recommendation to pursue or not pursue cost recovery from the consultant.

- The Office Administrator will forward this E&O information to the Office of Engineering Services to develop a consolidated report of Supplemental Agreements processed across all projects that are due to design errors and omissions. This consolidated report is distributed to the Chief Engineer, the GDOT Consultant Performance Review Committee (CPRC), and the FHWA. Projects for which the Office Administrator has recommended cost-recovery will be reviewed by the CPRC.

- The CPRC has as members the Director of Preconstruction, Director of Operations, Director of Construction (voting members), the Director of Legal Services, Director of Administration, and a FHWA representative (non-voting members). The CPRC is responsible for reviewing all recommendations for cost-recovery actions. Those recommendations that the CPRC votes affirmatively are forwarded to the Chief Engineer for

approval. Those actions that the CPRC does not support are returned to the Office Administrator with an explanation.

- In its deliberations the CPRC considers the following:

  — It verifies that the additional cost due to errors and omissions exceeds the threshold criteria discussed above. This review promotes cost-effective actions in seeking damages. However, the CPRC has the authority to recommend that cost-recovery proceed even if these criteria are not met.

  — The CPRC determines whether the error or omission was due to negligence by the consultant. If so, the cost-recovery amount will include the cost of redesign and the additional construction costs due to the error or omission. In making this determination, the CPRC will review relevant factors: e.g., the contractual Scope of Work agreed to by the design consultant.

  — The CPRC will also take into account mitigating factors such as an analysis of the Department's responsibility to have identified the error or omission during project plan development.

- The Chief Engineer reviews those E&O issues that the CPRC has voted as warranting cost-recovery. Once he or she approves these recommendations, the Office Administrator notifies the consultant of the Department's decision. The Office Administrator is responsible for conducting negotiations to try to resolve the issue without litigation. The GDOT Office of Legal Services, together with the State Attorney General's Office, will provide guidance and direction to ensure that these negotiations do not jeopardize the Department's ability to recover costs.

  — If negotiations are successful, the Office Administrator will obtain approval of the resolution from the Chief Engineer and implement the solution. The resolution agreement will be in writing.

  — If negotiations are unsuccessful, non-binding mediation may be considered to help in reaching agreement.

- In non-binding mediation, the Department and the consultant shall agree on a mediator and share the costs and expenses thereof. Within 10 days of the appointment of the mediator, the Department and the consultant will agree on the scope and the rules of the mediation phase. The mediation phase begins at the expiration of the negotiation phase and extends 120 days thereafter, unless concluded earlier or extended by mutual agreement. If mediation is successful, the agreement will be put in writing. If no agreement has been reached at the expiration of the mediation phase, the Department may pursue whatever remedies are available, including legal action. The Office of Legal Services will then act as a liaison between the Department and the consultant.

- If agreement on the cost-recovery issue has been reached by whatever means, GDOT will offer the consultant two methods of restitution: direct payment to the Department, and / or pro-bono design services.

Effect on Future Consultant Consideration

Instances of design errors and omissions should be documented and included in the record of the consultant's past performance for consideration in future contracting opportunities. The consultant's file should contain the CPRC's recommendation on whether or not cost recovery should be pursued, and the final resolution of those E&O issues that did lead to cost recovery. The Office of Consultant Design will maintain a consultant performance database that includes information on design errors and omissions.

Illinois Department of Transportation

Definitions

Illinois DOT defines its errors and omissions terminology in its ***Standard Agreement Provisions for Consultant Services*** as follows (***Standard Agreement***… Jan 1, 2001):

- ERROR: A failure to provide professional services in accordance with that degree of care and skill ordinarily exercised under similar conditions excluding, however, OMISSIONS.
- OMISSION: A failure to provide professional services in accordance with that degree of care and skill ordinarily exercised under similar conditions whereby there is a failure to indicate on drawings, specifications or other products of professional services the requirement for a feature, system or equipment, which is necessary to the complete function of a project…
- NEGLIGENCE: The OMISSION or neglect of reasonable precaution, care or action in accordance with that degree of care and skill ordinarily exercised under similar conditions.

These definitions are applied in contract provisions describing the design services and review and acceptance of design products, the procedures for addressing errors, omissions, and other matters, attendant consultant responsibilities during and following construction, requirements for insurance, compensation calculations and payment for services, and Illinois DOT's consultant evaluation process (described in a later section).

Illinois goes a step further by defining errors and omissions in terms of their severity, to support their formal consultant evaluation process. IDOT views a subset of errors and omissions as "significant and substantial enough to cause the project to be in jeopardy," and considers these problems "fatal flaws" (***Bureau of Design***… Dec. 2002, Chapter 8, pp. 8-4(7) – 8-4(8)):

- Errors involving significant structural deficiencies or safety on bridges / structures.
- Errors resulting in the Consultant failing to identify significant environmental impacts.
- Errors involving substandard geometrics for the specified design criteria.

- Inaccurate survey information affecting the project's constructibility.
- Inappropriate behavior by the Consultant when working with the public.
- False information used by the Consultant in the report documentation.
- Adjustment of letting date or design approval due to late Consultant submittals.

The implications of these serious design errors and omissions for consultant evaluation are described below.

Process/Procedures and Consultant Evaluation

Illinois' procedures and criteria for project design are documented in a manual produced by the Bureau of Design and Environment. Consultant-developed or –designed projects are covered in Chapter 8 of this manual. The material below is drawn from this source, and page numbers that are cited in parentheses are from this source (***Bureau of Design***… Dec. 2002, Chapter 8).

Illinois' definitions regarding E&O and descriptions of what the DOT regards as fatal flaws in design were presented earlier. While the DOT takes a realistic attitude that very few designed projects are truly "Excellent" in every respect, it nonetheless describes a benchmark of excellence as a project with the following characteristics:

- Submittals have no major errors and very few minor errors.
- The design Consultant is "self-managed": responsive to requests, understands and fulfills standard procedures, and takes the lead on projects.
- The design Consultant is innovative: able to direct resources to key issues, uses resources and technology imaginatively, identifies and deals with problems early and effectively, and poses solutions that save the Department significant dollars.
- Submissions are not only early, but allow the Department to advance a letting or advertisement to an earlier date. Allowances will be considered for an accelerated Department-dictated timetable.
- The resulting project design is cost-effective, safe, and considered to be a context-sensitive.
- Presentation of design products is of high quality with respect to spelling, grammar, labeling, and links.
- The Consultant maintains a consistently high-quality staff of people on the project throughout its life.
- The Consultant complies with all Department manuals, policies, and procedures; when necessary, he or she explains exceptions with minimal prompting from the Department.

- The Consultant promotes a positive image for the Department and minimizes controversy during public involvement.

To encourage performance that approaches this benchmark, Illinois DOT has established the criteria in Table 3-2 by which design consultants will be evaluated for pre-qualification and in interim and final evaluations. These criteria are ***guidelines*** and are not intended to be absolute. Consultant performance may fall between two of the criteria, for example, and evaluators take this into account in completing evaluation forms.

Table 3-2. Guidelines for design consultant evaluation, Illinois DOT.

Criterion	Exceeds the Standard	Meets the Standard	Needs Improvement
Timeliness	Consultant submits key items of work consistently early, affording the Department the opportunity to advertise the next phase of work on an earlier bulletin.	Consultant submits key items of work consistently on or about the time agreed to by both parties.	Consultant submits key items of work consistently past the time agreed to by both parties.
Completeness and Adequacy	(Blank)	Consistently on key items of work, the Consultant includes all items in a submittal as specified in Department manuals, policies, procedures, and the contract documents.	On key items of work, the Consultant consistently fails to include all items in a submittal as specified in Department manuals, policies, procedures, and the contract documents.
Quality and Accuracy	Consultant submittals contain no major errors and very few minor errors. Minimal hours are expended by Department staff in review of submittals. Presentation of material is clear, concise, and of high quality (e.g., spelling, grammar, labeling, links). The next phase of work experiences little or no major problems or questions attributable to the Consultant. The work thoroughly analyzes the major elements of the project. Consultant maintains a high quality of work with a Department-accelerated schedule.	Consultant submissions contain no major errors and some minor errors. Presentation of material is clear, concise, and adequate (e.g., spelling, grammar, labeling, links). The next phase of work experiences the expected problems or questions attributable to the Consultant.	Consultant submissions contain major errors. The Consultant demonstrates low quality of presentation of products (e.g., spelling, grammar, labeling, links). The next phase of work experiences problems or questions attributable to the Consultant. The Consultant shows poor understanding of the work type.

Criterion	Exceeds the Standard	Meets the Standard	Needs Improvement
Cooperation, Project Management	Consultant is consistently available and responsive to and ahead of problems and concerns. The Consultant initiates open and timely communications with the Department. Consultant is consistently self-managed.	Consultant is available and generally responsive to problems and concerns. The Consultant initiates open and timely communications with the Department. Consultant is self-managed at times.	Consultant is generally not available nor responsive to problems and concerns. The Consultant communications with the Department are rarely timely. Consultant continually asks the Department for clarification on standard procedures.
Public/ Agency Coordination	The Consultant independently develops proactive and creative public/ agency involvement techniques that both identify and effectively respond, in a timely manner, to minimize highly controversial issues. The Consultant manages and implements the public relations program and presents accurate and pertinent project information to the public, news media, and coordinating agencies, which results in project acceptance and a positive Departmental image.	The Consultant follows Departmental guidelines in performing project coordination with the public, news media, and agencies in such a manner that fulfills all requirements and results in project acceptance and design approval.	Consultant responses are misleading, incorrect, or inflammatory at public/ agency involvement meetings. Presentation material (e.g., aerial exhibits, details, tables, data) contain incorrect or conflicting information, which reflects negatively on the Department and on acceptance of the project design features. The Consultant's public/ agency involvement program requires an over-reliance on Department staff to correct, revise, and present project improvement/ mitigation.

Source: ***Bureau of Design***… Dec. 2002, pp. 8-4(9) – 8-4(10)

Performance evaluations are conducted on an interim basis on or about April 1 and October 1 each year as project work proceeds, and on a final basis following project completion. Interim evaluations are viewed as a very important and timely feedback mechanism to the consultant, allowing the consultant to correct deficiencies during the life of an active project, potentially turning what would otherwise have been a bad experience for all concerned into a good one (p. 8-4(11)). The final evaluation is determined in consultation with, and with the concurrence of, several Department managers, after which it is transmitted to the consultant and the Department's consultant-information database. The results of these performance evaluations have implications in terms of a consultant's record with the Department and prospects for selection on future work with Illinois DOT, and on the total amount to be paid to the consultant as computed under the Department's pay-for-performance program.

- If a consultant has committed errors that are significant and potentially place the project in jeopardy (the "fatal flaws" identified in the section on definitions earlier), the highest final rating the consultant may receive on the project is ***Satisfactory*** – providing the consultant has made corrections and improved its quality control. On interim evaluations these errors result in a ***Substandard*** or ***Poor*** project rating for the consultant in that period (p. 8-4(7)).

- In other cases where a consultant receives an interim rating less than ***Satisfactory***, the ***Substandard*** or ***Poor*** rating can be removed by any one of the following circumstances (p. 8-4(14)):

  — A subsequent interim evaluation on the same project in the same category is ***Satisfactory*** or better.

  — The Consultant meets with the district and / or central office bureau that made the ***Substandard*** or ***Poor*** evaluation, and the evaluation for the project is upgraded to ***Satisfactory***. This condition involves situations where there has been a misunderstanding between the Department's evaluator and the Consultant.

  — The Consultant demonstrates to the district and / or the central office bureau that corrective measures have been taken to correct the less-than-satisfactory performance. Under this condition, the original evaluations are not removed but rather are marked with an asterisk to indicate that corrective measures have been implemented by the Consultant to the satisfaction of the district and / or the central office.

- In final evaluations, numerical weights are available to compute a total final score. Weighted averaging is used, for example, when the design Consultant is evaluated by more than one Department unit or office. In this case the respective percentage of negotiated Consultant labor hours for work attributable to each unit is multiplied by the appropriate weight in Table 3-3 based on the unit's evaluation of Consultant's work. The weighted totals for each office or unit are summed to obtain the total weighted final score for the Consultant's performance. The interpretation of the consultant's final evaluation for the project based upon the weighted average final score is given in Table 3-4 (p. 8-4(13)).

- A final evaluation of ***Poor*** results in loss of prequalification in that category. Two final evaluations of ***Substandard*** within five years in a category also results in a loss of prequalification in that category (p. 8-4(14)).

- A Consultant may appeal a ***Substandard*** or ***Poor*** evaluation (pp. 8-4(14) – 8-4(15)):
  - — By writing to the Department office or unit that prepared the final evaluation (e.g., District Engineer, Bureau of Design and Environment, Bureau of Bridges and Structures).
  - — If agreement cannot be reached with that office or unit that prepared the final evaluation, the Chief of the Bureau of Design and Environment reviews the evaluation and documentation file and meets with the Consultant and the Departmental office or unit involved.
  - — If resolution still cannot be reached, the review and meeting documentation will be forwarded to the Deputy Director of Highways.
  - — Final appeal is to the Director of Highways.

Table 3-3. Design consultant rating scale, Illinois DOT.

Rating Received	Evaluation Weight
Exceeds	10
Meets	7
Satisfactory	5
Substandard	3
Poor	0

Table 3-4. Interpretation of the total weighted average score in a design consultant final evaluation, Illinois DOT.

Average Weighted Value of Score	Consultant Final Project Evaluation
9.00 – 10.00	Excellent
6.50 – 8.99	Good
4.50 – 6.49	Satisfactory
3.00 – 4.49	Substandard
0.00 – 2.99	Poor

When included in the consultant's agreement, consultant performance is tied to the amount to be paid for design services. The total amount is adjusted up, down, or not at all depending upon the consultant's final evaluation. Adequate or satisfactory performance receives no adjustment. Excellent performance is rewarded by a bonus. Sub-satisfactory performance results in a reduction of payment. The percentage adjustment in each case is shown in Table 3-

5. This percentage adjustment is applied to the consultant's negotiated direct labor dollars, including all supplemental agreements (p. 8-4(15)).

Table 3-5. Percentage adjustments based on pay-for-performance, Illinois DOT.

Final Project Evaluation Rating	Percentage Adjustment (%)
Excellent	5
Good	3
Satisfactory	0
Substandard	-5
Poor	-10

The Illinois DOT's philosophy toward claims placed on the design consultant is as follows:

> ***…the Department is not seeking a level of effort required to produce a perfect product and… to reduce the time and expense for both the Department and the Consultant in processing claims for minor dollar amounts, an EOT [Errors and Omissions Threshold] will be used. Claims for damages involving errors and/or omissions are not to be billed to the Consultant unless the damages exceed the EOT. The EOT is defined as ½ of 1% of the amount of the construction project or $5,000, whichever is less. …In addition, no bill less than $1,000 shall be sent to the Consultant. The amount billed is the total amount exceeding the EOT not previously billed, if $1,000 or greater, and may be from one or more occurrences.***
>
> Source: Bureau of Design… Dec. 2002, p. 8-5(2)

If a consultant has more than one project with the Department, a separate EOT is set for each project.

If the consultant disputes that it is responsible for the errors or omissions, it may appeal the claim to the district with a copy to the Bureau of Design and Environment (BDE). If the District Engineer rules against the consultant and the consultant disagrees, the consultant may request the BDE for another review. If the BDE upholds the District Engineer's ruling, the consultant may request a review by the Director of Highways. The Director of Highways will make a determination and inform the consultant by letter of the result of the appeal. The Director's ruling is final and concludes the process. At any level of this appeal, the consultant may request the opportunity to make an oral presentation supporting the case for appeal.

While consultants are contractually responsible for the additional costs due to their errors or omissions, the Department may choose not to assess damages to the consultant if it believes that it has received a "fair and equitable price" from the contractor for the additional work to remedy an omission. Such a fair and equitable price would reflect essentially the cost that would otherwise have been incurred had the omission not occurred (p. 8-5(1)).

Contract Provisions

The Illinois DOT employs standard provisions in agreements for consulting services, which include, among other items, the following (***Standard Agreement***… Jan. 1, 2001):

- Definitions of terms, including "error," "omission," and "negligence."
- A statement of contractual agreement between the consultant and the Department "to work together on a basis of trust, good faith and fair dealing" in achieving the contract objectives accurately, efficiently and economically.
- A provision requiring the consultant to guard against errors and omissions, exercise "appropriate care" in the performance of professional services, and assume responsibility for damages arising from errors and omissions.
- Procedural steps to be followed if errors or omissions are discovered.
- Applicable Department policies, procedures, and manuals to be followed in completing the work.
- Provisions for review and acceptance of work products, which do not relieve the consultant of the requirement to correct errors or omissions at the consultant's expense and assume liability for related damages.
- Requirement for the consultant to maintain liability or "errors and omissions" insurance in stated amounts of coverage.

Massachusetts Highway Department

Policy/Guidelines

The Massachusetts Highway Department (MassHighway or MHD) established a formal Cost Recovery Procedure in June 1997. This procedure was developed by a Project Liability / Cost Recovery Task Force comprising representatives of the MHD and the Massachusetts section of the American Council of Engineering Companies under the auspices of the MHD / ACEC-MA Partnership. The procedure was intended to strengthen relationships among MHD, design consultants, and contractors, with the objective "to minimize or eliminate cost recovery issues in the first place, not to recover costs associated with design errors or omissions" (DiPaolo, 2001, p. 4). A review of this procedure in 2001 showed that it was beginning to work as intended and starting to yield positive results. Points that were noted for further improvement included the need for more timely and effective communications in both directions between MHD and design firms, and the need for MHD project managers to work toward completing and closing out a cost-recovery issue when findings indicated that no further action was warranted (DiPaolo, 2001, p. 6). The 1997 procedure was superseded by an updated MassHighway

Standard Operating Procedure in 2006 (***Cost Recovery Procedure***, Sep. 2006). This 2006 procedure is described in the following sections.

The MassHighway Cost Recovery Procedure applies to "design professionals" who are defined as:

> ***…any entity performing professional services in connection with the design of MassHighway projects (including construction phase services) and shall include any professional consultants or subconsultants supporting the design effort.***
>
> Source: ***Cost Recovery Procedure***, Sep. 2006, p. 1

The MassHighway Cost Recovery Procedure has the following objectives (***Cost Recovery Procedure*** Sep. 2006, p. 1):

- To expand the role of the consultant designer in the construction of a project;
- To increase communication between the consultant design professional and MassHighway field personnel;
- To provide the consultant designer the opportunity to address and resolve design-related problems as soon as they are recognized in the field;
- To require MassHighway to examine why extra work orders occur so that similar problems can be avoided in the future;
- To take all factors into consideration before determining responsibility for problems that occur in the field;
- To increase the consultant designer's professional and financial accountability for the quality of their design work;
- To provide the MassHighway Architects & Engineers Review Board with additional information regarding the quality and constructibility of consultant designs; and
- To provide consultant designers with feedback regarding the quality of their designs.

> ***The general objective of the cost recovery inquiry is to make a determination whether there is sufficient basis to pursue recovery of costs or damages that the Commonwealth [of Massachusetts] has incurred or will incur because of deficient performance by design professionals in connection with MassHighway projects.***
>
> Source: ***Cost Recovery Procedure***, Sep. 2006, p. 8

The criteria that each panel or committee should consider when participating in the cost recovery process include the following:

- The terms of the applicable contract, including scope of services, deliverables, design standards, warranty, and indemnification.

- The professional standard of care that the consultant design professional is expected to exercise.

- Any extenuating or mitigating factors: e.g., any value-added principles, limitations on fee or scope of services, time constraints on performing services, unforeseen or changed conditions, third-party requirements, responsibility and comparative fault of other parties, and other circumstances that might have affected the design professional's performance.

- An estimate of the costs or damages, if any, that Massachusetts has or will incur due to the deficient performance of the consultant designer, and an analysis of the administrative costs versus benefits of seeking recovery of the additional project costs or damages.

Communications, reports, and recommendations by those involved in a cost recovery inquiry are regarded as privileged and confidential, and work products are distributed on a "need to know" basis. To encourage full and free exchange of information and ideas within panel or committee meetings, formal meeting minutes are not kept. The Cost Recovery Administrator keeps all completed forms, committee reports, and work papers, regardless of whether or not a cost recovery issue is pursued. Release of privileged and confidential material requires the written recommendation of the MassHighway Chief Legal Counsel and the written approval of the Chief Engineer.

Process/Procedures

MassHighway's process for cost recovery is described in its Standard Operating Procedure (***Cost Recovery Procedure***, Sep. 2006). Central to its process is a Cost Recovery Administrator, who is appointed by the Chief Engineer. The Cost Recovery Administrator tracks cost recovery issues through the process, schedules meetings of appropriate committees and panels, keeps records, and performs other duties to implement the process effectively. During the project construction phase, MassHighway's Resident Engineer maintains continuing communication with the consultant design professional on project status as part of the consultant's construction-phase services.

1. A possible cost-recovery issue is raised when one of the following events occurs:

    - A construction Extra Work Order (EWO) or other construction contract modification is processed;

    - A significant event occurs on the construction project (e.g., a structural failure); or

    - A construction contractor or other third party makes a claim involving design professional performance.

    The Resident Engineer considers the circumstances requiring the EWO to identify whether they point to a possible cost recovery issue. There are several possibilities that would not indicate a cost recovery issue:

- The EWO corrects an error on a project for which MassHighway is the designer of record (i.e., in-house design).

- The EWO corrects an Item Omission. Many Item Omissions, regardless of their value, are not cost recovery issues since MassHighway would have had to pay for them anyway had they been included in the original contract documents. However, Item Omissions may become potential cost recovery issues if they result in further additional cost to the project.

- The EWO is due to consultant designer error but the additional cost to correct the problem is less than $5,000. While MassHighway will not pursue cost recovery at that time (administrative processing and review of the matter are not cost-effective), MassHighway may pursue cost recovery on a group of these "small" items later, including after construction completion, if their cumulative additional cost is more than $50,000.

2. If a matter is judged to be a cost recovery issue, the initiator (MassHighway district office, central office, or the Claims Committee, which handles contractor claims and may determine that a claim could be due to design error) communicates the issue promptly to the consultant design professional through the MassHighway Design Manager. The consultant designer is given the opportunity to provide advice, resolve the issue, or mitigate any additional cost to the project: e.g., by recommending alternate procedures or providing additional information.

    - If the cost-recovery issue is construction-related, the Resident Engineer prepares a Cost Recovery Inquiry (CRI) form that summarizes the essential information on the issue with backup documents from the existing project file.

    - The CRI form is reviewed by District Construction personnel; if approved, the form is sent to the District Highway Director (DHD) for further review.

    - If the DHD agrees with the District Construction Office findings, the CRI form is forwarded to the Construction Engineer for further review.

    - If the Construction Engineer concurs with District findings, the CRI form is sent to the Cost Recovery Administrator, who in turn forwards a copy to the responsible MassHighway Design Manager.

3. The responsible Design Manager reviews the issue with a Cost Recovery Review Panel (Review Panel). The Review Panel is chaired by the Design Manager or designee and comprises the MassHighway Construction Engineer and/or designated staff and the responsible MassHighway Design Manager and/or designated staff. A Review Panel is designated for each cost recovery issue. The Review Panel contacts the design consultant in writing, transmitting all cost-recovery material (including the CRI form and supporting documents), with a response due within 10 business days. The Review Panel may also request additional information from the consultant to assist in its consideration of the cost recovery issue. Based on its deliberations, the Review Panel will recommend to the Cost

Recovery Administrator either that the issue was not caused by design error, or that a design error did cause the EWO and may warrant cost recovery.

