

**TRANSIT COOPERATIVE RESEARCH PROGRAM**

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**TCRP Synthesis 28**

**Managing Transit Construction  
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**A Synthesis of Transit Practice**

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## **Managing Transit Construction Contract Claims**

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## TRANSIT COOPERATIVE RESEARCH PROGRAM

The nation's growth and the need to meet mobility, environmental, and energy objectives place demands on public transit systems. Current systems, some of which are old and in need of upgrading, must expand service area, increase service frequency, and improve efficiency to serve these demands. Research is necessary to solve operating problems, to adapt appropriate new technologies from other industries, and to introduce innovations into the transit industry. The Transit Cooperative Research Program (TCRP) serves as one of the principal means by which the transit industry can develop innovative near-term solutions to meet demands placed on it.

The need for TCRP was originally identified in TRB *Special Report 213--Research for Public Transit: New Directions*, published in 1987 and based on a study sponsored by the Federal Transit Administration (FTA). A report by the American Public Transit Association (APTA), *Transportation 2000*, also recognized the need for local, problem-solving research. TCRP, modeled after the longstanding and successful National Cooperative Highway Research Program, undertakes research and other technical activities in response to the needs of transit service providers. The scope of vice configuration, equipment, facilities, operations, human resources, maintenance, policy, and administrative practices.

TCRP was established under FTA sponsorship in July 1992. Proposed by the U.S. Department of Transportation, TCRP was authorized as part of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). On May 13, 1992, a memorandum agreement outlining TCRP operating procedures was executed by the three cooperating organizations: FTA, the National Academy of Sciences, acting through the Transportation Research Board (TRB), and the Transit Development Corporation, Inc. (TDC), a nonprofit educational and research organization established by APTA. TDC is responsible for forming the independent governing board, designated as the TCRP Oversight and Project Selection (TOPS) Committee.

Research problem statements for TCRP are solicited periodically but may be submitted to TRB by anyone at anytime. It is the responsibility of the TOPS Committee to formulate the research program by identifying the highest priority projects. As part of the evaluation, the TOPS Committee defines funding levels and expected products.

Once selected, each project is assigned to an expert panel, appointed by the Transportation Research Board. The panels prepare project statements (requests for proposals), select contractors, and provide technical guidance and counsel throughout the life of the project. The process for developing research problem statements and selecting research agencies has been used by TRB in managing cooperative research programs since 1962. As in other TRB activities, TCRP project panels serve voluntarily without compensation.

Because research cannot have the desired impact if products fail to reach the intended audience, special emphasis is placed on disseminating TCRP results to the intended end-users of the research: transit agencies, service providers, and suppliers. TRB provides a series of research reports, syntheses of transit practice, and other supporting material developed by TCRP research. APTA will arrange for workshops, training aids, field visits, and other activities to ensure that results are implemented by urban and rural transit industry practitioners.

The TCRP provides a forum where transit agencies can cooperatively address common operational problems. TCRP results support and complement other ongoing transit research and training programs.

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The members of the technical advisory panel selected to monitor this project and to review this report were chosen for recognized scholarly competence and with due consideration for the balance of disciplines appropriate to the project. The opinions and conclusions expressed or implied are those of the research agency that performed the research, and while they have been accepted as appropriate by the technical panel, they are not necessarily those of the Transportation Research Board, the Transit Development Corporation, the National Research Council, or the Federal Transit Administration of the U.S. Department of Transportation.

Each report is reviewed and accepted for publication by the technical panel according to procedures established and monitored by the Transportation Research Board Executive Committee and the Governing Board of the National Research Council.

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## **PREFACE**

A vast storehouse of information exists on many subjects of concern to the transit industry. This information has resulted from research and from the successful application of solutions to problems by individuals or organizations. There is a continuing need to provide a systematic means for compiling this information and making it available to the entire transit community in a usable format. The Transit Cooperative Research Program includes a synthesis series designed to search for and synthesize useful knowledge from all available sources and to prepare documented reports on current practices in subject areas of concern to the transit industry.

This synthesis series reports on various practices, making specific recommendations where appropriate but without the detailed directions usually found in handbooks or design manuals. Nonetheless, these documents can serve similar purposes, for each is a compendium of the best knowledge available on those measures found to be successful in resolving specific problems. The extent to which these reports are useful will be tempered by the user's knowledge and experience in the particular problem area.

## **FOREWORD**

*By Staff  
Transportation  
Research Board*

This synthesis will be of interest to transit agency general managers, their legal, risk management, engineering and construction staffs, and others dealing with contract management issues on behalf of transit agencies. It offers information from selected transit agencies about the underlying causes of construction disputes and practices in use today to identify and resolve them before they become formal claims. The synthesis focuses on avoidance and resolution of disputes, examines ways of settling disputes at their inception, and considers the experiences of the transit industry in the use of alternative dispute resolution techniques.

Administrators, practitioners, and researchers are continually faced with issues or problems on which there is much information, either in the form of reports or in terms of undocumented experience and practice. Unfortunately, this information often is scattered or not readily available in the literature, and, as a consequence, in seeking solutions, full information on what has been learned about an issue or problem is not assembled. Costly research findings may go unused, valuable experience may be overlooked, and full consideration may not be given to the available methods of solving or alleviating the issue or problem. In an effort to correct this situation, the Transit Cooperative Research Program (TCRP) Synthesis Project, carried out by the Transportation Research Board as the research agency, has the objective of reporting on common transit issues and problems and synthesizing available information. The synthesis reports from this endeavor constitute a TCRP publication series in which various forms of relevant information are assembled into single, concise documents pertaining to a specific problem or closely related issues.

This report of the Transportation Research Board addresses a major focus of transit management, to maintain projects and programs within overall budget and time parameters, but does not address the experiences of the industry with regard to lawsuits involving unresolved disputes and claims.

To develop this synthesis in a comprehensive manner and to ensure inclusion of significant knowledge, available information was assembled from numerous sources, including a number of public transportation agencies. A topic panel of experts in the subject area was established to guide the researchers in organizing and evaluating the collected data, and to review the final synthesis report.

This synthesis is an immediately useful document that records practices that were acceptable within the limitations of the knowledge available at the time of its preparation. As the processes of advancement continue, new knowledge can be expected to be added to that now at hand.

## CONTENTS

- 1 SUMMARY
  
- 3 CHAPTER ONE INTRODUCTION
  - Background, 3
  - Scope of Work and Approach of the Synthesis, 3
  - Key Terms and Concepts, 3
  
- 6 CHAPTER TWO OVERVIEW OF RESPONSES
  - Responding Agencies, 6
  - General Information, 6
  
- 8 CHAPTER THREE TYPES OF DISPUTES AND CLAIMS AND THEIR CAUSES
  - Introduction, 8
  - Previous Studies, 9
  - Terminology of Disputes and Claims, 10
  
- 13 CHAPTER FOUR CLAIM AVOIDANCE PRACTICES
  - Industry Practices, 13
  - Agency Dispute Avoidance Practices, 18
  
- 21 CHAPTER FIVE RECOGNITION AND RESOLUTION TECHNIQUES
  - Recognition Techniques, 21
  - Agency Dispute Resolution Practices, 29
  
- 34 CHAPTER SIX CASE STUDIES
  - Tracking Field Problems, 34
  - Performance-Based Consulting Contracts, 34
  - Change Control System, 34
  - Debarment of Contractor, 35
  - Prequalification of Bidders, 35
  - Use of Consultants for Workload Surges, 35
  - Owner Furnished Mining Equipment, 36
  
- 37 CHAPTER SEVEN CONCLUSIONS
  
- 39 REFERENCES
  
- 41 BIBLIOGRAPHY
  
- 42 APPENDIX A QUESTIONNAIRE
  
- 50 APPENDIX B RESPONDING AGENCIES

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This study was managed by Donna L. Vlasak, Senior Program Officer, who worked with the consultants, the Topic Panel, and the J-7 project committee in the development and review of the report. Assistance in Topic Panel selection and project scope development was provided by Sally D. Liff, Senior Program Officer. Linda S. Mason was responsible for editing and production. Cheryl Keith assisted in meeting logistics and distribution of the questionnaire and draft reports.

Information on current practice was provided by many transit agencies. Their cooperation and assistance were most helpful.

## MANAGING TRANSIT CONSTRUCTION CONTRACT CLAIMS

### SUMMARY

This report examines the underlying causes of disputes in construction and the practices used to identify and resolve them before they become formal claims. Transit agencies in the United States and Canada with construction programs during the last 5 years were asked to answer a detailed questionnaire concerning their experiences. The responding agencies represent \$10.5 billion of construction investment during this period.

The majority of agencies (52 percent) reported that the trend of cost growth from disputes and claims remained constant, while the rest of the agencies were evenly split between an increasing trend and a decreasing trend. Agencies reported that they experienced an average cost growth of seven percent of contract value from settlement of disputes and claims for heavy civil contracts, with responses varying from a high of 20 percent to a low of 2.2 percent.

A number of studies have examined the underlying causes of claims and disputes and concluded that deficiencies in contract documents typically account for half of all problems and site conditions account for 20 percent. Site conditions have a higher dollar value of settlement, representing 35 percent of settlement dollars. Transit agencies should expect greater site condition problems because of the nature of the contract work when compared with the general construction industry, which involves more vertical work.

The legal jurisdiction of construction contracts, including contracts with federal funding participation, is state law. However, one federal court has recently applied federal case law rather than state case law, when federal funds were involved. Also, federal case law precedent is typically followed by state jurisdictions if the contract clause in dispute follows federal wording and there is no state case law precedent.

Two recent developments in establishing the construction time of contracts have proven effective in reducing the contract specified duration and in further reducing the achieved construction duration. These techniques are called the A plus B method and the incentive/disincentive method of bidding contract time. These practices have been especially effective with repair, rehabilitation, and replacement contracts.

An effort has been initiated by the professionals involved in underground construction to reduce or manage disputes involving geotechnical matters. Three techniques are involved in the effort. The first is to provide in the bid documents the engineer's appraisal of the likely ground conditions anticipated. This document is currently referred to as the Geotechnical Design Summary Report to be superseded by the Geotechnical Baseline Report. The second technique is the escrowing of the contractor's bid documents; and the third is the creation of a Dispute Review Board (DRB) to hear disputes relatively contemporaneously with construction and to submit nonbinding findings, which it is hoped, would be adopted by both parties, settling the dispute. Transit agencies with underground projects have adopted these practices except where stopped by pressure from contractors opposed to the escrowing of bid documents. The use of DRBs is also spreading fairly rapidly outside of underground construction as reports of the success of this technique spread.

Transit agencies have also adopted a number of industry techniques to prevent disputes by improving the quality of the design documents. A high percentage of agencies require

their design organization to establish and use a quality assurance program during the design of transit projects. No pattern emerged as to how the design is accomplished, whether by inhouse resources, the use of an engineering management consultant, or by separately awarded design contracts. Agencies appear to use varying combinations of the three techniques.

The majority of transit agencies also use three additional techniques during design to reduce overall program cost. These are design reviews during design, value engineering studies and constructibility reviews. Analyses of cost/benefit ratios of these techniques all show a 10 to 1 or better return on investments. Agencies not currently using these practices are strongly advised to consider them.

Analysis of dispute avoidance during construction shows that the people involved in the project delivery have the greatest impact on the success of a particular project with regard to avoiding disputes. Team building and partnering and, to a limited extent, DRBs are approaches to successful project delivery through enhanced cooperation. Partnering is being carried out by a number of transit agencies.

Transit agencies have also widely adopted a number of techniques in general industry use for early recognition and resolution of problems, including requiring comprehensive construction schedules with regular updates, proactive negotiations, and review of project documentation. These and other techniques are all widely and aggressively used by transit agencies.

The one area in which transit significantly lags construction industry management is the distribution of authority to settle disputes to field staff. This may be explained by the central location of transit project staff with headquarters staff contrasted with industries whose project staff are distributed over wide geographic regions. This is reflected in the dispute avoidance and early resolution training or lack thereof, of field personnel. Only 50 percent of transit agencies report the use of training in their practices of disputes and claims management.

Another area that seems to warrant improvement is the formal or informal practice of many transit agencies to wait until project completion to address disputes. Studies indicate that this practice can lead to higher contractor recovery than prompt resolution.

In conclusion, transit agencies devote considerable efforts to both prevent and minimize dispute growth into formal claims and litigation. Transit agencies have also implemented a number of additional techniques to minimize disputes and claims. Based on industry studies, these practices will save project cost growth and enhance the quality of project delivery.

## CHAPTER ONE

### INTRODUCTION

#### BACKGROUND

In the mid and late 1980s and early 1990s, a significant number of new starts and additions to existing transit systems were initiated throughout the United States and Canada. As construction on these programs got under way, it was soon recognized that management of disputes and claims required a major focus of management, to maintain projects and programs within overall budget and time parameters.

This synthesis was initiated to study the underlying reasons for construction contract disputes in transit construction and to identify methods used for dispute avoidance and resolution. The synthesis focuses on the avoidance and resolution of disputes and examines ways of settling disputes at their inception, before they become formal claims or lawsuits. It also considers the experiences of the transit industry with the use of alternate dispute resolution techniques. It does not address the experiences of the industry with regard to lawsuits involving unresolved disputes and claims.

Construction contracts entered into by mass transit agencies are frequently attended by significant risk of exposure to change order requests and claims. This is especially true of contracts for subsurface construction of rail lines and stations and the acquisition of specialized equipment. These claims involve numerous issues, such as contract ambiguities, changes and additions to the contract, differing site conditions, schedule delays, stop work orders, errors and omissions in the contract plans and specifications, acceleration of the contract by the agency, defective work by the contractor seeking indemnification from third parties, warranty/guaranty clauses, incentive/disincentive clauses, recovery of liquidated damages, and contractor interface. In addition, there are issues related to external entities, such as the public, businesses, politicians, and regulatory agencies that may be concerned with property acquisition, franchise utilities, and funding restraints. The complexities that arise significantly increase the exposure of transit agencies to large construction change order requests and claims. Effective cost controls and claims management require a sophisticated, anticipatory approach to avoid, resolve, or defend against such claims. Processing these claims consumes considerable management time and frequently requires the retention of additional consultants as well as legal firms. As the volume of unresolved disputes grows, relationships with the contracting community can deteriorate. This may lead to higher bid costs and the actual withdrawal from the bidding of some otherwise capable contractors. The early recognition, identification, and resolution of disputes can lessen management costs and administrative efforts and lower overall program costs, benefiting the public, the agency, and the contractor. The public will be the prime beneficiary of effective

dispute resolution as, ultimately, it is the public that pays the costs either directly or indirectly through various payment or taxing vehicles.

#### SCOPE OF WORK AND APPROACH OF THE SYNTHESIS

The goals of this synthesis are to 1) compile current information on the causes of contract adjustments and claims, 2) examine practices to avoid or minimize these causes, 3) investigate techniques for early recognition of potential disputes, and 4) explore alternative approaches to resolving disputes before they result in formal claims or lawsuits.

To meet these goals, a survey questionnaire was prepared and sent to all known transit agencies in the United States and Canada that engaged in construction within the last 5 years. Follow-up telephone conversations were held as necessary to clarify responses to the survey questionnaires. In addition, a literature review was conducted on trends and practices used in the construction industry to avoid and resolve claims and disputes, with particular focus on studies that have made a financial comparison of the results of using different resolution techniques.

The information received from responses to the questionnaires was then collated and analyzed 1) to study the methods used in the transit industry to identify techniques that are most effective in avoiding and resolving disputes, 2) to discuss how individual methods are used, 3) to discuss the results received from the transit industry, and 4) to present the results obtained from the literature search. Appendix A is a copy of the questionnaire.

#### KEY TERMS AND CONCEPTS

The language used in the construction industry for describing unresolved issues between contractors and owners, as well as with other parties to the contract process, is not well defined, leading to various interpretations of the problem. The two particular definitions that are important to this synthesis are the key terms *dispute* and *claim*. An example of the problem is the use of the word "claim." Many people involved with resolution of disputes and claims in the construction industry understand a claim to be an insurance matter and therefore conclude that the person working on resolution of the claim is an insurance adjuster. As used in this synthesis, a dispute refers to a contract related issue that has not yet become a matter of formal process; a claim develops from a dispute and has reached the stage where formal proceedings or

legal actions are underway. A third term with varying interpretations is *user change*. A user change is initiated by the owner to modify the construction as a result of influences outside the contract. A dispute arises from disagreements within the contract documents. For example, the passage of the Americans with Disabilities Act (ADA) required remodeling contracts to comply by January 26, 1992 and all new construction compliance by January 26, 1993, which made many agencies change active contracts to accommodate the requirements of the new legislation. It is possible that a user change could end in a dispute or claim if a negotiated agreement can't be reached as to dollars or time for the added work. However, the intent of this synthesis is to eliminate from consideration the effects of user changes and to focus on disputes and claims with an emphasis on their early identification and resolution by the agencies. The questionnaires that were sent out to the transit agencies included a list of definitions to be used in answering the questionnaire, even if the definitions differ from the individual agency's practice.

The definitions are as follows:

- *Dispute*--A contractual problem involving conflict between the parties concerning cost, scope, delay, differing site conditions, time of performance, etc., which is not yet formalized into a request for contract adjustment or lawsuit. This is the initial disagreement if the request for change order is not resolved successfully.

- *Claim*--A dispute that has progressed to the stage of a formal request for additional money for a lawsuit. In the context of this questionnaire, a claim is a formal process with contractual and legal implications. For example, a dispute has ripened into a claim when the contractor submits a formal request for a contract adjustment or a legal complaint or lawsuit has been filed. Also, a dispute may become a formal claim when it is not resolved at the field or project level, and is passed up to the central office for formal processing. A claim is contrasted with a dispute, which is a problem that has not been formalized with any legal trappings.

- *User change*--Sometimes referred to as owner change; a change in the original construction program prompted by the end user or occupant of a facility or project. It is caused by factors external to the contract requirements. For example, revising an awarded contract to accommodate new state or federal requirements, e.g., when ADA became law. User changes are contrasted with other contract changes that may be caused by design errors, constructive changes, and differing site conditions, which are internal to the contract requirements.

Contract language also leads to difficulties in providing a clear distinction between a dispute and a claim. All respondents indicated that the contractor was required to provide written notice as a prerequisite to filing a claim against the agency. Thus, while the contractor and the agency may have every intention to settle the dispute at an early stage, the contractor is faced with the contractual provision of providing timely written notice of a claim. This notice of a potential claim then triggers formal tracking procedures in the agencies for claims filed, even though the issue may be satisfactorily resolved at

an early stage by the project participants. It is not the intent of this synthesis to suggest that any changes of contract provisions to eliminate the written notice should be made. Written notice provides a clear and necessary function to allow the agency representatives to immediately and fully investigate the circumstances under which the contractor has provided notice of claim and allows the agency to track the contractor's cost related to the issue. Publications issued by contractors' organizations (for example, the Associated General Contractors) emphasize to their members the need to promptly and quickly file a written notice of claim to preserve their rights for additional compensation and/or time for a situation that is extracontractual. This seems to be a matter of a contract requirement to preserve the contractor's rights to pursue as a claim any dispute that is not resolved during the project.

A literature search was conducted to understand current industry practice with regard to the terminology of a dispute and a claim. This nomenclature problem was the subject of an indepth study by the Construction Industry Institute (CII). CII was founded in 1983 to improve the total quality and cost effectiveness of the North American construction industry from project conception to successful startup operations (1). CII reports that the construction industry is the United States' largest industry. Studies by the CII provide other definitions of disputes and claims (2). The CII study first made a survey of construction industry literature and then drew a chart depicting the time flow of a problem from its inception through final litigation (Figure 1). The study defined a claim as an unresolved request for additional compensation and/or schedule adjustment. Any request for equitable adjustment (time and/or money) becomes a claim when it cannot be resolved at the project level with established procedures in a timely fashion. The CII study presented five stages, as shown in Figure 1, between the identification of a problem and its ultimate resolution in litigation. These five stages are:

1. Problems are part of the normal construction process and are generally resolved by daily management.
2. Disagreements arise when the project participants cannot resolve a problem without substantial negotiation. Certain procedural steps (i.e., notice) and posturing are required, but the result is a negotiated agreement at the project level.
3. Disputes arise when the project participants are unable to resolve a disagreement in a timely manner. Persons outside the field staff become involved to resolve the matter at the project level.
4. Conflicts arise when the dispute cannot be resolved at the project level and internal and specialized consultants are engaged to address dispute entitlement and qualification.
5. Litigation is when final resolution is sought by invoking the process of binding resolution by courts or other legal forums.