4. The Cost Recovery Administrator consolidates information on cost recovery issues that are ready for presentation to the Cost Recovery Standing Committee at its monthly meeting. The presentation of an individual cost recovery issue is generally scheduled only when the project is substantially completed.

   - The Cost Recovery Standing Committee comprises several MassHighway managers: the Assistant Chief Engineer, Director of Projects, Deputy Chief Engineer of Construction, Construction Engineer, Project Management Engineer, and Chief Legal Counsel or designee (non-voting member); plus, for federal-aid projects, the FHWA Division Administrator or designee, at the option of the FHWA. The Assistant Chief Engineer serves as the Committee Chair. The Chief Engineer may adjust attending members: e.g., to add relevant expertise. At least one member of the Review Panel also attends the meeting to answer questions regarding the Panel's review and recommendation.

   - The Cost Recovery Standing Committee determines whether further analysis of the cost recovery issue is needed. The Standing Committee may consider the criteria and cost-benefit analysis discussed earlier. It may reach a number of conclusions:

     — The issue is not caused by design error; no further analysis is needed. The matter is referred back to the Cost Recovery Administrator, who processes all final materials to the Design Manager and the MHD Architects and Engineers Review Board. The Design Manager notifies the design consultant in writing of this final determination. The Resident Engineer is notified and updates the Record of Design to reflect this finding.

     — The issue is caused by design error, and no further analysis is needed. The matter is forwarded to the Chief Engineer, who reviews the issue and makes a final decision based upon the recommendations in the record. If the decision is to pursue cost recovery, the Chief Engineer consults with Chief Legal Counsel and recommends an action to the Cost Recovery Administrator. The Cost Recovery Administrator processes all final materials to the Design Manager and the MHD Architects and Engineers Review Board. The Design Manager notifies the design consultant in writing of this determination.

     — The issue requires further analysis. The Standing Committee may decide either to perform the analysis itself or to designate a Cost Recovery Evaluation Committee (Evaluation Committee) comprising representatives of the Design and the Construction groups (members of the original Review Panel can be considered for these positions). The Cost Recovery Administrator will be notified and will help familiarize Evaluation Committee members with information on the cost recovery issue. Outside engineers may also be contacted by the Standing Committee or the Evaluation Committee to assist on complex or highly specialized technical matters. The Evaluation Committee will contact the design consultant in writing via the Chief Engineer and request information or documents needed for the analysis. The Committee may also ask MassHighway staff and the Chief Legal Counsel for

assistance. The Evaluation Committee may meet with the consultant design professional to discuss the cost recovery issue and, within 30 days of this meeting or receipt of information from the consultant designer, will prepare a Draft Report presenting its findings and recommended disposition of the cost recovery issue.

5. A copy of the Draft Report is provided to the design consultant, who may respond with comments within 14 days. The Evaluation Committee will prepare a Final Report within 14 days after receiving the consultant designer's input and submit it to the Cost Recovery Administrator for review and approval by the Standing Committee. If it approves, the Standing Committee submits the Final Report to the Chief Engineer. If the Standing Committee does not concur, the Report is returned to the Evaluation Committee for further consideration.

6. The Chief Engineer reviews the Final Report and has 21 days to make a decision: accept the Evaluation Committee's recommendation, take a different course of action (consults with Chief Legal Counsel), or decide that cost recovery is not warranted. The Cost Recovery Administrator notifies the consultant designer of the decision. If a cost recovery action is recommended, MassHighway and the consultant designer work together to try to resolve the issue via methods of alternative dispute resolution: negotiation or mediation. Alternate methods of recovery by which the consultant designer can provide MassHighway an equivalent level of restitution may be considered: e.g., correcting the deficient professional services, re-performing the services, or providing other needed services. Litigation is viewed as a last resort if necessary to deal with non-responsive or uncooperative consultant designers, or if resolution is not possible through other methods.

7. Throughout this process each Panel or Committee that reaches a decision or recommendation signs off at the appropriate place on the CRI form. The Cost Recovery Administrator maintains all completed CRI forms and accompanying documents.

Standardized Scope of Services

To try to reduce design errors at an early stage, MassHighway has developed checklists for review of plans and specifications at the 25 percent, 75 percent, and 100 percent submittals. Section 900 of MassHighway's Standardized Scope for Consultant Services describes the following services to be provided by the design consultant during the construction engineering phase:

> ***The Consultant shall furnish consultations and interpretation of the Contract drawings and specifications as may be required by the Engineer. No payment will be made for visits to the work site in relation to errors and omissions made by the Consultant or to insufficient data in work previously submitted by the Consultant.***
>
> Source: ***Standardized Scope***…, Apr. 2008, p. 41 of 42.

Design Consultant Evaluation

MassHighway has established a separate process for design consultant performance evaluation. This process was developed in 1997 in cooperation with the engineering consultant community via the MHD / ACEC Partnership Performance Evaluation Task Force (***Improving the Quality***… May 1997). It was implemented by MassHighway in 1998 (***Consultant Performance Evaluation*** Mar. 1998). The process involves documenting performance and providing feedback to the design consultant as the design evolves, allowing correction of problems and improvements prior to completion of work. It also allows for input on designer's performance from several disciplines within MassHighway. This decentralization of input enables a more objective rating (rather than relying on a Project Manager's judgment alone), and strengthens the value of the review when considering the consultant's expertise for selection on future projects.

Performance evaluations are provided on forms that are completed, respectively, by managers in disciplines relevant to the project design: e.g., roadway, bridge, traffic, environmental, and other (encompassing geotechnical, hydraulics, landscaping, and right-of-way). The Project Manager also completes a review based upon the consultant's performance in management and administration: e.g., responsiveness and cooperation, involvement of key personnel in engineering decisions, evidence of ingenuity and experience in design, performance at public hearings, and so forth.

All ratings are submitted on a numerical scale of zero to ten (0 = Unacceptable, Average = 5, 10 = Exceptional). Comments on each form explain the reasons for the numerical score. The ratings in each discipline above are consolidated on a summary form. Guidance is provided on weights to be used for each discipline, depending upon the composition of work in the particular project. Weights are also established for District versus Project Manager ratings; equal weights are given to each stage of design that is reviewed (25 percent submittal, 75-100 percent submittals, and PS&E submittal). The performance evaluations of the design consultants are transmitted to MassHighway's Architects and Engineers Review Board, where they are entered into a database for future use in consultant selection decisions. They are also provided to the design consultant.

MassHighway recently sponsored research to consider design consultant performance within a quality-based framework. While this approach has not yet been implemented, senior management within MassHighway are interested in the concept and considering ways in which this method might be applied in future updates of the consultant evaluation process. A description of the research is included in Appendix C.

New Jersey Department of Transportation

Policy/Guidelines

The E&O guidelines by the New Jersey Department of Transportation (NJDOT) apply to consultant designers and construction inspection consultants ("Potential Design Errors…,"

und.). The goal of the NJDOT process is "to reinforce Design accountability and recover additional project costs due to carelessness or negligence from Consultant Designers" (p. 1). The desired long-term outcomes are higher quality plans and contract documents and improved project delivery. Guidelines for the process include:

- Early communication to a designer of possible error, omissions, or other design issues;
- Minimization of potential costly project delays;
- Earliest possible engagement of the design consultant in identifying a problem solution that resolves design-related issues and mitigates potential damages; and
- Recognition of the opportunity to develop a fair, working partnership between NJDOT and the design consultant.

Process/Procedures

The NJDOT E&O process encompasses design work by NJDOT employees as well as consultant professionals. The following descriptions focus on consultant-prepared designs. The process entails comprises several steps, summarized as follows ("Potential Design Errors…," und., p. 1):

- Discovery. NJDOT becomes aware of a potential design issue either through identification by Department staff or notification received from the construction contractor. NJDOT's Capital Program Management (CPM) office works with the Deputy Attorney General to determine if any presumed additional costs associated with the errors and omissions may be recoverable.
- Notification. The consultant is formally notified of a potential E&O issue through a notification letter sent as soon as possible after discovery. The Department has several "potential E&O" letters, with criteria on their appropriate use.
- Investigation and Verification. NJDOT will communicate with the consultant regarding the E&O issue. The Department will consider the consultant's response as part of its investigation of whether there was an error or omission and if so, what costs are recoverable. The consultant may avail itself of several steps to defend itself, mitigate the E&O issue, or settle the cost-recovery claim.
- Negotiation. Several meeting and negotiation "steps" may be offered to a consultant to seek agreement to a settlement and cost recovery.
- Recovery and Collection. A settlement may entail a formal agreement with releases. Collection procedures are covered in detail in a separate NJDOT document.
- Tracking and Reporting. NJDOT has a newly developed Project Reporting System to track and report the status of an E&O issue. The NJDOT Project Manager is responsible for entering status tracking data.

- Training and Evaluation. NJDOT's Program Management Office will assist in training Department personnel and evaluating E&O procedures.

NJDOT's analysis of recoverable costs may consider the estimated administrative costs to the Department to pursue a claim. These administrative costs could include the labor hours of NJDOT personnel in, for example, Construction, Project Management, Claims Section, Administration senior management, and Accounting, as well as time by the Deputy Attorney General. If the projected claim amount is less than these administrative costs, it may be in the Department's interest not to pursue damages. Other factors may also be taken into account "that may be more important to the Department from a legal or functional perspective than costs when determining if the Department needs to pursue damages from the designer. This should be decided on a case-by-case basis." ("Capital Program Management's…," und., p. 4)

If the consultant does not agree with NJDOT's determination of cost recovery and request for damages, more detailed written procedures govern. These procedures apply for the case where there is no claim from the construction contractor ("Capital Program Management's…," und.).

1. Negotiations Meeting. A meeting between NJDOT (Project Manager, Program Manager, and Resident Engineer) and the consultant designer attempts to resolve what NJDOT affirms is a design error or omission with recoverable costs.

2. CPM Design Issue Committee. If the Negotiations Meeting cannot resolve the issue (i.e., the consultant rejects the NJDOT Project Manager's or Program Manager's settlement demand), the dispute proceeds to a CPM Design Issue Committee review with the mutual consent of the NJDOT and the consultant. (The NJDOT Project Manager, Program Manager, and Director, Capital Project Management will discuss and may consult with the Deputy Attorney General before consenting to the meeting.) Membership of the CPM Design Issues Committee comprises three NJDOT managers selected by the Assistant Commissioner, Capital Program Management (the Program Manager of the affected project must be excluded from membership). The Assistant Commissioner will designate one of the three as chairperson. Additional, non-voting members may include the Deputy Attorney General, the Secretary of the Department Claims Committee, and a representative of the FHWA. The NJDOT will schedule the CPM Design Issue Committee meeting through the Secretary of the Department Claims Committee.

    - The NJDOT Project Manager and / or Program Manager will make a presentation to the Committee separately from the consultant designer. The consultant designer will make a presentation to the Committee separately from the NJDOT managers. After hearing these presentations, the CPM Design Issue Committee will meet in executive session to make a settlement determination. The Assistant Commissioner, CPM, must approve this determination before the design consultant is notified.

    - Within 60 days after the conclusion of the CPM Design Issue Committee meeting, the Secretary, Department Claims Committee, will notify the consultant in writing of the Design Issue Committee's settlement demand or determination.

- Within 30 days of receipt of this notification, the consultant will reply in writing with its acceptance or rejection of the settlement demand.

- If the dispute remains unresolved, the consultant may request to proceed to or accept a review by Non-Binding Mediation. The Secretary, Department Claims Committee, will discuss this request with the Director, Capital Project Management and the Assistant Commissioner, CPM, to determine if the NJDOT tentatively consents to Non-Binding Mediation. If so, the process moves to the next step. If not, other options below must be considered.

3. Non-Binding Mediation. If NJDOT tentatively agrees to Non-Binding Mediation, the consultant must satisfy the following steps:

   - Enter into a Non-Binding Mediation agreement.

   - Submit the names of six proposed mediators, including their biographies, fee schedules, and any past connections with NJDOT or the design consultant firm.

   - NJDOT will select a mediator from this list. If the Department rejects all six names, the consultant will be asked to submit four additional names. As an option by mutual agreement, the Department may also suggest a candidate's name. The selected mediator must be acceptable to both parties.

   Once the above steps are fulfilled, the Secretary, Department Claims Committee, will coordinate meeting scheduling for Non-Binding Mediation. The NJDOT Project Manager and / or Program Manager may be asked to make a presentation. The consultant will also be afforded the opportunity to make a presentation. If an agreement is reached through the mediator, it will be forwarded to the Department for approval.

4. Legal Action. If the above steps are unsuccessful in reaching an agreement, or if a consultant chooses not to participate in the process to defend its position, the Department reserves the right to settle the claim without the consultant's participation and continue to hold the consultant liable. The Deputy Attorney General may file a lawsuit against the consultant on behalf of the NJDOT to recover costs of the claim ("Selection Guidelines for Potential Design Error…," und.).

Design Quality Processes

NJDOT has implemented a design submission process involving quality assurance and quality control concepts. One of the objectives of this process is to identify design errors during the actual design, when they are more easily corrected, rather than at the end of the design phase. The benefits of this process are expected to be an improved design, improved design submissions, and potential savings in time during the design and construction project phases ("Design Submission Procedure," und., p. 45). NJDOT has also developed detailed constructibility checklists for preliminary and final design submissions (e.g., "Final Design Submission Quality Checklist," und.).

Design Consultant Evaluation

NJDOT has developed a Consultant Evaluation System (CES) to provide objective, consistent measures for assessing consultant performance. Consultant ratings allow the Department to recognize good work, provide reference data for in consultant selection in future projects, and give feedback to consultants as an opportunity to improve performance where needed. Evaluations are made for different work disciplines. The work discipline of interest in this study is ***design***. Others include planning, construction inspection, structural evaluation and bridge management, maintenance, and others, depending upon the particular services that have been contracted. Each work discipline is evaluated in three categories: Schedule, Quality, and Project Management. The Quality evaluation is relevant to design errors and omissions. Within each work discipline and category, ratings range from unacceptable performance (=1) to outstanding performance (=5).

Design consultants are evaluated at six-month intervals until construction is 70 to 90 percent complete. These 6-month evaluations cover scope development, preliminary design, final design, and, once construction has begun, construction engineering and construction support. When construction has progressed to near-completion and following the 70-90 percent-construction-complete meeting, a design consultant will also be rated on the overall quality and constructibility of the design.

The specific rating criteria for the design-phase Quality category are shown in Table 3-6, illustrating the strong dependence of consultant performance on its track record with respect to errors and omissions. These ratings are appropriate to design phase submissions: the goal is that "work submitted should not require changes due to inaccuracies in technical presentation or consultant errors or omissions. Corrective work should not require repeated resubmissions to the Department" (***Consultant Evaluation System Manual*** Feb. 25, 2005, p. 8).

Table 3-6. Design consultant evaluation criteria for quality in the design phase, New Jersey DOT.

Numeric Rating	Performance Criterion for QUALITY
5	Changes were required for clarity of document presentation only. There were no technical errors and omissions that influenced the quality of the work.
4	There were documented errors and omissions that were corrected upon notification. A resubmission was not required.
3	There were documented errors and omissions. One resubmission, free of inaccuracies, was required to correct the work.

Numeric Rating	Performance Criterion for QUALITY
2	There were documented errors and omissions. Two resubmissions were required to correct the work.
1	There were documented errors and omissions after three resubmissions of the work and / or reassignment of work by the Department was required.

Source: ***Consultant Evaluation System Manual*** Feb. 25, 2005, p. 8

A second set of evaluation criteria is presented in Table 3-7, appropriate to the construction phase. These Quality evaluations continue to be performed every 6 months until construction is nearly complete. The evaluations reflect project experience with respect to deviations in accepted quality-control standards that are noted during construction. The design consultant will be notified of such deviations, as well as whether the deviations are significant enough to cause the agency to incur additional costs that would not have occurred had the design documents been accurate. Examples of deviations that trigger notifications include incorrect quantities, missing pay items, survey busts, incorrect elevations, geometric errors, inconsistencies between plans and specifications, change-of-plan errors, and incorrect specifications (***Consultant Evaluation System Manual*** Feb. 25, 2005, p. 10).

Table 3-7. Design consultant evaluation criteria for quality in the construction phase, New Jersey DOT.

Numerical Rating	Performance Criterion for QUALITY
5	There were no notification deficiencies issued this rating period.
4	There was 1 affirmed notification deficiency issued this rating period.
3	There were 2 affirmed notification deficiencies issued this rating period.
2	There were 3-5 affirmed notification deficiencies issued this rating period.
1	There were more than 5 affirmed notification deficiencies issued this rating period.

Source: ***Consultant Evaluation System Manual*** Feb. 25, 2005, p. 10

A third set of criteria is presented in Table 3-8, appropriate to the near-completion of the construction phase and reflecting overall project experience with respect to the constructibility of the design and related impacts of errors and omissions. This evaluation for Quality is made after the 70-90%-construction-complete meeting. The errors and omissions that are considered in this Overall-Quality rating must be only those:

- that result in a legal settlement where the designer has a financial component;
- for which the designer has accepted liability;
- for which a change order has been executed that the Project Manager has signed and indicated is due to consultant design error or omission;
- and by which, as a result of the error or omission, the Department has incurred additional costs that would not have been incurred had the contract document been correct (***Consultant Evaluation System Manual*** Feb. 25, 2005, p. 11).

Table 3-8. Design consultant evaluation criteria for overall quality -- constructibility, New Jersey DOT.

Numerical Rating	Performance Criterion for QUALITY
5	There were no or only minor design errors or omissions in the plans and / or specifications that did not significantly impact either project schedule or cost (cost impact less than 0.5 percent of the project cost; schedule impact less than 2 percent).
4	There were design errors or omissions in the plans and / or specifications, which impacted either the project schedule and / or cost. Cost impact less than 1 percent of the project cost; schedule impact less than 4 percent.
3	There were design errors or omissions in the plans and / or specifications, which impacted either the project schedule and / or cost. Cost impact less than 2 percent of the project cost; schedule impact less than 6 percent.
2	There were design errors or omissions in the plans and / or specifications, which impacted either the project schedule and / or cost. Cost impact less than 4 percent of the project cost; schedule impact less than 12 percent.
1	There were design errors or omissions in the plans and / or specifications, which impacted either the project schedule and / or cost. Cost impact greater than 6 percent of the project cost; schedule impact greater than 15 percent.

Source: ***Consultant Evaluation System Manual*** Feb. 25, 2005, p. 11

The methodology assembles the individual ratings for Quality, which are guided by Tables 3 through 5, together with corresponding ratings for the Schedule and Project Management categories, to produce a single overall Design rating. Weighted averaging is used to aggregate the individual ratings in the design phase and construction phase to the overall Design rating. Weighting factors are assigned to each of the categories to enable this calculation; these weights are not to be adjusted. In the design phase, Quality is assigned a category weight of 40%;

Schedule and Project Management are each assigned 30%, attaining the total of 100% across all categories. In the construction phase, Quality is assigned a category weight of 30%; Schedule, 60%; and Project Management, 10%. To compute the Overall Quality—Constructibility score after the 70-90%-construction-complete meeting, the category weight of Overall Quality--Constructibility is assigned a value of 100%, since it is counted effectively as three ratings (i.e., it is "over-weighted"). The Overall Quality—Constructibility evaluation is combined with the aggregate design-phase and construction-phase evaluations to produce a Final Design Project Average for the design consultant. Weighted scores can be computed in an analogous way for the other work disciplines (Planning, Maintenance, Structural Evaluation and Bridge Management, etc.). Examples of these calculations are given in the ***Consultant Evaluation System Manual.***

These evaluation ratings have consequential and procedural implications for the design consultant. For any rating lower than ***Satisfactory*** (< 3) during the project, the consultant may request a rating review, and the Department will schedule a debriefing. Long term, these evaluations will characterize the consultant's performance, and can affect future consultant prequalification and selection decisions. For the Design discipline specifically, the following weighted-average calculations of a consultant's ratings are maintained within the Department's system: the Final Design Project Average (a rating for each project), the Design Discipline Average (an average rating of all projects for which the consultant has performed the Design discipline), and a Consultant Overall Average (the average rating of all projects currently in the system for this consultant). For Design projects, ratings remain in the system for 2 years after completion of project construction.

New Mexico Department of Transportation

The New Mexico Department of Transportation (NMDOT) has recently produced draft manual of procedures to manage consultant services. This draft document, representing an update of procedures originally developed in 1991, was performed under the direction of the Consultant Management Unit of NMDOT's Context Sensitive Solutions Bureau. The manual includes a brief set of guidelines and provisions on errors and omissions (***Consultant Services***…, Apr. 2006).

Policy/Guidelines

The basic policy governing any dispute between NMDOT and a consultant professional is to resolve it at the lowest possible organizational level. If the dispute cannot be resolved directly with the Project Development Engineer (PDE) or another member of the NMDOT design team, the policy calls for bringing the matter to successively higher organizational echelons until a solution or settlement is reached. The Department's Claims Review Board is NMDOT's authority of last resort and will make the final decision on the issue if it cannot be resolved at lower levels. The organizational ladder within the Department for dispute resolution is as follows (***Consultant Services***…, Apr. 2006, p. 5-9):

- PDE or another member of the design team;

- Regional Design Manager;
- Context Sensitive Solutions Bureau Chief;
- Office of Infrastructure Chief Engineer; and
- Department's Claims Review Board.

Process/Procedures

The manual does not propose specific procedures to deal with design errors and omissions. Rather, it states the following responsibilities of the consultant design professional (***Consultant Services***…, Apr. 2006, pp. 5-6 and 5-7):

- The consultant has "total responsibility for the correctness, accuracy, quality control, and completeness" of all design documents that it produces, and is required to check these materials accordingly.
- If design E&O are not found by the consultant in its quality checks during design, and are not identified by NMDOT in its spot checks, "then the consultant will be responsible for any damages or delays resulting from the errors and omissions during construction." This responsibility will be exercised through the consultant's professional liability or errors-and-omissions insurance (see next section).
- NMDOT will provide only spot checks of design documents for conformity with NMDOT requirements, not more extensive checking of details. These spot checks do not lessen the responsibility of the consultant to ensure the correctness and accuracy of design, nor do they relieve any consultant responsibility for errors and omissions. Such defects in design are the "full responsibility of the consultant."
- Corrections in design defects "will be made by the consultant at no additional cost to the Department." Specific language will be included in each consultant design contract.

Insurance Requirements

Prior to execution of the contract, the consultant must show proof of insurance for errors and omissions of $1 million per claim and $1 million in the aggregate.

Design Consultant Evaluation

In the review of each project phase (preliminary engineering, final design, and construction completion), the PDE rates the consultant designer according to NMDOT's performance evaluation procedure (***Consultant Services***…, Apr. 2006, Chapter 7 and Appendix C). Evaluations provide feedback to the consultant and the Department, promoting greater quality

in the project and the highway program, and may be used in future consultant-selection decisions. The consultant is rated in the following elements and rating items, which vary somewhat by phase:

- Element I: Project Administration (same for both design phases):
  - — Communication
  - — Responsiveness
  - — Schedule Adherence
  - — Cooperation
  - — Coordination
- Element II: Project Activities, Preliminary Engineering:
  - — Alignment Study
  - — Location Survey and Mapping
  - — Preliminary Property Ownership Maps
  - — Traffic Studies
  - — Environmental Process and Docuemnts
  - — Utility Designation, Location and Mapping
  - — Drainage Reports
  - — Preliminary Roadway and Bridge Plans
  - — Preliminary Right-of-Way Needs
- Element II: Project Activities, Final Design:
  - — Partnering
  - — Public Relations
  - — Geotechnical Services
  - — Right-of-Way Design
  - — Final Design
  - — Visual and Aesthetic Design
  - — Environmental Folow-up
  - — Permitting

These items are rated using the following scale: E = Exceeds Expectations; G = Good, Above Average; S = Meets Expectations; NI = Needs Improvement; and U = Unsatisfactory. Ratings may be accompanied by explanatory remarks as needed.

Ratings of consultant designers for their performance during the construction phase are structured differently. Rather than using a scoring scale as described above, consultant ratings consist entirely of comments or remarks. Construction-phase ratings are organized in five parts:

- Part I. Pre-Construction Preparation. This part concerns preparatory activities and certifications that should be completed prior to construction. Among rating items are whether certifications are in place; utility identification to avoid conflicts; consultant-prepared specifications; environmental clearances; and consultant attendance at the preconstruction meeting.

- Part II. Construction Plan Sheets. This part concerns the quality of the final design products. Among items to be rated are quantity schedules, roadway template details, environmental commitments, various types of road engineering sheets, and NPDES.

- Part III. Major Quantity Changes. This part concerns the accuracy of project estimates. Among items to be considered in comparing actual quantities versus design estimates are earthwork, pavement, bridge and other structure work, specialty items, and changes resulting from survey information.

- Part IV. Contract Changes. This part calls for an evaluation of changes required during construction and the effects on actual construction cost as compared to the bid award amount. Several items describing potential causes of contract changes are listed. Among them are Plan Error and Plan Omission.

- Part V. Communication and Responsiveness. This part will be used to evaluate and improve communications among the Department, contractor, and design consultant. Various parties to these communications are listed for consideration: e.g., the Department, the FHWA, and the general public. Processes requiring communication and responsiveness are also included: e.g., partnering, environmental issues, and timeliness of consultant reviews of change orders and responsiveness to requests for information.

North Dakota Department of Transportation

Definitions

The North Dakota Department of Transportation (NDDOT) applies the following definition and provisions related to design E&O:

- ERRORS AND OMISSIONS: Deficiencies from the standard of care on the part of a design / construction engineering consultant in the performance of professional services under contract with NDDOT.

- The "standard of care," applied to the performance of consultant services for the NDDOT, shall be the "***duty to exercise the degree of learning and skill ordinarily possessed by a reputable design professional practicing in the same or similar locality and under similar circumstances*** ."

- An alleged error or omission will be considered "alleged" until either the consultant acknowledges, or the Errors and Omissions Review Board determines, that it is an error or omission.

Policy/Guidelines

While the NDDOT has the goal of complete, accurate, high-quality design documents, it recognizes that "professional services are based on reasoned judgment and that there is no one correct course of action." It also recognizes that each project is unique, and that latitude in the application of professional skill and experience to each project should be given. A standard of care thus is needed for an objective assessment of professional consultant services; this standard was discussed earlier with the definitions of terms. NDDOT may seek cost recovery if the design consultant does not meet the established standard of care ("Procedures for Pursuing… Aug. 2007).

Process/Procedures

Procedures are described in two steps: 1) Discovery, in which the alleged error or omission is identified a) prior to bid advertisement, b) after advertisement but prior to bid opening, c) after bid opening but prior to construction contract award, or d) after the construction contract is awarded; and 2) Resolution of Error, which details procedures for resolving the matter. This second stage assigns responsibility for the error or omission, determines the amount of the change-order cost that is attributable to the error or omission, and obtains the response of the consultant. The consultant may accept liability and resolve the matter. If the consultant does not, the matter is taken to the next administrative level. The final level of appeal is for the consultant to request a hearing before the Department's Errors and Omissions Review Board (EORB). If the EORB finds against the consultant and the consultant does not comply, the agency will process a claim against the consultant. The Department will consider further legal measures to recover costs from the consultant, subject to a final decision by the Director.

The EORB comprises four members plus a committee chair, with the following membership criteria ("Procedures for Pursuing…" Aug. 2007):

- The chair will be the Director of the Office of Project Development.

- Two members will represent NDDOT, appointed by the Deputy Director for Engineering.

- Two members will be from the American Council of Engineering Companies (ACEC), appointed by the ACEC Transportation Committee chair and co-chair after receiving notification from the Director, Office of Project Development. The two ACEC members

cannot be employees of the firm being reviewed, or anyone with direct involvement in the project itself or the project review preceding the EORB hearing.

- All members will be professional engineers.

Oregon Department of Transportation

Oregon Department of Transportation (ODOT) recently launched a new errors and omissions policy for use on contracts for A&E services (***Errors and Omissions***…, Oct. 2007). This policy applies to all projects with consultant-prepared plans and specifications and to consultants providing construction engineering, inspection, and contract administration services. ODOT has also launched a new quality-based evaluation of its design process. Both initiatives are described in the following sections.

Definitions

ODOT defines ***standard of care*** as follows:

> ***The Consultant shall perform all Services in accordance with the degree of skill and care ordinarily used by competent practitioners of the same professional discipline under similar circumstances, taking into consideration the contemporary state of the practice and the project conditions.***
>
> Source: ***Errors and Omissions***…, Oct. 2007, p. 9.

Apart from non-compliance with state laws and regulations (which would fall under the responsibility of the Oregon State Board of Examiners for Engineering and Land Surveying (OSBEELS)), design consultants could fail to meet the standard of care through defects in their work products (***Errors and Omissions***…, Oct. 2007, p. 8):

- Errors: plan or specification details or contract administration actions that are incorrect, conflicting, insufficient, or ambiguous.

- Omissions: cases in which the plans, specifications, or contract administration actions are silent on an issue that should otherwise be addressed in the documents.

Policy/Guidelines

ODOT's policy is founded on the principle of accountability to the laws and standards that govern professional engineering work performance. In addition to conforming to the tenets of OSBEELS, this principle calls for engineers to 1) have the technical competence to perform an assignment, and to limit professional practice to areas in which they are competent; 2) exercise appropriate care and professional judgment in their assignments, being knowledgeable of current industry practices and paying due attention to appropriate details; and 3) understand

current state-of-practice at the location of the project, and how that must be applied given the particular site conditions and other characteristics of the project. These legal duties constitute a ***standard of care***. ODOT has adopted a comprehensive programmatic approach to supporting accountability for meeting a standard of care including E&O policies and procedures, training on their purpose and implementation, a program to promote design quality, and methods to encourage compliance. This approach applies to both ODOT employees and consultant design professionals, but with different professional and financial implications (***Errors and Omissions***…, Oct. 2007).

ODOT explicitly notes that meeting a standard of care does not necessarily imply 100 percent confidence in an engineered design. It is technically and financially impractical to have literally complete knowledge of field conditions (e.g., consider subsurface data revealed by borings), and in some projects (e.g., rehabilitation of existing structures), more complete information on inaccessible components is not obtained until construction work is underway. Nonetheless, an engineer must rely continually on sound technical judgment, applying knowledge that is accumulated and reflected in manuals, design codes, policies, standard drawings, details and specifications. Uncertainty regarding field conditions or potential risk of failure can be mitigated through judicious applications of factors of safety, which are also an aspect of documented industry practice. Even in cases when ODOT may require use of specific directives and standards that are themselves part of "accepted documented industry practice," this does not relieve the consultant designer of the responsibility to check whether these requirements are reasonable and appropriate, and to notify ODOT if there is a problem (***Errors and Omissions***…, Oct. 2007, pp. 7-8).

ODOT's contract language (discussed below) holds design consultants accountable for the technical accuracy and quality of their work products. Recognizing that project designs are rarely perfect and that mistakes may or may not represent a failure to meet the standard of care, ODOT has developed a claims process to deal with E&O issues. The process was formalized in October 2007 following a period of internal and external review. Its purpose is to provide consultant design professionals with a clear, consistent, and systematic process in which E&O issues will be identified, evaluated, and resolved. The intent is to give priority first to resolving these issues quickly and collaboratively with the consultant, and second, to consider whether cost recovery is warranted. The policy objectives are as follows (***Errors and Omissions***…, Oct. 2007, p. 2):

- Identify E&O issues early and communicate them quickly to the consultant;
- Establish a common understanding between ODOT and the consulting community regarding the standard-of-care concept and how it is applied to errors-and-omissions policies and procedures;
- Establish a collaborative environment in which ODOT and the consultant work together to correct or mitigate the effects of the design problems on construction project quality, schedule, and cost; and
- Identify the additional costs due to the consultant's failure to meet the standard of care and provide restitution for these damages.

Process/Procedures

ODOT's process is consistent with its policy objectives in 1) seeking to identify E&O issues as early as possible at the project level, 2) communicating the problem to the design consultant and ` construction contractor immediately, 3) working with them to resolve the issue quickly to avoid future damage claims, and 4) keeping the project on track with respect to quality, schedule, and cost while preserving each party's right (with appropriate documentation) to press claims in the future if the standard of care has not been met. The process is as follows (***Errors and Omissions***…, Oct. 2007):

1. After the consultant has been notified of an E&O issue, the agency's Consultant Contract Administrator (CA) works with the consultant to try to resolve the issue. If it cannot be resolved at this level, the CA requests a Standard of Care Determination from the Chief Engineer.

2. The Chief Engineer has three options by which a Standard of Care Determination may be made:

   - The Chief Engineer reviews information provided by the CA and makes the determination herself / himself.

   - The Chief Engineer appoints a Technical Investigator (TI) to make a recommendation on whether the standard of care has been met.

   - The Chief Engineer appoints a TI to chair a Technical Review Committee (TRC) comprising at least three technical experts drawn from ODOT, the ACEC, or other body, all of whom have no connection to the issue at hand. The TRC reviews the terms of the contract, including statement of work, data provided by ODOT, consultant-supplied documentation and correspondence, work products, and applicable design standards. Both the consultant and the ODOT CA may present their views. The TRC recommends to the Chief Engineer whether the standard of care has been met.

3. In all three options above, the ODOT Chief Engineer makes the determination of standard of care. If it is determined that the standard of care has been met, all parties subsequently work together to correct, mitigate, and minimize the effects of the problem; ODOT will cover any additional costs. If it is determined that the standard of care has not been met, ODOT will pursue Cost Evaluation and Recovery.

4. In Cost Evaluation and Recovery, the additional costs for which the consultant designer may be responsible are referred to as Premium Costs. Premium Costs are defined by ODOT as:

   The additional costs incurred by the Agency… [that] result from the Consultant's failure to meet the standard of care. Premium Costs are dollar amounts for non-value added work. Premium costs are not reimbursed by the federal government on federal aid projects. Delays, inefficiencies, rework or extra work as shown below, caused by the Consultant's failure to meet

the standard of care, will be considered as non-value added work. Non-value added work can occur in three distinct situations:

a. Work delays or inefficiencies… [costs of which are paid to the construction contractor];

b. Rework [original cost of items that have to be removed plus the costs of removal]; and

c. Extra work [net difference between the final agreed-upon price paid to the contractor and the cost of the item had it been correctly included in the original bid package].

Source: ***Errors and Omissions***…, Oct. 2007, p. 5.

5. The Cost Evaluation and Recovery process proceeds as follows:

   - ODOT evaluates the cost recovery issue through the Agency CA with assistance from ODOT's TI or TRC as requested by the Chief Engineer. Included in this review are any potential mitigating circumstances: e.g., limitations on the consultant's scope of services or fee, time constraints on performing requested services, unforeseen or changed conditions, third-party requirements, the responsibilities and possible comparative fault of third parties, and other factors that may have affected the consultant's performance.

   - The ODOT CA will negotiate with the consultant to see if agreement can be reached on the degree of consultant responsibility for not meeting the standard of care and the resulting Premium Costs to be attributed to the consultant. If agreement can be reached, the issue is resolved. If not, the issue moves to consideration by the Chief Engineer.

   - The Chief Engineer or designee meets with the consultant and seeks resolution through one or more of these possible actions:

     — To negotiate a resolution with the consultant;

     — To agree to a non-binding presentation of the issue to a credible, neutral third party, and to share equally the cost of this process;

     — To try other methods of Alternative dispute Resolution that are agreeable to both parties; and

     — To escalate the matter to litigation.

6. ODOT allows several methods by which a consultant may satisfy its cost-recovery obligation:

   - Make a direct payment to ODOT;

   - Correct or re-perform the deficient services;

   - Forfeit payments for other services on other ODOT contracts;

   - Provide in-kind services at no cost to ODOT; and

   - Apply other methods that are acceptable to both parties.

7. The Agency CA or designee is responsible for documenting the contract file with relevant correspondences, notices, determinations, meeting notes, and statements of findings relating to the cost recovery issue and its outcome.

Contract Provisions and Insurance Requirements

ODOT's A&E agreements apply three contractual elements to establish consultant designer responsibility for errors and omissions: indemnity, insurance, and standard of care.

- Under clauses in ODOT contracts or price agreements with A&E consultants, the consultant agrees to indemnify ODOT and other groups within the state transportation hierarchy from actions and consequences arising out of professionally negligent acts, errors, or omissions of the consultant or its subcontractors.

- ODOT requires A&E consultants to maintain insurance in several categories, among them professional liability for negligent acts, errors, and omissions. There is not a single fixed requirement for per occurrence or cumulative coverage. Rather, ODOT selects appropriate limits for each contract, ranging from $100,000 to $2,000,000 per occurrence and from $100,000 to $2,000,000 in annual aggregate amount. Insurance requirements are contained in Exhibit C to the contract or price agreement.

- The standard of care expected of consultants is embedded in a contract clause, reproducing the wording presented above.

ODOT's contract language also embodies the E&O evaluation and claims process that is described above. These provisions are contained in Exhibit I ("eye") of the price agreement (May 2007).

These contract clauses and exhibits are available on ODOT's A&E consultant services website ("Professional Services…").

Design Quality Process

Oregon DOT is producing a guidebook to address project development based on quality assurance and quality control principles (***Project Development***…, u.d.). While this is a work in progress and details of the process remain to be completed, some basic elements are in place. The proper implementation of quality assurance (QA) principles – i.e., to enforce quality control standards in a process – seeks to improve product performance and usability while decreasing risks of errors and omissions. As ODOT states in its guide, "Quality assurance should function as a 'voice' for the customer who expects a certain level of quality to be provided" (***Project Development***…, u.d., p. 3).

The principles of the quality process now being developed include:

- To prevent errors from being introduced into project development.

- If errors occur, to ensure that they are detected and corrected as early as possible. Quality controls are therefore included in all phases of work.

- To eliminate the causes of errors as well as the errors themselves, thereby improving the overall project development process.

The Design QA program will define a set of objective standards for project review, consistent and fair methods of project selection for two types of reviews, Detailed and "Lite", and effective documentation and communication of information. Providers of project designs will be managed according to "standard application of expectations and how reliably these are met." The process will be implemented through multi-disciplinary review teams for the detailed analyses; "lite" teams will be smaller. Work plans for each review will be developed quarterly for projects to be reviewed that quarter. Reports will be in a standard format based on consistent, objective criteria to promote a cooperative effort among all parties in maintaining or improving quality.

Texas Department of Transportation

Policy/Guidelines

The Texas Department of Transportation (TxDOT) recently updated its policy on design consultant errors and omissions (Behrens, Aug. 2007). The policy calls for TxDOT to:

- Enforce consultant contracts to gain delivery of quality professional services, prudent use of public funds, and continuing cooperative business relationships with the consultant community.

- Devote the resources needed to negotiate clear and fair professional services contracts.

- Recognize that, even with the best of contracts and work performance, professional services may sometimes contain errors and omissions.

- Notify the consultant as a first step when errors and omissions are identified, and involve the consultant in efforts to resolve the issue.

- Ensure that, if a dispute arises under the contract regarding errors and omissions, TxDOT will seek to resolve the dispute in a way that provides the public the services for which it has paid while the consultant is treated with fairness and respect.

- Consider the totality of facts and factors surrounding the consultant's agreement, including the services required to be provided, consultant's overall performance, cost to TxDOT of consultant's services and of the apparent error or omission, and the value of the services provided.

- Give the consultant the opportunity to bring the issue to TxDOT's administration if an agreement could not be reached at lower levels, prior to looking to legal action to recover damages.

- Develop and apply guidelines and procedures for use by districts in handling claims due to apparent errors and omissions. These guidelines must include instructions for coding construction change orders to identify whether or not they are due to design errors and omissions, and if so, whether due to design work by a consultant professional or TxDOT employee. The procedures must also include a process for determining the resulting cost of the alleged error or omission. These guidelines and procedures may be updated from time to time as needed and in accordance with this policy.

This policy conforms to state law that was also passed in 2007, requiring agencies that engaged in cost recovery to observe the following elements in their procedures ("Texas Legislature…," Jun. 19, 2007):

- Notification of the affected design consultant when the error is discovered.

- The opportunity for the consultant to be involved in resolving the problem.

- Guidelines to distinguish errors and omissions from other possible reasons for a change order.

- A process for determining the cost attributable to the error or omission.

- An evaluation of the totality of the consultant's services.

- Consultant opportunity for internal appeal without a requirement for prepayment of the claim.

- A process for tracking the errors and omissions of in-house employees.

- Recognition that some errors are likely to occur in any project.

Process/Procedures

The procedures that respond to the above policy are described in a 2008 TxDOT document (***Consultant Errors & Omissions***…, Mar. 2008). Consultants are subject to these process requirements before, during, and after construction of the project that they have designed. Errors and omissions that are identified prior to construction will be corrected by the consultant at no additional cost to TxDOT. Errors and omissions that are discovered during or after construction may cause additional costs that TxDOT is entitled to claim as damages, in accordance with the stated process. TxDOT also has responsibilities under this process, and its responsibility to recover "appropriate costs" that are "clearly due" the Department is part of its engineering and construction contracting. It is incumbent upon TxDOT to identify and communicate consultant design errors and omissions and fairly evaluate consultant

responsibility for any additional cost. Judgment is needed at several points during this process, and good judgment is expected on the part of TxDOT personnel. "It is the responsibility of TxDOT staff to ensure that TxDOT's business practices are professional, fair, equitable, and reasonable" (***Consultant Errors & Omissions***…, Mar. 2008, p. 13).

1. Error and Omission Identification and Communication. TxDOT recognizes that errors and omissions can occur, even in the best of contracts. When these issues arise during construction, TxDOT must notify the consultant and provide the opportunity for the consultant to assist in addressing the issue. TxDOT will document all notifications sent to the consultant.

    - When practical, the consultant contract should extend through the project construction phase. The consultant should be involved in the pre-construction meeting.

    - If the contract is no longer active and an E&O-related problem occurs during construction, the consultant firm should still be contacted.

2. Error and Omission Correction. Consultants are expected to correct errors and omissions promptly without compensation. If there is a dispute regarding compensation, consultants must avail themselves of the disputes mechanism in their contract. They still must respond so as not to delay the project.

    - If a deficiency is noted during PS&E development, the TxDOT Design Project Manager (Design PM) will identify the error or omission, notify the consultant, and indicate what must be corrected at the consultant's expense. These communications should be documented for purposes of consultant evaluation and for the record in case of problems during construction.

    - If a problem occurs during construction, TxDOT Construction PMs will coordinate with construction contractors and design consultants as appropriate. There is no single procedure that can deal with all possibilities; judgment must be exercised by TxDOT staff. Districts should, however, strive for consistency in how their area offices deal with E&O issues.

    - TxDOT will notify the consultant of the apparent E&O and provide the opportunity to assist in addressing the problem. If the PS&E must be revised, the TxDOT Design PM will be consulted to determine if other factors should be accounted for in determining responsibility for the error or omission. Appropriate TxDOT staff will indicate what is to be revised at the consultant's expense. TxDOT will document these notifications.

    - It is important that TxDOT staff maintain good internal coordination and communication to avoid, for example, holding the consultant responsible for omission of a design item that TxDOT may have earlier directed the consultant to delete.

3. Change Orders. Change orders are tagged with a reason code identifying the cause of the modification. Five reason codes are related to design errors and omissions as described in

Table 3-9, based upon the responsible design organization and the impact of the errors or omissions on project cost, time, and need for rework.

Table 3-9. Types of design errors and omissions as reasons for change orders, Texas DOT.

Reason Code	Description
1A	Incorrect PS&E (TxDOT design): This code should be used when TxDOT prepared the PS&E and an error and / or omission is discovered, but there is no additional cost to the project, nor any contractor delay, rework, or inefficiencies.
1B	Incorrect PS&E (Consultant design): This code should be used when a Consultant prepared the PS&E and an error and / or omission is discovered, but there is no additional cost to TxDOT, nor any contractor delay, rework, or inefficiencies to the project.
1C	Other: This code should be used when there is an error and / or omission, (TxDOT or consultant) but the cause (all or partial) cannot be assigned to TxDOT or the consultant and other codes in this category are not appropriate. This code also applies if the PS&E were prepared by a third party: e.g., a donor or a local government. This code should not be used to avoid the process of pursuing the recovery of costs.
1D	Design error or omission that resulted in delay, rework, or inefficiencies (TxDOT design): This code should be used when TxDOT prepared the PS&E and an error and / or omission is discovered and additional cost, contractor delay, rework or inefficiencies occur on the project.
1E	Design error or omission that resulted in delay, rework, or inefficiencies (Consultant design): This code should be used when a consultant prepared the PS&E and an error and / or omission is discovered and additional cost to TxDOT or contractor delay, rework, or inefficiencies occur on the project.

Source: ***Consultant Errors and Omissions***…, Mar. 2008.

The explanations in Table 3-9 indicate that the critical code regarding consultant design responsibility for recoverable additional cost is 1E. Documentation supporting a change order that is coded 1E should show the estimated additional cost to be recovered, and any revisions to this estimate occurring after coordination with the consultant that reflect factors such as the following:

- The design scope of work, the level of services provided, design information provided to the consultant, and specific direction provided by TxDOT during design.

- The type of project, the need for assumptions when certain aspects of detailed design are not applicable, governing standards and specifications at the time of design work, and changes to TxDOT policy, standards, and specifications that occurred during design.

- Changes in site conditions after the project was let (e.g., new development), and decisions by TxDOT or the contractor to redesign, move, extend, or change a design item that could not have been reasonably anticipated by the consultant.

- The cost to TxDOT of the services provided and of the apparent error or omission, and the value of the services provided.

- The design consultant's overall performance.

- The construction contractor's use of project plans and its compliance with the contract by notifying TxDOT of a potential problem.

- Any other design issues that may have affected the PS&E.

If it has been determined that an apparent E&O may result in a change order, TxDOT must notify the consultant, give that firm an opportunity to address the matter, and document these communications. Needed revisions to the PS&E would be handled as described earlier. The amount of the recoverable cost is that which would not have been incurred had the plans been correct. Costs that would have been incurred even if the plans had been correct are not recoverable, since they would have been part of a correctly designed project anyway. The cost to be recovered should be based on actual cost to TxDOT as reflected in the change order. Engineering and contingency (E&C) costs are not to be included in cost recovery. The consultant must reimburse these costs in cash; in-kind services by the consultant are not acceptable as payment.

More detailed procedures on cost recovery are specified in other sections of these guidelines, covering the timing of cost recovery (when to request payment from the consultant), the timing, content, disposition, and documentation of communications between TxDOT and the consultant, and further actions to pursue. A certified initial notification letter signed by the District Engineer or the Design Division Director will be sent to the consultant describing the alleged errors and omissions, related additional costs, and references to pertinent prior events. The consultant will be asked to respond within 30 days. Through this exchange of letters, TxDOT and the consultant may come to agreement, in which case there are further procedures for remitting payment to the Department. If agreement cannot be reached, the consultant and TxDOT have the options described in sections below.