This synthesis focuses on the first three stages of the CII definition which show the handling of the issue at the project

Problem	Disagreement	Dispute	Conflict	Litigation
				Formal court documentation and proceedings
			Complex technical and legal studies for quantification and entitlement	
		Attempts at resolution removed from day to day management	"Continental Divide"	
Routine discussions & negotiations	Substantial honest negotiation on defined problem			
←————— On the Project —————→			←————— Removed from the Project —————→	

FIGURE 1 Escalating nature of problems (6).

level. However, it must be remembered that this is not a clear boundary and that agencies' customs and practices are different.

The term "user" merits some clarification. In commercial construction, the user would commonly be the owner of the completed facility. In most cases in the transit industry, the

user would be the constructing agency, which is commonly also the system operator. However, this is not a universal circumstance. Some operating agencies are not the constructing agencies. When this occurs, the user should broadly be considered to include both the constructing agency and the operating agency.

## CHAPTER TWO

**OVERVIEW OF RESPONSES****RESPONDING AGENCIES**

A total of 21 responses were received from the 33 agencies that were solicited (a response rate of 64 percent). A list of responding agencies is contained in Appendix B. Questionnaires were sent to all transit agencies in the United States and Canada, including the commuter rail agencies, that have undertaken construction in the last 5 years to either create a new system or add to existing systems. Some of these agencies had completed their construction and had trimmed the agency support staff accordingly. The construction records were then also retired or were otherwise unavailable. The result is that a very high rate of return occurred from the agencies with active construction programs at the time the questionnaire was submitted to the agencies. This indicates a high level of interest in the Synthesis subject matter among transit agencies. Of the 21 agencies responding, 20 indicated the total value of their construction program over the last 5 years. The combined total for these 20 agencies exceeds \$10.5 billion.

**GENERAL INFORMATION**

The agencies reported a widely varying use of consultants in their program execution. The use of engineering management consultants and individual designer contracts showed no pattern. Several agencies with large programs reported using both techniques. However, it does appear that the vast amount of design work was accomplished by consultants.

Agencies were much more involved with agency employees in managing the construction than in the design phase of projects. However, this practice also varied widely, from hiring a program manager for the construction program to hiring individually awarded construction inspection contracts.

The survey found that seven of the 21 reporting agencies require escrow of bid documents by contractors with the submission of bids; one of these agencies limited the requirement to large contracts. Thirteen of the responding agencies (62 percent) required a resource loaded CPM schedule following award. The response indicates that some agencies varied the types of schedules required from the contractor depending on the type and size of contract. As mentioned earlier, all 21 agencies report that a contractor must submit a written notice of a claim as a prerequisite to asserting a claim. Three agencies require that the contractor provide cost records with the claim and two require revised time schedules. Several agencies have other individual submittal requirements that appear to satisfy a local requirement.

All agencies report that they track the cost growth of contracts from the point of final award to final closeout. Cost growth is the final contract value at completion and closeout

compared to the value of the contract at award. Nineteen of the 21 respondents (90 percent) do seek to recover cost growth from others. Table 1 shows the efforts that the responding agencies have made to recover cost growth from various project participants. Table 2 tracks the cost growth that has been experienced by the agencies reported from their history for the last 5 years by type of contract.

TABLE 1

EFFORTS TO RECOVER COST GROWTH FROM VARIOUS PROJECT PARTICIPANTS

Percent of Agencies	Project Participants
81	Design Engineer
48	Construction Manager
48	Project Insurance
81	Liquidated Damages
43	Actual Damages By Contractor
43	Third Parties

Source: Questionnaire responses of 21 agencies

TABLE 2

REPORTED CONTRACT COST GROWTH PERCENTAGES FROM DISPUTES AND CLAIMS

Type of Contract	High (%)	Low (%)	Average (%)
Heavy Civil	20	2.2	7.0
Systems	20	1	4.1
Purchase	10	1	3.4

Source: Questionnaire responses of 21 agencies

Not all agencies that responded to the questionnaire reported individual figures to separate user changes from the total growth in the contract. All agencies reported that they did track total growth of contracts. Several agencies commented that the principal form of growth in contracts results from poor definition of scope by the user and from additional user changes, requiring amendments or changes to the contract. The growth in claims and disputes was as high as 20 percent in one agency for both systems and heavy civil contracts; four agencies reported a low of 3 percent in heavy civil contracts; one had only 2.2 percent from claims and disputes; and one agency reported only a 1 percent growth in systems contracts attributable to disputes and claims. Average cost growth reported on heavy civil contracts was 7 percent in disputes and claims and 4.9 percent on the average systems contract. Agencies were also asked to report on the trend in the cost growth in contracts in the last 5 years. The results are shown in Table 3. Twenty-four percent of the agencies reported that

TABLE 3  
REPORTED TRENDS IN COST GROWTH PERCENTAGES IN  
LAST 5 YEARS

Type of Contract	More (%)	Less (%)	Same (%)
Heavy Civil	24	24	52
Systems	24	0	76
Purchase	0	0	100

Source: Questionnaire responses of 21 agencies

the trend for cost growth was increasing. Twenty-four percent (five agencies) experienced less or declining cost growth, while the majority (52 percent) said that the trend was remaining the same. In systems contracts, 24 percent reported more claims as time passed and 76 percent reported that the claims and disputes were remaining at the same level. In purchase contracts, 100 percent of the respondents said that the trend was flat, with no growth and no decline.

Most surprising in these figures is that there is so little overall decline in the cost growth from disputes and claims. Since the mid 1980s there has been recognition by most major owner organizations that additional attention and emphasis needed to be placed on reducing the cost of disputes and claims. Significant efforts have been made over the last 10 years to introduce various forms of alternate dispute resolution to the construction industry, all with the expectation that costs would be controlled or reduced and that added benefits to the project construction staff would follow. It seems from

the questionnaire responses that, to date, the agencies have not received significant benefits from procedures implemented in the past. When the agencies were asked about cost growth as a result of user changes, separate from dispute and litigation, 38 percent stated that there was increase in user directed changes resulting in cost growth, 38 percent said they were at the same level, while 24 percent experienced a decrease. When asked their opinions as to the reasons for these trends, 29 percent said that the type of work is becoming more complex, creating more potential for claims to arise, and more difficult to bid, resulting in changes. Ten percent attributed the changes to a decline in the quality of the design documents, 14 percent to third-party requirements and 39 percent to regulatory requirements that had to be incorporated into existing contracts. Los Angeles reported declining user changes was due in part to implementation of a lessons learned program.

Transit agency response to the incidence of disputes is that 38 percent indicate an increase, 5 percent indicate a decrease, and 57 percent respond that they were essentially the same in frequency and severity over the last 5 years. The reasons given for indicated increases were that the work was more difficult to bid (19 percent); the quality of the contract documents (29 percent); the quality and expertise of the contractors (33 percent); agency staffing and budgeting limitations (10 percent); mandatory inclusion of the federal requirement for a differing site condition clause (5 percent); and a surprising 57 percent attributed the increase or the lack of decline to the business climate (some responses had multiple causes). A discussion concerning the differing site condition clause is included in chapter 5.

## TYPES OF DISPUTES AND CLAIMS AND THEIR CAUSES

### INTRODUCTION

One of the unresolved difficulties in an exchange of information on change orders, disputes, and claims is a common agreement on terminology. The language used between the parties, the contractor and owner, to describe a given situation is frequently at variance. This problem makes direct comparisons between studies and data gathering based on various personal classifications of problems somewhat murky. But review of the literature and responses from the questionnaire indicate commonality of the general trends. So, while the precise cause or nature of a problem may not be exact as a result of individual judgment and interpretation, the thrust of the emphasis that should be applied to reduce change orders, disputes, and claims becomes apparent. A study authored at the University of California, Berkeley, illustrates the differences in language

used by contractors and closely examines the underlying causes of contractor initiated requests for compensation (3). Of particular interest is that 55 percent of such problems were shown to be caused by contract documents (Figure 2). The authors of the study had scrutinized more than 600 projects to determine the causes of changes and claims on these projects; they classified the causes in two different ways. The first was through the language assigned by the contractor to the problem. Figure 3 shows this distribution. The authors then studied each one of the changes and claims in some detail to determine their underlying causes. The results of this study are shown in Figure 2. This analysis represents the frequency of the claims, not their dollar value. The authors note that root causes of claims show differing site conditions at 20 percent of the total number submitted, but they account for 35 percent of the total dollar value of changes and claims (3).

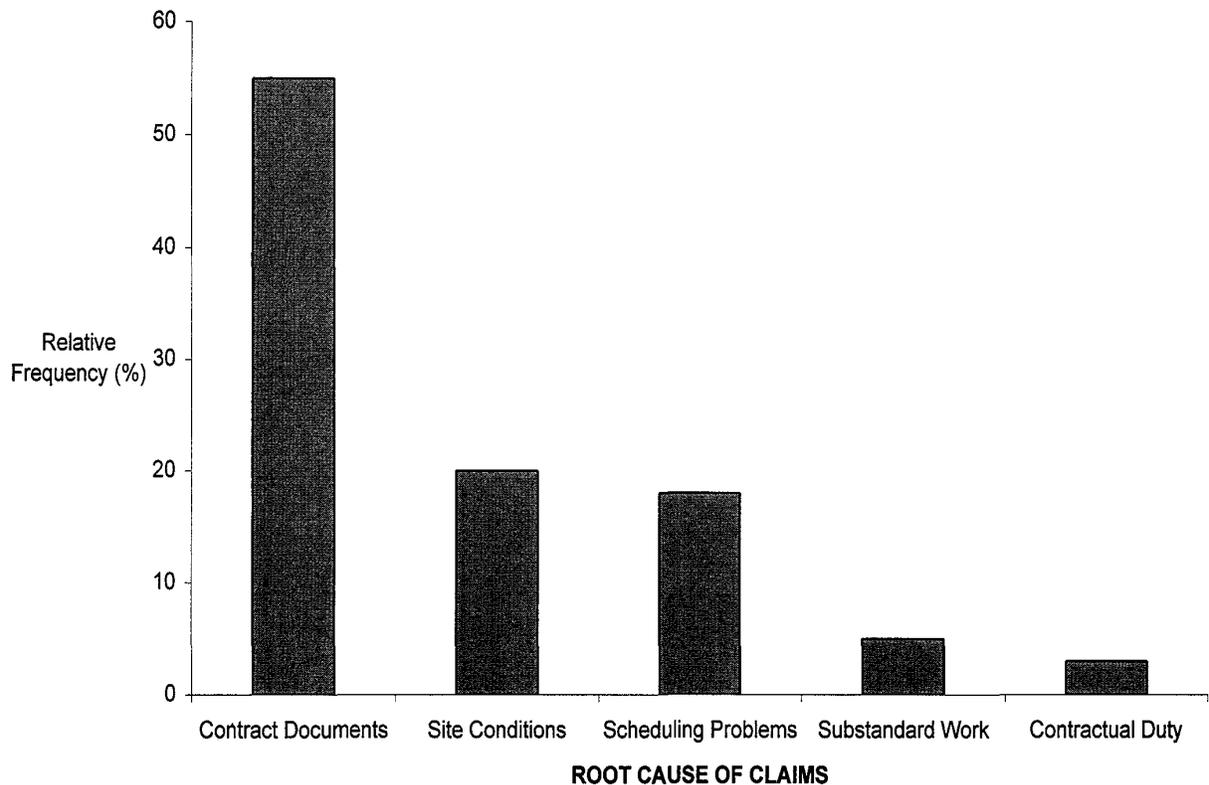


FIGURE 2 Relative frequencies of claims based on root cause(s) (6).

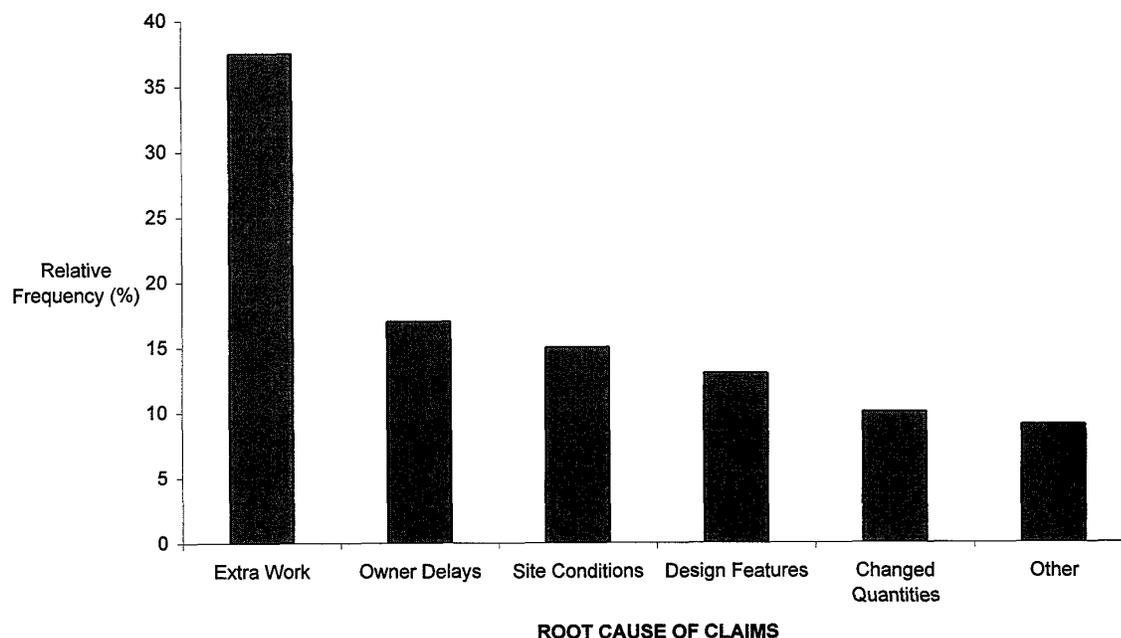


FIGURE 3 Relative frequencies of claims as argued by contractor (6).

## PREVIOUS STUDIES

The 1983 *NCHRP Synthesis of Highway Practice 105: Construction Contract Claims: Causes and Methods of Settlement* (4) reported on an exhaustive study of the underlying causes of construction disputes and claims. While this study may seem dated, one individual currently involved in transit disputes and claims remarked that it is still relevant and applicable to transit. The synthesis identified five principal causes of claims: 1) time problems and liquidated damages, 2) additional compensation for unanticipated conditions, 3) ambiguous contract provisions, 4) extra work, and 5) changes in design and specifications. The synthesis then discussed in some detail and specificity, shown here in Table 4, the causes of claims that had been identified in highway construction.

A study was performed at the University of Calgary in Alberta, Canada of the claims originating from 24 different projects involving both public and private owners. Of the total, 49 percent of the claims involve increases in scope, 20 percent involve claims as a result of excessive cold weather and other weather related incidents, 17 percent involved restricted access and 15 percent were claims for accelerations (5).

A study conducted at Purdue University for the U.S. Army Corps of Engineers, Construction Engineering Research Laboratory, focused on how to improve the design to ensure the

quality of construction contract documents (6). This study reported that "approximately half of all construction contract modifications can be attributed to design deficiencies." The study further defined a design deficiency as "Any deficiency in the drawings and or specifications which results in the facility which would not adequately perform its intended mission." The report summarized the most common design deficiencies into one of the following three types (6): 1) Contract Document Conflicts--Discrepancies between drawings and specifications; 2) Interdisciplinary Coordination Errors--Conflicts or interference problems between structural, mechanical, electrical etc. and 3) Technical Compliance Discrepancies--Nonadherence to the appropriate design guidelines, technical specifications, or building codes.

An article in the periodical *Architecture* also cited that 50 percent of change orders, disputes, and claims to the contract are the result of deficiencies in design documents of both specifications and drawings (7).

A study reported in the American Society of Civil Engineers' (ASCE's) *Journal of Management and Engineering* reported the cause of disputes in construction based on structured interviews with attorneys, contractors, and designers (8). Figure 4 shows the results of these interviews, with defective specifications being one-third of the total as a primary source of disputes.

TABLE 4  
CAUSES OF CLAIMS (4)

<p><i>Contractor Practices</i></p> <ul style="list-style-type: none"> <li>Inadequate investigation before bidding</li> <li>Unbalanced bidding</li> <li>Bidding below cost and over optimism</li> <li>Poor planning and use of wrong equipment</li> <li>Failure to follow authorized procedures</li> </ul> <p><i>Contracting Agency Practices</i></p> <ul style="list-style-type: none"> <li>Changes in plans or specifications</li> <li>Inadequate bid information</li> <li>Inadequate time for bid preparation</li> <li>Excessively narrow interpretation of plans &amp; specs</li> <li>Restrictive specification</li> <li>Contract requirements for socioeconomic objectives</li> <li>Unrelated to the construction process</li> </ul> <p><i>Personal Factors</i></p> <ul style="list-style-type: none"> <li>Incompatible personalities</li> <li>Adverse attitudes</li> </ul> <p><i>Institutional Factors</i></p> <ul style="list-style-type: none"> <li>Complex construction</li> <li>Lengthy performance period</li> <li>High quality requirements</li> </ul>	<p><i>Contract Documents</i></p> <ul style="list-style-type: none"> <li>Exculpatory clauses</li> <li>Mandatory notice requirements</li> <li>Finality of engineer's decisions</li> <li>Changed conditions clauses</li> <li>Out of date specifications</li> </ul> <p><i>Contract Awards</i></p> <ul style="list-style-type: none"> <li>Diversity of state contract award procedures</li> <li>Treatment of bid mistakes</li> </ul> <p><i>Contract Administration</i></p> <ul style="list-style-type: none"> <li>Coordination</li> <li>Interpretation of policy</li> <li>Inspection standards</li> <li>Administrative styles</li> <li>Documentation</li> <li>Funding schedules</li> <li>Political considerations</li> </ul> <p><i>Claims Settlement Practices</i></p> <ul style="list-style-type: none"> <li>Encouragement of project-level settlements</li> <li>Delegation of settlement authority to field supervisors</li> <li>Effectiveness of field/headquarters consultation</li> </ul>
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Response	Attorneys	Contractors	Designers	Total
Changed Conditions	6	5	6	17
Defective Specifications	(5)	(3)	(2)	(10)
Subsurface Problems	(1)	(1)	(3)	(5)
Payment Issues	2	4	3	9
Time and Delays	2	0	0	2
Errors in Bid	0	0	1	1
Lack of Communication	0	1	0	1
Total	10	10	10	30

FIGURE 4 What is primary source of disputes in construction? (10)

TABLE 5  
CAUSES OF DISPUTES: AGENCY PERCEPTIONS (9)

Cause	Percent of Projects
Design defects	38
Third-party actions/inaction's	36
Unknown conditions	35
Agency actions/inaction's	18
Contractor problems	5

Note: Based on 102 representative profiles provided by 42 different agencies. The percentage exceeds 100 percent as more than one factor may have been reported to have caused a dispute.

A previous study reported on the causes of disputes based on agencies' perceptions, shown here in Table 5 (9). These results show a somewhat smaller percentage of disputes caused by design problems, 38 percent, however, it is still the most common cause. Unknown conditions, either differing site conditions or misrepresented site conditions, were at 35 percent of causes, a higher figure than earlier described results of the

Berkeley study of 600 projects (3). This is most likely attributable to the earlier study's inclusion more vertical construction in the study base, while highway and transit construction, which typically involves a higher percentage of horizontal construction, would experience greater site problems as a root cause.

### TERMINOLOGY OF DISPUTES AND CLAIMS

This synthesis focuses primarily on requests for extra compensation or time as "a result of circumstances within the contract" as contrasted to user requested "additions or changes to the contract." The cost impact of a dispute involving time quickly rises in dollar value. Contractors normally expect to recover their fixed field overhead costs, including extended time on the project for equipment, management, and the provision of utilities and supplies, and to receive an allocation for home office overhead and to be relieved from either liquidated

or specified damages. It is also common practice in the transit industry for the contracts to be interdependent so that delay in one contract can impart serious cost consequences or delays to other contracts that are adjacent physically or are follow-on contracts.

The following are key definitions listed in the questionnaire of types of disputes and claims used in this study:

- *Constructive Change*--A change in the scope of work required by circumstances or the conduct of the owner, engineer, or other agents of the owner that lacks the formality of a directed change order.
- *Impact Claim*--Typically in construction disputes, an impact claim includes delay, disruption, acceleration, or lost labor productivity rather than the direct cost of performing the work.
- *Delay*--An event or condition that results in an initiation or completion of a work activity or project that is later than originally planned.
- *Differing Site Conditions*--A material difference between the actual site conditions and those conditions indicated by the contract documents, or that could have been reasonably anticipated from the contract under normal circumstances.

The federal courts have decided that a differing site condition (DSC) must pre-exist the creation of a contract (10). There is some uncertainty in several cases about exactly when this period commences, either at advertisement, award, or the commencement of construction, but it cannot involve the modification of geologic conditions after award of the contract. Examples of differing site conditions that would not be allowed by federal courts include the abnormal rise in ground water based on an unusually wet rainy season after award of the contract; or the addition of water caused by flooding or a hurricane after award of the contract. *The rationale is that the contractor is responsible for site conditions once it has received possession of and responsibility for the construction site, through award of the contract.* Litigation based on this particular condition precedent to a DSC apparently has not been reported by any of the states.

Many of the mass transit systems are being upgraded, expanded, or newly constructed using transit grants from the U.S. federal government. This financial benefit does not come without certain requirements in contracting between the agency and its contractors. The use of federal money implements certain DOT regulations and Federal Transit Administration (FTA) grant agreements that trigger flow-down clauses to the agency. Agency contracts using federal funds must include certain clauses concerning terminations, energy conservation, the Buy American Act, rights in data and copyrights, record retention, remedies, equal opportunity, the Civil Rights Act, notice of federal requirements, the Americans with Disabilities Act, cargo preference, labor provisions, audits and inspection, environmental requirements, privacy, integrity certification, lobbying certification, and participation by disadvantaged business enterprises. Additionally, there are specific clauses required to be in the agencies' construction contracts,

including provisions for liquidated damages, labor standards, and equal employment opportunity (11). One respondent to the survey indicated that these requirements can limit competition for construction contracts. Generally, the FTA policy is to allow state law to be applicable to the interpretation of the contract, except to the extent that the dispute is over specific language in the FTA grant.

A review of the state laws concerning procurement disputes at the state and local levels characterizes the situation as a hodgepodge of remedies (12). This study noted that a number of states have still not consented to be sued on contract disputes in their own courts and therefore have not waived the defense of sovereign immunity. The doctrine of sovereign immunity limits the liability of government for its actions. Most of these states provide a dispute resolution procedure that is administrative in nature but offers little in the way of appealability. Other states impose liability limitations of such administrative procedures (12). In a recent case, one transit agency successfully used sovereign immunity as a defense for a claim for prejudgment interest when the transit agency breached a settlement agreement (12).

Notwithstanding specific contract language making state law applicable, a federal circuit court has ruled that federal law should be applied to interpreting and applying the federal remedy clauses when federal funds were part of funding. The main point of this discussion is that contract administrators should be aware of court decisions that interpret current contract language. A hindrance to early dispute recognition and settlement can be the rejection of a dispute based on contract language that is either inappropriate, unenforceable, or in some cases, contrary to public policy (for example, a no damage for delay clause in some jurisdictions). In the case cited above, the U.S. Circuit Court refused to enforce a contract provision requiring prompt written notice of a differing site condition (which would have been upheld under state law) because the court ruled that, under federal law, constructive or actual notice of the condition by the owner allowed recovery (12). Additionally, if the contract language in a specific contract parallels or is similar to federal language, a decision most likely will be made based on federal precedent, if no precedent exists at the state level.

The distinction between a dispute and a claim can also have somewhat bizarre consequences. In 1978, Congress passed the Contract Disputes Act applying to all federal contracts. A court ruled in 1991 that a dispute between the parties must exist before a lawsuit could be brought. The court ruled that for a dispute to exist, a claim submitted by a contractor must have been rejected by the contracting officer. If the contracting officer failed to respond, a dispute did not exist, and a lawsuit could not be filed (13).

Apparently, many contracting officers frustrated the contractors' remedy rights by refusing to respond to a claim. Between 1991 and the end of 1994, more than 200 litigations argued the existence of a dispute. However, in mid 1995 a federal circuit court revised this ruling and returned the appearance of reason to the remedy provision of federal contracting (13).

This type of dalliance on the part of contract administrators did not serve their projects well. Later discussion will

document its counterproductivity. This type of environment ill serves the owners' interests and certainly the contractors' interests. Unfair dispute handling by an agency can lead to higher future bids by contractors who must raise contingencies to cover their costs. This situation was observed by Philip

K. Howard, in his book, *The Death of Common Sense*, which states "litigation is a world in which lawyers manipulate the detailed rules of procedure to harass the other side and delay for years any reckoning for their client's conduct" (14).

## CHAPTER FOUR

### CLAIM AVOIDANCE PRACTICES

The construction industry has developed a number of practices to minimize cost growth through better planning and execution. This chapter looks at the techniques and practices reported by the responding transit agencies.

### INDUSTRY PRACTICES

The construction industry has focused on a number of practices to enhance the quality of contract documents, to improve the functionality of the completed facility, and to quickly handle evidence of an impending dispute through early practices rather than allowing disputes to fester, grow, and drag on over time. These efforts, discussed later in this chapter, include constructibility reviews, quality assurance of the contract documents, value engineering, obtaining and presenting sufficient geotechnical information, and overall management of the program and the project during its initial planning and design. Additionally, a recent development has been identification of a litmus test for a project to indicate the likelihood of encountering serious disputes.

#### Quality Assurance of Contract Documents

In the late 1980s, the trade publications, general news magazines, and most newspapers carried reports about the insurance crisis that had overtaken many professional companies. Trade publications discussed the risks of "going bare" when the cost of obtaining errors and omissions (E&O) insurance was becoming prohibitive. Since that time, the number of claims made against E&O policies has steadily declined and the talk about an insurance crisis has all but disappeared. (No article could be located that discusses the reasons for the decline of E&O claims made against architects and engineers.) However, the technical press has been full of articles on methodologies to improve the quality of the completed design with one obvious objective being to reduce the E&O claims made against architects and engineers. If the decline in claims made against architects and engineers truly reflects improvement in the quality of the contract documents, then transit agencies will benefit by having reduced changes, disputes, and claims. Studies have historically shown, as reported earlier, that 50 percent of the requirement for changes is caused by deficiencies in the contract documents. At the height of the crisis over E&O insurance, an article in *Architecture* proposed a check list to pinpoint interdisciplinary coordination errors (7). The author suggested that a single qualified individual could check an \$8 million project (probably \$10 million at current prices) in six work days using the checklists (7). Many

different programs have been created, all with a view of improving the quality of the construction documents. These include Design Assurance (A design-quality review program by Purdue University for the U.S. Army Corps of Engineers Construction Engineering Research Laboratory) (6) and Total Quality Management (TQM). One study recommended that architecture and engineering firms institute Quality Management into their design programs to remain competitive as well as to provide the expected level of services (15).

#### Contract Time

In 1995, TRB released NCHRP Synthesis 215, which evaluated the factors used in determining contract time for construction contracts (16). Additionally, this study reported on the use of innovative contract practices regarding contract time. Two innovative techniques for determining the contract time were discussed in the synthesis. The first is called the A + B method, and the second type is an incentive/disincentive contract or I/D, a variation of the first type. The study found that 35 of the 39 states responding to the survey questionnaire for Synthesis 215 reported use of either the A + B method or the I/D method (16). In the A + B contract methodology, A represents the contractor's bid price. The contract documents specify the value for each day of contract performance. The value is determined similarly to a liquidated damages calculation but in the case of an operating system, may include the cost to both the system and to the traveling public for the loss of the system availability during the renovation or rehab project. The contractor then submits a time estimate for the contract as part of the bid, which is multiplied by the daily cost rate, arriving at the B portion of the bid. The two parts are added to determine the total bids. The low bidder is based on the lowest bid of the combined prices, adding the A + B components. For example, if the contract cost estimate produced by the engineer is for a project of \$5 million that will take 200 days and the value of the daily cost is \$10,000.00 a day, the engineer's estimate will be  $\$5,000,000.00 + 200 \times \$10,000.00 = \$7,000,000.00$ .

Upon receipt of bids, a table would be created showing each bidder's A price and B number of days. The number of days bid by the contractor then becomes the contract completion date against which performance is measured. Liquidated damages are assessed at the rate of \$10,000.00 a day for any failure to complete within the B days bid with the addition of any contractually appropriate time extensions.

An I/D modification of this practice has been used more extensively. An incentive/disincentive contract would be bid similar to an A + B but would add the proviso that the contractor

is entitled to receive an incentive bonus payment each day that it finishes earlier than the bid time. The disincentive part of the clause is that the contractor would be subject to deduction from its contract earnings of a similar value for each day it finishes after the latest acceptable contract completion date. When using the incentive/disincentive bid process, many owners specify the maximum time that will be allowed under any circumstances, but set the calculation of the incentive/disincentive from the number of days that the contractor bid.

After publication of Synthesis 215, one of the authors conducted further research into the results expected to be obtained from using the A + B bidding method or the I/D method. The results of this study were published in the *Journal of Construction Engineering and Management* (17). Data were gathered from 24 states that had used the A + B method or the I/D method. The incentive/disincentive clause was used in 94 percent of the total number of projects submitted by the state highway departments for study. The study determined that the primary use of this scheduling methodology was on repair or replacement of previously completed highway projects, either on road reconstruction, bridge rehabilitation, or bridge replacement, with only 12 percent on new highway construction and 18 percent on other ancillary structures. The study also obtained the engineer's estimates for the construction cost and the construction time for the project. The study also considered the bidding cost and the contract time assigned to similar projects using conventional bidding practices so that a comparison could be drawn between conventional scheduling and bidding practices compared to the use of the A + B methodology. While not a focus of the study, no reduction in quality or safety was found. The following conclusions were reached in the study:

- A substantial reduction in contract time was achieved as compared to the time of similar projects bid in a conventional method.
- In most cases, contractors completed the project on time or even ahead of schedule.
- The reduction of bid time was achieved with no addition to the cost of the project compared to the cost of similar projects.
- Most projects used the A + B plus I/D provision rather than the straight A + B.
- In most cases with an I/D provision, contractors were able to receive a substantial incentive fee and in many cases the maximum incentive fee allowed by the contract provisions.
- Analysis of case studies shows that contractors, when motivated to work rapidly, can reduce construction time with more accurate scheduling, more effective management on the project, and better use of their own resources (17).

Many of the transit agencies in the East and Midwest parts of the United States and Canada report substantial need for system rehabilitation and replacement while trying to maintain operations and reduce the impact on riders. The use of I/D scheduling seems to present a significant opportunity to drastically reduce the construction time estimated by project

engineers using conventional scheduling and estimating techniques. Contractors bid time durations substantially below the engineer's estimate and then managed to achieve even better results than they bid. The study, however, did not analyze whether or not construction change orders, disputes, and claims were reduced on projects using either the A + B or I/D scheduling approach. Nevertheless, the reduced construction time resulted in considerable cost savings for the agencies because of the reduced contract administration and management related costs. Substantial benefits occurred to the public through less disruption and inconvenience. The successful projects generated good will from the affected public and positive media coverage.

### Contract Dispute Predictability

A recent article on contract dispute predictability in the *Journal of Construction Engineering and Management* reported on efforts sponsored by the Construction Industry Institute (CII) to determine whether a procedure, a Disputes Potential Index (DPI), could be developed that would give an indication of whether a particular project would have a serious dispute problem (18). The study team, in close coordination with the CII Task Force on Dispute Prevention and Resolution, identified three major categories of project definition used to develop and gather information, and to give an indication of results. These were: 1) the people, 2) the project, and 3) the process.

The study team developed a hierarchy of areas to examine under each of the three main categories. The people category includes the total owners project delivery system, including the owner, the general engineering consultant or the project engineer, and the construction management or construction inspection team hired for the project. The areas considered are shown in Figure 5. It is evident that the greatest focus from this definition is on the people category, as they presented the largest number of variables to be considered when dealing with the success of a project as far as dispute avoidance was concerned. The second major category mentioned above is the project. The various conditions of externals and internals with regard to the project are shown in Figure 6. As seen in the figure, externals are those forces outside the project that impact the project's success, and internals are those within the control of the project that also influence the project's success. The last major category to be considered in developing the DPI is the process, which is divided in two sub-parts: those that take place during and leading up to the initiation of construction and those that take place during construction. These activities are shown in Figure 7. Data were then gathered using surveys of 159 projects with ratings of each one of the indicated categories shown in Figures 5, 6, and 7 of a numerical score between 1 and 6, with 1 being the low score and 6 being the high score. The study team then conducted various mathematical studies of the data and developed a discreet choice modeling system based on logistic regression. What was particularly evident to the project team in both the evaluation of the various computations and subsequently testing the results on an

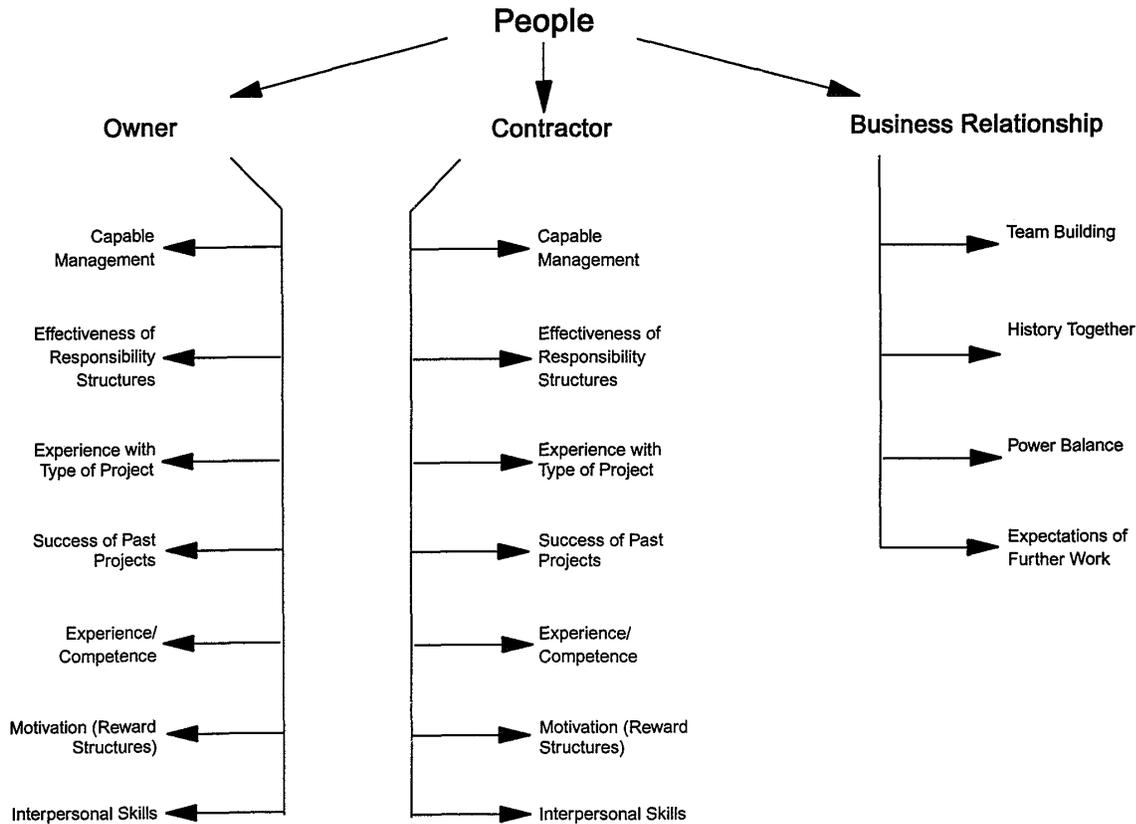


FIGURE 5 People branch of hierarchy (13).

additional 25 projects, was that people played the largest part overall in whether or not the project would be successful with regard to a minimization of disputes. One limitation of the DPI in transit construction is the general lack of control over the people presented by the contractor, who generally receives the contract as a result of being the lowest priced bidder. The study team further found that the technical complexity of the project played little part in the success or failure of a project with regard to disputes. Further, the study team points out that the DPI is an indicator of results and is not more than that. Projects scoring low in an analysis in advance of the construction would be more likely to have bad results with regard to disputes and those scoring high would be more likely to be successful with regard to disputes, but not with mathematical certainty.

This study is also available through CII (19) and is available in a Microsoft Windows application that calculates the results of the regression analysis between the three areas of evaluation--people, process, and project (20). As mentioned earlier, once the field work had been completed and the relationships of the categories had been determined, the study team tested the model on 25 projects. The test results are shown in Table 6. This validated the DPI as an indicator of the potential for disputes on a project.

#### Improved Geotechnical Data and Interpretation

The Berkeley study (3) of an extensive number of projects to determine the cause of construction disputes reported that 20 percent of the total number of disputes were caused by differing site conditions (DSC). However, the study also determined that these DSC disputes represented 35 percent of the total dollar settlement value of all claims. Thus, differing site conditions, or changed conditions as it was formerly called, represents a very significant risk to the success of a project finishing on time and on budget. Underlying geotechnical studies are fundamental to the design of a project, being the basis for construction contract documents. The results of the survey questionnaire for this synthesis indicated that every responding transit agency provides access for all bidders to the available geotechnical subsurface studies for the project. Some 90 percent provide access to site investigation reports, right-of-way information, and utility location maps and reports. The use of a DSC clause by an owner is essentially a statement that the owner intends to pay for the risk of conditions encountered varying from those indicated in the contract document with the resultant expectation that the contractor would not include a contingency in its bid for having to deal with unknown or

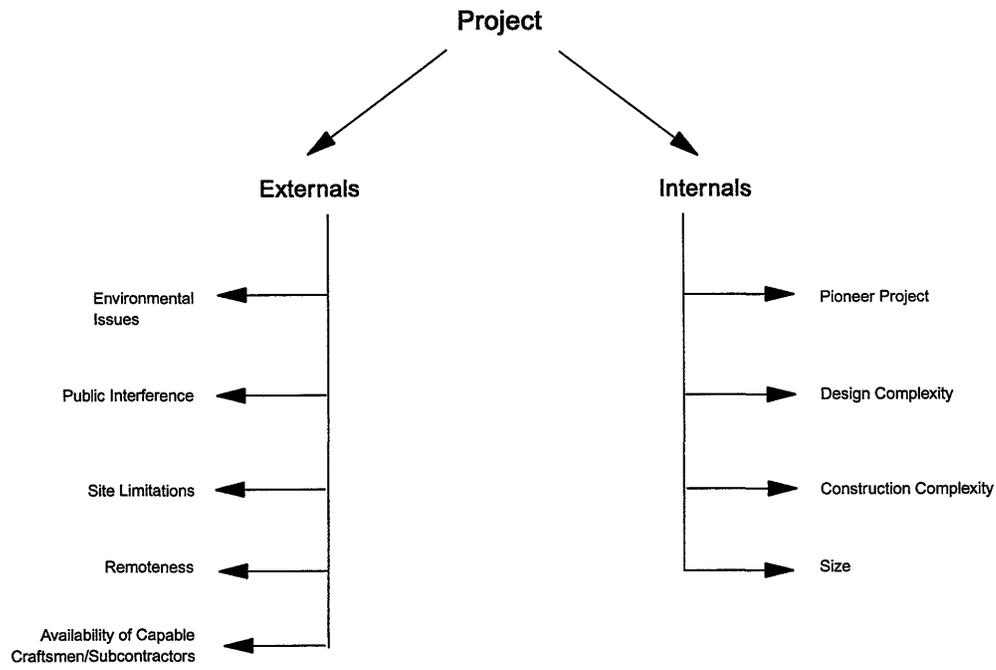


FIGURE 6 Project branch of hierarchy (13).