4. Consultant Request for Consideration by TxDOT Administration. If the consultant is not able to reach agreement with TxDOT at the district level, it may request consideration by TxDOT Administration (central office). Information on the issue and disagreement between the two parties will be submitted via the Design Division Director to the Assistant Executive Director of Engineering Operations. The district will contact the Design Division – Consultant Contract Office (DES-CCO) to provide a full copy of the initial notification letter

and the consultant's response explaining its disagreement. DES-CCO will work with the TxDOT district on additional steps to pursue or information that is needed, as requested by the Design Division Director.

The process recognizes this consideration by TxDOT Administration as an opportunity to review the E&O disagreement outside the district. Further steps that may be taken depend upon the size and extent of the issues involved. For example:

- Minor issues might be addressed solely through submittal by the consultant of additional information and its review by the Design Division Director.
- Issues of moderate difficulty might entail a teleconference among the Design Division Director, district staff, and consultant representatives.
- Issues of larger or more complex difficulty might require one or more meetings between the TxDOT district and the consultant.

5. Result of TxDOT Administration Review. With the additional information developed through this Administration review, the Design Division Director will submit a summary and recommendation to the Assistant Executive Director of Engineering Operations for review and decision. DES-CCO will notify the consultant of the Assistant Executive Director's decision, with a copy to the district. The letter will require the consultant's response within 30 days and provide instructions for remitting payment. If the consultant does submit payment, it is credited according to the procedural guidelines as a refund of expense on the affected construction project. If the consultant does not make payment, TxDOT may consider legal action.

6. Legal Action. If litigation is the only remaining recourse, TxDOT will work with the State Attorney General's Office. The statute of limitations is four years from the time the consultant contract terminates. The Attorney General must file suit against the consultant within this four-year window for recovery of costs.

7. Release and Settlement Agreement. If the consultant and TxDOT have agreed upon payment of damages, the consultant has the option of requesting a Release and Settlement Agreement. TxDOT will process the agreement through its Contract Services Section and execute it upon receipt of the consultant's payment.

Contract Provisions

Contract provisions that address errors and omissions in project design are contained in Attachment A, General Provisions, of TxDOT's contract for engineering services ("Contract for Engineering Services," Apr. 2008). Relevant requirements are paraphrased as follows, identified by the appropriate contractual article and paragraph. The term "Engineer" refers below to the design consultant and its agents and employees.

- The Engineer is responsible for the accuracy of its work and shall promptly correct or revise matters resulting from error, omission, or negligent act of the Engineer. [18.A]

- When required by TxDOT, the Engineer shall correct errors or omissions at no additional compensation. [5.C]

- The Engineer's responsibility for all questions that arise from design errors or omissions will be determined by TxDOT in accordance with its Errors and Omissions Policy. The Engineer will not be relieved of responsibility for subsequent correction of errors and omissions or for clarification of any ambiguities until after the project construction phase has been completed. [18.B]

- The Engineer shall indemnify the State and its officers and employees from claims and liability that are caused by the Engineer's error, omission, or negligent act. [17.A]

Article 20 of the General Provisions requires certification of insurance required by TxDOT. Insurance requirements include Workers' Compensation, Comprehensive General Liability, Comprehensive Automobile Liability, and an Umbrella Policy if applicable, but not Professional Liability or E&O Insurance ("Certificate of Insurance," Jan. 2008). Discussions with the TxDOT Contract Services Section clarified that TxDOT regards errors and omissions in consultant-prepared designs as a matter of breach of contract rather than one of professional malpractice. Its focus is on obtaining services from engineers that perform at a higher level of quality than the threshold reflected in a standard of "gross negligence," and engages in a pre-certification process to ensure this higher professional quality. As a result, the Department does not require E&O insurance coverage, although it recognizes that consultants may routinely have such insurance. Having said all this, the occurrence of litigation to resolve an E&O issue is rare in TxDOT's experience. Many design defects are corrected in the design phase, and those that occur during construction are typically resolved before legal action becomes necessary.

Design Consultant Evaluation

TxDOT now has a web-based consultant evaluation system that inputs rating data directly into the Department's Consultant Contract Information System ("CCO-15…," Jul. 2007). These evaluation data have two purposes: to provide a tool for feedback to consultants on their performance, and long-term as a reference for consultant selection on future projects. Evaluations of the consultant project manager and the consultant firm (the "prime provider") are completed at least annually by the TxDOT project manager, in consultation with other TxDOT staff involved in the project. TxDOT and the consultant may agree to alternate evaluation schedules: e.g., at the completion of each milestone if that is felt to provide more helpful and timely information, or if problems exist that need to be assessed more frequently than annually. A built-in scoring algorithm assigns a base score to each evaluation criterion, and additive, deductive, or neutral adjustments to the base score that reflect the evaluator's rating of consultant performance for that criterion. The consultant project manager is evaluated based on eleven criteria, and the consultant firm on three criteria, as follows ("CCO-15…," Apr. 2005):

- Consultant project manager: accuracy and completeness of deliverables, deliverable presentation and format, schedule management, responsiveness to review comments, level of TxDOT oversight needed, project manager's responsiveness and availability, coordination and communication, reliability and responsibility, subconsultant management, handling of scope changes and supplemental work estimates, and contract administration.

- Consultant firm: responsiveness to TxDOT needs, resource management, and quality and timeliness of invoicing.

Washington State Department of Transportation

The Washington State Department of Transportation (WSDOT) has recently developed procedures for evaluating errors and omissions and determining whether cost recovery is warranted. In collaboration with the ACEC of Washington, it has also established a process for evaluating the performance of design consultant professionals.

Process/Procedures

WSDOT describes its approach to handling consultant-design errors and omissions in Chapter 15 of its Consultant Procedures Manual (***Consultant Programs***…, 2007). The process comprises the following steps:

1. WSDOT identifies design error. When a possible consultant design error is identified, the WSDOT Project Manager notifies his or her supervisor and the Area Consultant Liaison (ACL). (ACLs are WSDOT staff resources for use by WSDOT personnel in headquarters, regional offices, and division offices on a variety of consultant-related matters: e.g., advertising for services, appropriate types of agreements for particular tasks, negotiations, consultant selection, task order procedures, and so forth. ACLs also serve the consultant community as a point of contact to identify upcoming leads, respond to questions, provide information, clarify scopes of work, and so forth.)

2. ACL meets with WSDOT managers. The ACL meets with the WSDOT Project Manager and appropriate Executive to discuss the alleged design errors and their possible implications. The Project Manager will be asked to submit more detailed information: e.g., descriptions of work performed, data on labor, equipment, and materials used, records of project decisions, and so forth.

3. ACL contacts consultant. After WSDOT has discussed further action, the ACL contacts the consultant design professional to schedule an initial meeting. The ACL, Executive representative, and Project Manager represent WSDOT. The consultant should be represented by its project manager and other personnel, including subconsultants, as appropriate.

4. Project team resolves alleged consultant design error. Following the meeting with the consultant, there are the following possible outcomes:

- Mutual agreement: No consultant design errors occurred. If this outcome is reached, no further action is needed.

- Mutual agreement: Design error(s) did occur. If this outcome is reached, the WSDOT Executive will assist the ACL or Project Manager in negotiating a settlement with the consultant. Settlement may be in terms of payment to WSDOT, or a cost reduction in the consultant agreement wherein the errors or omissions occurred. Once the settlement is reached and implemented, no further action is needed.

- No mutual agreement. The consultant may request further review by the Director of the Environmental & Engineering Programs Division. The ACL notifies the Division Director. Proceed to Step5.

5. Director assembles Review Committee. The Director, Environmental & Engineering Programs Division, takes several actions following notification by the ACL:

   - Reviews the available information to determine whether WSDOT will request reimbursement of the legally recoverable costs due to the design error(s).

   - If necessary, consults with the Attorney General's Office.

   - Makes a determination of further action:

     — If no further action is needed, the Division Director so informs the WSDOT Executive, ACL, and Project Manager in writing. The ACL informs the consultant designer. No further action is needed.

     — If further action is warranted – i.e., to seek reimbursement (cost recovery) from the consultant -- the Division Director will organize a Review Committee to review and assess the matter further. The Review Committee will comprise the Director, Environmental & Engineering Programs Division; the WSDOT Executive that is assigned to this project; the State Construction Engineer; a representative of the Consulting Engineers Council of Washington (CECW), American Institute of Architects (AIA), Society of Naval Architects and Marine Engineers (SNAME), or other organizations as appropriate for the project; and a representative of the FHWA, Federal Railroad Administration (FRA), U.S. Coast Guard, or others federal agencies as appropriate for the project.

6. Review Committee makes determination. WSDOT and the consultant make separate presentations to the Review Committee to state their case. The Division Director leads the Review Committee in its consideration of potential consultant negligence, which will be based on "commonly accepted industry-wide professional standards." The Review Committee faces several possible courses of action:

   - If it finds that the consultant was not responsible for negligent design error(s), it will so notify the Executive, ACL, Project Manager, and consultant in writing.

- If it finds consultant responsibility and recommends cost recovery, the Committee will determine the amount and notify the Division Director and the consultant in writing, including options for repayment or appeal. The Committee will lead all settlement negotiations with the consultant. When the consultant follows through on the agreed method of repayment, WSDOT will release it from further liability.

- If the consultant requests an appeal of the Review Committee's decision, the Committee will so notify the Director, Environmental & Engineering Division in writing and provide the file containing information on this errors-and-omissions case and decisions to date. The Committee will notify the consultant in writing of WSDOT actions taken on the appeal. This process continues with Step 7.

- If the consultant does not request an appeal but refuses to pay the settlement amount, the Review Committee will take up the matter in writing with either the Office of Attorney General if legal action is contemplated, or the WSDOT Comptroller to withhold payments due the consultant. WSDOT's ***Procedures Manual*** describes criteria for selecting which of these actions is appropriate (***Consultant Programs***…, 2007, p. 44).

7. Consultant requests appeal of Committee's decision. Following the consultant's request of appeal, the Director, Environmental & Engineering Programs Division will establish a three-member Appeal Committee comprising the Division Director; a representative of CECW, AIA, or SNAME; and a third member selected collectively by the first two members. The Division Director will lead the Appeal Committee in its deliberations of whether the consultant was negligent according to "commonly accepted industry-wide professional standards." The Division Director will keep the consultant and the Review Committee informed in writing of the recommendation by the Appeal Committee. While WSDOT and the consultant should carefully consider the Appeal Committee's recommendation, it is not binding. Either party may appeal a recommendation to the Appeal Committee for reconsideration. If the Committee's recommendation is finally that the consultant is responsible for negligent design error(s), the process returns to the actions in Step 6. If the Appeal Committee's recommendation does not lead to resolution, all records and written recommendations will be admissible in any subsequent litigation.

8. In the event of consultant lawsuit. If the consultant files a lawsuit in this matter, all actions by WSDOT under the Procedures Manual stop. The matter is turned over to the Office of Attorney General for further action.

Design Consultant and WSDOT (Client) Evaluation

WSDOT has prepared a draft version of guidance to its Project Office, WSDOT Regions, and other staff that will promote uniform standards and procedures in evaluating the performance of consultant design professionals (***Consultant/ WSDOT Performance***…, Aug. 2007). This Manual also describes a process for consultant evaluation of WSDOT as a client, but that aspect of the evaluation process is not discussed here. The evaluation forms consider several components of consultant design services. Each is evaluated using the same general qualitative scale, which is translated to a numerical value for aggregating and averaging ratings.

The rating scale for consultant services evaluation consists of three levels of performance summarized as follows (***Consultant/ WSDOT Performance***…, Aug. 2007, pp. 5):

- Above Standard. The consultant demonstrates leadership in terms of helping define work direction, requiring little agency monitoring relative to project size and complexity, and exercising proactive project management. Performance exceeds requirements or expectations in at least some work elements, and the consultant responds well to feedback. The consultant exercises sound engineering judgment, and the quality of the work product often exceeds expectations. Agency coordination and public involvement are timely and well done. Evaluation of alternative solutions is often innovative. Work progress is ahead of schedule and / or cost is below budget. (Numerical rating = 3.)

- Standard. The consultant follows direction and requires routine monitoring relative to project size and complexity. Performance meets requirements and expectations in all work elements, and the consultant generally accepts feedback well. The work product routinely meets expectations, and agency coordination and public involvement are adequate. The consultant employs good engineering and management practices. Evaluation of alternative solutions is adequate. Work is generally completed on time and on budget. (Numerical rating = 2.)

- Below Standard. The consultant often does not follow direction and may require close monitoring relative to project size and complexity, as well as possibly requiring a high degree of monitoring to complete the work. Performance fails to meet requirements and expectations in at least one work element, and the consultant may not accept feedback well. The work product may have errors or omissions. The consultant needs a plan for improvement to qualify for additional projects. (Numerical rating = 1.)

These evaluation guidelines are used to grade several performance criteria on the consultant evaluation form. The criteria include Negotiations, Cost and Budget, Schedule, Technical Quality, Communications, and Management. Each criterion consists of sub-criteria that provide additional detail in the evaluation. The sub-criteria are evaluated on the same rating scale that is described above, with specifics tailored to each criterion and sub-criterion. As an example, the Technical Quality criterion defines a standard level of performance as follows:

> Technical Quality: ***The products delivered meet the standards agreed to in the scope of work, established by WSDOT, or the industry standard. Professional documents have had the appropriate review and are appropriately signed and/or stamped by the Consultant. The documents are complete when submitted for interim reviews, or final submittals.***
>
> Source: ***Consultant/ WSDOT Performance***…, Aug. 2007, pp. 10-11.

This criterion describes work that meets the "standard" level of performance. "Above standard" performance would exceed the accomplishments above; "below standard" performance would fail to meet the level of accomplishments above. Within the Technical Quality criterion, sub-criteria typically include the following:

- Work products meet professional standards of practice / Submittals are complete;

- Performed appropriate quality control;
- Responds to review comments in subsequent submission;
- Sought opportunities to incorporate innovative solutions;
- Delivered electronic files as defined in Contract Agreement; and
- Implemented procedures to control design and construction costs.

Additional sub-criteria may be defined to reflect particular performance expectations needed on specific projects or contracts. Sub-criteria are rated according to the same three-level performance scale described above. The overall score of each criterion is the average of the scores for the respective sub-criteria. The total performance score of the evaluation is the average of the scores across the six criteria.

In addition to assigning one of the three performance-level ratings, evaluators must also supply explanatory narrative comments. Narrative comments should be based on the project record, including documented conversations, letters, and formal actions such as contract changes. General comments or summary statements should accompany the average ratings that are given for the six criteria. More detailed comments amplify the sub-criteria ratings. Source documentation for detailed comments should be cited adequately so that justification can be readily provided to address appeals, litigation, further investigations, or other needs. Ratings should be supported by several examples rather than a single instance, and should reflect performance over the duration of the reported period. Comments must be based on facts, not unsubstantiated opinion. Narrative justification must accompany positive (above-standard) as well as neutral or negative ratings to avoid possible accusations of favoritism. Above-standard ratings that are not adequately justified and documented will be adjusted to a maximum "standard" rating when reviewed by WSDOT Headquarters, with notification of the change to the consultant.

Consultant evaluations are completed by the WSDOT Project Manager and the Area Consultant Liaison. Each recommends whether the consultant passes or fails based upon the criteria evaluations and comments. These results are reviewed and signed off by the WSDOT Executive with responsibility for the project and filed with the Consultant Services Office. "Pass" indicates that the consultant has met the performance expectations on the project and is recommended to continue receiving contracts from WSDOT. "Fail" indicates that the consultant has not met performance expectations and is not recommended for further WSDOT contracts until it takes corrective action, usually through a corrective action plan. A corrective action plan is required when the average rating for any of the six criteria is below standard. The plan describes how the consultant will correct or has corrected the noted deficiency, how performance will be improved, and how the consultant will monitor future performance. The WSDOT Consultant Services Office and Area Consultant Liaison must agree that the plan will address the problem, and so advise the consultant in writing, before the consultant can be eligible to receive further WSDOT contracts.

Consultant evaluations occur at several points in a project: 1) interim reports are prepared during the life of a project at defined times and events, but in no case encompassing a period longer than one year; 2) a final report is prepared at project completion or immediately after a contract is terminated, encompassing the total duration of the project including those periods that were addressed in interim reports; and 3) a special report is prepared for a non-scheduled evaluation: e.g., to facilitate a counseling session, or when requested by the consultant or WSDOT. A special report will not be referenced in a final report.

CHAPTER 4

PERSPECTIVES OF PRIVATE SECTOR PARTICIPANTS

AMERICAN PLANNING ASSOCIATION

The American Planning Association (APA) has issued guidance for planning agencies and officials when acquiring professional planning services that may also require engineering services. The part of this guidance that deals with legal considerations and insurance addresses the problems of engineering errors and omissions ("Part 4. Legal Considerations…" Feb. 1993). Relevant guidelines to planning agencies and officials include the following:

- When a planning office contracts for services with a team of experts, it may be prudent to contract with firms individually rather than through a prime consultant who then contracts with subconsultants if there is a possibility of malpractice by a licensed professional (e.g., design errors and omissions by a licensed engineer). Cost recovery for damages due to errors and omissions, as well as the structuring of malpractice insurance among team members, may be within a legally a more tenable framework if the planning office has a direct contractual relationship with the engineering firm allegedly responsible for the error or omission.

- More typically, a planning office providing "planning" advice is essentially advising on policy, and it would be difficult to prove that a planner is "wrong" in providing this type of advice. In this situation, the planning office may be better to contract with the team overall, and generally would not require malpractice (or "errors and omissions" or "professional liability") insurance coverage.

- Such insurance would be prudent (and effectively necessitated by professional licensing requirements) if the specified planning work also requires "signed or sealed drawings" or "specifications of a design, engineering, or scientific nature" (p. 5). Such coverage should be considered when architects, engineers, and landscape architects are engaged for services.

AMERICAN COUNCIL OF ENGINEERING COMPANIES

Managing Clients' Expectations of Perfection

The ACEC has prepared a document suggesting guidelines for consulting design engineers dealing with clients whose expectations of design documents may lean toward perfection ("Client Expectations…" Aug. 2005). This document focuses on clients who contractually 1) establish and enforce an "unreasonably high" standard of care, 2) insist on indemnification of the client for "anything connected with design services," or 3) require "any and all 'deficiencies' be corrected at no cost to the client" (p. 1). Underlying this focus is the premise by the ACEC that there is a difference between the occurrence of "errors and omissions" and "negligence," and that this distinction is sometimes lost among certain clients who believe that design plans and specifications must be completely without defect: i.e., perfect. An expectation of perfection may lead to distortions in the relationship between owner-agency client and the design consultant: e.g., by the clients' viewing of design consultants as a source of cost recovery on projects that a) have exceeded their budget, b) have experienced changed conditions, or c) have engaged a contractor that submits "frivolous or weak change orders" to gain additional payment; by owners' insisting that design consultants fix or pay for design deficiencies "to the client's satisfaction" (without reference to a normal or accepted standard of care); and by viewing any defect in plans and specifications as an indication of negligence, regardless of actual cause. The guidelines point to several instances in which the distinction between "errors and omissions" and "negligence" may be blurred, and errors and omissions occur without necessarily negligence on the part of the consultant designer (pp. 1-2):

- Using inaccurate or incomplete data that are provided by others, which design professionals would normally have a right to rely on.
- Working with a scope of services that has been reduced by the client specifically to save money, in a situation where a more complete scope could have prevented or mitigated the cost of the design defect.
- Encountering changed site conditions during construction that were not detected through normal investigations during design.
- Experiencing changes in the ownership structure of the facility that introduced new parties and new expectations into the project.
- Encountering changes in codes or standards during design, which result in design changes.
- Receiving interpretations from officials and inspectors that may differ from previous interpretations.
- Contractors or owners misinterpreting design documents or missing some elements required in construction.

The guidelines also cite contracting language that may be viewed as unreasonable (source agency not provided):

> ***… The Engineer is responsible for damages caused by its errors and omissions. Errors and omissions include any item that is incorrect in or missing from the construction documents or any actual quantity that is 10% or more above the amount shown in the construction documents.***

This language is in the view of ACEC objectionable because the 10% variance is arbitrary and unreasonable in many situations – the proper standard should be ***negligence*** rather than the magnitude of the resulting variance. The ACEC document also cites examples where public agencies have contacted their peers and adopted (or adapted) E&O provisions that, again, are not reasonable embodiments of a standard-of-care concept. Examples of resulting agency policies or rules that have been established in this way include the following (p. 2; again, source agencies not provided):

- Design professionals will be held accountable for errors and omissions that exceed 1% of construction cost or $10,000, whichever is less.
- Design professionals are required to pay for all additional costs caused by "any" error or omission.
- The standard of care that is required is beyond the normal negligence standard.
- Various studies are underway to develop and implement procedures to recover cost from design professionals on same basis other than professional negligence.
- Invoices are sent to design professionals to pay for construction cost increases – after the fact, with no justification to do so, and with no involvement of the design professional in resolving the problem or settling the claim between the client and the construction contractor.
- Payment is withheld pending resolution of a potential claim.
- Design professionals are required to correct "any" deficiency, without further compensation, when the agency determines ***at its sole discretion*** that the services are "unacceptable."

The document concludes with a number of recommendations to improve processes, organizational strengths, and designer-client relationships. These will be developed further in subsequent tasks.

The Cost of Perfection in Public Works Projects

In a second paper the ACEC has explored the cost of seeking perfection in public works projects (***The Cost of Perfection***… Apr. 20, 2006). This issue has implications for consultant design professionals in terms of a perceived shift in risk by the owner toward the designer to try to

achieve this perfection. The ACEC notes that engineering design services are not a commodity and should not be procured in that way with the assumption of a "money-back guaranty." Rather, a collaborative team approach will produce the best design result when respective team members that are "best able to influence, manage, and mitigate a risk are contractually responsible" for assuming that risk (p. 2).

The ACEC proposes that the contributions of the design professional to this team effort should be understood in the context of an economic approach to quality. Increasing quality will cost more, but costs associated with defects in services will be lowered as the result of higher quality. A cost-minimization process therefore exists, and the appropriate level of design quality can be seen as that level that minimizes total costs – i.e., the costs of providing that level of quality plus the total cost attributable to defects in services that may exist at that level of quality. Trying to increase design quality beyond this minimum-total-cost level will result in a rapidly increasing cost to provide the services without commensurate benefit in terms of reduced cost of defects.

Achieving this minimum total cost of design services and an optimal allocation of risk can be promoted, in the opinion of the ACEC, with a collaborative team relationship in which the design consultant is viewed as a "trusted advisor" to the owner. There are a number of initiatives that an owner can take to promote teamwork in this way. Among these steps suggested for implementation by owners are the following (***The Cost of Perfection***… Apr. 20, 2006, p. 7):

- To engage in meaningful negotiations to produce a contract that allows project issues to be properly addressed and that allocates risks fairly among the parties.

- To discuss candidly with the design professional the owner's expectations of the design documents, recognizing that no design is perfect, and to review the management processes during design and construction that will be used to identify and correct problems when they arise.

- To educate owner's project representatives on the roles and responsibilities of the design professional, concepts of standard of care and negligence, professional liability insurance, tradeoffs among quality-schedule-price, and a recognition that some errors may occur even in well managed design efforts, but these do not necessarily translate into negligence.