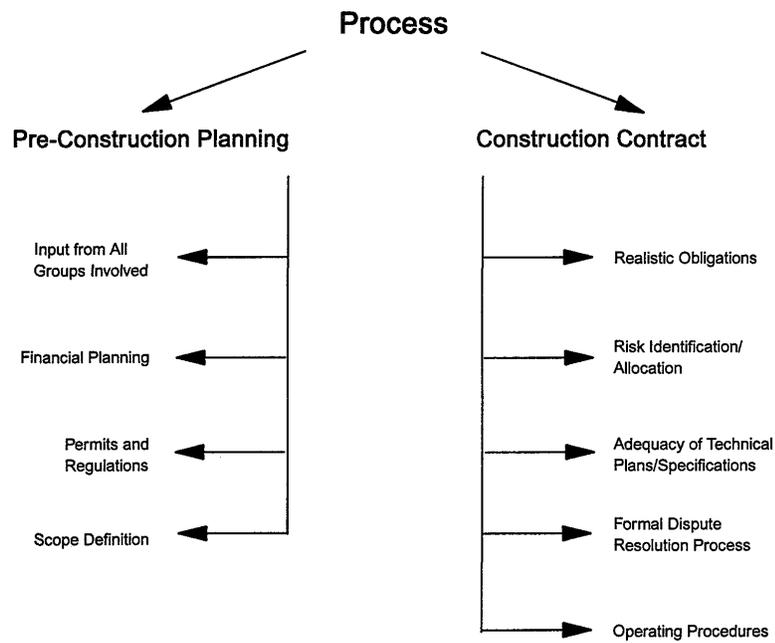


FIGURE 7 Process branch of hierarchy (13).

TABLE 6  
COMPARISON OF TEST RESULTS (18)

Projects Scoring	Number of Projects	Actual Performance		
		Number Good	Number Average	Number Bad
80-100	4	3	0	1
60-80	6	1	3	2
40-60	5	1	3	1
20-40	2	0	1	1
0-20	8	0	2	6

unforeseen conditions. If the conditions encountered are materially different, or the conditions were unusual and unreported by the contract documents, then the contractor seeks additional compensation for the time and money associated with dealing with the conditions. Contractors will still file claims if they encounter conditions different from those represented, even if those contracts do not have a DSC clause. Contractors also seek compensation alleging that the owners' documents misrepresented the conditions that were encountered. A study described in chapter 5 concerning claims under a differing site condition clause and claims from misrepresentation shows that claim payments to contractors as a percentage of construction are approximately the same whether or not the contract contains a differing site condition clause.

A general presumption in project design is that the information gathered concerning geologic and subsurface conditions is similar to the information that a contractor would need in estimating and planning for the construction of a project. A study reported in the *Journal of Construction Engineering and Management* reported on the contractor's view of different geological parameters and their usefulness (21). The study suggested that a simple cost/benefit ratio would show that providing tailored geologic information deemed important and critical by contractors in the development of their bids would be a valuable project cost-saving mechanism (21).

The Underground Technology Research Council (UTRC), sponsored by the American Society of Civil Engineers and the American Institute of Mining, Mechanical and Petroleum Engineers, has for a number of years been studying the problems of site conditions with an aim to reducing or avoiding disputes during construction in underground projects. The UTRC, through a number of subcommittees, has published a series of pamphlets on recommended practices. The first pamphlet, published in 1989, provided recommendations for a contractual document called a Geotechnical Design Summary Report, which was intended to summarize the bases for design with specific reference to the anticipated subsurface conditions. This was a significant departure from traditional practice, which had been to provide contractors only with the information gained from the geologic explorations and laboratory tests that were conducted. Contractors were then left to their own devices to predict how the ground was expected to behave and what construction difficulties were to be encountered. A revised version of the 1989 pamphlet was published in 1991 (22), providing further justification for this approach. The document explained that the engineer of the

project has had many months to assess the conditions and to develop an appropriate interpretation, given the risks and issues to be confronted by the owner. The engineer is, therefore, in the best position to assess the reliability and completeness of the data, in the context of the project to be constructed. The contractor, on the other hand, has only weeks to assimilate all the available data and to develop a bid.

Over the years, the practice of preparing interpretive geotechnical reports has been received with mixed reviews. Well-written reports have served to effectively inform all parties to the contract about the anticipated subsurface conditions. Poorly written reports have created more harm than good, as would a poorly devised set of drawings and specifications. The UTRC has just completed a third pamphlet, titled "Geotechnical Baseline Reports for Underground Construction, Guidelines and Practices" (23), which addresses this subject in greater detail. The result of three industry forums conducted from 1994 to 1996, the pamphlet provides the following suggestions:

- The contract document should be called a Geotechnical Baseline Report (GBR) and should have, as its primary focus, clear baseline statements regarding anticipated subsurface conditions.
- The document should summarize the geotechnical bases for design, but more so in support of the key baseline conditions anticipated.
- As stakeholders to the contract, owners should be informed, and even participate, in the setting of the baseline statements, which will influence how the risk of the subsurface conditions is allocated between the owner and the contractor.

The GBR is recommended to contain the following sections:

1. Introduction
2. Project description
3. Sources of geologic information
4. Project geologic setting
5. Previous construction experience
6. Ground characterization
7. Design considerations
8. Constructions considerations.

Additional recommendations and examples are provided for writing good geotechnical baseline statements, and "do's and don'ts" that have been demonstrated through past projects.

## Constructibility Reviews

CII defines constructibility as "the optimum use of construction knowledge and experience in planning, design, procurement, and field operations to achieve overall project objectives" (24).

Constructibility reviews are usually done in the later part of the design process, frequently when the contract documents, specifications, and drawings have reached the 85 to 95 percent completion phase. At this point, the documents are reviewed, if at all possible, by the construction staff who will administer the construction contracts of the design documents. If the agency is using a program manager or construction manager to implement its construction, then this organization will act as the constructibility reviewer. The review staff should be familiar with construction techniques currently in use by the contractors in the various trades, i.e. heavy civil, mechanical, electrical, fire protection, etc. Reviews can also be made at this time to ensure that adequate information has been spread to the multiple specification and drawing sections necessary to install the mechanical, electrical, and systems portion of the contracts. Lessons learned from previous construction programs are incorporated into the current construction documents. Personnel familiar with previous claims and disputes that arose as a result of the previous design documents review the current documents to ensure appropriate corrective measures have been implemented. CII reports that "documentation of constructibility effort shows that owners accrued an average reduction in total project cost and schedule of between 4.3 percent and 7.5 percent respectively. These savings represented a 10 to 1 return to the owners' investment in the constructibility effort" (24). Constructibility reviews are different from value engineering (VE) reviews. Both programs result in cost savings with a significant benefit/cost ratio, but the focus is different. VE focuses on functional analysis of the design and its life-cycle costs, while constructibility focuses on the construction practicality of the nearly completed construction contract documents.

## Value Engineering

The objective of value engineering during the design stage of a project is to ensure that the completed facility is adequate for its function at the lowest life-cycle cost reasonable. Another use of VE has connotations in construction contracts with a "value engineering incentive clause," which is not the subject of this discussion. The Urban Mass Transit Administration (UMTA) now the FTA, reported that savings from VE (during design) typically ranged from 3.7 to 7.0 percent with a return on investment from 12 to 1 to 34 to 1, with an average of 18 to 1 (25). Value engineering is a 40-hour study following formal guidelines by a group of independent professionals experienced in the design and construction of similar facilities. To achieve the maximum benefits of a VE study, it should typically be done at the completion of preliminary design, at approximately the 30 percent stage of the design. The VE study will typically be led by a management team headed by a

team coordinator who is a Certified Value Specialist. It is at this stage of the design that the savings can be the greatest and the implementation cost of the study recommendations is the least. As the design proceeds and becomes more defined, implementation of the recommendations from VE are more complicated, costly to implement, and may be forgone as an expedient to completion of the design. Some of the typical processes involved in a VE study are a functional analysis, creative thinking, and cost modeling as standard techniques, which are all different from a normal design or constructibility review. The report also recommends that, on some large complex projects, it may be advantageous to conduct a second VE study at the 60 to 75 percent level of completion (24).

## Escrowing of Bid Documents

Contractors frequently argue that they are experiencing significant costs above what they bid on a project. Contractors will also refuse for various reasons, including an argument that their bid data is proprietary, to reveal the bid to the agency's investigating body. One effort to overcome this is the requirement of escrowing of bid documents, first promoted by ASCE's Underground Technology Committee of Underground Practices (22). The contractor's rights to the proprietary information contained within its bid document (generally the contractor wants to protect its production rates from other contractors) is protected by the storage of these bid documents in a protective location and they are used only by either party to resolve claims on costs that are based on the bid documents.

The recommended practice is to store the bid documents in a neutral third-party location. This is done to protect the contractor's trade practices from any unauthorized disclosure. Access to the documents would be gained upon request of either party, but only with both parties present. A principle concern of contractors is the potential public and competitor access to their bidding strategy and production rates. The United States and many states have passed Freedom of Information laws allowing access by the public to information held by public agencies. The Federal Freedom of Information Act does, however, contain an exclusion from commercial trade secrets, which should also protect the documents from unwanted disclosure. The escrow bid documents are to include all of the quantity take off, calculations, quotes from consultants reports, notes, and other information a bidder used to arrive at the bid price (22). Complete discussion and sample contract language for escrowing of bid documents is contained in the 1991 ASCE pamphlet (22).

## AGENCY DISPUTE AVOIDANCE PRACTICES

The questionnaire sent to transit agencies for this synthesis requested information on their current methods of dispute avoidance and for their opinions of the effectiveness of the various methodologies to reduce or eliminate disputes.

Table 7 presents the results of the survey concerning dispute avoidance practices in use by the transit agencies.

TABLE 7  
DISPUTE AVOIDANCE PRACTICES USED BY TRANSIT AGENCIES

Practice/Technique	Percent of Agencies Using
Coordination of Adjacent or Interrelated Projects or Contract Sections	100
Pre-design or Preconstruction Investigation of:	
Soil Borings	86
Existing Condition Surveys	67
Preconstruction Surveys of Adjacent Properties	52
Design Reviews	100
By In house Staff	100
Agency Construction Staff	48
Independent Consultant	14
Others	24
Value Engineering (During Design)	90
Program/Construction Management Consultants	
All Projects	19
50-95% of Projects	38
11-49% of Projects	5
10% or Less	38

Note: The percentage reported for each use is the number of agencies who report using design review at various stages of design compared to the number of questionnaire responses.

TABLE 8  
WHEN DESIGN REVIEW IS TYPICALLY  
ACCOMPLISHED BY TRANSIT AGENCIES

Status of Design (%)	Agency Use (%)
Design Completion 35	76
Design Completion 50	71
Design Completion 80	5
Design Completion 90	86
Design Completion 100	76
Average number of design reviews per reporting agency 3.15	

Note: The percentage reported for each use is the number of agencies who report using design review at various stages of design compared to the number of questionnaire responses

Two practices were used by 100 percent of the agencies. The first was coordinating adjacent or interrelated projects or contract sections to ensure the reduction of interference and that both contracts clearly articulated the conditions to be anticipated by each contractor concerning its adjacent contractor. The second practice used by all respondents was design reviews conducted by in-house staff. As was reported in chapter 2 of this synthesis, many studies have found that up to 50 percent of disputes and claims are the results of deficiencies with the contract specifications and drawings. Apparently in recognition thereof, design reviews represent a substantial effort on the part of all agencies to coordinate these designs and minimize the problems. Table 8 shows the agency use of design review at various stages of design. What is remarkable is that, based on responses to the synthesis questionnaires, the average contract documents are reviewed more than three times during the design. The level of design review in the transit industry was significantly higher than reported for highway design in NCHRP Synthesis 214 (9). This study reported that design review of highway projects was not initiated most commonly until the design was at least 90 percent complete and that more than half of the agencies spent less

than 40 hours of professional time conducting the reviews. The response from the transit industry indicated that only 29 percent of the transit project design reviews involved less than 40 hours, while 29 percent took 41 to 100 hours, and 42 percent spent more than 100 hours in design review in the average project, and of that 33 percent representing an average expenditure of over 200 hours in each of the project reviews. Information on the size of the projects for which data were submitted was not provided. Obviously, a small project would warrant less design review than a larger project.

In response to the question concerning whether the agency has instituted quality assurance/quality control (QA/QC) procedures for either in-house design or for design consultant contracts, 81 percent responded in the affirmative for in-house QA/QC procedures and a further 67 percent of the respondents have either instituted a QA/QC requirement or had already required that of the design consultant. This practice compares favorably with the practices in use by the highway departments, many of which have instituted various quality management programs including implementation of Total Quality Management. However, none of the transit agencies specifically mentioned that they had instituted procedures in accordance with ISO 9000, a QA/QC program that has been widely implemented in Europe and other areas of the world with European design influences, for example Australia, New Zealand, Hong Kong, and Singapore.

VE during the design stage is used by 90 percent of the reporting agencies. While VE itself does not seek to correct errors in the design document, the review of the design documents to identify errors and omissions is an inherent benefit of having additional outside interests review the design documents. Sixty-seven percent of responding agencies indicated that they used VE at the 35 percent design completion stage, 29 percent at the 50 percent design completion stage, and 25 percent each at the 75, 90, and 100 percent design completion stages. Thus, of these agencies that use VE during design, the average number of studies during the project design is 1.5,

indicating that approximately half of the reporting agencies have multiple VE studies during the design of a project. The respondents indicated the value of VE studies savings, which are consistently achieved, as shown below.

<i>Percentage of Agencies</i>	<i>Savings as Percentage of Estimated Construction Cost</i>
38	<5
14	5-7
29	7-10

A common practice in many parts of the construction industry is the use of program or construction management consultants. However, only 19 percent of the responding transit agencies used either a program or construction management consultant on all projects, an additional 38 percent reported using program or construction management consultants on between 50 and 95 percent of the projects undertaken. Thirty-eight percent of the agencies used program or construction management consultants or construction inspection contracts on 10 percent or less of their projects. The conclusion to be drawn is that in-house staff manage the construction phase for more than 50 percent of the total construction placed by the reporting transit agencies.

The survey also asked responding agencies to provide their opinions concerning the value of various techniques to reduce disputes and claims or their severity. The area that received the most attention by the respondents was coordination of contracts between adjacent and follow-on projects. This coordination requirement was judged to be very valuable by 76 percent of the respondents, valuable by 19 percent, and not valuable by only 5 percent. On the other hand, constructibility reviews were listed as very valuable by only 47 percent of the respondents and as valuable by 53 percent. Two other techniques that can reduce the occurrence or severity of disputes or claims in the opinion of the respondents were mandatory construction scheduling (76 percent considered this a very valuable technique) and periodic construction meetings (71 percent considered

very valuable). Considering the level of effort indicated by the respondents to be expended in review of design, it was somewhat surprising that only 24 percent believed that a design QA/QC program was very valuable; 43 percent believed it was valuable. This indicated that 33 percent did not respond to design QA/QC having an importance in reducing or minimizing construction disputes and claims. Table 9 presents the full response to the question concerning the opinions of the respondents to the various techniques identified. The response of 48 percent finding that VE was not a valuable tool to reduce disputes/claims was also somewhat surprising. It may be that VE is seen as reducing the cost of construction by modifications to the design rather than as a source of identifying design discrepancies within the contract documents.

The questionnaires requested information as to whether or not agencies had revised or reorganized standard agency project organization or department structure in an attempt to minimize or avoid potential contract disputes or claims. Forty-two percent of the agencies reporting indicated that there have been agency reorganizations with the primary change being the integration of design and construction staff responsibilities. Twenty-four percent of responding agencies have increased the responsibilities of construction field staff for handling claims and dispute resolutions, and one agency had reduced the responsibility of its field staff for claim and dispute resolution. One agency had sought additional legal effort in the project administration and one agency had reduced the level of legal involvement of project administration. Twenty-four percent of reporting agencies had either created or strengthened their in-house scheduling expertise, two agencies had created a problem intervention group, 19 percent of the agencies had increased in-house design responsibilities, while 14 percent of the agencies had reduced in-house design responsibilities. Twenty-four percent of the agencies indicated that they had entered partnering agreements with their design firms, while 43 percent of the agencies indicated that they were now using partnering agreements with their construction contracting firms. Thirty-three percent of reporting agencies said that they have made a commitment to Total Quality Management.

TABLE 9  
TRANSIT AGENCIES OPINIONS OF TECHNIQUES TO REDUCE DISPUTES/CLAIMS OR THEIR SEVERITY

Techniques	Percentage				
	Very Valuable	Valuable	Not Valuable	Counterproductive	No Opinion
Contract Coordination	76	19	5	--	--
Constructibility Reviews	47	53	--	--	--
Predesign/Preconstruction Investigation	43	57	--	--	--
Problem Intervention Group	5	30	20	10	35
Value Engineering	5	38	48	--	9
Construction/Program Management Consultants	20	35	10	5	30
Design QA/QC	24	43	--	--	33
Preconstruction Meetings	33	43	14	--	10
Prebid Meetings for Contractors	48	48	5	--	48
Increased Access to Site Information by Contractors	38	14	10	--	62
Mandatory Construction Scheduling	76	14	--	--	10
Periodic Construction Meeting	71	14	--	--	15

Note: The percentage reported is the number of responses per category compared to the total number of responses.

## RECOGNITION AND RESOLUTION TECHNIQUES

### RECOGNITION TECHNIQUES

The most important part of dispute avoidance is recognizing an emerging problem that could lead to a dispute, and allowing for this problem to be dealt with early in its life. This chapter reports that the transit industry is very aggressive in its efforts to identify and resolve disputes at an early stage, compared with other industries.

#### Industry Developments

In recent years, there have been increased efforts by industry to avoid disputes before awarding contracts and to develop competent, responsive staff to manage during construction so that early recognition of emerging disputes becomes a focus of the team. Industry has also focused on strengthening the relationships of the project team.

Establishing a project manager as the single focal point for all issues on a project helps by allowing easy identification of the decision makers, which avoids the potential situation of individual disciplines taking hard-line attitudes to their own advantage, rather than that of the project.

Partnering and team building are two commercial practices that have extended into public work contracting, partnering more successfully so. In this type of atmosphere, the partners mutually discuss conflict early, and openly seek acceptable solutions for mutual benefit. These long-term arrangements also work to give people in both organizations a sense that mutual success--the ultimate goal--is not served by a confrontational stance or mistrust in a polarized relationship.

About 15 years ago, construction scheduling was confined to main-frame computers with only the largest organizations having either the hardware access or the means to afford the

enormous cost of a main-frame scheduling program. As personal computers evolved to the required speed and capacity, project scheduling as a management tool and as an identifier of project slippage has changed forever the analytical skills available for nearly instantaneous use on a project.

Tracking systems have been created to follow the document flow of RFI's, RFC's, shop drawings, and other project administrative needs to ensure timely response, preventing project delays and disruptions.

Finally, major industry groups have been formed and are actively seeking solutions to the causes of disputes. Groups such as the Business Roundtable and Construction Industry Institute seek to investigate and educate to successful paths. Public agencies could benefit from aggressively investigating techniques developed by these trade groups and implementing appropriate improvements. As agencies reduce the cost of program delivery, further growth will occur.

#### Agency Dispute Recognition Practices

According to the questionnaire responses, all of the reporting agencies used project meetings, and proactive problem management at meetings, to identify disputes at an early stage. The techniques used in early identification attempts are recorded in Table 10, which shows that 95 percent of the agencies used construction scheduling as an early indicator of a dispute. Table 11 shows the frequency of regular project meetings during the construction. Table 12 shows the types of schedules that are required by the reporting agencies, all of which reported that they require a complete construction schedule submittal as well as other schedule submittals. Eighty-six percent require a monthly update of the complete schedule, and another 10 percent require periodic updates but

TABLE 10  
TECHNIQUES USED IN ATTEMPTS TO ANTICIPATE OR IDENTIFY DISPUTES AT AN EARLY STAGE

Techniques	Percentage	
	Agencies Using Techniques	Agencies Indicating Technique Is One of Three Best Methods
Preconstruction Meetings	90*	10
Project Meetings	100	62
Construction Scheduling	95	76
Bid Evaluation/Comparison	90	28
Project Cost/Payment Forecasting	71	10
Regular Review of Project Documentation	76	38
Proactive Problem Management at Meeting	100	90

\*Includes 15 percent reported generally, but not always.

Note: The percentage reported for each technique is the number of agencies that report using the technique compared to the number of questionnaire responses.