- To plan for adequate contingency budgets.

- To engage the design consultant materially and meaningfully during the construction phase, particularly to interpret design intent and to help resolve problems when they arise.

- To ensure that the contract allows alternative dispute resolution short of arbitration or litigation. A good-faith discussion of disputed items with agency senior management is a useful approach, as is mediation. Peer reviews of design documents or of specific issues and "mini-trials" are also recommended techniques, but are more cumbersome and expensive.

- To retain a separate design professional as an advisor to the owner when reviewing claims or disputes involving the project designer.

- To participate in constructability reviews, whether or not the construction contractor has yet been selected.

- To foster an overall team approach among the owner, designer, and construction contractor.

Model Cost Recovery Policy for Departments of Transportation

The ACEC has developed a model cost recovery policy or process for departments of transportation to consider in developing a stronger partnership with consultant design professionals. This process lists a number of key policy issues or elements; for each, it provides a reason why the item is important, and explains the preferred way in which the item should be carried out. The issues or items addressed in this model policy include the following:

1. The purpose / scope / foundation principles of the policy.

2. Definitions of key terms used in the policy.

When a problem is detected:

3. Immediate notification of the problem to the design engineer.

4. Provision of the opportunity for the design engineer to participate in the solution.

Process of evaluation and assessment:

5. Recognize the principle of "betterment": the design engineer is not responsible for the additional cost of materials or construction that are required or desired by the owner, regardless of whether they were omitted or misquantified on the design documents (i.e., if they had been included in the design initially, the owner would have paid for them).

6. Consider the totality of the project and the complete package of services delivered by the designer.

7. Base the evaluation of errors and omissions on the concept of negligence: the failure to adhere to the standard of care that is applicable to the services provided.

8. Weigh the recovery costs versus the damages.

9. The design consulting engineer should be compensated for services rendered on behalf of the owner in resolving project issues when the issues are not the result of the design consultant's negligence. Conversely, when it is determined that there is negligence on the part of the design consultant, there should not be compensation for time spent in addressing these project issues.

10. There should be an appeals process that provides for an independent review and opinion as to whether the design consultant was negligent.

11. When a consultant accepts responsibility for an issue and pays, it should be released from any future liability for that problem.

Other considerations, not necessarily part of the actual cost recovery policy:

12. No percentage thresholds should be established to determine cost recovery against design engineers. The many factors that affect construction project performance and cost make it impractical to set meaningful percentage criteria for general use.

13. Owners should establish a contingency budget to cover minor issues and changes that are common on projects.

14. Design engineer participation in post-design services is generally highly beneficial and desirable.

CHAPTER 5

CONCLUSIONS

OVERVIEW

All of the U.S. state DOTs have been determined to have written procedures regarding errors and omissions by consultant design professionals, as required by federal regulation. Nonetheless, as of 2005, the FHWA noted that implementation and enforcement of these procedures was more of a case-by-case rather than a systematic approach. At about the same time, AASHTO found that in more than one-quarter of the states, the written procedures appeared to be limited to contract provisions and professional liability insurance requirements. The review performed in this study indicates, however, that this situation is beginning to change. Since 2005, there have been several new E&O processes put into place as well as updates of previous policies and procedures. These current developments have gained from past DOT experience as well as from industry recommendations for improved practice. As a result, they share a number of important principles in common: defined objective and procedures, a focus on problem solution as the first priority, early engagement of the consultant design professional, access to impartial technical experts when needed, maintenance of a process fair to both agency and consultant, effective documentation and communication throughout, and clear decision points for review and analysis, problem resolution, appeal, and internal and external communication of findings and decisions. This is not to say that state DOTs are becoming uniform in their E&O policies and procedures. Variability in current practice stems from different management, legal, and institutional approaches to addressing consultant design errors and omissions, as illustrated in the sections below. Most of these differences, however, are in procedures and details rather than fundamental principles. Recent developments thus establish a basis for describing the evolving state of practice in this chapter and recommending a best-practice framework for future errors-and-omissions processes in Chapter 6.

Definitions of Errors and Omissions

There is no standard definition of "errors and omissions" used nationwide by state DOTs, although a number of definitions share common elements drawn from legal and contract administration principles. To facilitate comparisons, Appendix A compiles the definitions used by those DOTs reviewed in Chapter 3 that have developed formal descriptions of errors and omissions, plus entries from Michigan DOT (Appendix B) and the U.S. Army Corps of Engineers (Chapter 2). Many of these definitions incorporate concepts of standard of care and

of negligence, although specific definitions of these terms can very by agency. Some agencies also blend a description of negligence (from tort law) with that of breach of duty (from contract law). Agencies have also sought recently to analyze design-consultant performance from the standpoint of quality; relevant definitions have been included from these initiatives as well.

E&O and Cost Recovery Policies and Procedures

Whether they are short and succinct or comprehensive and detailed, state DOT policies and procedures documents accomplish several useful functions in guiding an agency's business processes and consultant relationships with respect to design errors and omissions.

- They focus on errors and omissions specifically as an important consideration in project design and development. They can be used to define an agency's objectives and philosophy in managing errors and omissions and resulting project risks, and communicate these policies internally and externally among all interested parties.

- They help clarify relevant contract provisions, emphasize important priorities, and flesh out the procedures, milestones, evaluation criteria, and supporting documents that relate to managing errors and omissions.

- All the appropriate policies and procedures may be unified in a single document, recognizing that the several agency functions are involved that may be the responsibility of different DOT offices. Thus, individual sections or chapters may address a variety of procedures: e.g., pre-qualifying prospective design consultants, avoiding, identifying, and resolving errors and omissions, pursuing cost recovery, evaluating consultant performance, and integrating E&O mitigation and administration within overall project design and construction.

Several agencies have developed their guidelines and procedural requirements in conjunction with the private sector. Private sector experts may also be called upon to serve as consultants to an agency for projects of technical complexity, or as members of panels or committees in determining consultant liability and financial responsibility. More detailed conclusions on these procedures are presented in later sections of this chapter.

Conclusions regarding this leading edge of the current state of practice are summarized in the following sections for the national and state transportation levels.

NATIONAL POLICY GUIDANCE

Federal Highway Administration

FHWA's E&O policy focuses on two primary requirements that must be met by state DOTs:

- The FHWA's general policy is that each errors-and-omissions issue should be considered on its merits. In this context, consultants should not be held responsible for additional construction costs resulting from errors and omissions unless gross negligence or carelessness are involved. Furthermore, federal-aid participation in the additional costs due to design errors and omissions may be justified for the kinds of errors that can occur in design, even with normal diligence, so long as the cause of these errors is not gross negligence or carelessness by the consultant or carelessness, negligence, incompetence, or understaffing by the state agency. Decisions on eligibility for such federal-aid participation are a field office responsibility.

- In contracting for design services by consultant professionals, and as a recipient of federal funds for highways, each state DOT must have written procedures, approved by the FHWA, for determining the cost-related liability of consultants that results from their design errors and omissions. [23 CFR 172.9 (a) (6)]

The FHWA also encourages state DOTs to include the following provisions in their consultant design contracts:

- The consultant shall perform additional work to correct design deficiencies promptly and at no additional cost to the agency; and

- Acceptance of design products by the state agency does not relieve the consultant of responsibility to correct errors that are subsequently found in its work.

FHWA field offices work with state DOTs to strengthen their errors and omissions processes. The development of an updated E&O policy and procedures was accomplished by Georgia DOT in partnership with its FHWA division office.

The recommendations in Chapter 6 are consistent with the above FHWA policies.

AASHTO Guidance

Current AASHTO guidance on design errors and omissions by consultants is contained in its ***Guide for Consultant Contracting*** (Mar. 2008). Appendix A of this ***Guide*** reports the results of a survey of state DOTs conducted during the first quarter of 2005. The 43 states that responded provide a description of then-current E&O practice:

- Seventy-one percent of respondents reportedly had an E&O policy, and a corresponding number had defined procedures for specific types of consultant agreements. Others were progressing toward an E&O policy. Some states noted that their contracts contained an errors-and-omissions clause and / or required E&O insurance, but they did not otherwise have an errors-and-omissions policy.

- A number of states noted the importance of immediate notification of the consultant when an E&O issue is identified, providing an opportunity for the consultant to correct the design

error. Notwithstanding any such correction, however, the consultant still faced potential liability for resulting increases in construction cost.

- While many states had experience with E&O-related claims, this experience varied in terms of the ways that consultants were allowed to provide restitution, and the degree of success in achieving solutions by methods short of litigation.

Based upon these findings, the AASHTO ***Guide*** recommends several practices with respect to design errors and omissions:

- Consultant design contracts should have clauses protecting the owner agency from design errors and omissions by providing that:
  - — The consultant's work should meet "sound, prudent, appropriate, and required professional standards and practices"; and
  - — The consultant will promptly redo work that does not meet agency criteria, at no additional cost to the agency.
- An alleged instance of design error or omission calls for early notification of the consultant and the opportunity for the consultant to correct the design error and help resolve any problems that have been caused in project construction. The consultant should also be given an opportunity to help resolve problems generally that arise in project construction, including those due to other reasons such as unforeseen conditions.
- An alleged design error or omission should prompt an agency to begin carefully reviewing the facts regarding both the cause of the problem as well as potential mitigating circumstances. The agency should form a review committee to gather relevant information and establish the consultant's liability, if any, for additional costs. The agency may seek to recover additional costs that are due to the error or omission and that would not have been incurred had the design been correct. These costs result from factors such as delays in construction and any premium on costs of items that had to be added to the project after the original bid. These findings and actions should be official determinations of the agency. The consultant should be given the opportunity to appeal adverse decisions.
- Because litigation is expensive and time-consuming, agencies should allow for other methods of dispute resolution in their design contracts.
- Design consultants normally carry professional liability insurance that covers errors and omissions. An agency's consultant contracting practices preferably should require E&O coverage that varies with the type and size of project. This coverage should remain in effect during the project performance plus a "reasonable" time following completion.

The recommendations in Chapter 6 are consistent with these guidelines.

STATE DOT PRACTICES

The sections below summarize current state DOT practices as determined in this study. References below to "state DOTs" or "agencies" refer to the 12 DOTs that have been reviewed in Chapter 3. In addition, information on Michigan DOT's design quality process is described in Appendix B, and Appendix C presents recent research study sponsored by the Massachusetts Highway Department with the assistance of The Engineering Center, Boston, and the Massachusetts section of ACEC.

Policy Objectives

Several DOTs preface their E&O procedures with a statement of policy goals or objectives, which can take several forms. For example, the stated goal may be straightforward: the formal implementation of a process to deal with consultant errors and omissions (e.g., Arizona, Florida). Typical objectives in this case would be to announce a process that determines whether a consultant is liable for additional project costs due to design errors and omissions, estimates the amount of these premium costs, and pursues cost recovery. In other cases multiple, more explicit objectives of the E&O process may be stated, as in this example from California:

- Clear benchmarks for design consultant performance;
- A timely and equitable process for dispute-resolution;
- Improved project and program management; and
- Long-term improvement in design quality.

Other practices have also been documented in Chapter 3. Massachusetts and New Jersey have specific, detailed objectives for their respective E&O processes that have an internal functional or procedural focus: e.g., to expand the role of the consultant designer in project construction; to increase communication between the consultant designer and agency field personnel; to provide early communication to the designer of a possible error, omission, or other design-related problem; to require the agency to examine why extra work orders (i.e., change orders) occur so that similar problems can be avoided in the future; and so forth. Other agencies may not state any policy goals or objectives at all, preferring to launch directly into the description of their E&O procedures.

In addition to goals or objectives of the E&O policy and process, agencies may refer to governing state statutes or federal regulations that authorize and inform their E&O procedures (e.g., Florida, Georgia, Texas).

Definitions of Design Defects

Definitions of "errors" and "omissions" by DOTs are straightforward and reflect intuitive understanding. The definitions in Appendix A are substantially the same as the following.

- Errors are design features or details that are incorrect, conflicting, insufficient, or ambiguous (Oregon). An alternate definition: An errors is an incorrect or insufficient plan detail (California).

- Omissions are instances in which design documents are silent on an issue that should otherwise have been addressed (Oregon, California).

Agencies typically relate these to concepts of standard of care and negligence, as mentioned above and described more fully in Chapter 3. One exception to this approach is the process used in Texas, which is based fully on concepts of breach of contract rather than negligence (refer to Chapter 3). Other unique treatments of design defects by individual agencies are the following:

- California identifies other types of design flaws that engineers may commit besides errors and omissions:

  — Specifications that are flawed by being "canned" and not properly tailored to the particular project circumstances.

  — Breaches of contract administration caused by untimely review of submittals and untimely and inadequate responses to requests for information.

  — Problems in cost estimates and in conduct of construction inspections.

- Illinois goes a step further by characterizing errors and omissions in terms of their severity. IDOT applies this concept by viewing a subset of errors and omissions as "significant and substantial enough to cause the project to be in jeopardy," and considers these problems fatal flaws (***Bureau of Design***…, Dec. 2002, Chapter 8, pp.8-4(7) – 8-4(8)):

  — Errors involving significant structural deficiencies or safety on bridges and structures.

  — Errors resulting in the consultant failing to identify significant environmental impacts.

  — Errors involving substandard geometrics for the specified design criteria.

  — Inaccurate survey information affecting the project's constructibility.

  — Inappropriate behavior by the consultant when working with the public.

  — False information used by the consultant in the report documentation.

  — Need for IDOT to delay letting date or design approval due to late consultant submittals.

Process Steps

Errors and omissions that are discovered during project design are expected to be corrected by the consultant at no additional cost to the agency. Errors and omissions procedures therefore focus on problems during or after project construction. While a variety of E&O procedures have been described in Chapter 3, generally speaking they have several basic steps in common.

A composite of these procedural steps follows, using descriptions primarily from Florida, Massachusetts, and New Jersey, plus additional states for specific steps as identified below.

- Discovery: The agency becomes aware of a potential design issue through identification by department staff, the occurrence of a significant event (e.g., a structural failure), or notification from the construction contractor or other third party.

- Initial Notification: The agency notifies the design consultant of a potential E&O issue. The consultant is given the opportunity to advise on the problem, mitigate potential damages, or resolve the issue.

- Investigation: The agency and consultant communicate with each other. The agency will consider the consultant's response as part of its investigation of whether there was an error or omission and if so, what costs might be recoverable ("premium costs"). Estimates of premium costs are made by the agency's construction and design personnel. Based on this information, the agency begins to assess the consultant's potential liability and responsibility for damages.

- Decision on Pursuit of Cost Recovery: The agency evaluates the likelihood of actual cost recovery by analyzing several factors including the anticipated amount of recovery, likelihood of success, administrative and legal costs to the state, and consultant's performance history.

- Notification of Agency's Assessment of Issue: The agency notifies the consultant of its assessments of liability and cost recovery. If cost recovery actions will be taken, the agency informs the consultant of the E&O process to be followed.

- Process Negotiations, Presentation Meetings, and Agency Decisions: A series of negotiations and presentation meetings between the agency and the consultant is conducted according to the process to try to resolve the issue. Typically this process begins at the project level in a negotiation with district design, construction, or project management staff. If the consultant agrees to restitution, the process moves to conclusion. If the consultant and agency do not agree in the initial negotiation, the consultant is afforded some number of additional meeting and negotiation steps to defend itself, mitigate the E&O issue, or settle the cost-recovery claim. These escalating steps occur at progressively higher organizational levels within the district or central office, served by different committees or panels. Each negotiation or meeting closes with an agency decision that is communicated officially to the consultant. At each step the consultant may choose to settle or to proceed to the next step. In some agencies an explicitly identified appeals procedure is included as a separate step (e.g., Florida, Illinois, North Dakota, Texas, Washington). While other agencies may not label a step specifically as an appeal, the descriptions in Chapter 3 demonstrate that the consultant nonetheless has several levels at which to defend its position.

- Alternative dispute Resolution: Of the agencies reviewed in Chapter 3, the following include alternative dispute resolution explicitly within their processes: Arizona (arbitration for claims of $100,000 or less); California (non-binding dispute review board or facilitated

dispute resolution if mutually agreeable to the agency and the consultant); New Jersey (non-binding mediation); and Oregon (non-binding review by a neutral third-party).

- Recovery and Collection: When the consultant agrees to restitution for damages, a settlement is made. A formal Release and Settlement Agreement may be executed following payment, either routinely or upon the consultant's request. Collection procedures are typically covered in instructions from the financial division, accounts receivable section. Monetary payments are credited to the program or project within which the design E&O issue occurred.

- Litigation: If an agreement has not been reached and litigation is necessary, the E&O matter is turned over to the DOT's legal office and / or the state attorney general.

- Tracking and Reporting: Management systems and databases are beginning to be used to track the status of E&O issues (e.g., Florida's Resolution Tracking System, New Jersey's Project Reporting System). States also have incorporated reason codes within their construction project management systems, which enable them to track the construction cost implications of avoidable causes such as design errors and omissions.

Agencies may also conduct support activities for errors and omissions management, including training and evaluation of the E&O process (e.g., Arizona, Florida, New Jersey, Oregon).

Discussions of specific aspects of current E&O processes follow, indicating similarities and differences among the agencies reviewed in Chapter 3.

Analyses of Potential Claims for Recoverable Costs

Agencies reviewed in Chapter 3 estimate the damages due to errors and omissions in similar ways. Damages reflect the premium costs of construction due to the design errors and omissions. These premium costs are the additional costs of construction that would not have been incurred by the agency had the work been correctly included in the original contract. Premium costs thus reflect non-value-added work: i.e., construction delays or inefficiencies, rework, and extra work (e.g., refer to Florida and Oregon examples, Chapter 3). They do not reflect additional project work that would have been included if the design were correct originally, particularly if the agency has received a "fair and equitable price" from the construction contractor to perform this work (e.g., refer to discussion of the Illinois process, Chapter 3). These construction estimates are coordinated with processing of the construction change order.

Agencies compare premium construction costs to the administrative costs of obtaining a settlement: i.e., the costs associated with time spent by agency personnel plus legal work by the attorney general. If the estimated damages exceed these administrative costs, it is cost-effective to pursue the claim. However, agencies exercise varying degrees of latitude in this decision, and specific practices differ among DOTs in the following ways.

- Some agencies estimate damages and administrative costs at each instance of one or more E&O issues. Others apply a pre-determined threshold value, whether to each issue or to the cumulative number of issues, that reflects estimated administrative costs. If the estimated damages exceed the threshold, agencies may pursue cost recovery; otherwise, not. Among those agencies that apply thresholds, the amounts differ as follows:
  - — Arizona: five percent of the construction bid price or $20,000, whichever is less (cumulative E&O issues to date).
  - — California: $200,000 for an individual E&O issue, or 10 percent of bid price for cumulative E&O issues.
  - — Georgia: $20,000 for an individual E&O issue, or $50,000 for cumulative E&O issues.
  - — Illinois: $5,000 or 0.5 percent (one-half of one percent) of construction project value, whichever is less (for one or more E&O occurrences). Only amounts of $1,000 or more will be billed to the consultant.
  - — Massachusetts: $5,000 for an individual E&O issue, or $50,000 for cumulative E&O issues.

- At each settlement of errors and omissions, Illinois bills consultants for the amount of premium cost that exceeds the threshold value, if this amount is more than $1,000. Arizona bills consultants for the amount of premium cost that exceeds the threshold value, but only in the first instance of cumulative errors and omissions. Subsequent occurrences of errors and omissions are billed without this threshold reduction.

- The other agencies (California, Georgia, and Massachusetts) apply thresholds as guidelines. Georgia reserves the option to pursue E&O claims in any amount, whether or not they exceed the threshold. California views thresholds as signals that an E&O issue warrants further review. Massachusetts may not initially pursue a claim on an individual E&O issue that falls below the threshold, but may revisit the matter later if the cost of cumulative errors and omissions exceeds the higher threshold value.

Apart from the monetary aspects above, New Jersey explicitly allows for non-monetary considerations in determining whether to pursue recovery of damages. Its procedure refers to "legal or functional" considerations that may outweigh cost, and that need to be considered case by case. This guidance echoes the discussion of FAR 36.608 (Chapter 2), which likewise recognizes non-economic factors that may affect a decision.

Methods of Restitution

Agencies differ in the forms of restitution of an E&O claim that they allow. As examples:

- Texas accepts only direct payment to the Department.

- Georgia allows either direct payment or pro-bono design services.

- Oregon allows the greatest number of options, including direct payment, correction or re-performance of the erroneous design services, forfeiture of payments for other services by the consultant on other ODOT projects, performance of in-kind services at no cost to the Department, and other methods that are acceptable to both parties.

Agency Decision-Making Authority

The agencies reviewed in Chapter 3 vest final decision-making authority regarding design-consultant E&O liability and cost recovery in different individuals or groups.

- Several agencies authorize a key executive to make final E&O determinations as follows:
  - California, Georgia, Massachusetts, Oregon – Chief Engineer;
  - Illinois – Director of Highways;
  - Texas – Assistant Executive Director of Engineering Operations.
- The remaining agencies place final decision authority with designated panels or committees, as follows:
  - Arizona – Appointed Review Panel;
  - Florida – Consultant Evaluation Committee;
  - New Jersey – Capital Program Management Design Issue Committee;
  - New Mexico – Claims Review Board;
  - North Dakota – Errors and Omissions Review Board;
  - Washington State – Review Committee.

E&O Process Facilitator

Several agencies have documented the role of a facilitator to shepherd their errors-and-omissions process from start to finish. This facilitator acts as a single point of contact for all parties and performs a variety of tasks including arranging meeting agendas and schedules, managing the important tasks of official internal and external communications as well as documentation of findings and decisions in the project and consultant files, performing other administrative tasks, and in general ensuring that the process runs smoothly, efficiently, and correctly. These facilitators have somewhat different organizational affiliations and have different titles across agencies, but their roles are central to the functioning of E&O procedures in the following states:

- Arizona: Engineering Consultants Section;
- Florida: Errors and Omissions Liaison;

- Georgia: Office Administrator;
- Massachusetts: Cost Recovery Administrator;
- Oregon: Consultant Contract Administrator;
- Texas: the Design Division—Consultant Contract Office (DES-CCO); and
- Washington State: Area Consultant Liaison.

These positions vary in their authority within the E&O process itself. For example, in addition to administrative, communication, and coordination responsibilities, Oregon's Consultant Contract Administrator conducts negotiations with the design consultant at certain procedural steps. Texas' DES-CCO also has responsibilities for the settlement agreement with the consultant.

Private Sector Involvement

Current DOT practices provide several examples of how the private sector can be actively engaged in the E&O process to provide the benefit of their expertise and judgment.

- Florida's process calls for a representative of the Florida Institute of Consulting Engineers to sit on its Consultant Claims Review Committee.
- The Massachusetts Highway Department may appoint outside engineers to its Cost Recovery Standing Committee or its Cost Recovery Evaluation Committee to provide needed expertise and assist on complex or specialized technical matters.
- North Dakota's process requires two representatives from the American Council of Engineering Companies as members of its Errors and Omissions Review Board.
- Washington State may appoint outside experts from a number of engineering associations to provide technical expertise on its Review Committee as well as its Appeal Committee.
- California state law requires that in E&O-related litigation, Caltrans must retain an impartial consultant to review and analyze the facts of the case. This impartial consultant must independently determine that the defendant design professional was negligent for the case to continue.

Agencies have also collaborated with professional engineering associations such as ACEC to update and refine their errors and omissions policies and procedures. Agencies also meet periodically with representatives of local branches of associations.

Insurance Requirements

Required insurance coverage for errors and omissions by design consultants have been discussed in Chapter 3. These findings support the results of the 2005 AASHTO survey, which indicated that almost 60 percent of DOTs require coverage of at least $1,000,000. Apart from dollar limits, the review in Chapter 3 found unique provisions and practices.

- California requires a good-faith effort on the part of the consultant to maintain professional liability insurance coverage in effect for three years after completion of work under its agreement.

- Oregon's required professional liability insurance has flexible limits from $100,000 to $2 million that are set individually by project per occurrence and in the annual aggregate amount.

- Texas DOT does not have a professional liability insurance requirement, although it recognizes that most consultants will likely already have this insurance. Texas' E&O process is based on the legal concept of breach of contract, not one of negligence. Maintaining reasonable assurance of high-quality work is accomplished through consultant pre-certification.

CHAPTER 6

RECOMMENDATIONS

MODEL E&O PROCESS TEMPLATE

This chapter outlines a recommended process for state DOTs to address consultant design errors and omissions. It conforms to existing FHWA policies, AASHTO recommended guidelines, and findings on recent state DOT policies and procedures that capture innovative concepts and methods. It reflects many recommended good practices proposed by the ACEC and described in Chapter 4. The recommended process offers a template or framework for consideration by state DOTs in developing their written procedures. It is intended not to be overly prescriptive, recognizing that DOTs differ in their design, construction, and project management practices. Agencies must also fit an errors and omissions procedure to their state's legal and institutional setting, internal agency policies and priorities, and the expectations of their public constituents and other stakeholders. Previous chapters provide a range of detailed examples of how an E&O process may be implemented with different features and methods, which can assist an agency in implementing this framework with specific policies, procedures, roles, and responsibilities. This recommended process, combined with current information in previous chapters, provides AASHTO with source material that can be applied to developing a guide for its members on design errors and omissions by consultants.

Definitions

Definitions of key terms avoid ambiguity and help frame the remaining parts of the process. The definitions used by Oregon DOT, for example, are brief but cover several potential design pitfalls. Explanation of the standard of care to be used establishes expectations of the design professional. Definitions of terms, however, must conform to the legal concepts that the agency wishes to follow. For example, Florida DOT's definitions of "errors" and "omissions" reflect immediately a focus on negligence, a concept that contrasts with Texas DOT's approach based upon breach of contract. The definitions used by Oregon DOT and the Corps of Engineers are suggested as examples and a point of departure for agencies' consideration.

- Errors: plan or specification details or contract administration actions that are incorrect, conflicting, insufficient, or ambiguous.

- Omissions: cases in which the plans, specifications, or contract administration actions are silent on an issue that should otherwise by addressed in the documents.

- Standard of care: The consultant shall perform all services in accordance with the degree of skill and care ordinarily used by competent practitioners of the same professional discipline under similar circumstances, taking into consideration the contemporary state of the practice and the project conditions (***Errors and Omissions***…, Oct. 2007).

- Negligence: The failure to meet the standard of reasonable care, skill, and diligence that an A-E professional would ordinarily exercise under similar circumstances (***Architect-Engineer Contracting***, May 2007).

- Other: Definitions of additional terms appropriate to the legal approach underlying the agency's treatment of design errors and omissions and recoverable costs.

Goals / Principles / Priorities

An agency may include a policy statement that documents the goals and objectives of the E&O process, principles to be followed, and particular priorities to be served. Again, several examples are given in Chapter 3. Goals may be stated at a general level, as for example:

- More efficient and cost-effective delivery of transportation infrastructure projects.

- Fair and reasonable contract administration.

- Ability to gain full value-added for the tax dollars spent on design and construction of transportation projects.

- Encouragement of appropriate and respectful professional relationships among the agency, design consultants, construction contractors, and others involved in design and construction of transportation projects.

More specific objectives may be included for each goal. Chapter 5 pointed to several ways in which objectives have been stated in current DOT policies, including "outward facing" objectives that look to what is proposed to be accomplished with parties outside the DOT, and "inward facing" objectives that propose improvements in the agency's methods and procedures.

An agency may optionally include principles and priorities of the E&O process that illustrate further its intentions and values to be served. Examples of principles include the following:

- The agency recognizes that no design can be 100-percent "perfect," but the consultant is expected to exercise reasonable care in its work. Even the best of contracts and work performance will produce some errors and omissions.

- The agency pledges to work with consultants in good faith and on the basis of trust and respect in fulfilling the contracted design. (Refer to Chapter 3, Illinois and Texas for analogous statements.)

- Problems in design will be communicated quickly to the consultant. The consultant will be involved in helping to resolve the matter and mitigate the potential damages.

- The agency will maintain good communication with the design consultant continually throughout the contract. (Misunderstandings in performance expectations often arise from lack of good communication.)

- The agency consider all relevant facts and information surrounding the consultant's agreement and design performance, including mitigating circumstances.

Priorities depend upon an agency's particular situation. Following are examples drawn from the cases in Chapter 3:

- The agency's priority is to avoid errors and omissions claims in the first place. (Arizona, Texas.)

- The agency's desire is to resolve E&O claims administratively rather than through litigation. Legal action is viewed as a last resort. (Virtually all DOTs reviewed.)

- The agency will seek to resolve design problems at the lowest organizational level possible. (Refer to Chapter 3, New Mexico, for a similar statement.)

Agencies may also have internal priorities that should be communicated continually to staff involved in managing design and construction contracts, and included in training programs. Examples include:

- The need to maintain full and accurate documentation throughout the design process, particularly if problems arise. Time spent in tracking the E&O problem and estimating its effects on construction should be recorded. Communications with the consultant should be in writing (and oral communications followed up in writing), and entered in the project file and the consultant's design performance file.

- The need to record change order codes accurately when documenting the causes of construction problems that require contract modification. This is especially true if the codes identify errors and omissions or other "avoidable" factors as the cause of the needed change order.

- The need to properly account for the costs of errors and omissions. Several examples are provided in the guidance discussed in Chapter 2 and the state DOT examples presented in Chapter 3 (see, for example, Florida, Georgia, and Oregon, among others). Agencies may consider these examples in formulating their own guidelines on agency, contractor, and any other cost items to be included, and what data need to be maintained or obtained to support needed estimates and compilations of cost data.

Process Steps

The recommended process steps are shown in Table 6.1. This table presents the full process, as though a consultant availed itself of all procedures and reviews. In practice, the design professional and the agency may decide to settle the matter at any step, in which case the process moves directly to conclusion (if the consultant is not liable for damages) or to Recovery and Collection, after which it is concluded. The process is a schematic, and agencies should feel free to adapt and modify it as appropriate to their circumstances. For example, two review meetings are shown, with the second constituting an appeal step; agencies may decide that fewer or more review meetings are needed, depending upon the size and complexity of projects and the size and degree of centralization of the agency itself. The agency may likewise decide to have an appeal panel that is separate from the review panels (e.g., to accommodate a different desired membership on the appeal panel roster). A similar comment applies to the location of these actions. A large, decentralized agency may conduct actions more at the district level, whereas small, centralized agencies may locate more procedures at the central office. Agencies may also wish to experiment with the sequencing of the several steps shown. For example, Alternative Dispute Resolution is suggested in Step 7, prior to litigation but after a number of agency reviews. An option is to try mediation shortly after the start of the process: e.g., after limited discovery and communication with the consultant in Steps 1 and 2.

Table 6-1. Recommended errors and omissions process.

#	Step and Level	Actions
1	Discovery (Any Level)	• Agency becomes aware of a problem on the project, and conducts an initial review of circumstances to assess whether the problem is likely a) design-related, b) construction-related, or c) due to other causes that are not the responsibility of the design consultant or the contractor. For purposes of this example, assume a determination that the problem is design-related.
2	Initial Notification (Project or District Level)	• Agency notifies consultant, requests involvement. • Consultant responds to request, advises on problem.

#	Step and Level	Actions
3	Investigation and Decision on Liability (i.e., responsibility for negligent performance) and Resulting Damages (District Level, Support from Central Office if Needed)	• Agency and consultant maintain communication regarding problem. • Agency investigates likelihood of error or omission resulting from design consultant's negligence. Agency also considers other factors that may influence potential consultant liability, for or against. If E&O issues are identified, the agency assesses the type and extent of potential damages due to these errors or omissions. • If the agency determines that damages have occurred as the result of design E&O, the agency estimates the premium costs that reflect these damages. • Agency evaluates cost-effectiveness of recovery, other influencing factors. • Agency's legal office is consulted prior to decision on consultant liability and cost recovery.
4	Notification to Consultant of Agency Decision (District or Central Office)	• Agency decides whether cost recovery will be undertaken, based upon factors evaluated in Step 3. • Agency communicates decision to consultant.
5	Review Meeting at District Level	• Agency schedules meeting of district review panel (membership defined in agency E&O procedure). • Agency or outside technical experts if needed. • Separate agency and consultant presentations, panel review of project record and other relevant information. • Panel assessment and decision on consultant liability and extent of damages. • Agency communicates decision to consultant, notifies consultant of options.
6	Review Meeting at Central Office (Appeal)	• Agency schedules meeting of central office review panel (membership defined in agency E&O procedure) • Agency or outside technical experts if needed • Separate agency and consultant presentations, panel review of project record and other • Panel assessment and decision on consultant liability and extent of damages • Agency communicates decision to consultant, notifies consultant of options

#	Step and Level	Actions
7	Alternative dispute Resolution (Central or District Level)	• Agency and consultant participate in ADR • Procedures (including possible cost sharing) defined in agency E&O procedure, agreed to by consultant
8	Recovery and Collection (Appropriate Level)	• If consultant agrees to restitution of damages at any point above, agency advises consultant on procedure and processes payment • Release and Settlement Agreement executed • Monetary payments credited to program in which E&O issue occurred
9	Litigation (Appropriate Level, State Attorney General)	• Agency technical staff provide DOT legal office with file documentation • Agency relinquishes matter to state attorney general

Comments on particular aspects of the process follow:

- The descriptions of each step are similar to those given in Chapter 5 for the composite E&O process.

- Membership of the review panels should be documented in the agency's E&O process. Panels may comprise appropriate agency personnel and representatives of the FHWA, the design consultant community, and the attorney general's office if needed. Impartial technical experts from the agency, the consultant community, or academia may be appointed to panels when it is felt to be appropriate given technical complexity or unusual circumstances of the problem. In certain cases (e.g., where the E&O issue is relatively small and simple), the "panel" may comprise a single individual: e.g., the Chief Engineer. Circumstances where this option is allowed should be documented in the E&O procedure.

- In addition to the panel membership issue, the agency should consider two other matters of organizational role and responsibility:

  — The responsibility for decisions at each step. Current practices differ across agencies, as documented in Chapter 3 and summarized in Chapter 5. An agency has two basic options: to vest final decision authority in an individual, typically a central-office executive, or to have decisions made by the appropriate review panel. If an individual is the decision-maker, it is presumed that the panel at that step serves in an advisory or recommendation capacity.

  — The agency may wish to designate a process facilitator as described in Chapter 5. This facilitator may be an individual or a section or office. The facilitator should be familiar with the engineering consultant community and their engagement in agency designs;

with construction and project management procedures; and with good administrative practices regarding internal and external communications and record-keeping.

- Although the agency's legal office is mentioned only in selected steps in Table 6.1, good judgment dictates that the legal office be kept informed as the process moves forward.

Process Elements

Selected elements of the recommended E&O process are described below. Implementation may require changes to current agency operating procedures or contract standard provisions.

- Insurance: Required coverage for professional liability is recommended. A flexible coverage amount, similar to that described for Oregon DOT in Chapters 3 and 5, is recommended to be consistent with AASHTO guidance.

- Cost-effectiveness of cost recovery: Agencies should analyze the cost-effectiveness of potential cost recovery before making a decision, but should reserve the option to undertake cost recovery of any amount. Possible non-monetary factors that can influence a decision on cost recovery should be illustrated in the E&O procedure as appropriate. The definition of threshold amounts is useful as a guide, but should be applied in that context and not be used arbitrarily or rigidly. If used, threshold amounts should be updated periodically to ensure that they reflect appropriate administrative costs for the agency, the attorney general, and others involved in reviewing and conducting consultant liability and cost recovery.

RESEARCH NEEDS

The performance of this study has suggested that research and further gathering of practical information on the topics discussed below may be helpful to public- and private-sector participants in transportation project design and construction. The study has recognized that state DOTs are beginning to focus more on systematic methods of addressing design errors and omissions by consultants, but there has been little research on this topic to date. Consequently, the recommendations below give priority to communication of progress in this field, development of a common understanding of issues and potential solutions, review of relatively new and updated E&O processes, and identification of comparative advantages of different approaches.

- There are virtually no statistics on the magnitude of errors and omissions issues throughout the United States. This is due partly to the lack of data gathering procedures and relevant information technology systems until very recently, and partly to the somewhat ad hoc, case-by-case approach to resolving errors-and-omissions issues that has prevailed until very recently. Now that agencies are developing systematic procedures and database capabilities in this area, research might begin to identify the magnitude of the problem, prevalent

causes, and methods of successfully reducing or mitigating the cost impacts of errors and omissions by design consultants.

- The state DOT E&O processes reviewed in Chapter 3 are all relatively new or recently updated. They represent new approaches such as quality-based management of design, flexible insurance coverages, more team-oriented relationships with design consultants, tighter integration with information technology systems and data, and use of Alternative Dispute Resolution techniques. It would be useful to assess the relative performance of these several approaches after they have compiled several years of experience in actual use. This performance can be gauged in several ways: e.g., outcomes in terms of success in achieving resolution, preventive considerations in terms of successfully reducing or avoiding E&O, and resource considerations in terms of the time and effort needed to make each process work. Specific techniques such as appointing an E&O facilitator can also be assessed and compared across agencies.

- State DOT practices regarding E&O (sometimes referred to as malpractice) insurance vary widely, and some agencies do not require such insurance at all. While a policy limit of $1 million is typically used, it is not clear whether this is the most appropriate amount. Research is needed to investigate how E&O insurance requirements affect design professionals' ability to participate in state DOT projects, what policy limits work best, and what is the most effective way of structuring coverage limits (e.g., as a set amount across all projects? or on a flexible scale as used, for example, by Oregon DOT).

- Methods of quality management are evolving as a major driver in managing functions such as project design. Several examples of quality initiatives have been presented in Chapter 3 and Appendices B and C. DOTs are now beginning to integrate quality management, improved project design procedures (including reduction in errors and omissions), and design consultant evaluation. Research, supplemented by conferences and peer exchanges, could shed light on how these initiatives have performed, their success stories, and further improvements needed.

- Agencies seek to avoid litigation in E&O issues where possible. Research could provide insight to what steps and techniques in an E&O process (or in consultant design management generally) are most helpful in resolving the matter before litigation becomes necessary. For example, it would be useful to understand what benefits agencies have gained from Alternative Dispute Resolution methods, consultant pre-certification, and risk management. The most beneficial point in the E&O process at which to try ADR techniques such as mediation would also be useful to investigate.

- DOT personnel have found that recorded peer exchanges are useful ways to share and learn new ideas and success stories, particularly in rapidly evolving fields such as performance measurement and innovative methods of project delivery. A peer exchange among design and construction staff directly involved with errors and omissions issues might be a useful exercise. As an example, one useful outcome of such a meeting might be to understand under what conditions particular contractual provisions or procedural steps work better than others. Domestic scans are another mechanism of obtaining information on current practices concurrently across several agencies.

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ABBREVIATIONS AND ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
ACEC	American Council of Engineering Companies
ACEC / MA	American Council of Engineering Companies of Massachusetts
ACL	Area Consultant Liaison [Washington State]
AIA	American Institute of Architects
APA	American Planning Association
A-E	Architect-Engineer
A&E	Architect(s) and Engineer(s)
BDE	Bureau of Design and Environment [Illinois]
CA	[Consultant] Contract Administrator [Oregon]
CCEI	Consultant Construction Engineering and Inspection [Florida]
CCO	Contract Change Order [California]
CCRC	Consultant Claims Review Committee [Florida]
CEC	Consultant Evaluation Committee [Florida]
CECW	Consulting Engineers Council of Washington [Washington State]
CES	Consultant Evaluation System [New Jersey]
CFR	Code of Federal Regulations
Construction PM	Construction Project Manager [Texas]
CPM	Capital Program Management [New Jersey]
CPRC	Consultant Performance Review Committee [Georgia]

CRI	Cost Recovery Inquiry [Massachusetts]
DES-CCO	Design Division – Consultant Contract Office [Texas]
Design PM	Design Project Manager [Texas]
DOT	Department of Transportation
DPM	Design Project Manager [Florida]
DRB	Dispute Resolution Board [Florida]
E&C	Engineering and Contingency [Texas]
E&O	Errors and Omissions
EOR	Engineer of Record [Florida]
EORB	Errors and Omissions Review Board [North Dakota]
EWO	Extra Work Order [Massachusetts]
EOT	Errors and Omissions Threshold [Illinois]
FAR	Federal Acquisition Regulations
FHWA	Federal Highway Administration
FICE	Florida Institute of Consulting Engineers
FRA	Federal Railroad Administration
GDOT	Georgia Department of Transportation
ITD	Intermodal Transportation Division [Arizona]
JLARC	Joint Legislative Audit and Review Committee [Washington State]
MHD	Massachusetts Highway Department (also MassHighway)
MRP	Management Review Panel [California]
NMDOT	New Mexico Department of Transportation
ODOT	Oregon Department of Transportation
OOC-GAO	Office of Comptroller – General Accounting Office [Florida]

OSBEELS	Oregon State Board of Examiners for Engineering and Land Surveying
PDB	Potential Design Breach [California]
PDE	Project Development Engineer [New Mexico]
PS&E	Plans, Specifications, and Estimates
QA	Quality Assurance
QC	Quality Control
SNAME	Society of Naval Architects and Marine Engineers
SSP	Standard Special Provisions [California]
TI	Technical Investigator [Oregon]
TOPPS	Transportation Online Policy & Procedure System [Georgia]
TRC	Technical Review Committee [Oregon]
USDOT	United States Department of Transportation
WSDOT	Washington State Department of Transportation

APPENDIX A

DEFINITIONS USED BY STATE AGENCIES

California DOT

- Error: an incorrect or insufficient plan detail.
- Omission: an instance where plans are silent on an issue.
- Other design flaws:
  - — An engineer may produce specifications that are "flawed by being contradictory, ambiguous, omitting material, or by being 'canned' and not properly tailored to the particular project circumstances."
  - — An engineer may also commit breaches of contract administration through "untimely reviews of submittals, [and] untimely and inadequate responses to requests for information."
  - — There may also be issues regarding preparation of cost estimates and conduct of construction inspections.

Florida DOT

Florida DOT defines the following terms and provisions in its E&O procedural guidelines ("Identifying and Assigning Responsibility…" Oct. 21, 2004):

- ERRORS AND OMISSIONS: Acts of negligence committed by the Engineer of Record (EOR) in the performance of engineering design service or creative work, and acts of negligence committed by the Consultant Construction Engineering and Inspection (CCEI) personnel in the performance of construction engineering inspection services. (In this procedure, the Engineer of Record is understood to be a professional consulting engineer retained by FDOT to provide design services or creative work, and who is in responsible charge for preparing, signing, dating, sealing, and issuing the resulting engineering documents.)
- NEGLIGENCE: The failure by a professional engineer to utilize due care in performing in an engineering capacity or failing to have due regard for acceptable standards of engineering principles.

- PREMIUM COSTS: The additional cost of a contract change that would not have been incurred if the work had been included in the original contract. More specifically, premium costs are dollar amounts paid for non-value added work. Delays, inefficiencies, rework, or extra work as shown below, other than those caused by the contractor and / or his subcontractors or suppliers, will be considered as non-value added work. Non-value added work can occur in three distinct situations:

  — Work delays or inefficiencies. In this situation, the premium costs are the total delay / inefficiency damages paid to the contractor.

  — Rework. The premium costs are the dollar amount of the original items of work that have to be removed and the costs to remove these items.

  — Extra work. In this situation, the premium costs are computed as the net difference between the final agreed prices paid to the contractor and the Engineer's Estimate – what the cost would have been had the extra work been included in the original bid at letting.

- Premium costs associated with EOR and CCEI Errors and Omissions shall be Federal-aid Non-Participating.

Georgia DOT

Georgia DOT defines its errors and omissions terminology in its policy statement for E&O as follows ("Errors and Omissions" Aug. 10, 2007):

- ERRORS: Items in plans or other contract documents that are shown incorrectly.

- OMISSIONS: Items in the plans or other contract documents that are not shown or included.

- ERRORS AND OMISSIONS: Design deficiencies in the plans or other contract documents which must be corrected in order for the project to function or be built as intended.

- DEGREE OF CARE: The level of caution, prudence, or forethought legally required to avoid causing harm or loss to another person.

- DILIGENCE: The degree of care and caution required by the circumstances of a person.

- GROSS NEGLIGENCE (applying to the practice of engineering): The failure of a professional engineer to utilize due care in performing in an engineering capacity or failing to have due regards for acceptable standards of engineering principles.

Illinois DOT

Illinois DOT defines its errors and omissions terminology in its ***Standard Agreement Provisions for Consultant Services*** as follows (***Standard Agreement***… Jan 1, 2001):

- ERROR: A failure to provide professional services in accordance with that degree of care and skill ordinarily exercised under similar conditions excluding, however, OMISSIONS.

- OMISSION: A failure to provide professional services in accordance with that degree of care and skill ordinarily exercised under similar conditions whereby there is a failure to indicate on drawings, specifications or other products of professional services the requirement for a feature, system or equipment, which is necessary to the complete function of a project…

- NEGLIGENCE: The OMISSION or neglect of reasonable precaution, care or action in accordance with that degree of care and skill ordinarily exercised under similar conditions.

These definitions are applied in contract provisions describing the design services and review and acceptance of design products, the procedures for addressing errors, omissions, and other matters, attendant consultant responsibilities during and following construction, requirements for insurance, compensation calculations and payment for services, and Illinois DOT's consultant evaluation process (described in a later section).

Illinois goes a step further in defining errors and omissions in terms of their severity, to support their formal consultant evaluation process. IDOT views a subset of errors and omissions as "significant and substantial enough to cause the project to be in jeopardy," and considers these problems "fatal flaws" (***Bureau of Design***… Dec. 2002, Chapter 8, pp. 8-4(7) – 8-4(8)):

- Errors involving significant structural deficiencies or safety on bridges / structures.

- Errors resulting in the Consultant failing to identify significant environmental impacts.

- Errors involving substandard geometrics for the specified design criteria.

- Inaccurate survey information affecting the project's constructibility.

- Inappropriate behavior by the Consultant when working with the public.

- False information used by the Consultant in the report documentation.

- Adjustment of letting date or design approval due to late Consultant submittals.

The implications of these serious design errors and omissions for consultant evaluation will be described in a later section.