TABLE 11  
FREQUENCY OF PROJECT MEETINGS

Frequency	Percent of Agencies Requiring
Weekly	76
Bi-weekly	19
Monthly	5

Note: The percentage is the number of agencies indicating use of project meetings compared to the number of questionnaire responses

TABLE 12  
SCHEDULING SUBMISSION REQUIREMENT

Requirement	Percent of Agencies
Complete Construction Schedule	100
Monthly Updates	86
Periodic But Not Monthly	10
Weekly Look Ahead Schedules	67
30-Day Schedule	43
90-Day Schedule	33

Note: The percentage reported for each requirement is the number of agencies that report using the requirement compared to the number of questionnaire responses.

not monthly. Thus, 96 percent of the reporting agencies required some type of regular update of the complete construction schedule.

Prebid meetings were also widely used by transit agencies; 90 percent reported that they were used regularly, only 10 percent reported that attendance was mandatory as a precondition for bidding on the project. Only one agency reported that minutes were not taken and three agencies reported that the minutes were not distributed to all attendees, two agencies did not distribute them to all bidders. Attendees at these prebid meetings generally included the Engineer of Record, the Agency Contract Administration Staff, the Agency Contract Administration Representative, with other occasional attendants, including utility company representatives and agency legal staff.

Preconstruction meetings were reported to be used by 90 percent of the agencies, which includes 15 percent reporting that they were in general use but not always required for small projects. But only 10 percent of the reporting agencies indicated that the use of preconstruction meetings was one of the three best methods of identifying the early indication of disputes, which was not surprising. These meetings are listed as having included the Contract Administration Representative, Agency Field Staff Representative, and the Engineer of Record, with about 25 percent of the reporting agencies having the utility company representatives present and 25 percent of the agencies required principal subcontractors to attend. Agencies reported wide use of every single agenda item indicated in the questionnaire, including staging or sequencing, scheduling right-of-way or site access, utility conflict, change order procedures, shop drawings submittals, payment processing, and safety. About 75 percent reported that they discussed claims procedures, design clarification requests, environmental matters,

and mobilization requirements and 50 percent discussed manpower projections and procurement of principal components. Other items mentioned by the agencies included EEO requirements and payroll submittal requirements. Proactive problem management at meetings was used by all of the reporting agencies and it was ranked as the most effective of the three best early indicators of a dispute.

Ninety percent of the reporting agencies indicated that they conduct a bid evaluation and comparison and that all were required as a matter of law to award the contract to the lowest bidder otherwise determined to be responsible and responsive in its bid submission. Agencies were not directly asked if they prequalified construction contractors for bidding, a common technique in commercial construction, and none reported that they did so.

While only 10 percent of the agencies indicated that project cost or payment forecasting was one of the three best methods of early dispute detection, it nonetheless is used by 71 percent of the agencies, which is the lowest percent of any technique indicated in the survey.

#### *Revised Change Order Procedures*

Sixty-two percent of the responding agencies indicated that they had revised their change order procedures within the last 5 years in an effort to settle changes by mutual agreement before they become disputes. These newly revised procedures require much more aggressive negotiation in an effort to reach a mutually acceptable change order. Thirty percent of the responding agencies improved their time and material record management procedures to reduce disputes over the value of the effort required to accomplish the change work. Fifteen percent indicated that they had instituted review by a noninvolved party if the claim negotiation process was bogging down. One agency had eliminated a differing site condition clause and one agency now requires contractors to warrant job site conditions--an effort to manage risk by placing more responsibility for these conditions on the contractor.

## **Dispute Resolution Techniques**

### *Overview*

Studies have shown that as a dispute is not resolved promptly by mutual agreement, three phenomena act to increase the impact of the eventual settlement on the project (3):

- The claim value asserted (quantum) rises,
- The percentage of recovery measured as a rate of settlement value/claim value rises, and
- The likelihood of contractor recovery increases.

All of these results demonstrate that early dispute resolution is a financial imperative to project success. In recognition thereof, the industry has developed a number of techniques to be used at the project level for the resolution of disputes.

Several of these techniques have functioned to prevent disputes, particularly partnering, dispute review boards (DRB), and project neutral. This happens when management objectively looks at its position on the issue and considers the impact of the position when brought before industry leaders or executives in a partnering session.

One additional advantage of having these techniques in place is that they can prevent one party from refusing to make a decision until the end of the project, a problem with some agencies and occasionally the position of a contractor. Either party to the contract, without veto power by the other side, can require a dispute to be heard by the DRB, the project neutral, or in a partnering session. So the very existence and orderly functioning of these practices will serve to reduce program cost by prompt recommendations for settlement.

Arbitration is also briefly discussed in this chapter in the interest of completeness. However, this technique is most commonly used when the dispute has been formalized into a claim and resolution is not possible without full legal trappings. Mediation is also discussed in this chapter. At present the common practice in North America is for mediation to be tried once a dispute cannot be resolved without legal proceedings. However, it has a contractual place in dispute resolution in many parts of the world, and it could be so used by transit agencies.

#### *Dispute Review Boards*

A technique that is gaining wider acceptance in the transit construction industry is the use of a dispute review board. The DRB resulted from the frustrations involved in solving disputes in tunnel engineering via litigation. Tunnel construction is today still very much an art and the industry has grown up with its own language for the tools, material, equipment, and labor that are used in the construction of a tunnel. The consequence was that a dispute involving a tunnel construction required significant time and money to educate lawyers and judges, to say nothing of completely mystified juries. For example, today tunnel construction workers (miners) are still identified as top lander, bottom lander, or walker; terms that have no meaning in conventional construction and are not known to people involved in other areas of construction. When the first Eisenhower tunnel was driven for the Colorado Division of Highway, a major contract dispute ensued. The final settlement doubled the original contract price and consumed significant efforts of the management of the highway department in the litigation. A tunnel engineering consultant, A.A. Matthews, extremely well known and respected in the tunneling trade, recommended that a Mediation Board be convened and impaneled during the second bore to act in a capacity to recommend settlements of disagreements between the owner and the contractor as they arose in the construction of the tunnel. The process was so successful that the subsequent use of DRBs became much more common in tunnel construction (26).

The DRB procedure has been found to have a number of advantages for both the owner and the contractor (26):

- The DRB procedure is much less costly and time consuming than formal litigation.
- Recommendations from professional experts are more likely to be based on practical considerations than on abstruse points of law. The savings in senior management time devoted to contract dispute resolution is significant.
- Disputes are settled promptly while the construction continues to go forward, and consequential delays and costs are reduced.
- The process is much less adversarial than litigation and the climate of contract administration is improved.

The DRB was originally conceived to evaluate claims in differing site conditions, particularly in tunnel construction. The process, however, has been so successful that it has rapidly spread to other parts of the transit construction industry and is now being extensively used by several highway departments and is gaining acceptance in commercial applications. The initial publication discussing the DRB process, *Avoiding and Resolving Disputes in Underground Construction*, was issued by the American Society of Civil Engineers (ASCE) in 1989. This book was updated in 1991 and the title was revised to *Avoiding and Resolving Disputes During Construction* (22). This publication provided an overview of three different techniques recommended by the Technical Committee on Contracting Practices of the Underground Technology Research Counsel; an organization generally sponsored by ASCE and the American Institute of Mining, Metallurgical and Petroleum Engineers. The three recommended practices are the use of a DRB, the escrowing of bid documents, and the issuance by the owner of a geotechnical design summary report to be included as a contract document. When the revised pamphlet was published in 1991, a total of 81 disputes had been heard by DRBs, 78 had been settled, 3 were in process, and none was litigated (22). The DRB is created as a part of a contracting process and is established by the contract between the owner and the contractor and comes into being at the beginning of the contract. Initially, both the owner and the contractor select their appointed representative to the DRB, who must be acceptable to the other party, and these two nominees then select the third member who acts as chairman. The recommendation and selection process aims to select a representative who is technically competent in the area of the construction of the particular contract, who is well familiar with the type of construction, is professionally well regarded within the industry, and whose opinion will be held in respect by all parties. The DRB members then become familiar with the contract through the review of the contract documents and a tour of the contract site. They meet periodically to be briefed by the owner and contractor's representatives on the status of construction and to observe the status of construction for themselves. If a dispute arises between the owner and the contractor that cannot be mutually resolved, it is immediately referred to the DRB, which looks at the job conditions and makes an in-person evaluation of the merits of each party's position, while bringing its members own technical experience and competence to bear on the issue. The DRB members are compensated equally by the owner and the contractor. Typically,

the results of the DRB are nonbinding on the parties and are admissible in court, both of these conditions being spelled out in the terms of the contract between the owner and the contractor. The admissibility of the DRB into court is viewed by the members of the Technical Committee on Underground Contracting Practice to be an important incentive for the parties to look seriously to the recommendations of the DRB as a contemporaneous technical evaluation of the situation, to which a court at any subsequent litigation would be expected to give serious weight.

Several members of the technical committee that authored the two previous ASCE publications have recently authored a book on the DRB that provides more information concerning the use and experience with DRBs (27). This publication reported that, by 1994, an additional 250 projects were using DRB concepts and that its use had spread to significant international projects. It is reported that the World Bank has now adopted a policy of requiring DRBs in its larger projects (27). This publication reported that DRBs were in use by the following transit agencies by 1994: Los Angeles County Metropolitan Transportation Authority, The Washington Metropolitan Area Transit Authority, The Toronto Transit Commission, and The San Francisco Bay Area Rapid Transit District (27). This book provides an extensive evaluation of all of the reported pros and cons of the use of a DRB. Its review could be valuable to organizations either currently using the DRB process or contemplating its use. For those agencies that have not yet contemplated the use of a DRB it is strongly suggested that this publication be reviewed so that an assessment can be made at the local level as to whether a DRB could serve to reduce or mitigate the effects and consequences of disputes and claims and their severity and frequency.

### Partnering

Partnering is a relatively new concept that has taken hold in the construction industry in a very short time. Much of the literature being written about dispute resolution efforts reflects this trend. The primary goal of partnering is to effect a change in the relationships between the owner, the contractor, and the engineer so that disputes can be avoided (28). The primary use of partnering has been with commercial operations that have established long-term arrangements between customers, producers, and suppliers, to effect a mutually beneficial relationship for all of the parties. In the early 1980s, the U.S. Army Corps of Engineers introduced partnering as a concept to improve the relationships between the owner and the contractor in public works construction projects. As the success, or at least the sense of success, with these early efforts spread, the use by other public works owners began. This use may have accelerated when the district engineer of the Portland District U.S. Army Corps of Engineers, who was one of the prime proponents of partnering in the Corps of Engineers, became the Director of the Arizona Department of Transportation and infused partnering into the construction programs of the Arizona Highway Department. Not only has the U.S. Army Corps of Engineers published a pamphlet on partnering (29), the

Associated General Contractors has also published a guideline on the use of partnering in construction projects (30). Partnering has been characterized as a relationship wherein:

- All seek win-win solutions,
- Value is placed in long-term relationships,
- Trust and openness are norms,
- Environment for profit exists,
- All are encouraged to openly address any problem,
- All understand that none benefits from exploitation of the other,
- Innovation is encouraged, and
- Each partner is aware of the other's needs, concerns, and objectives, and is interested in helping their partner achieve success (28).

In a recent article, members of a U.S. Army Corps of Engineers District, who have successfully used partnering, described what they believe to be the eight essential elements to a successful partnership.

1. Commitment must come from the top of each of the organizations involved in the Partnering.
2. Equity means that there is a change from the old winlose attitude to a win-win attitude.
3. Trust is fundamental to the ability of the partners to function and succeed.
4. Mutual goals mandate that a common denominator be found that supports a result that all can live with.
5. Implementation means a workable action plan that can be put into place and functionally succeed, as contrasted with the setting of agendas and general goals.
6. Continuous evaluation is required. All of the participants in the Partnering process must give continuous feedback to the other players as to their view of the ongoing Partnering relationship.
7. Timely response requires that the partnership deal with problems immediately and not put them off or push them down to a lower level.
8. Celebration. These authors believe that a fundamental ingredient to a successful project is that all the team members celebrate the success, enjoy the project fulfillment, and gain satisfaction from the job success (31).

*NCHRP Synthesis 214: Resolution of Disputes to Avoid Construction Claims* (9) reported that more than half of the state highway departments that responded to their questionnaire have instituted partnering on some levels in their projects. Florida and Arizona at that time had the most extensive commitment to the use of partnering. A recent article in the *Journal of Management and Engineering* discussed the implementation of partnering by Caltrans (The Highway Department of the State of California) (32).

Synthesis 214 was only able to obtain results of the use of partnering from the Arizona Department of Transportation. This agency reported that on projects with partnering, the final cost averaged 2.5 percent over the initial contract amounts, compared with a 4.5 percent on nonpartnered projects, with

the direct cost of partnering between 0.2 and 0.4 percent of overall project costs. Additionally, Arizona reported that partnering also reduced the average project completion time compared with nonpartnered projects. Thus, Arizona reported savings in engineering, traffic control, and other administrative costs on partnered projects as a result of the reduced construction time (9).

An article in the *Journal of Management of Engineering* reported on a survey of the participants in partnering projects. This survey was made of the partnering members on 114 project teams and of those teams, 105 (92 percent) said they would partner again in the future. Of the 114 projects surveyed, 85 percent were in public work projects with slightly more than half of these highway projects and the balance buildings and industrial projects. This survey also found schedule completion benefits with partnered projects. This survey reported that 70 percent of the projects were either on or ahead of schedule, and 82 percent of the projects were at or below budget, with a reported savings from partnering of 2.2 percent of the total project costs (33).

A presentation at a conference on engineering management reported on the performance of partnering within the U.S. Army Corps of Engineers. This study reported that the average cost growth for partnered projects was 2.72 percent, with an average schedule growth of 9.07 percent. Further, on partnered projects, a value engineering savings of 0.73 percent was achieved. On nonpartnered projects, the average cost growth

was 8.75 percent and the average schedule growth was 15.53 percent with VE savings averaging a lowly 0.05. The study also reported that the average claims costs on all nonpartnered projects were 5.01 percent, but that on partnered projects they averaged 0.67 percent (34). Figure 8 shows the results of the study reported at the conference. This study also revealed what may be a hidden benefit of the partnering process--the increased use of VE by contractors because they believe they will get legitimate consideration of their proposal at a senior management level. It is the author's experience that many contractors believe that legitimate VE proposals are rejected by engineers who may be hesitant to admit to a client that the contractor has found a cheaper way of doing the same thing successfully.

#### *Managing Unforeseen Site Conditions*

As reported earlier, site conditions were identified as the root cause of 20 percent of claims filed on more than 600 projects; but they resulted in a payment of approximately 35 percent of the total amount paid for claims (3). The highway department study showed that 35 percent of claims had site conditions as a cause (9). The techniques an owner uses for identifying and dealing with claims for unforeseen site conditions can significantly increase the cost as well as the time to resolve the claim. The study of 600 projects concluded that the

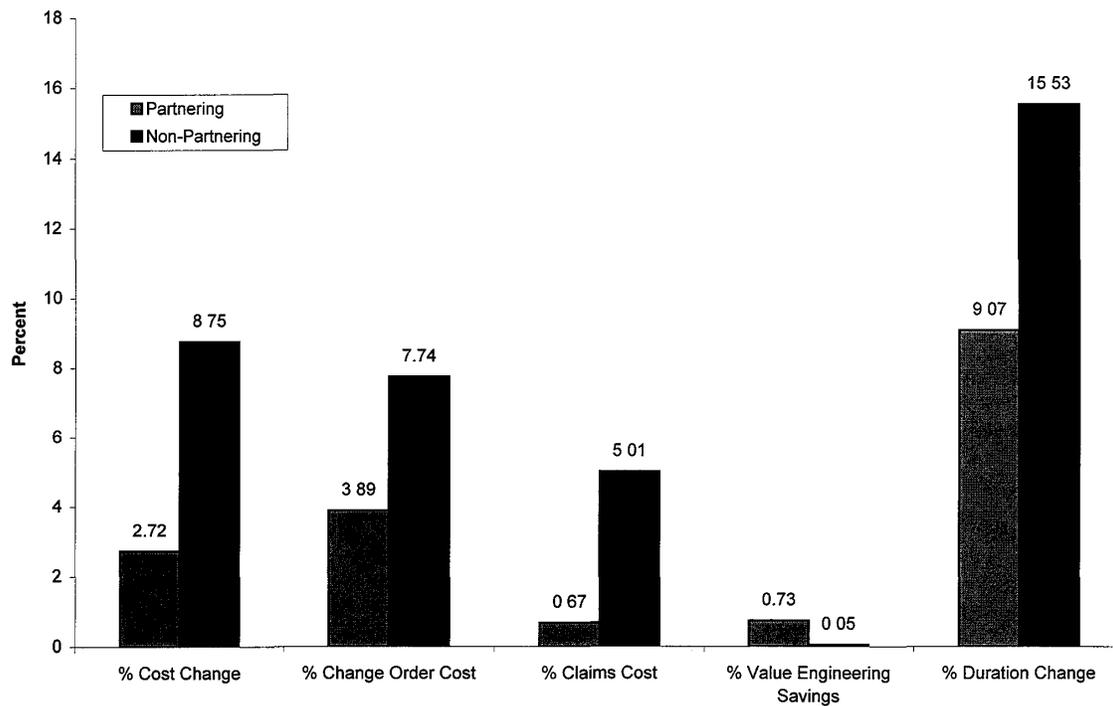


FIGURE 8 Project performance comparison (27).

cost of settlement of individual claims tended to be reduced by their early resolution and that this applied to unexpected site condition claims as well as other types of claims. Once the claim left the project and was handled by higher levels of management through litigation, it was found that the dollars claimed rose and continued to rise.

Additionally, the longer the time for resolution, the chances of the contractor succeeding increased and the percent of claims dollars paid increased. The study found that, in general, the amount of money paid on average was the same regardless of what risk sharing provisions the contract contained. That is, contracts with a differing site condition clause and contracts that had no differing site condition clause, but which had disclaimers for site conditions stating that the contractor was responsible for all conditions, resulted in approximately the same percentage of payment. That is, when owners attempt to shift the risk for site conditions to the contractor, they are essentially at risk to the same percentage as owners who apply a differing site condition clause and assume responsibility for conditions that vary from those represented by the contract documents (3). The study also found that a significant number of claims that had a differing site condition as the root cause of the problem, were not asserted as a differing site condition claim, but as other events under contract clauses. Apparently, this was done in the contractor's belief that it would be more likely to recover a greater sum of money or time allocation for arguing the differing site condition under a separate contract mechanism.

The conclusion to be drawn is that equitable analysis of the dispute should be promptly and quickly undertaken at the project level with every effort made to resolve the dispute by mutual agreement in an effort to reduce the cost of eventual settlement of claims and their overall impact to the project. An extensive study was conducted concerning the resolution of disputes based on a differing site condition clause. This study (35) found that most differing site condition clauses, if not identical to, are close to the federal differing site condition clause in wording that identifies Type 1 and Type 2 conditions. A Type 1 condition occurs when physical conditions at the site are different materially from those indicated in the contract. A Type 2 condition is said to occur if the contract was silent about the possibility of the condition being encountered. Earlier it was mentioned that the laws under which construction contracts are administered in the various states are characterized as a hodgepodge of remedies (12). Despite the characterization, this extensive study of the court decisions found an extraordinarily consistent pattern to the decisions of the courts when confronted with the evaluation of an alleged differing site condition. Figure 9 presents a simple flow chart for decision making that follows the pattern set in most judicial review (35). Use of the flow chart analysis at the project level at the early stage of the claim to determine if recovery is likely, could result in lower cost with less administrative burden.

A somewhat similar study (36) was undertaken of claims for unforeseen site conditions in contracts with a disclaimer for site conditions as well as a requirement for the contractor to warrant that it is fully responsible for all conditions encountered. The synthesis survey found that all responding agencies

make site condition information available to the contractors. When contractors encountered conditions that were different from those contained in contract documents made available for review, the contractor would generally argue that the owner misrepresented the site conditions. In general, the study determined that if the conditions encountered did differ from those represented and that reliance by the contractor on the conditions represented was reasonable, then recovery by the contractor was likely (36). Figure 10 presents a simple flow chart developed in this study that can be used at the project level by agencies that do not use a differing site condition clause to make an early evaluation of the contractors claim and evaluate whether recovery is likely.