Michigan DOT

Michigan DOT has issued a checklist of common errors and omissions in design documents, organized by type of document: e.g., title sheet, typical cross sections and miscellaneous details, the note sheet, plan and profile sheets, and general items ("Common Design… Jan. 22, 2003). Entries under each of these categories offer guidance on how to complete particular details with reference to the DOT's Design Manual. They also provide instruction on avoiding pitfalls and handling particular situations correctly: e.g., ensuring that the stationing difference between the project beginning and ending limits agrees with the mileposts that are shown. As another example, one of the general items states that:

> ***Adding items of work to Standard Pay items by note is to be avoided. All non-standard pay items need a Special Provision.***
>
> "Common Design… Jan. 22, 2003, p. 4

North Dakota DOT

The North Dakota DOT applies the following definition and provisions related to design E&O:

- ERRORS AND OMISSIONS: Deficiencies from the standard of care on the part of a design / construction engineering consultant in the performance of professional services under contract with NDDOT.
- The "standard of care," applied to the performance of consultant services for the NDDOT, shall be the "***duty to exercise the degree of learning and skill ordinarily possessed by a reputable design professional practicing in the same or similar locality and under similar circumstances*** ."
- An alleged error or omission will be considered "alleged" until either the consultant acknowledges, or the Errors and Omissions Review Board determines, that it is an error or omission.

Oregon DOT

Oregon DOT defines ***standard of care*** as follows:

> ***The Consultant shall perform all Services in accordance with the degree of skill and care ordinarily used by competent practitioners of the same professional discipline under similar circumstances, taking into consideration the contemporary state of the practice and the project conditions.***
>
> Source: ***Errors and Omissions***…, Oct. 2007, p. 9.

Apart from non-compliance with state laws and regulations (which would fall under the responsibility of the Oregon State Board of Examiners for Engineering and Land Surveying

(OSBEELS)), design consultants could fail to meet the standard of care through defects in their work products (***Errors and Omissions***…, Oct. 2007, p. 8):

- Errors: plan or specification details or contract administration actions that are incorrect, conflicting, insufficient, or ambiguous.

- Omissions: cases in which the plans, specifications, or contract administration actions are silent on an issue that should otherwise by addressed in the documents.

Texas DOT

The Texas DOT has defined five reason codes for construction change orders that are related to design errors and omissions. These codes are identified in Table A-1, based upon the responsible design organization and the impact of the errors or omissions on project cost, time, and need for rework.

Table A-1. Types of design errors and omissions as reasons for change orders, Texas DOT.

Reason Code	Description
1A	Incorrect PS&E (TxDOT design): This code should be used when TxDOT prepared the PS&E and an error and / or omission is discovered, but there is no additional cost to the project, nor any contractor delay, rework, or inefficiencies.
1B	Incorrect PS&E (Consultant design): This code should be used when a Consultant prepared the PS&E and an error and / or omission is discovered, but there is no additional cost to TxDOT, nor any contractor delay, rework, or inefficiencies to the project.
1C	Other: This code should be used when there is an error and / or omission, (TxDOT or consultant) but the cause (all or partial) cannot be assigned to TxDOT or the consultant and other codes in this category are not appropriate. This code also applies if the PS&E were prepared by a third party: e.g., a donor or a local government. This code should not be used to avoid the process of pursuing the recovery of costs.
1D	Design error or omission that resulted in delay, rework, or inefficiencies (TxDOT design): This code should be used when TxDOT prepared the PS&E and an error and / or omission is discovered and additional cost, contractor delay, rework or inefficiencies occur on the project.
1E	Design error or omission that resulted in delay, rework, or inefficiencies (Consultant design): This code should be used when a consultant prepared the PS&E and an error and / or omission is discovered and additional cost to TxDOT or contractor delay, rework, or inefficiencies occur on the project.

Source: ***Consultant Errors and Omissions***…, Mar. 2008.

U.S. Army Corps of Engineers

- Negligence: The failure to meet the standard of reasonable care, skill, and diligence that an A-E professional would ordinarily exercise under similar circumstances.
- Comparative negligence: The doctrine that holds that the Government may still recover damages even if it is also negligent, but these damages are proportioned according to the relative fault of the parties involved.
- Burden of proof. To successfully pursue a claim for cost recovery, the government must prove that a) the consultant design professional was negligent and b) the consultant's design error or omission was the cause of the damages.

- Mitigation. The government agency has a responsibility to minimize the damages due to design errors or omissions. The consultant must be notified promptly of the design defect and be given a reasonable opportunity to correct its work.

- Government assumption of risk. The consultant design professional may be relieved of responsibility for design error or omission if the defective design results from actions by the government taken without the concurrence of the consultant.

APPENDIX B

DESIGN QUALITY PROCESS: MICHIGAN DOT

Michigan Department of Transportation

Process/Procedures

Michigan DOT has developed a Quality Assurance and Quality Control Process for managers of its Trunkline Projects (***Quality Assurance***…, Jan. 2005). Guidelines are built around stages of the project development process: the Scope Verification meeting, the Plan Review meeting, the Omissions and Errors Check meeting, and Final Package Submittal. An optional Base Plan Review meeting is also discussed, but its inclusion is at the discretion of the Project Manager. For each of these meetings the guidelines describe preparatory activities prior to the meeting, items potentially to be covered at the meeting, specific procedures and analyses to be carried out, requirements and prerequisites for the meeting (e.g., compilation of field data, completed documents, specific information), and reference materials.

For example, the Omissions and Errors Check meeting includes the following guidance (summarized):

- Purpose: to review the final plans and proposal package to ensure they are complete.
- Preparation: The Project Manager should resolve as many issues beforehand to minimize the time and membership needed at the formal meeting, and to discourage additions or changes to the scope of work. Participants at the meeting should focus only on omissions and errors in the package; changes to the scope of work or project limits should not be considered at this stage except in exceptional circumstances.
- Procedure: The Project Manager should accomplish several tasks before, during, and after the meeting. Among them are:
  - — To verify that the plans and proposal package are complete, and to input the actual start date into the appropriate data system.
  - — To identify meeting attendees and schedule the meeting.

  - — To distribute the plans and proposal package to all project participants, and request that all Design Package Evaluations be completed.
  - — To review the project cost and schedule and compare with approved programming documents.
  - — To hold the meeting and sign project documents.
  - — To ensure that all meeting recommendations are incorporated into the plans and proposal package.
  - — To input the project completion date into the appropriate data system.

- Requirements: Example requirements include:
  - — Plans: 100 percent complete, including final quantities, special details, and title sheet signed or sealed.
  - — Proposal: 100 percent complete, including special provision for traffic maintenance, all coordination clauses, all permits, all contractual provisions and specifications, Notice to Bidders (checklist and project-specific), right-of-way certification, and utility relocation status report.
  - — Other requirements: e.g., critical path network if required, approved design exceptions, local agreements, road cost estimating checklist, bridge lump sum worksheet, and final QA / QC checklist.

- Reference materials: relevant documents and Web sites, including the Road Design Manual, Bridge Design Manual, and QA / QC Review Process appropriate to the particular project.

List of Common Errors and Omissions by Michigan DOT

Michigan DOT has issued a checklist of common errors and omissions in design documents, organized by type of document: e.g., title sheet, typical cross sections and miscellaneous details, the note sheet, plan and profile sheets, and general items ("Common Design…," Jan. 22, 2003). Entries under each of these categories offer guidance on how to complete particular details with reference to the DOT's Design Manual. They also provide instruction on avoiding pitfalls and handling particular situations correctly: e.g., ensuring that the stationing difference between the project beginning and ending limits agrees with the mileposts that are shown. As another example, one of the general items states that:

> ***Adding items of work to Standard Pay items by note is to be avoided. All non-standard pay items need a Special Provision.***
>
> Source: "Common Design…," Jan. 22, 2003, p. 4

APPENDIX C

PROPOSED QUALITY FRAMEWORK: MASSHIGHWAY

Definition of Design Quality by the Massachusetts Quality Initiative

As part of a Massachusetts Quality Initiative, The Engineering Center in Boston conducted a study of "design management practices that influence the quality of highway and bridge construction" (Jones et al. Sep. 2003). Errors and omissions were viewed within the context of ***design quality***. The study team considered two definitions of "quality" in formulating its approach:

> ***[Quality is] the totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs.***
>
> Source: ***ISO 9000***… 1992, p. 16, as quoted by Jones et al. Sep. 2003.
>
> ***[Quality is] the totality of features, attributes, and characteristics of a facility, product, process, component, service, or workmanship that bear on its ability to satisfy a given need: fitness for purpose. It is usually referenced to, and measured by, the degree of conformance to a predetermined standard of performance.***
>
> Source: ***Quality in the Constructed Project***… 1988, p. 17, as quoted by Jones et al. Sep. 2003.

Based on these concepts, The Engineering Center team adopted the following definition and explanation in support of its work, and recommended its adoption by the Massachusetts Highway Department (MHD):

> ***Design quality for highway construction is the totality of characteristics and features of all preconstruction engineering processes, tasks, and deliverables that bear on satisfying stakeholders' needs.***
>
> ***In order to achieve quality, all stakeholders' needs must be defined explicitly and addressed. Not every need can be satisfied. Those needs that both the sponsoring and performing organizations agree must be satisfied are the requirements for quality. Everything bearing on satisfaction is quality.***
>
> ***In short, design quality is everything prior to construction that bears on stakeholders' satisfaction.***
>
> Source: Jones et al. Sep. 2003, p. 11

Massachusetts. Based on this definition, the study sought 1) to translate the general concept of quality into practical ways of measuring it on transportation design projects, and 2) to identify those management practices that tend to be associated with high-quality work. The following material is drawn from the final report of the study team that developed an objective methodology to gauge stakeholder satisfaction as an indicator of design quality (Jones et al. Sep. 2003); page numbers in parentheses in this section refer to this source.

Model Formulation. Methodological development went through a number of stages: e.g., reviews of highway and bridge projects – first from Massachusetts, later from other states; theorizing as to useful, objective metrics of stakeholder satisfaction (and therefore of design quality); proposal of a model, incorporating these metrics, to represent relative design quality; measurement of the values of selected metrics on actual projects; correlations among metrics and assessments of their individual and collective strength in predicting the measure of quality; retesting and refining the model on additional projects, adjusting the specific metrics of stakeholder satisfaction; and application of the model to analyze the correlations between different management practices and resulting design quality. In all, 53 highway, bridge, and resurfacing projects were used in building, testing, and refining the model. The completed model is expressed as follows (p. 29):

$$DQR = (BV + QE + EW + DREW)/4 \quad [1]$$

where:

DQR = Design Quality Ranking, a measure of relative quality: a lower DQR value represents higher design quality;

BV = Bid Variation, the relative ranking of a project among a set of projects in terms of variation in the bid price (lower variation indicates higher satisfaction): see eq. [2].

QE = Quantity Estimates, the relative ranking of a project among a set of projects in terms of variation in cost of unit-price items in a bid (lower variation indicates higher satisfaction): see eq. [3].

EW = Extra Work, the relative ranking of a project among a set of projects in terms of the total cost of extra work items in construction as compared to the total construction award price (less extra work indicates higher satisfaction): see eq. [4].

DREW = Design-Related Extra Work, the relative ranking of a project among a set of projects in terms of the total cost of design-related extra work items in construction as compared to the total construction award price (less design-related extra work indicates higher satisfaction): see eq. [5].

Interpretation of Variables. This model is a quantitative representation of the concept of design quality discussed in the E&O definitions earlier: to focus on everything prior to construction that affects stakeholders' satisfaction. The independent variables in eq. [1] represent stakeholders' satisfaction on the premise that more closely competitive bids and little or no need for extra work in construction indicate a high-quality design. Model developers found that no single measure of stakeholder satisfaction is "sufficiently reliable or complete" as an indicator of quality; the four metrics used in eq. [1], when applied together, yield the most reliable and practical estimate (p. 34). The original model formulation expressed the four satisfaction metrics in eq. [1] as indexes: i.e., absolute numerical values computed for each project. The current model expresses these metrics as ***relative*** values among a ***set*** of projects: i.e., the project with the "best" index value for a particular measure of satisfaction (BV, QE, EW, or DREW) receives a value of "1" for that metric. Other projects receive values of 2, 3, 4, … and so on in terms of their respective rank for that measure of satisfaction. The overall measure of DQR is a composite of these four relative rankings. This approach will be clearer following the examples below.

Bid Variation. Bid Variation provides a good example to explain and illustrate the model's workings and assumptions. The model's developers recognized that members and suppliers of construction contractor teams are key stakeholders in highway and bridge projects. While their project bids are influenced by several factors related to project technical and management requirements, the local costs of labor, equipment, materials, and finance, corporate business considerations, the local business climate, and contractors' perception of risks and uncertainties inherent in the project, the quality of the design is one of the factors shaping their perceptions of risk and their bidding strategy.

> ***The quality of the construction plans, specifications, contract documents and quantity estimates significantly affect their perception of risks associated with bidding and constructing the project. 'Good' documents are interpreted as low risk. 'Bad' documents are considered high risk.***
>
> ***Bidders express their opinions of risk in their price proposals… Small bid spreads indicate quality in plans, specifications, and contract documents. Large variations among bids indicate that bidders perceive risks differently [from] one another. The cause for their differences is often rooted in unanswered design questions or unclear or conflicting information in the bid documents.***
>
> Source: Jones et al. Sep. 2003, p. 16.

The degree of this spread in bid prices was translated analytically into a Bid Variation Index that model developers defined by eq. [2] (p. 17).

$$BVI = 1.0 - (Std_Dev_TBP \,/\, TAP) \qquad [2]$$

where BVI = Bid Variation Index, a measure of the spread in bid prices submitted by contractors. BVI = 1.0 indicates no variation; if BVI < 1.0, the smaller the value of BVI, the larger the variation in bid prices.

Std_Dev_TBP = Standard deviation of total bid prices.

TAP = Total awarded bid price (usually the lowest bid price in lump-sum bids).

The ratio of the standard deviation of the total prices submitted by all bidders to the awarded bid price is taken by model designers as a "rational measure of departure from design quality. If 'perfect' quality is numerically represented as 1.00, then 1.00 minus 'departure from quality' represents the balance of remaining design quality'" (p. 17). From the analytical construction of eq. [2], BVI will have a range usually between 1.0 and 0. A value of BVI=1.0 indicates no variation or spread; BVI~0 indicates considerable variation or spread. (Theoretically, BVI could be negative for very large standard deviations in bid price.) Typical values of BVI in projects used by Jones et al. for model development and testing range between 1.0 and 0.6. When the BVI values have been computed for a set of projects, the ranking variable BV in eq. [1] can be quantified. Assume five projects with BVI values as shown in Table C-1. When the projects are ranked in order of decreasing value of BVI (i.e., in order of increasing variation in bid prices, therefore decreasing quality of design), the value of BV is set for each project by its rank order: from 1 to 5, as shown in Table C-1.

Table C-1. Example of bid variation ranking, Massachusetts model.

Project	Value of BVI	Value of BV
Project A	0.995	1
Project B	0.982	2
Project C	0.893	3
Project D	0.742	4
Project E	0.656	5

Quantity Estimates. The other terms in eq. [1] are interpreted in a similar way. To set the value of QE reflecting variation in design quantity estimates, the Quantity Estimates Index, QEI, must first be computed (p. 20):

$$QEI = 1.0 - [\, ABS \{\Sigma (BP \times QV)\} / \Sigma (BP \times EQ) \,] \qquad [3]$$

where QEI = Quantity Estimates Index, a measure of the cost variation in all unit-priced bid items submitted by contractors. QEI = 1.0 indicates no variation; if QEI < 1.0, the smaller the value of QEI, the larger the variation in costs of all unit-priced bid items.

ABS = Absolute value operator: Variations in quantity and cost estimates are expressed in absolute values: negative variations do not cancel out positive variations.

BP = Bid price of each unit-priced bid item (e.g., $/ton, $/sf, etc.).

QV = Quantity variation of each unit-priced item: QV=CQ – EQ.

EQ = Estimated quantity (by design engineer).

CQ = Construction quantity (bid by construction contractor).

Computation of QEI is based ***solely*** on the ***unit-priced*** items in a bid. Fixed-priced or lump-sum bid items are excluded from all aspects of this computation. Model designers felt that this approach captures with greater sensitivity the variations in bid prices due to differences in bidders' estimates of work or material quantities (p. 20).

Extra Work. The variable EW to rank projects by Extra Work is based on the relative value of the Extra Work Index, or EWI:

$$EWI = 1.0 - (TCEWO / TAP) \quad [4]$$

where EWI = Extra Work Index, a measure of the cost of all change orders for extra work, regardless of cause. EWI = 1.0 indicates no change orders for extra work. If EWI < 1.0, the smaller the value of EWI, the more costly the sum of all work orders.

TCEWO = Total cost of extra work orders.

TAP = Total awarded bid price (usually the lowest bid price in lump-sum bids).

Design-Related Extra Work. The term DREW is similar to EW, but focuses on extra work attributable specifically to design-related flaws. DREW depends on the corresponding index DREWI defined by eq. [5]:

$$DREWI = 1.0 - (TCDREWO / TAP) \quad [5]$$

where DREWI = Design-Related Extra Work Index, a measure of the cost of all change orders for extra work that are attributable to design errors. DREWI = 1.0 indicates no design-related change orders for extra work. If DREWI < 1.0, the smaller the value of DREWI, the more costly the sum of work orders due to design errors.

TCDREWO = Total cost of design-related extra work orders.

TAP = Total awarded bid price (usually the lowest bid price in lump-sum bids).

Example. The application of the Massachusetts model to a set of projects is illustrated in Table C-2. The order of calculations and entries is as follows:

- Compute BVI, QEI, EWI, and DREWI according to eqs. [2] through [5] for each project. Enter results in columns 2, 4, 6, and 8, respectively.

- For each column of index values above, identify the relative (or ordinal) ranking. Index values of 1.000 receive a rank of 1; other index values are ordered by decreasing magnitude. Enter these relative numbers in columns 3, 5, 7, and 9 for BV, QE, EW, and DREW, respectively.

- Note that ties receive the same relative ranking, but the number of slots taken affects the rank of subsequent index values. For example, if five index values equal 1.000 (as occurs in column 8 of Table C-2), all of these projects receive a rank of 1 in column 9, but the next index value (for Project F) receives a rank of 6 in column 9.

- When values of BV, QE, EW, AND DREW have been assigned for all projects, compute the value of DQR according to eq. [1]. Results are shown in column 10 in Table C-2.

- Lower values of DQR indicate higher design quality according to this model. The ranking of overall design quality according to DQR is shown in column 11 to complete the example. The projects in Table C-2 have been listed in order of their computed design quality.

Management Practices. The definition guiding the Massachusetts study is that design quality is ***everything*** prior to construction that bears on stakeholders' satisfaction (discussed earlier). "If ***everything*** before construction determines design quality, then ***many*** factors affect DQR as a measurement of design quality" (p. 66). The model designers therefore correlated their model results (DQR) with a set of management practices to determine which of those were associated with low-DQR (high-quality) designs, and which were associated with high-DQR (low-quality designs). Those management practices that were identified with higher-quality designs are listed in Table C-3, together with the average DQR of the projects that were beneficiaries of these practices. Those management practices that were identified with lower-quality designs are listed in Table C-4, again with the average DQR of projects that received these practices.

Table C-2. Example application of the Massachusetts design quality model.

Project	BVI	BV	QEI	QE	EWI	EW	DREWI	DREW	DQR	Rank
col. (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Project A	0.964	1	0.942	1	0.985	3	1.000	1	1.50	1
Project B	0.920	3	0.918	2	1.000	1	1.000	1	1.75	2
Project C	0.918	4	0.901	3	0.980	4	1.000	1	3.00	3
Project D	0.802	7	0.860	5	1.000	1	1.000	1	3.50	4
Project E	0.942	2	0.738	6	0.904	6	1.000	1	3.75	5
Project F	0.874	6	0.875	4	0.863	7	0.999	6	5.75	6
Project G	0.901	5	0.565	7	0.949	5	0.949	7	6.00	7
Project H	0.754	8	0.424	8	0.590	8	0.590	8	8.00	8

Note: Variables in column headings are explained in eqs. [1] through [5].

Table C-3. Management practices associated with higher design quality according to the Massachusetts model.

Management Practices Normally Found in Projects with Higher Design Quality	Avg. DQR
Partnering agreement between DOT and designer	12.0
Used commercial project management software for managing design	13.6
Prepared detailed staffing plan by task and deliverable	14.6
Reviewed design quality at least monthly	15.9
No DOT policy advocating cost recovery	17.1
No design changes stemming from constructibility review	17.4
Design schedule performance reviewed at least monthly	18.0
No rigorous and detailed submittal reviews by DOT	18.9
Used work breakdown structure to scope design services	19.0
Staff availability considered in planning design	19.1
Construction specialists reviewed design	19.3
Milestone dates included in design plan	19.8
Submittals reported as “Fair to Good”	20.1
Design scope modified promptly when needed	20.4
Rates of designer compensation not “capped”	23.3
State reviews of submittals usually on-time	24.2
Designer submissions of deliverables usually on-time	24.8
No value engineering performed	25.4

Source: Jones et al. Sep. 2003, Chart 15, p. 67. (DQR = Design Quality Ranking. Lower DQR value denotes higher design quality.)

Table C-4. Management practices associated with lower design quality according to the Massachusetts model.

Management Practices Normally Found in Projects with Lower Design Quality	Avg. DQR
Untimely design quality review meetings	29.0
Constructibility review by design team	29.1
Untimely design scope changes	29.2
Salary and overhead caps	30.1
State DOT policy advocates "cost recovery"?	30.4
Untimely reviews of design schedule by DOT	31.5
Untimely design submittals	33.0
DOT reviews submittals in detail	35.4
Value engineering	37.7
Untimely submittal reviews by DOT	42.8

Source: Jones et al. Sep. 2003, Chart 16, p. 68. (DQR = Design Quality Ranking. Higher DQR value denotes lower design quality.)

Some of these results in Table C-3 and Table C-4 may appear counter-intuitive or contrary to findings of other studies. Discussions with MHD and The Engineering Center personnel indicated several potential reasons to explain these effects, and their interpretation and implication are addressed to a degree in the report by Jones et al. Further research would provide a more definitive explanation.

Several of the metrics in this model are computed using bid price results. Bid prices can be distorted by practices such as bid unbalancing. Jones et al. concluded that while bid unbalancing by skillful contractors can give them a profitable advantage, such unbalancing is unlikely by rational bidders unless quantities are "significantly" misestimated – again, a product of poor quality design. Jones et al. estimated that the cost of bid unbalancing in the pool of 53 projects that were included in their study is about 7.7 percent of the total award price. Most of this additional cost is concentrated in those projects that were found in the study to have a high DQR: i.e., a low design quality (pp. 79-80).

Other MassHighway-ACEC/MA Activities. Following completion of this study, MHD worked with Transportation Agency Liaison Committee of the American Council of Engineering Companies of Massachusetts (ACEC/MA) to conduct an interactive work session with managers from MassHighway and ACEC/MA member firms. The purpose of this session was to cover a broader set of complementary topics on the relationship of the agency to the consultant design profession. Among these topics was a discussion of common design errors and omissions, and ways to avoid them on future MHD projects. The impacts of design errors on project cost and time were discussed. Suggestions to reduce these errors and omissions included ("MassHighway and ACEC/MA…" May 10, 2004):

- Conducting a field verification walk-through before each major submission.
- Early contact with utility companies regarding possible events influencing the project.
- Greater use of quality control techniques such as pre-design kickoff meetings, distribution of project manuals, and independent reviews by senior engineers.
- Use of checklists when reviewing designs and drawings.
- Use of more detailed, up-to-date survey and boring data.
- Early notification and involvement of the design consultant in helping to mitigate the effects of errors and omissions when they are discovered.
- Involvement of the design consultant during construction and in debriefing following construction to review how the project could have been improved.