If it is determined that recovery is likely, then an early resolution should be undertaken. This may present somewhat of a more difficult challenge for project level people to gain acceptance for resolution, as it is likely that the management of the agency made a deliberate decision to attempt to shift the risk for unforeseen conditions to the contractor. Management then may be hesitant to approve a claim for an unforeseen condition, having decided contractually to place the risk on the contractor. However, the extensive study found that the percentage of settlements of the numbers of claims and in dollar value of settlements was approximately the same when unforeseen conditions were encountered (3). Therefore, prudence dictates a prompt equitable resolution as the most beneficial solution. However, legal counsel should provide local advice, for some jurisdictions will enforce disclaimers on site conditions.

Additionally, lower divisions of government may also have laws for the administration of construction contracts as well as providing for acceptable disclaimer provisions, and specifying remedy methodology. For example, New York City has a dispute resolution process that includes:

- Scope of work delineated by the contract,
- Interpretation of contract documents,
- The amount to be paid for extra work or disputed work,
- Conformity of the contractor's work to the contract, and
- The acceptability and quality of the contractor's work

(37).

A three-person panel consisting of two city employees and one neutral person review submissions. (There is no provision for a hearing with witnesses or examination of oral testimony.) Claims for breach of contract or for damages for unanticipated delay still are submitted to court for resolution. However, courts still enforce no damage for delay clauses even if the delay is city caused (37).

#### *Project Neutral*

One technique that is being used in some commercial projects is the project neutral. The project neutral is an experienced person, selected at the inception of a construction project, who is acceptable to both the owner and the contractor and who has no affiliation with either party. The objective is to

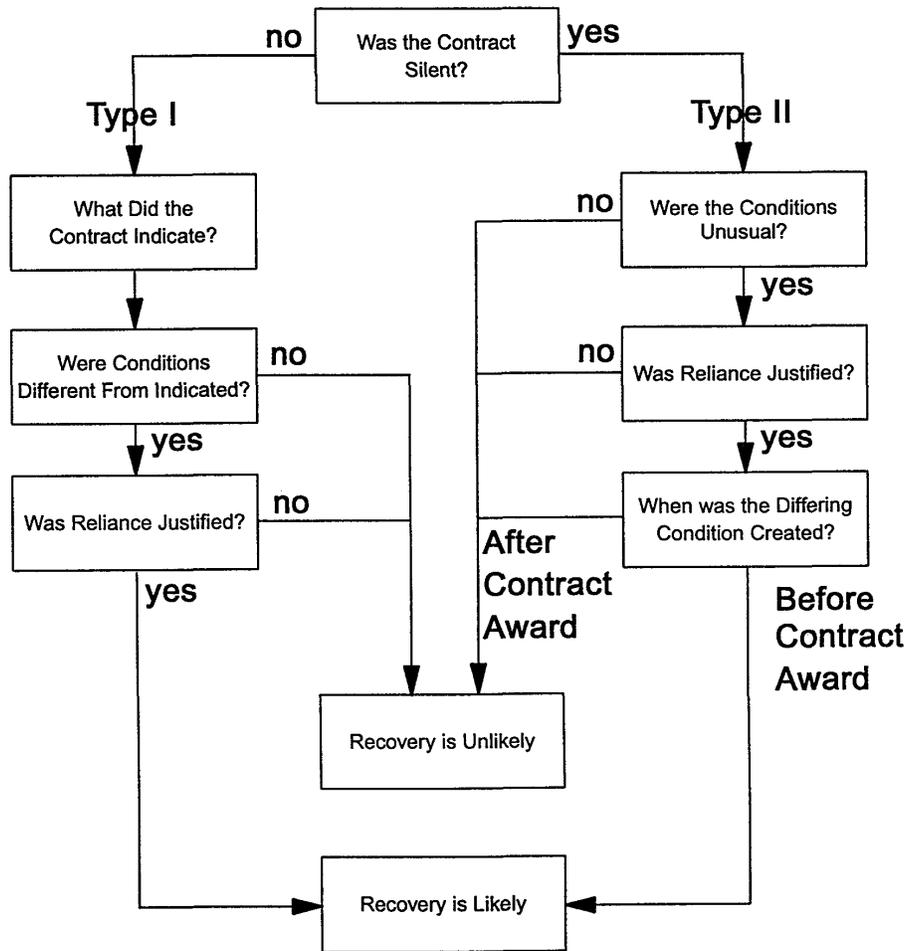


FIGURE 9 Decision rules for resolving differing site condition disputes (28).

select a person both sides trust and respect and who can bring an objective view to the construction contract. If a dispute arises and the parties are unable to settle amongst themselves through negotiation at the project level, the project neutral is brought in. This person then investigates the dispute and, depending on what specific arrangements have been made between the parties as to the handling of the matter, can either recommend an impartial settlement, or the neutral can act then as an informed mediator in attempting to achieve a common settlement. The DRB process previously discussed is an expanded use of this system, but the functioning of the DRB is slightly different from a project neutral; the neutral does the investigation and the DRB members receive presentations by both sides. The primary objective is the same for both—to resolve the dispute equitably, amicably and quickly at the project level. As with the DRB, the project neutral will periodically visit the jobsite to keep familiar with the construction as it

proceeds and to be well informed in the event that his or her services are necessary to investigate and make recommendations for settlement of a dispute. The neutral can function in several ways, one is to make nonbinding recommendations that would either be admissible or nonadmissible, depending on the agreement between the parties in any subsequent proceedings in the event that settlement efforts fail. The expectation is that the neutral would bring objectivity, authority, and trust to the table in the resolution process (38).

#### Mediation

Mediation is a technique in which an individual to facilitate the parties' mutual resolution of a dispute. Mediation is well known in labor management relationships, but it is used extensively in all types of dispute resolution. In construction in

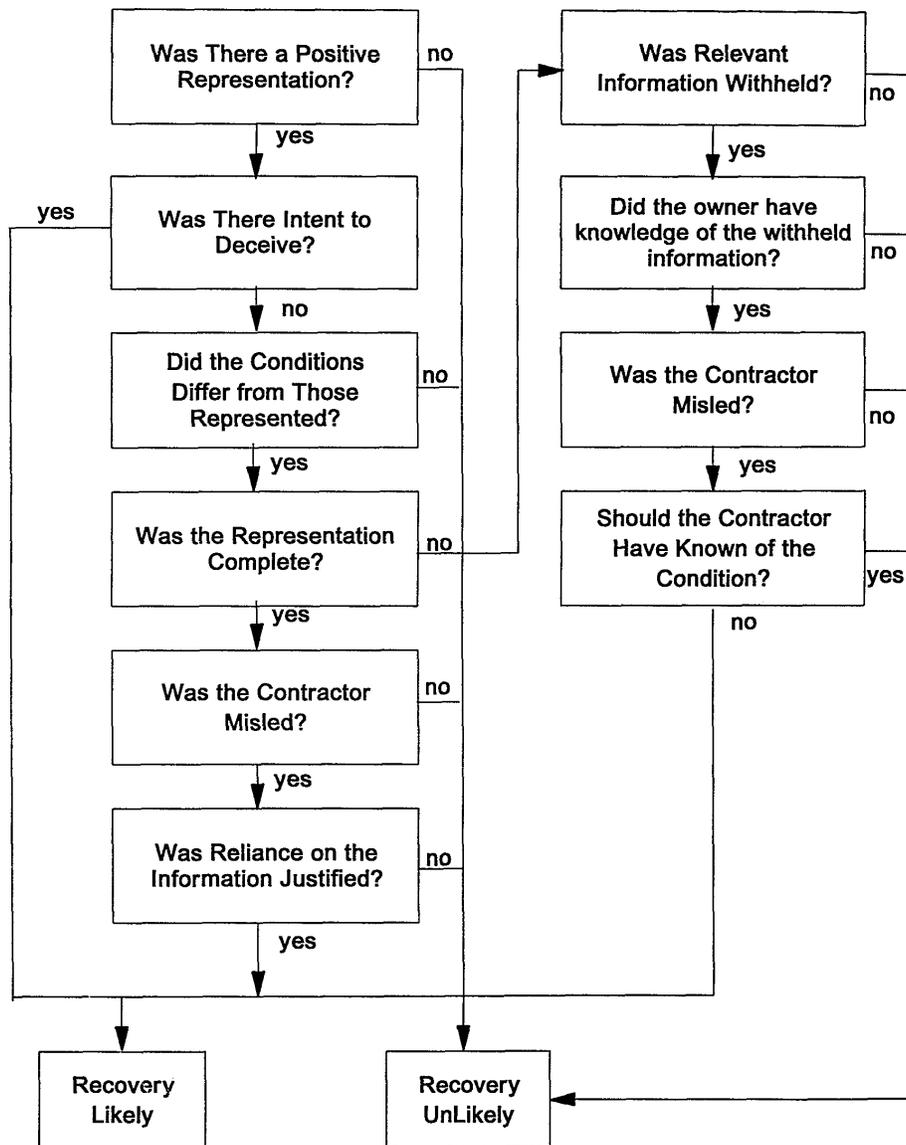


FIGURE 10 Decision process for resolving misrepresentation disputes (29).

the United States, it is most commonly used after the project is completed and when the parties seek resolution and each party realizes that it may have some risk in its position. Typically, mediators are available through private organizations, although the American Arbitration Association does have a list of mediators available for construction projects. The Institute of Water Resources of the U.S. Army Corps of Engineers has published a pamphlet that describes mediation in the construction industry (39). Styles of the individuals who practice mediation in the construction industry vary significantly based

on their personality and what they have found to be effective. However the format of the mediation process is generally the same. Both sides to the construction dispute will jointly select the mediator and provide for payment in full in advance of the mediation, which usually is a 1- or 2-day time period. The mediator will receive, shortly before the mediation date, a brief from each side outlining the position of the parties. The brief is to give the mediator an understanding of the facts and present the position of the party and serves to educate the mediator to the nature of the dispute. The mediator requires that each

side to the mediation bring a decision maker to the table, so that an agreement can be reached that will be binding on both parties. Understanding that most public agencies require that the settlement be submitted to a Board, a City Council, or other approval body, the public agency must be represented by someone on the staff with the authority to make a personal recommendation to The Board of Directors. At the hearing, each side presents its position for approximately one hour. The mediator then will shuttle between the parties discussing the pluses and minuses of its case and the likely outcome if it proceeds to litigation. Mediation is usually successful if both sides are prepared to yield from their initial position and the decision maker is able to objectively look at the strength of his case versus the strength of the other party's position. Once an agreement is reached and before the parties depart, the mediator will draw up the agreement and have both parties sign, indicating acceptance. A mediation in the United States is primarily practiced after the project completion. It is commonly used during the project in the English-speaking portions of the Far East (Hong Kong, Singapore, Australia, New Zealand). In these areas, mediation is a part of the contract, which establishes a mechanism for the appointment of a mediator at the beginning of the project and has a requirement that disputes be submitted for mediation immediately when the parties reach the point of unsuccessful negotiation at the project level. The mediations are nonbinding, but do result in substantial settlements of disputes early in the projects rather than letting them drag out to the end of the project to be handled by arbitration or litigation (40).

#### *Arbitration*

In general, there are two types of arbitration. The first type is arbitration established as a matter of state or local law as the remedy for a contractual dispute in the absence of litigation. The state law may frequently have details about how the arbitration is conducted, may create a state organization to administer the arbitration program and provide for arbitrators (12). Under these circumstances, the case may be heard by a single arbitrator or by a panel of three, all established as a matter of law. The second general form of arbitration is established either by contract provision as the sole remedy for disputes or as a remedy if mutually agreed by the parties to the construction contract. This type of arbitration is usually performed under the jurisdiction of a private organization, the most commonly used is the American Arbitration Association (AAA). The Association provides rules for conducting the arbitration, establishes sites, provides discovery, and will provide contract provisions to the parties desiring to specify its services in the contract (41). The AAA has recently modified many of its rules and procedures affecting construction arbitration in response to suggestions and criticisms from users of its services.

The U.S. Army Corps of Engineers has also used nonbinding arbitration as a means of fact finding and obtaining an unbiased viewpoint by an individual or panel, allowing objectivity to be the key motivation of the process. The process

described by the Corps of Engineers (42) seems surprisingly similar to other techniques with different names, for example a project neutral. It is very interesting that the Corps admits that a dispute at this stage may, in many cases, be the result of people involved in the case whose perceptions may be skewed by self-interest, who focus only on facts that tend to support their own position, and who have an inability to see the other's point of view (42).

A study was undertaken of two different arbitration practices established by state law; the first in Florida, which requires all claims below \$100,000.00 to be submitted to state-created arbitration and the second in California, where there is no limit on the amount of a claim to be taken to state arbitration. Both of these situations apply to disputes with a state contracting agency, not necessarily a local agency. The study concluded that there was no specific relationship between the size of the claim and the amount of payout. The study reported that, in Florida, with a limit to arbitration of \$100,000.00, the average payout per claim was more than 50 percent of the claim amount. In California, with unlimited potential for the disputed amount to be submitted to arbitration, the average award for arbitration has been approximately 35 percent of the claim amount. California's litigation experience before arbitration became mandatory was 25 percent of the claim amount. Thus, this study confirms the suspicions of many who have believed that arbitration results in average payout to contractors greater than the average amount awarded in court. However, the benefits of arbitration to offset these claim costs are the significantly lower costs and shorter time to resolution compared with litigation (43).

## **AGENCY DISPUTE RESOLUTION PRACTICES**

A section of the questionnaire for this synthesis sought information from the agencies concerning techniques used at both the project level and the central office level to resolve disputes. The selections available in the questionnaire are shown in Table 13. The results were somewhat surprising based on the earlier responses to the survey that appear to indicate that transit agencies were very aggressive in the management of disputes. The results may reflect that many of the responding transit agencies do not have multiple projects in different geographic areas underway simultaneously. Thus structurally, it is much more conceivable to manage the project closer to the agency, which could result in less distribution of authority to the project staff by the agency management.

The results from the questionnaire do, however, show a pattern of strong efforts to resolve disputes at the field level. Table 14 shows survey results of the project-level dispute resolution practices of the transit agencies. The results show strong use of informal negotiations at the field level, with 95 percent of the reporting agencies indicating that they use this technique with strong use of job meetings and change orders and with collaborative problem solving being used by 71 percent of the agencies. Collaborative problem solving was defined in the questionnaire as a cooperative team approach

TABLE 13  
PROJECT EMPOWERMENT/CENTRALIZED APPROACH FOR DISPUTE RESOLUTION PRACTICES

Project Level Options to Resolve Disputes	Options Beyond Field Level to Resolve Disputes
Informal negotiations	Decisions of agency at higher levels
Issue change orders to settle dispute	Formal negotiators
Use job meetings to settle disputes	Mediation
Collaborative problem solving	Involvement of legal staff
Partnering Program	Involvement of outside claims consultants
Delegating more authority to project staff	
Training field personnel in claims avoidance and dispute resolution	

Source: Survey Questionnaire

TABLE 14  
PROJECT-LEVEL DISPUTE RESOLUTION PRACTICES

Technique/Resource Used to Assist in the Resolution of Disputes	Transit Agencies Respondents (%)	If Used Is Practice	
		Increasing	Decreasing
Information negotiations	95	65	
Job meetings	76	75	7
Change orders	62	69	
Partnering	43		
Collaborative problem solving	71	46	
Dispute Review Board	38	63	
Training field personnel in dispute resolution	55	64	

Note: The percentage reported for each technique is the number of agencies who rate the method one of the three most effective compared to the number of questionnaire responses. The percent increasing/decreasing is based on the number of respondents for each technique.

between the parties to a dispute in which the focus is primarily on solving the immediate problem, rather than fixing blame or responsibility.

The use of DRBs by the transit agencies was 38 percent or 8 agencies. The use of partnering reported by the transit agencies was 43 percent. The use of DRBs by transit agencies can also be explained by its origin with the Underground Technology Research Council and its emphasis on underground construction, particularly with tunneling. As the Los Angeles project is built and additions are added underground in San Francisco, Portland, Atlanta, Washington, Toronto, and elsewhere, the use of DRB's for this underground construction is appropriate. The questionnaire also asked the respondents to indicate whether they were increasing or decreasing their use of the particular technique used at the field level to resolve disputes. Use was indicated to be increasing by over half of the agencies that were using each of the techniques with only one agency reporting that it was decreasing the use of trying to resolve disputes at job meetings (the questionnaire neglected to ask if partnering was being used more or less frequently as experience was gained). Respondents were asked to rank the three methods that, in their opinion, were most effective in resolving disputes. Informal negotiation was rated most effective by 95 percent of agencies. Job meetings were rated the second most successful technique, followed by collaborative problem solving, which received 10 votes, although none indicated that it was the best method. These three areas, informal negotiations, job meetings, and collaborative problem solving, were the techniques for which agencies reported the highest percentage

of use (Table 14). Respondents were also asked to judge which of the administrative techniques or additional resources were the most effective in the resolution of disputes. The area that received the most attention was early involvement of the project manager in the dispute, judged by 65 percent of the respondents as being the most effective administrative method, the second being delegation of authority to field staff, at 60 percent. Early involvement of in-house claims staff was rated effective by 50 percent of respondents. For complete results, see Table 15.

Additionally, 18 of the responding agencies have an engineering support group available to resolve design conflicts during construction. It should be obvious that prompt responses to requests for information (RFIs) or requests for classifications (RFCs) is vitally critical to preventing project delay with resultant disputes and claims.

Agencies also report that 76 percent use agency design staff, construction and/or contract administration support, or have a designated problem intervention group that can be promptly available at the project level to assist in the analysis and resolution of disputes at an early stage.

Additional information reported by respondents concerning procedures in use by agencies is shown in Table 16. This table shows the results of the use of informal negotiations and formal negotiation. The principal difference between the two types is that formal negotiations take on the mantle of a claim with full participation on both sides by legal counsel. Informal negotiations generally take place without involvement of legal counsel. Forty-eight percent of the reporting

TABLE 15  
MOST EFFECTIVE METHOD IN THE RESOLUTION OF DISPUTES BASED ON OPINION OF RESPONDENTS\*

Percent of Respondents	Technique
57	Delegation of authority to field staff
24	Central office approval
10	Early involvement of outside claims consultants
29	Early involvement of legal staff
67	Early involvement of the project manager
52	Early involvement of in-house claims staff

\*Respondents could select up to three techniques

Note: Number of selections by respondents for each technique in questionnaire compared to number of respondents.

TABLE 16  
PROCEDURES USED BY AGENCIES IN AN ATTEMPT TO RESOLVE DISPUTES, BY PERCENTAGE

Informal Negotiations*	90
Field level	81
Central office	76
Legal department	5
Formal Negotiation**	71
Field level***	14
Central office***	67
Legal office***	19
Discussion of administrative agency at different levels with increasing authority	43
Mediation	48

\*Informal negotiation was defined in the questionnaire as "an attempt to settle a dispute through casual discussions or settlement without the structured procedures or legal trappings. For example an informal negotiation may take place at a job meeting or telephone conversation without involvement of legal council "

\*\*Formal negotiation was defined in the questionnaire as "an attempt to settle a dispute, claim, or lawsuit through discussion or compromise in a formal manner, for example, with all parties represented by counsel, with structured procedures, and with written submission "

\*\*\*Several agencies indicated more than one level of negotiation

Source: Survey Questionnaire

agencies indicated that they had used mediation to attempt to resolve disputes and 43 percent reported that they had sought decisions at higher levels of increasing authority to settle disputes.

Agencies were also asked for their opinion concerning the main obstacles to early resolution of disputes. The agencies were asked to select up to four obstacles which, in their view, constituted a problem to the early resolution of disputes. Interestingly, none of the respondents believed that a lack of support either from the project manager or from agency legal counsel was an impediment to the solution of a dispute. Only 5 percent lacked adequate technical support to assist in the analysis of the dispute. Ten percent lacked the informal administration process to facilitate negotiation. Fourteen percent believed that either party was not allowing the administrative process to work, that is, that either the agencies' bureaucracy or the contractors' management would not let the process proceed to the settlement of the dispute. However, 76 percent of the respondents indicated that lack of information from the contractor to support its position in the dispute was the principal obstacle to settlement. Apparently, this is not a particularly unusual event. The contractor would quickly know that it is spending money in excess of what was anticipated and will immediately submit a notice of intent to claim. It is

not uncommon to hear contractors say that they do not want to divert the energies of their project staff during times of intense construction activity to preparing claim packages. Nor do they want to bring in additional staff to only look at the claims, but want to wait and have the project staff prepare the documents at a later date.