Cost Recovery Policy Issues
for Departments of Transportation

Introduction

The transportation consulting engineering community recognizes the obligations of state departments of transportation and the FHWA to be good stewards of public funds, and thus the need for a process to recover non-value-added costs resulting from the negligent performance of professional design engineering services. We believe that any such process should be fair and equitable and, to the extent possible, be consistent from state-to-state. The process should strive to embrace the principles of a sincere partnering relationship. In addition, it is our desire to effectively utilize the time and resources of both the state departments of transportation and the design engineering community as each state develops its policy and process.

To facilitate the achievement of those goals, we have prepared the attached list of elements that we believe should be considered in the formation of a fair cost recovery policy.

Version 1.3

September 8, 2005

Cost Recovery Policy Issues for Departments of Transportation
Version 1.3

	Issue	Reason / Talking Points
1.	**Purpose/Scope/Foundation Principles**	It is important to state the purpose and scope of the policy. It is also important to mention some foundation principles embodied by the policy including: a "teamwork" approach in analyzing and correcting errors and omissions efficiently; the recognition that all design and construction projects contain some errors and omissions; the design engineer should be expected to perform to the standard of care applicable to the services provided; and that the cost recovery policy applies to errors and omissions that breach the standard of care, i.e., negligence.
2.	**Definitions**	It is important to define various terms used in the policy.
	When a problem is detected:	
3.	**Immediate notification to design engineer of problems.**	This is important to ensure that the design intent is properly interpreted and that recommended changes are consistent with the design approach. The design engineer should provide timely input to find the most effective and efficient solutions.
4.	**Provide opportunity for the design engineer to participate in the solution**	All members of the project team bring different skills and experience to the project. It is essential for the design engineer to work with the owner and the construction contractor to resolve project issues and mitigate the damages.
	Process of evaluation and assessment:	
5.	**Recognize betterment**	"Betterment" refers to the principle that the design engineer is not responsible for materials or construction that are required and/or desired by the owner regardless of whether they were omitted or mis-quantified on the design documents. This is because they would be required on the project and the additional costs are part of the inherent project costs; that is, had they been identified initially, the costs would have been borne by the owner.
6.	**Totality of the project and services must be taken into consideration**	Final resolution of cost recovery should be decided at the end of the project where the totality of the services can be taken into consideration. It is out of context in many cases to look at individual issues without an appreciation for the level of quality, performance, and value provided over the course of the entire project.
7.	**Tie to negligence**	In order to ensure that the procedures established are fair and consistent with long-standing legal interpretations, the evaluation of potential errors and omissions should be based on "negligence", which is the failure to adhere to the standard of care applicable to the services provided.

8.	**Weigh recovery costs vs. damages**	As a matter of fiscal responsibility it is important to evaluate the resources needed to pursue recovery vs. the amount being pursued and the likelihood of recovery.
9.	**Design engineer compensation for services to address project issues if such issues are not the result of consultant's negligence**	As a matter of principle, services rendered by the design engineer on behalf of the owner should be properly compensated. Likewise, when it is determined that there is negligence by the design engineer, there should not be compensation to the design engineer for time spent in addressing those project issues.
10.	**Include an appeals process**	To maintain integrity and confidence in the policy there should be an appeals process that provides for an independent review and opinion.
11.	**When a consultant accepts responsibility for an issue and pays, it should be released from any future liability for that problem**	To encourage proactive participation and the timely closure of issues by all parties, the participating parties should be released from future liabilities regarding that issue when fair participation leads to resolution.
	Other considerations, not necessarily part of the actual cost recovery policy:	
12.	**No percentage thresholds should be established to determine cost recovery against design engineers**	It is not appropriate to assign a percentage of construction threshold for all projects to trigger cost recovery. There are many factors impacting construction projects such as: • Schedule • Project Complexity • Level of subsurface investigation • Subsurface conditions • Owner directed changes • Contractor desired changes • Field betterment and constructability issues • Consistent funding • Bidding process • Project execution efficiencies • Consultant's scope and budget Factors like these make it impractical to have any meaningful percentage for general use.
13.	**Contingency Planning**	It is recommended that owners have a contingency budget in place to account for minor issues and project changes that are common on every project. This provides the owner the flexibility to address project changes in an appropriate and fair manner.
14.	**Design engineer participation for post-design services**	The owner benefits by active participation of the design engineer by providing real-time input on design intent. While procurement practices differ greatly from location to location and project to project, having some meaningful level of design engineer participation during construction is highly beneficial and desirable.

RISKY BUSINESS: Why Shifting All the Risk to Consultants Doesn't Work

By Thomas H. Porterfield,
Victor O. Schinnerer & Company, Inc.

Airport projects have become more complicated. And with more complex projects, the risks are higher. Risk has always been inherent in projects large and small. However, with increasing frequency design professionals are being asked—in some cases even required—to sign agreements in which they are asked to defend and indemnify their clients and other parties against any loss they may suffer in connection with projects for which the design professionals have provided services.

Shifting more and more risk to consultants may seem attractive to project sponsors. But does it really work?

Schinnerer is seeing more cases of broad form indemnification clauses in professional service contracts. These clauses may include:

> Language so broadly worded that it applies to any loss the client may suffer *whether or not it is attributable to the design professional's activities* on the client's behalf.

> Indemnification for loss based on any wrongful conduct by the design professional *regardless of the degree of responsibility for the loss*. Other clauses make the design professional liable for losses (caused in whole or in part) by its negligence regardless of the fact that much of the damage may have been caused by the party seeking indemnification.

Airport project sponsors may not receive the benefits they believe will be achieved through broad form indemnification clauses. Why?

1. Indemnification language is likely to impose liabilities on design professionals that are not their proper professional responsibility or involve exposures considerably in excess of what the law would otherwise normally require. The courts recognize that design professionals must meet the professional standard of care. Any indemnification obligation that is broader than that covering the negligence of the insured or those working for the insured is likely to raise judicial scrutiny. Any indemnification provision that asks a design professional to indemnify the client for damage caused by the client's negligence may be void as against public policy.

2. While a consultant may agree to defend and indemnify its clients for anything allowed under law, professional liability insurance only provides coverage for those damages and costs resulting from the insured's professional negligence in providing services on a project!

   For example, consider the following example of indemnification language:

   > "Design professional agrees to indemnify and hold harmless the client from all claims, losses, damages and expenses (including attorneys' fees and other legal expenses) caused by, related to, or in any way connected with the Project [or the design professional's services.]"

   This indemnification provision extends beyond the coverage provided by the CNA A/E Professional Liability Insurance Policy and, to my knowledge, all other professional liability policy available. Such an indemnity agreement would, subject to all policy terms and conditions, be covered if the design professional were negligent in its performance or in not providing the professional services at all. In this case the design professional may not have coverage for a claim or may have to argue with its insurer to determine if coverage exists.

3. Finally, airport clients that incorporate broad form indemnification language in contracts may violate Federal Aviation Administration regulations and may potentially risk losing federal eligibility for project assistance. Specifically, the FAA addresses indemnification and expanded liability in consultant contracts in Advisory Circular 150/5100-14D. Paragraph 3-3 of the Advisory Circular, *Division of Responsibility and Authority*, Sections b and c, states that "the contract must not attempt to make the Consultant an indemnitor of the sponsor such as in the event of the sponsor's negligence or the absence of any wrongdoing by the Consultant." The FAA states that such provisions "could affect the competitive process of contract award in a way the conflicts with the requirements of 49 CFR part 18 and may impact Federal eligibility."

On the whole, broad form indemnification provisions provide little benefit to a client. If the intent is to hold the design professional responsible for any claim that could tangentially be associated with the project or with his or her performance, the client is overreaching. Since no design professional has insurance coverage for such broad indemnification provisions, the client is left to try and secure the indemnity payment from the assets of the design professional. Since few firms have much in the way of financial assets (no professional service firm of any type has sufficient financial assets for such broad liabilities), the client spends its resources to essentially drive its design professionals out of business.

In conclusion, owners should be prepared to accept some risk as being incident to the owner's participation in the project and not attempt to transfer such risks to design professionals through indemnification provisions. Specific indemnification provisions should be included for damage resulting from the *negligent* acts, errors or omissions of the insured. At the same time, consultants should take care to avoid agreeing to an indemnification provision they may be accepting contractual responsibilities beyond this normal insurable legal liability.

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The Cost of Perfection
In Public Works Projects

A Design Professional's Perspective

THE RISK OF TRYING TO ATTAIN PERFECTION

There is a down side to trying to attain a perfect project including increased costs and a fracturing of the project team among others; in the end this may even cost the success of the project. Owners that involve themselves in a collaborative and cooperative team approach with the design professional (and construction contractors when identified) are most likely to accomplish successful projects. This team approach involves the honest exchange of ideas, information and problem solving efforts that minimize costs and improve results. However, there is a trend with some owners to define a successful project as one without any risk to the owner. This "risk free" approach is anything but risk free – in fact it may be just the opposite. This document was written to explain some of the ramifications of this trend that involves risk shifting and cost recovery efforts by some owners in an attempt to attain perfect projects.

THE DESIRE FOR PERFECTION

There is a natural inclination for owners to seek perfection in their projects. Construction industry surveys and studies indicate that between one-third and one-half of all projects are over budget or behind schedule and that more than one-third of owners of major new construction projects are involved in arbitration or litigation of construction contract claims.[1] Recent high profile megaproject cost "overruns" provide dramatic examples of this. As professionals and representatives for the public we naturally want to avoid being associated with projects that are not viewed as successes. In addition to a tightening of fiscal constraints and an elevated awareness of the need for better accountability the trend is for some owners to move closer and closer to wanting perfect or "risk free" projects. Of course, while this may be desirable for all parties involved, perfection is not reasonably achievable and the quest for perfection can be costly.

Like any owner, these owners don't want any surprises, cost increases, delays, or change orders. They would prefer to not have any of the risk associated with the project, and they would prefer to not have to rely on the use of contingency funds. However, projects are not static; they are subject to changing conditions, requirements, and constraints. While risk free perfection is desirable, it is not achievable for even the best-funded projects.

The symptoms of this desire for perfection become evident in challenges the design professionals are finding themselves confronted with:

1. An owner thinking of the design professional consultant and its insurance policy as a potential source of money to cover contingencies.
2. A restructuring of risk so the design professional and the construction contractor are required to assume all risks, including extra costs or damages caused by the owner's own negligence through unfair contract clauses.

[1] Barry B. Bramble, Michael T. Callahan, Construction Delay Claims, (Third Edition, Construction Law Library, Aspen Publishers 2000)

WHY NOT SEEK PERFECTION?

While owners have every right to seek perfection in their projects, the downside is that it is not a realistic or practical approach to accomplishing "successful" projects. Owners need to understand the ramifications of their decisions when they do so. Professional engineering and design services are not commodities that can be bought off the shelf with a money-back-guarantee. The design and construction processes are inherently dynamic and fraught with decision points and inputs that are variable. Successful projects are attained through the collective working of a committed team with a vested interest in achieving the same outcome. The best "value" will be achieved through a process where the organizations best able to influence, manage, and mitigate a risk are contractually responsible for them. When owners deviate from this they will not achieve the best value and will pay more, either in up front bids, through contingencies spending, through poor contractor performance, or through claims.

To achieve the best value in the constructed project, it is not in the best interests of the owner to try and produce the perfect set of plans. Instead, project refinements normally should be made during the construction phase through design improvements, explanations of design intent, or change orders. This allows the construction contractor to use methods and details best matched to its experience, expertise and ideas. It does not mean that the design professional is not responsible to provide a design consistent with the project and contractual requirements. The important thing to consider is that one needs to keep the cost of quality versus the cost of trying to attain perfection in perspective when considering the role of the design professional and the value they bring to the project.

THE COST OF QUALITY

In addition to the consideration of value in the constructed project, one also needs to understand that the "costs" associated with too high of an emphasis on quality to try to attain perfection comes at a price that is not linear with the resulting actual increase in quality. The graph depicts the relationship between quality, the costs of defects because of a lack of quality, and the associated cost relationship.[2] Optimally owners should strive to have the total costs of quality minimized, thereby minimizing overall project costs.

When owners or consultants begin demanding quality beyond this optimal point, it is not a linear increase in costs; rather they experience a steadily increasing cost of quality with minimal gain in benefit. With perfection never achievable, the costs of trying to achieve it become extremely high.

[2]Cost of Quality Graph – based on Phillip B. Crosby, Quality is Free

SOME COMMON MISCONCEPTIONS

The Unique Nature of Design and Construction

The nature of the design process is such that each project is unique – the first and only one exactly like it. This can be contrasted to a manufactured product that is perfected over time. Consumers buy products expecting perfection or make a trade-off to a lower priced option. Take, for example, a new car, which will be reproduced thousands of times. If you find a defect, you take it back to be corrected under warranty. This is because a manufactured product can be "perfected" through product testing, design improvements and manufacturing process improvements during the life of the production line for that particular model and its predecessors. While the engineering, design, and construction community continues to improve its methodologies and learn from the past each project is different with its own unique challenges.

Thinking of the engineering and design process as a product has lead to some common misconceptions:

- Contract documents are 100% complete, free of any defects, and contain everything needed for the construction contractor to do the job.
- No change orders are to be expected.
- No contingency budgets are necessary.
- Any construction change order probably stems from a design fault.
- Once there is a construction contract, the owner only has to pay for changes in the work that the owner initiates.
- All extra costs are damages regardless of their origin (e.g. *project improvements or changes at the request of the owner should be borne by the owner).*
- Design professionals are responsible to see that the construction contractor builds it right.
- Professional liability insurance is a no-fault policy.
- Design documents or construction contract documents are "guaranteed" or come with a "warranty" to be free from defects and fit for the intended use.
- More than a few "RFI's" on any project are clear evidence of defects in the design.

PROFESSIONAL LIABILITY

In a typical public works construction project, the owner warrants the adequacy of the design to the construction contractor. This can result in a natural belief by many owners that the designer warrants the design to the owner. However, given the nature of the design process, this is not the case, and a warranty is not made nor implied from the designer to the owner. The designer is a professional and held to a professional standard, not a standard of perfection. Because designers are not perfect, some level of design deficiencies exists on every set of plans and specifications. The courts have recognized this, and the common law that applies to design professionals is that they must meet the professional standard of care in the performance of their professional services. In the event they do not meet the professional standard of care, they may be found to have acted in a

negligent fashion. If a design professional's negligence causes an owner to suffer damages, the design professional should be held liable for these damages.

The rationale for this negligence-based liability is founded on the imprecise and judgmental nature of the design process and on how inaccuracies may creep into design documents without "negligence." Examples of some possible non-negligent errors or omissions might include:

- Using inaccurate or incomplete data provided by others that a design professional has a duty to use and a right to rely on.
- Scope of services specifically being reduced by the owner to save money in a situation where a more complete scope could have prevented or mitigated the loss or cost.
- Reliance on a vendor's data that is misleading or is not accurate.
- Unforeseen site conditions that were not detected through reasonable investigations.
- Changes in owners' personnel who have different understandings or expectations than the original personnel who championed the project and hired the design professional.
- Code and standard changes which become effective during the design process, resulting in design changes.
- Interpretations by building officials and inspectors, which may differ from the actual intent of the building ordinance or from previous interpretations.
- Contractors or owners misinterpreting design documents.

Professional Liability Insurance

Design professionals usually maintain professional liability insurance to cover the cost of the damages their negligence has caused. Professional liability insurance policies only provide coverage for professional negligence. All professional liability policies exclude coverage for liability the design profession assumes by contract. That is, the policies exclude coverage for professional services that may meet the professional standard of care but do not meet the elevated standard of care agreed to in the contract. The policies also exclude any other losses the design professional may experience that are not caused by professional negligence; examples include liquidated damages, penalties and warranties.

While professional liability insurance is sometimes incorrectly referred to as E&O (errors and omissions) insurance, it is not. In fact there is no such thing as E&O insurance. It is frequently believed by owners and contractors that any deviation or item that caused a loss should be classified as an error or omission. However, as discussed above, minor errors and omissions are common and should be expected as part of the normal process. In fact, it is only when designers' actions are negligent (i.e., fall below the professional standard of care) that professional liability insurance provides coverage.

IMPLICATIONS OF RISK TRANSFER

The changing expectations and drive towards perfection normally lead to a reallocation of risks. The general principle in risk management is that the party with the most control and influence over a risk be responsible for that risk. When risks are improperly allocated, either programmatic or monetary contingencies are required. This only drives up costs and many times drives wedges between the project members.

Loss of Team Approach

An unfair allocation of risks is in many cases putting design professionals in a defensive position from the onset of the project. However, professional designers have always believed that their role should be one of a "trusted advisor" to the owner. The current shifts in risk allocation causes animosity between project team members and inhibits open communications. Without the opportunity to openly discuss options, risks and rewards and to provide creative solutions, the project will not benefit from the attributes of a trusted advisor.

Also, during construction, many owners frequently do not consider the design professional to be an important and valuable part of their team. This can be especially true when cost control issues arise during the construction phase. Design professionals frequently find themselves in situations where the owner has accepted construction contractor claims without involving the design professional in the evaluation process. Or worse yet, based on the theory there must have been an "error" or "omission", the owner demands that the design professional answer and defend all contractor claims. This forces the design professional to spend a significant amount of time in defending themselves and trying to get paid for their efforts on behalf of the owner. Sadly, these situations lead to strained and deteriorating relationships between design professionals and owners. The real loss in these situations is that the project is then not benefiting from the knowledge of the design professional in what the original design intent was and why it was developed as such.

Cost To Owners

Hiring the most qualified design professional should result in the greatest value for the completed project through excellence in design and cost savings during construction by informed handling of emerging construction issues and support in addressing potential contractor claims. However, in light of these trends owners may be unable to attract and retain the most qualified design professionals to their projects if the owner knowingly, or unknowingly, unfairly allocates risks and demands perfection. The best and most qualified design professionals are more and more frequently shying away from these projects. Considering that the fees paid for design services are usually less than about 1% of the life cycle costs or 10% of the construction costs of a project, it only make sense to hire the most qualified design professional and for them to be an integral part of the project team.

Once hired under a project where risks have been unfairly allocated, risk avoidance by the design professional may also increase construction costs. In a lower risk environment, the owner may rely on the quality and creativity of the design to lower construction costs and life cycle costs. Conversely, on a high risk (for the design professional) project, to avoid the risk of claims, the design professional may over-design or keep the design overly simple. This approach can increase construction costs by requiring greater quantities of materials and possibly increase operating costs through lack of innovation or quality in design.

Owners are adamant that the design professional carry professional liability insurance. However, the unfair allocation of risk may interfere with the owner's access to insurance coverage. The claim may be viewed by the insurance company as an uncovered claim, since it may be based on contractual warranty or breach of contract. If owners are to rely on professional liability insurance, they will have to base their claim on negligence. To do so, they will need to show that the design professional did not meet the professional standard of care. The owners will need to prove: 1) what the standard of care was (taking into consideration the complete contract/project situation including scope and responsibility issues), 2) that the design professional did not perform to this standard, 3) that the failure to do so was the cause of the damages, and 4) the specific amount of the damages. One of the risks is that the courts may find otherwise, leaving the owner without insurance company coverage and empty handed if the design professional can't directly cover the loss.

IMPLICATIONS OF UNDERESTIMATING PROJECT COSTS

A more serious situation can confront an owner when there has been deliberate underestimating of costs by the owner in order to obtain project approval. Recent studies of large public improvement projects indicate that public owners have not made improvements in cost estimating over the last few decades while all the tools and information sources to help make estimates have improved.[3] The speculation is that large projects have been intentionally under budgeted in order to obtain voter support for the financing approvals. Whatever the cause, almost all large public improvement projects contain initial cost estimating errors that result in the need for increased funding to complete the projects. This scenario creates a strong incentive for the owner to look to design professionals for perfection and develop contracts that rely on design professionals and their insurers to help fund the projects.

As stated in a January 2004 article "… when cost overruns result (in whole or predominately) from deliberate and strategic Owner cost underestimation – as distinct from cost overrun attributable to the professional's failure to meet the professional standard of care – professional liability insurers will quite correctly and appropriately take the position that they have no responsibility since the causes of the cost overrun were outside the control or responsibility – not due to deficient performance – of their professional insureds."[4]

The article further concludes "At the end of the day the design and construction management professional will probably succeed in most situations in defending claims against it based on external risk factors which are outside the involvement, control or responsibility of the professional; however, what is equally clear is that exposure risk of the professional due to the potential or actual assertion of such claims arising out of external risk factors is substantial and an aggressive and successful defense may well irreparably damage relations with the Owner …"[5]

The external factors referred to in the above statement are those that the owner is responsible for and in control of. These include developing and approving a project budget, defining the project program, defining the scope and sequence of the project scope and cost estimating process, defining and implementing cost reporting procedures, decision-making regarding risk allocation, dispute resolution, delivery method, project management structure and amount of cost contingency.[6]

ROLE OF THE DESIGN PROFESSIONAL

It should be clearly understood in these discussions of negligence and risk allocation that the authors in no way mean to suggest that design professionals be not accepting of their responsibilities as professionals and servants to the greater public good. Nor should it be construed that the standard of care be degraded. In contrast, it is widely recognized that the standard of care for professional engineering services has been and continues to be very high with ever increasing levels of productivity through training, education, experience, and the application of technology. Design professionals are typically contracted and compensated for a given risk sharing situation based on the ability to control those risks. When risks are allocated to those without the ability to effectively and efficiently control them, it will place a strain on the project and lead to a breakdown in the team.

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[3] B. Flyvbjerg, N. Bruzelius, W. Rothengatter, Megaprojects and Risk: An Anatomy of Ambition (Cambridge University Press 2003).
[4] D. J. Hatem, Developing Risk Indicators for Evaluating Professional Liability Exposure on Major Public Projects: A Broader Dimensional Approach (Boston, Massachusetts, January 2004), p. 28.
[5] Ibid, p.37.
[6] Ibid, p. 25.

TEAMWORK AND UNDERSTANDING

The best way for owners to establish a successful project program is to develop a collaborative relationship with its project team including the design professional acting in the capacity of a "trusted advisor." This should result in enhanced understanding between the owner and the design professional, both with their focus on a successful project. To accomplish this, owners may want to take the initiative in the following areas:

- Establish the design professional as a "trusted advisor" to the owner.
- Engage in meaningful contract negotiations, working toward contracts that provide the right elements to allow for project issues to be properly addressed and for risks to be fairly allocated.
- Candidly discuss with the design professional the owner's expectations of the design or construction documents, realizing that they typically contain some errors and omissions – *no set of documents is perfect* – and the processes to identify and correct each problem as it arises, both during the design process and during construction.
- Make sure that owners' project representatives understand the following:
  - The imprecise and judgmental nature of the design business.
  - How inaccuracies can creep into design documents without negligence.
  - Standard of care/negligence issues.
  - Professional liability insurance issues.
  - Quality-price-schedule tradeoffs.
  - Roles and responsibilities of the design professional.
- Plan for adequate contingency budgets, including those to pay for design enhancements or unexpected conditions.
- Foster a team approach among the construction contractor, the design professional, and the owner.
- Have the design professional materially involved during the construction phase of the project, especially with respect to interpreting design intent and helping to resolve problems and conflicts.
- Insist on participating in all constructability reviews, whether or not the construction contractor has been identified.
- Include a design professional as an advisor to the owner when evaluating claims or disputes involving the design professional.
- Make sure the contract includes provisions for alternative dispute resolution short of arbitration or litigation. Probably the most effective and efficient dispute resolution techniques are "good faith" senior management discussion of disputed issues and mediation. Other recommended, but more cumbersome and expensive techniques are peer-review of design documents/project issues and "mini-trials".

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