Forty-eight percent of the respondents indicated that there was insufficient authority delegated to the project staff to allow the early resolution of project disputes. This may explain the relatively low level of training field personnel in dispute resolution by transit agencies, reported at 55 percent in Table 14. Respondents indicated that delegation of authority was the second most effective technique to early settlement of claims.

The trend may be to do otherwise, for example the California legislature recently passed a law affecting Los Angeles County Metropolitan Transportation Authority requiring that all potential change orders receive an independent review and certification by agency counsel and agency contract administration staff. While authority may be delegated to the resident engineer in Los Angeles to execute a change order up to \$25,000, he may not do so without prior review and approval by the agency legal counsel and the agency contract administration staff, a trend that would be unfortunate if it adds significant delay to the timely settlement of the dispute. As

TABLE 17  
MAIN OBSTACLES TO EARLY RESOLUTION OF DISPUTES BASED ON OPINION OF RESPONDENTS\*

Percent of Respondents	Obstacle
48	Insufficient authority delegated to project staff
76	Lack of information from contractor to support its position in the dispute
0	Lack of support from Project Manager to assist in the dispute evaluation
0	Lack of involvement by agency legal counsel
14	Too much involvement by contractor legal representative
5	Insufficient project funding
29	Informal or formal agency policy to defer decisions on disputes until the end of the project
14	Either party not allowing administrative process to work
10	Lack of informal administrative process to facilitate negotiations
48	Defensive perspective by design engineer
5	Lack of the other technical support to assist in the analysis of the dispute
14	Too much involvement by legal counsel
10	Lack of approval by the central office
48	Belligerent manner of disputing party
48	Self-serving posturing by parties to the dispute

\*Respondents could select up to 4 obstacles.

reported earlier in this synthesis, the timely settlement of disputes after submission seems to reduce the total amount of settlement dollars paid to a contractor. The complete results of the response to the questionnaire on the opinion of respondents as to the main obstacles to early settlement of disputes are shown in Table 17.

Another area of interest is that 29 percent of the respondents say that there is either an informal or a formal agency policy to defer decisions on disputes until the end of the project. This may be somewhat at odds from the earlier discussion concerning the widespread use of schedules by transit agencies. This would indicate a significant degree of tracking on the part of all agencies of the contract progress. A common administrator's response in years past to a contractor's request for time extension to an otherwise entitled event would be "Let's wait until the end of a project to see how much time the contractor needs." With the level of scheduling effort in use by all agencies, it is no longer true that the agency does not know the effect of a claim event on construction duration. One would expect, then, that the attitude of refusal to settle until the end of a project would have dissipated with the proliferation of sophisticated scheduling techniques.

Once again, this does not bode well for cost control of the eventual settlement as the cost continues to grow in the contractors view with the failure to complete the decision process in a timely manner (3).

Forty-eight percent of the respondents indicated that a defensive position by the design engineer was a principal obstacle to the early resolution of disputes. This is hardly surprising, in view of the studies that found that 50 percent of the total amount of contract problems were a result of deficiencies in the contract documents and with the aggressive nature of many of the responding agencies to seek recovery from the design engineer for errors and omissions. For the engineer to admit that the problem was created by a deficiency in the design documents is to agree that he or she is responsible for either an error or omission. An example of a typical dispute involving an engineer's defense would be over a contractor's claim for entitlement based on a contractual ambiguity. An ambiguity occurs when there is more than one reasonable interpretation of

the contract documents. The contractor takes a position with an ambiguity that is to its financial advantage. The engineer will point to the other part of the contract that supports his or her position. If an agency has an administrative review process for the resolution of the dispute that requires unanimity on the part of the reviewers to granting of the change orders for settlement of the dispute, then opposition by the engineer will certainly cause delay or perhaps present an insurmountable obstacle to the settlement of a dispute, requiring that the dispute eventually become a claim with full legal trapping. The two other obstacles that receive significant attention by the respondents were the inability to settle a dispute caused by the belligerent manner of the disputing party (48 percent) and the self-serving posturing by parties to the dispute (48 percent). Both of these problems highlight people as being a principal obstacle to the settlement of a dispute. The Construction Industry Institute, in creating the Dispute Potential Index, similarly found that people and their attitudes, training, etc. were the most likely source of disputes on a project (18).

One of the primary goals of the partnering process is to overcome these two obstacles by creating an atmosphere in which parties on both sides of the dispute can look objectively at the position of the other side and then act responsibly to dispose of the dispute. Many of the other techniques described have similar goals, including the DRB, collaborative problem solving, mediation, the project neutral and nonbinding arbitration. While the DRB was created primarily to analyze the technical merits of a differing site condition, it also functions to enable project participants to act responsibly in front of industry peers and recognize the position of the other party.

Thirty-three percent of the responding agencies indicated that they require the escrowing of bid documents with high dollar value contracts. However, use of this technique is facing significant opposition from local contractors and construction trade groups.

Secondly, escrowing of bid documents may no longer be as effective as conceived by the Technology Committee on Underground Contracting Practices. One member of this committee has concerns about its reliability because of the widespread use of sophisticated computer techniques that allow

manipulation of the actual bid documents and creation of a substitute bid document skewing the data differently from the actual bid. The skewed document could then be submitted in escrow as the actual bid preparation document. In former periods, contractors did not have this capability, but today's advanced computer systems do create the possibility that contractors could manipulate the bid documents, especially if they believe that the contract has a window of opportunity for a claim as they prepare their bid for the project. However, there is no direct evidence that this practice either has occurred or will occur.

To obtain a perspective on claims settlements for general completeness, agencies were asked for data. Agencies reported that, for those who maintained records, 33 claims had been submitted to litigation in the last 5 years, one of which resulted in a 100 percent judgment for the contractor, one at 50 percent, and the remainder at 40 percent or lower, with one at 1 percent and another with case dismissal. A total of 15 disputes were arbitrated with reported results at or exceeding 50 percent with the highest at 80 percent. Of four disputes reported as being mediated, one settled at 50 percent and a second at 100 percent.

## CHAPTER SIX

**CASE STUDIES****TRACKING FIELD PROBLEMS**

The Port Authority of Allegheny County (Pittsburgh) reported that it tracks field problems in an effort to provide rapid response to quickly resolve problems. This process is implemented by a requirement in each of its professional service contracts and each of its construction contracts for a monthly progress report. This monthly progress report has a mandatory section requiring the identification of potential problems. The construction contractors submit this monthly report along with their invoice for the previous month's work. The construction manager first receives the contractor's report and must report to the agency each potential problem raised by the contractor. This could take the form of a copy of the response to the contractor, discussing how the potential problem is to be solved, or it can be a discussion of the rest of the story of the potential problem with the construction manager's recommended solutions for consideration by the agency. The Port Authority finds that this is an effective way to identify problems early, when numerous options are available that could lead to inexpensive solutions.

**PERFORMANCE-BASED CONSULTING CONTRACTS**

The Port Authority of Allegheny County also reports that it now ties the fees paid for design and CM consulting services to performance reviews. This practice commits 60 percent of the fee to the minimum fee that will be awarded to the consultant, the remaining 40 percent is at risk, based on the performance of the consultant. The Port Authority has two types of design contracts, one for a single project, for which it institutes incremental work orders. A performance rating occurs after each work order and results in the award of a portion of the 40 percent, based on the consultant's performance against its expectations. The second type of contract is a work order contract, which is used for smaller tasks and requires a review period every 6 months. Each consultant has a description of their performance review items and their rating. The rating is done by Port Authority staff who have direct knowledge of the performance of the consultant. To date, there has been no statistical analysis of the effect of using this system, but both the Manager of Construction and the Manager of Design have experienced improved performance from consultants when a fee determination review resulted in reduced fee for the previous period. They believe that this has made the consultants more responsive to the requirements of the agency, which results in reduced disputes and claims by the construction contractors.

**CHANGE CONTROL SYSTEM**

The Los Angeles County Metropolitan Transit Authority (LACMTA) has developed and implemented a computer-based

Construction Contract Change Control System. The system is an interactive software package that is used by all levels of the construction management team. The system networks between the agency's staff and its construction management offices, down to each resident engineer office. The system has standardized input and output at the resident engineer office for all areas of the change order process. Modules for the generation of Change Orders, Requests for Information, Potential Claims, Claims, and for Contract Submittal Processes are included. The system generates all required letters, forms, and documentation in addition to creating a historical record. Real-time information is shared at the construction management offices and at the agency's staff in a consistent format, allowing management overview in real time of each contract's current status. Trend reports can be generated that forecast project costs in real time for multiple projects and multiple consultants. Personnel using the system who were present before its implementation estimate a 100 to 400 percent savings in time over the previous system. The system requires that all changes and claims have a basis that allows management review of the causes and cost. The system also has a module that allows the agency to manage within the Change Control System its Consultant Contract Changes. This module has limited access and also controls access to various portions of the system. The agency reports that the system has the following benefits for executive management:

- Visibility of program and project construction change activity and related cost,
- The ability to monitor overall contract change performance and cost of construction in consultant contracts,
  - Change trend data that indicate potential problems,
  - Standardized change data to be presented to the governing board,
- The ability to request and receive unique data summaries to respond to board inquires, and
- Rapid responses to public information requests.

But perhaps more importantly for the manager of an individual project, it allows specific contract change submittal and claims trend data indicating areas needing attention and allowing rapid response of management to any trend indicating negative performance. The Los Angeles Red Line Segment One project was placed in service in May 1991. This project resulted in a cost growth from the base award of construction contracts through final closeout of some 24 percent. At the present time Segment Two of the Los Angeles Metro is still under construction, however a portion of this project has already been placed in service and all underground excavation has been completed in the remaining portion of the project. The current estimated cost growth from awarded construction

contracts is only 12 percent. LACMTA implemented a number of fundamental construction contract packaging practices with the second segment to reduce change orders over the first segment, but implementation of the CCS system is viewed by management as one of the techniques that have been successful in reducing cost growth. The system currently is being marketed by LACMTA and has been implemented in the new Puerto Rico project and is being seriously considered by another system about to undertake additional construction; it also is being actively marketed to construction undertakings other than transit.

In addition to LACMTA, other agencies have found that gathering and maintaining historical data are important components of managing cost growth of changes and claims in the future. A danger to be concerned about is the maintenance of the historical data during periods of construction inactivity. Transit agencies' construction programs are driven by approvals for new projects, project expansion, or for renovations. When an agency reaches its presently approved construction goal, it should exercise care and prudence to maintain the historical records generated during the project for the future when new projects or expansions are approved. The loss of this historical data can result in an agency essentially having no history on which to draw in managing its cost growth from disputes and claims.

### **DEBARMENT OF CONTRACTOR**

The low bidder on a public works contract in the United States must be awarded the contract if it is determined that the contractor is responsive and responsible. Responsive has to do with the compliance by the bidder to all of the requirements of the bid submittal process. Responsibility has to do with the integrity and capability of the contractor to execute the work. A contractor who is debarred cannot receive a public works contract during the period of debarment. California state law allows the City of San Francisco to develop its own laws regarding competitive bidding of public works contracts. Under this process, a contractor received a construction contract for the San Francisco Muni Project. The contractor submitted a claim followed by subsequent litigation concerning certain allegations. During the claim hearing and litigation process, certain of the contractor's damages were determined to be wrong, however, the contractor refused to revise its damages and continued to pursue the claim for the full amount of its original request even with the knowledge that its damages were incorrectly stated. The City's contracting laws allow an administrative action to be taken against a contractor if it is determined that the contractor knowingly submitted a false claim. An administrative hearing was held with the evidence presented that the contractor had knowingly submitted and pursued an incorrect damage claim and lawsuit. The San Francisco law provides that if a hearing determines that a contractor failed to obey the regulations of the law, it would be declared an irresponsible bidder for a period of 5 years, and not be allowed to receive any construction work from the City of San Francisco for that period. The contractor appealed this decision and the State Court of Appeal agreed with the City of

San Francisco. This type of action by the City serves to keep contractor claims reasonable and based on a current factual analysis rather than an inflated statement of damages. While it may not in itself reduce the number of claims, such provisions can keep the dollar value of those claims much more reasonable and also serve to reduce final settlements.

### **PREQUALIFICATION OF BIDDERS**

Prequalification of bidders is reported by New Jersey Transit to be an effective way to reduce changes and claims on complicated projects. This agency has established prequalification of bidders as a requirement on a case-by-case basis. Each potential new contract is examined by staff to determine whether or not prequalification should be required. It is generally used by the staff when the construction is out of the ordinary and it is important to have knowledgeable, experienced contractors, or if there is the likelihood of significant public or safety impact from the construction. Prequalification of bidders is also required when New Jersey Transit issues a design-build contract. The project is initially advertised to the contracting community as a contract requiring prequalification of bidders. The agency has no one fixed procedure for doing this, but tailors the prequalification process to the needs of the individual contract. This is determined by the size of the contract and complexity of the project. On an extremely complicated project, New Jersey Transit uses a three-stage selection process, involving first a brief submittal of qualifications, followed by a second, more substantial submittal from those firms judged to be capable based on their brief submittal, and third, followed by interviews. The bidding contractors are asked to fill in a detailed questionnaire of their experience, which is submitted and evaluated. Those firms judged to be qualified are requested to submit bids. The agency reports that this process is fully in compliance with the public contracting laws of New Jersey and the agency has met with no legal challenges from the contracting community to the use of this procedure. Several contractors who were judged not qualified in the selection process did submit written protests to the agency over their nonselection, to which the agency responded directly in writing, which satisfied the contractor. The agency also lets many contracts through the normal solicitation process without prequalifications and then judges the responsiveness and responsibility of the contractor as part of its bid award process, generally using the submission of a payment and performance bond as adequate assurance of responsibility. The agency reports that this prequalification process is extremely helpful in finding qualified contractors to do complicated construction tasks with a minimum of changes and claims.

### **USE OF CONSULTANTS FOR WORKLOAD SURGES**

Chicago Transit Authority (CTA) indicates that it has shipped more design responsibilities to outside agencies in an effort to reduce the potential for contract disputes and claims.

CTA has traditionally used in-house resources for both design and construction management, but recently faced a significant surge in its workload with which it was unable to adequately cope. Serious consideration was given to CTA's traditional means of accommodating increased work, which was to hire additional staff, but finding adequately trained and qualified recruitment candidates was difficult. Additionally, CTA believed that hiring additional staff employees, considering the available sources, would diminish the quality of the design documents leading to more disputes, changes, and claims. Therefore, to accommodate the surge, they sought the assistance of qualified design consultants and construction management consultants for the surge work. Once the surge was completed, over several years, the services of the design firms and construction management firms were diminished. CTA believes that this method maintained a traditional high quality of design documents and lead to reduced claims in the management of the project by ensuring that all of the personnel involved in the design and construction management process were qualified, trained, and experienced professionals.

### **OWNER FURNISHED MINING EQUIPMENT**

By the early 1990s, the Toronto Transit Commission (TTC), which operates a well-established commuter transit system, received approval for major expansion of the system. However, it had been some time since TTC had accomplished a major construction project, so it essentially had no on-going staff capability in place. The Commission retained a consulting team who put into place a strong project management organization. The team undertook a study of the contracting practices it would recommend for the forthcoming construction program, much of which would be underground, and recommended a package that included all of the recommendations of the Underground Technology Committee--an in-place Distribute Review Board, escrow of bid documents, and a geotechnical design summary report--added partnering and introduced a new concept of construction to the planned tunneling. This new technique was for the owner to purchase the tunneling machines in advance of awarding the construction

contract, and require the contractor to use the owner-furnished machine. One of the primary purposes of this idea was to allow the owner to control the type of machine to be introduced into the construction project. One observer to the underground construction contracting situation has observed that, no matter how much geotechnical information is provided to the bidding contractors, the owner is still committed to engage the contractor that is the most optimistic about the expected conditions, the machine, and the machine's performance. TTC purchased two earth pressure balance machines with ripper-type heads for use on the first expansion project, which was to be the Eglinton Line. A principal financial backer of these projects was the Province of Ontario and when the political parties in power changed through the election process and the economies of both Toronto and Ontario weakened, many projects were shelved or canceled, although the Sheppard Project, extending eastward in Ontario, was allowed to proceed. However, the geology was different on this project than on the Eglinton Line, requiring TTC to purchase new heads for the tunneling machines to accommodate the expected boulders that are present on the Sheppard Project and had not been discovered in the Eglinton Line. By mid 1997, a construction contract had been awarded and assembly of the earth pressure balance machines in the cut-and-cover portal was expected to commence by early summer of 1997. These two machines will each dig a 3.5-kilometer tunnel. TTC further required that contractors be prequalified for the right to submit construction bids. Seven firms submitted prequalification credentials, one firm was disqualified for lack of previous experience with earth tunneling and one qualified firm failed to submit a bid. This resulted in five bids being submitted, with the low three bids being very tight and slightly under the engineer's estimate. The contract provides baselines for machine production and for machine performance similar to that described for a geotechnical design summary report as a geological baseline. That is, the owner expects the machine to perform at a certain level of efficiency and productivity and is responsible if it fails to achieve that rate. The expectation is that by providing what engineering believes to be the best machine for the expected geology in the tunneling construction, disputes will be minimized and the impact of tunneling through an urban environment will also be lessened.

## CHAPTER SEVEN

**CONCLUSIONS**

This chapter contains conclusions from each of the subject areas in the synthesis, including: ways to avoid disputes, a program to recognize the potential for disputes in individual projects, discussion of practices used to resolve disputes at the project level in order to avoid their escalation, and suggested areas of future study.

The most common causes of disputes in construction are deficiencies in the contract documents (50 percent of the total number of disputes) and site conditions (35 percent of total dollar value of disputes). These figures are the result of detailed study of the underlying causes of disputes as contrasted with the contractor's characterization of the dispute. Contractors will characterize a dispute to improve their chances or percentage of recovery. Certainly the rate of design deficiencies can be improved with better management of the design documents preparation. All responding agencies reported having a systematic means of tracking cost growth of contracts from the point of award to final closeout. Eighty percent of responding agencies indicated that they maintained a separate record of the project disputes that had occurred in the last 5 years. Detailed recordkeeping allows self-evaluation of the success of various programs to minimize future claims and can indicate areas that require additional concentration of effort to prevent disputes.

Three reasons strongly indicate that early resolution of disputes is in the best interest of the project:

- Contractor's claim value increases,
- Likelihood of recovery increases, and
- Percentage of recovery increases.

This indicates that all three situations involve enhanced recovery by the contractor as time passes. With this in mind, it will be well for agencies that presently have either stated or informal policy of not resolving disputes until the end of the project to reexamine their practice.

All responding agencies reported that they make available to bidders the information known to the agency concerning site conditions. Agencies use of the differing site condition clause is far from universal, although several agencies reported that they do use the differing site condition clause even though not legally required to do so to achieve better bid results by accepting the risk of unknown conditions. Detailed industry studies comparing the results of contractor's claims under contracts with differing site condition clauses and contracts that placed the risk of unknown conditions on the contractor, show that recovery by the contractor as a percentage of frequency of claims and dollar value of claims is somewhat similar. This finding would indicate that contractors who make claims for misrepresentation (the second case described above) recover approximately the same amount as if the

contract placed the risk for site conditions on the owner. The underground technical community has suggested three practices to reduce exposure to claims from site conditions and to quickly respond by investigation and consideration of contractor's claims. The first of these approaches is to publish as part of the contract documents a Geotechnical Design Summary Report, which clearly sets out the expected behavior of the underground conditions with regard to the expected method of construction by the contractor. The second practice is to escrow the bid documents of the successful bidder, allowing these documents to be examined in appropriate dispute situations to determine more reliably how the contractor interpreted the contract data in the preparation of its bid. The last practice recommended was to create a Dispute Review Board, sitting during the life of the contract. If one assumes that agencies with a practice of not resolving disputes until the end of the project would not use a Dispute Review Board, then half of the remaining agencies are employing a Dispute Review Board on their projects. It is likely that these are more commonly in use with underground construction.

The construction industry in general has implemented a number of practices to avoid disputes. These include design reviews, value engineering studies, constructibility reviews, and quality assurance/quality control throughout the design process, among others. This synthesis concludes that use of these practices by the transit industry is significant. Ninety percent of the responding agencies use value engineering studies during the design stage. In the case of design reviews, both the number of reviews and the level of effort expended in the review were significant. All of the transit agencies do design reviews, with an average of more than three reviews during the design of the project. The design review is generally done at the completion of the preliminary design, then somewhere near mid point of the design, and again near the finalization of the design. Constructibility reviews were also heavily used by agencies and 80 percent report having instituted QA/QC requirements as either part of their in-house design or as a contract requirement with their design consultants. Industry studies have shown that all of these practices have a cost/benefit ratio exceeding 10 to 1 and the average impact on construction costs is between 2 and 4 percent for each of the programs.

Two new contract time programs, A + B and the incentive/disincentive clauses are in use by industry. They have been more commonly used in rehabilitation and replacement of existing facilities than in new construction. They have resulted in reduced construction time over the engineer's estimate and even further reductions in construction time over the contract time. This reduced construction time has been achieved with no increase in contract cost. Agencies savings were realized as a result of the reduced construction management and

support necessary by the agencies. No study has been done as to whether contracts with the A + B method or the incentive/disincentive method have resulted in reduced costs associated with changes, claims, and disputes. While no transit agency reported using these scheduling techniques, there appear to be substantial benefits to owners using the technique. Such studies should be undertaken to determine whether the use of this scheduling technique would reduce disputes in claims in addition to the other benefits.

Based on industry practice, transit agencies should consider mandating that the design effort, either in-house or by contract, include QA/QC practice. Based on cost/benefit ratios, transit agencies could benefit from using value engineering, constructibility reviews, and design reviews during design.

Transit agencies also report significant use of construction scheduling as a contract requirement (100 percent of responding agencies use contract scheduling). Industry has also developed a litmus test to predict the susceptibility of a project to disputes. Tests of this system show that it is a relatively reliable system of predicting the success of the project with regard to dispute and claims.

The responding agencies use all of the techniques identified by industry practices for the early recognition of disputes. In essentially every category of reported use, the transit agencies used the technique at a high level of intensity. Proactive project management scheduling is also extensively used by the transit agencies as a means of identifying disputes at an early stage. Agencies also extensively used prebid and preconstruction meetings as both a contract management technique and as an early indicator of a dispute. Regular review of project documentation is also used as an early indicator of the potential for a dispute. More than half of the responding agencies indicated that they have revised their change order procedures within the recent past to more effectively manage and settle issues as mutually agreed changes before they become disputes.

Agencies identified two of the principal obstacles to the early resolution of disputes as being related to the attitude of the people involved in the dispute. Many of the practices presently used by industry are, in large measure, a reaction to the problem of individual personalities that prevent the resolution of disputes. Dispute Review Boards, partnering, and a project

neutral in some way all serve to influence the opinions of parties to the process of resolution of the dispute. The Dispute Review Board publications document extremely high success through this nonbinding advisory body. This allows resolution of the dispute during the project with all of the ancillary cost savings otherwise associated with protracted litigations.

A study has provided objective information as to the effectiveness of partnering in reducing the cost of disputes to projects, improving the scheduled completion of projects, reducing total change orders, and increasing value engineering contract savings initiated by contractors.

The use of a project neutral and mediation both serve to have a higher level of management objectively review the issues without the burden of having previously taken a position. Agencies are increasingly using both informal and formal negotiations as a principle vehicle, along with collaborative problem solving to resolve disputes. However, a limiting problem is that agencies believe that insufficient authority is delegated to project staff to allow effective resolution of disputes on an on-going basis. Industry has found that the escrowing of bid documents has been successful in settling disputes over elements of cost and methodology that the contractor alleges was part of its bid. These arguments can quickly and effectively be settled by the observation of the bid without any concern that the documents may have been revised sometime after the fact.

In addition to the established industry practices, transit agencies have implemented a number of practices that are somewhat unique, all to improve program performance. These practices include: performance-based fees for consultant contracts, prequalification of construction contractors, hiring consultant services for workload surges, and establishment of a sophisticated computer-based contract changes management system. Toronto Transit Commission is also trying the technique of providing the tunneling machine to bidding contractors to enhance construction performance.

On the basis of information gathered for this synthesis, the following research topics have been identified as areas for further study: avoidance and management of claims, including internal training; establishing and implementing QA/QC programs for transit projects; and understanding owner expectations and limits of authority.

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## APPENDIX A

### Questionnaire

#### DEFINITIONS

Note: Defined terms are italicized in questions which follow. Use these definitions rather than your own agencies definitions to answer the questions.

***Alternative Dispute Resolution***--Informal or formal methods of resolving and settling disputes without going to court, arbitration, or agency boards of contract appeals.

***Change Order***--The formal bilateral amendment or modification of the contract which alters the scope, time and/or cost of the contract.

***Claim***--A dispute that has progressed to the stage of a formal request for additional money or a lawsuit. In the context of this questionnaire, a claim is a ***formal*** process with contractual and legal implications. For example, a dispute has ripened into a claim when the contractor submits a formal request for a contract adjustment or a legal complaint or lawsuit. Also, a dispute may become a formal claim when it is not resolved at the field or district level, and is passed up to the central office for formal processing. A ***claim*** is contrasted to a ***dispute*** (see below) which is a problem which has not been formalized with any legal trappings.

***Collaborative Problem Solving***--A cooperative team approach between the parties to a dispute in which they focus primarily on solving the immediate problem rather than affixing blame or responsibility.

***Constructive Change***--A change in the scope of work required by circumstances or the conduct of the owner, engineer or other agents of the owner which lack the formality of a directed change order.

***Cumulative Impact***--Cost overruns or schedule delay caused by the indirect or combined effect of several change orders, rather than the direct.

***Dispute***--A contractual problem involving conflict between the parties concerning cost, scope, delay, differing site condition, time of performance, etc., which has not yet formalized into a request for contract adjustment or lawsuit. This is the initial disagreement, often the request for change order is not resolved successfully. (Contrast this term with ***claim***).

***Disputes Review Board***--An independent panel for a specific project set up under the terms of the construction contract which meets regularly to consider and settle disputes and claims as they arise during the course of the project.

***Formal Negotiations***--An attempt to settle a dispute, claim or lawsuit through discussion or compromise in a formal manner, for example, with all parties represented by counsel, with structured procedures, and with written submission. In contrast with informal negotiations. (see below)

***Impact Claim***--Typically, in construction disputes, an impact claim includes delay, disruption, acceleration or lost labor productivity rather than the direct costs of performing the work.

***Informal Negotiations***--An attempt to settle a dispute through casual discussions or settlement without the structured procedures or legal trappings. For example, an information negotiation may take place at a job meeting or telephone conversation without involvement of legal counsel.

***Mediation***--A method of trying to resolve a dispute or claim by the use of an impartial intermediary to suggest ways to settle a dispute. A mediator does not have the authority to impose a decision upon the parties to a dispute.

***Partnering***--A team or team building approach for a project in which the agency, designer and/or contractor organize the project or agreements to emphasize team building, conflict management, open communication, and common goals. A key element is often a conflict review and resolution procedure to resolve disputes as they emerge.

***Problem Intervention Group***--A special group of design, engineering or contract administration professionals which are part of the agency's staff, and which can be involved on an immediate intensive basis to resolve critical design, construction, contract or dispute issues.

***Request for Change Order***--This is the initial request by a contractor for a modification to the contract. At this point, it may or may not contain full documentation; i.e., justification, cost analysis, schedule analysis, etc.

***User Change***--A change in the original construction program prompted by the end or occupant of a facility or project. For example, revising an awarded contract to accommodate new state or federal requirements, e.g., when ADA became law. User changes are contrasted with other changes which may be caused by design errors, constructive changes and differing site conditions.



6. Approximately how much have change orders increased the cost of transit construction projects undertaken during the past five years? (If appropriate attach back-up document)

- Above 10%     Between 5 - 10%     Less than 5%

7. Has your agency revised its procedures in the last five years to settle requests for changes before they became disputes?

- Yes     No

If Yes, which are new or revised procedures.

- Aggressive negotiation     T&M record management     Review by noninvolved party
- Eliminated differing site condition clause     Added no damage for delay clause
- Require contractor to warrant responsibility for job site conditions

8. Are you legally able to use a no damage for delay clause (no state or federal prohibition)?

- Yes     No If yes, do you?     Yes     No

If no, please explain why

---

9. Are you legally required to use a differing site condition clause (either state or federal requirement)?

- Yes     No. If no, do you?     Yes     No

If no, please explain why:

---

10. Does your agency maintain history/record of project *disputes* (for projects undertaken during the last five years)

- Yes     No

11. Is the frequency and severity of transit construction disputes increasing, decreasing or staying the same (over last five years)?

- Increase     Decrease     Same

Why? (Your Opinion)

- Type of work (more difficult to bid)     Business climate
- Quality of contract documents     Agency staffing/budget limitations
- Quality/expertise of contractor labor/     Mandatory inclusion of federal differing site condition clause.

Other (*Explain*): \_\_\_\_\_

12. If you maintain records of claims/disputes, how many claims/disputes have been submitted to the following types of resolution in the last 5 years?

Litigation \_\_\_\_\_ Arbitration \_\_\_\_\_ Mediation \_\_\_\_\_

13. What is the average resolution decision as a percentage of contractor claim:

Litigation \_\_\_\_\_ Arbitration \_\_\_\_\_ Mediation \_\_\_\_\_

**III. DISPUTES RESOLUTION TECHNIQUES**

A. In the past five years, has your agency used any of the following procedures or techniques in an attempt to resolve disputes before they are formalized into claims or lawsuits? Is your agency's use of this technique increasing or decreasing?

1. By issuing change orders to settle a contract dispute matter (rather than extra work items)

- Yes     No     Increasing Use     Decreasing Use

2. By trying to settle the disputes in the job meetings?

- Yes     No     Increasing Use     Decreasing Use

3. By dealing with disputes through *informal negotiation* (*See definition*)?

- Yes     No     Increasing Use     Decreasing Use

a. If yes, at what administrative level were the informal negotiations held?

- field level     central office     legal dept.

4. By dealing with disputes through *formal negotiations* (See definition)?

- Yes     No

a. If yes, at what administrative level were the informal negotiations held?

- field level     central office     legal dept.

5. By decision of administrative agency at different levels of review with increasing authority?

- Yes     No     Increasing Use     Decreasing Use

6. By *collaborative problems solving* (see definition)

- Yes     No     Increasing Use     Decreasing Use

If yes, with:

- The contractor     The design engineer     Other consultants

7. By mediation (see definition)?

- Yes     No     Increasing Use     Decreasing Use

8. By the use of an independent *disputes review board* (see definition)?

- Yes     No     Increasing Use     Decreasing Use

9. By implementing the terms and procedures of a *partnering* agreement or *partnering* program (see definitions)

B. Which three of the following dispute resolution techniques in your opinion have been most effective in resolving disputes? (Rank three)

- Informal Negotiations*

- Job meetings     Field level     Central Office

*Formal Negotiations*

- Job meetings     Field level     Central Office

Administrative Process

Collaborative Problem Solving

- Mediation*     Disputes Review Board     *Partnering* Implementation

Unilateral Change order

Other (*specify*) \_\_\_\_\_

C. In the past five years, has your agency employed any of the following administrative techniques or resources as a way to assist in the resolution of *disputes*? Is your agency's use of these technique increasing or decreasing?

1. Delegating more authority to settle *disputes* to the field office or project staff?

- Yes     No     Increasing Use     Decreasing Use

2. Requiring that approval to settle all major *disputes* come from the central office?

- Yes     No     Increasing Use     Decreasing Use

3. Involving agency legal staff early in the *dispute*?

- Yes     No     Increasing Use     Decreasing Use

4. Involving the project manager early in the *dispute*?

- Yes     No     Increasing Use     Decreasing Use

5. Involving outside claims consultants early in the *dispute*?

- Yes     No     Increasing Use     Decreasing Use

6. Involving in-house claims analysts early in the *dispute*?

- Yes     No     Increasing Use     Decreasing Use

7. Training of field personnel in claims avoidance and dispute resolution.

- Yes     No     Increasing Use     Decreasing Use

D. Which three of the following administrative techniques or resources, if any, in your opinion, were the most effective in the resolution of the *disputes*?

- Delegation of Authority to Field Staff
- Delegation of Authority to District Level Staff
- Central Office Approval
- Early Involvement of Legal Staff
- Early Involvement of the Outside Project Manager
- Early Involvement of the *Claims Consultants*
- Early Involvement of In-House *Claims Staff*

E. What four items, in your opinion, are the main obstacles to the early resolution of *disputes*?

- Insufficient authority delegated to the *process to project staff*
- Lack of information from the contractor to by design engineer support its position in the dispute
- Lack of support from the Project Manager technical support to assist in the dispute evaluation assist in the analysis of the dispute
- Lack of involvement by agency legal counsel legal counsel
- Too much involvement by contractor representative representative
- Insufficient project funding* office
- Informal or formal agency policy to party defer decisions on disputes until the end of the project
- Either party not allowing administrative parties to process to work
- Lack of informal administrative facilitate negotiation*
- Defensive perspective
- Lack of the other to
- Too much involvement by
- Not enough involvement by legal contractor legal
- Lack of approval by the central
- Belligerent manner of disputing
- Self serving posturing by the dispute

**IV. DISPUTES AVOIDANCE TECHNIQUES**

A. In the past five years, has your agency undertaken any of the following procedures in an attempt to avoid or minimize the potential for contract *disputes* on your construction or rehabilitation projects?

1. Coordination of adjacent or interrelated projects or contract sections

- Yes
- No

2. Predesign or preconstruction investigation

- Yes
- No
- Soil borings
- Existing conditions surveys
- Destructive or intrusive testing
- Utility Survey
- Preconstruction survey of adjacent properties

3. Design Reviews

- Yes
- No
- By in-house staff
- Agency Design staff
- Agency Construction staff
- Agency Design liaison staff
- By an independent engineering consultant
- By others

a. If your agency has performed design reviews, how extensive was the engineering effort on the average?

- Less than 40 hours
- 41-100 hours
- 100-200 hours
- More than 200 hours

b. If your agency has performed design reviews, at what point in time were the reviews performed.

- 35% Design Completion
- 50% Design Completion
- 90% Design Completion

(Specify):  100% Design Completion  Other Stage of Design Completion.

c. Does your agency have an engineering support group to resolve design conflicts during construction?

Yes  No

4. Does your agency have a design, engineering, or contract administration support group which can be involved on an immediate, intensive basis to resolve critical design, construction or *dispute* issues? (*Problem Intervention Group*).

Yes  No

a. If yes, what level of authority is required to mobilize the group to assist on a problem-ridden project?

Resident Engineer  Construction Engineer  Project

Manager

Central Office Bureau Chief  Other

5. Has your agency instituted QA/QC procedures or requirements either inhouse or as a design consultancy requirement? (For example, ISO 9000)

In house  Yes  No  
Design Consultants  Yes  No

6. Does your agency use *Value Engineering* (*see definition*)

Yes  No

By in-house staff  Design Group  
 Construction Group  Design Liaison Group Staff  
 Maintenance Group  By the Engineer of Record  
 By a construction management firm  By an independent engineering

firm

By a bidder/construction contractor  By others

a. If your agency has performed value engineering, at what point in time was the value engineering studies performed?

35% Design Completion  50% Design Completion  
 75% Design Completion  90% Design Completion  
 100% Design Completion  Other Stage of Design  
 During Construction by use of VE incentive clause

Completion

b. If your agency has performed value engineering studies, what savings were consistently achieved by value engineering.

less than 5% of the estimated construction cost  
 more than 5%, but less than 7% of the estimated construction cost  
 more than 7%, but less than 10% of the estimated construction cost  
 more than 10%, but less than 15% of the estimated construction cost  
 more than 15% of the estimated construction cost

7. Pre-Bid Meetings?

Yes  No

Mandatory attendance by all bidders  Non-mandatory attendance by bidders

Are minutes taken?

Yes  No

Are minutes distributed to all attendees?

Yes  No

Are minutes distributed to all bidders?

Yes  No

Attendees generally include:

Engineer of Record  Agency Contract Administration  
 Utility Company Representative  Agency Legal Staff

8. Preconstruction Meetings (*After award but prior to notice to proceed*)

Generally required  Always required

Attendees generally include:

- Representatives
- Agency Contract Administration Representative
  - Agency Field Representative
  - Agency Legal Staff
  - Subcontractor Representative
  - Engineer of Record
  - Utility Company

Topics addressed generally included:

- Staging/Sequencing
- Scheduling
- Right of Way/Site Access
- Utility Conflict
- Change Order Procedures
- Claims Procedures
- Procurement Items
- Other (Specify): \_\_\_\_\_
- Design Clarification/Revision
- Payment Processing
- Mobilization Requirements
- Manpower Projections
- Safety
- Environmental
- ShopDrawings/Submittals

9. Periodic Construction Meetings

a. Frequency

- Weekly  Bi-weekly  Monthly  Periodic but not regularly scheduled

b. Attendees generally include:

- Contractors
- Subcontractors
- Agency Field Staff
- Engineer of Record
- Agency Contract Administration Staff
- Suppliers
- Utility Company Representative
- Other (Specify): \_\_\_\_\_

c. Topic addressed generally include:

- Scheduling
- Mandatory Schedule Updates
- Claims/Disputes
- Progress to date
- Utility Conflict
- Procurement Items
- Change Orders
- Shop Drawings/Submittals
- Construction Problems
- Other (Specify): \_\_\_\_\_

10. Does your agency allow the bidder access to project data prior to bid?

- Yes  No

- Soil Studies
- Site Surveys
- Site Investigation Reports
- Right of Way Information
- Utility Location Maps/Reports
- As built drawings for rehab work

11. Is Construction Scheduling mandatory on most large projects?

- Yes  No

a. Performed by:

- Program Manager
- Contractor
- Engineer of Record
- Agency in-house staff
- Independent Scheduling Consultant
- Other: \_\_\_\_\_

b. Are any of the following mandatory scheduling submissions?

- 30 day Schedule
- Complete Construction Schedule
- Periodic but not Monthly Updates
- Schedule Revision to Support Time Extensions
- 90 day Schedule
- Monthly Updates
- Weekly Lookahead

Schedules

12. Please indicate the value of the following techniques in reducing the number of severity of disputes/claims or resolving disputes/claims?

1. Very Valuable 2. Valuable 3. Not Valuable 4. Counterproductive

- \_\_\_\_\_ Contract Coordination
- \_\_\_\_\_ Investigation
- Pre-design/Preconstruction \_\_\_\_\_ Problem Intervention Group
- \_\_\_\_\_ Constructability Reviews \_\_\_\_\_ Construction/Program Management Consultants
- \_\_\_\_\_ Value Engineering \_\_\_\_\_ Preconstruction
- \_\_\_\_\_ Design QA/QC \_\_\_\_\_ Increased Access
- \_\_\_\_\_ Pre-bid Meeting \_\_\_\_\_ to Site Information
- \_\_\_\_\_ Meetings \_\_\_\_\_ Periodic
- \_\_\_\_\_ Mandatory Construction Scheduling \_\_\_\_\_ Other: (Specify) \_\_\_\_\_
- Construction Meetings \_\_\_\_\_ None \_\_\_\_\_
- \_\_\_\_\_ of the above

B. In the past five years, has your agency reorganized its standard project organization or departmental structures in an attempt to minimize or avoid potential contract *disputes* or *claims* on your construction or rehabilitation projects?

Yes  No

1. If yes, which of the following would apply:

- Integration of Design/Construction staff/responsibilities
- Separation of Design/Construction staff responsibilities
- More responsibilities of construction field staff for claims/dispute resolutions
- Less responsibilities for construction field staff for claims/dispute resolutions
- More involvement of legal staff in the project administration
- Less involvement of legal staff in project administration
- Creation/addition of in-house scheduling expertise
- Creation of a *Problem Intervention Group*
- More in-house design responsibilities
- Less in-house design responsibilities
- More delegation of responsibilities to contractors
- Use of multiple prime contracts
- Formation of *partnering* agreements with design/engineering firms
- Formation of *partnering* agreements with construction contract
- Commitment to your *Total Quality Management*
- Other (*Specify*) \_\_\_\_\_

VI. EARLY RECOGNITION OF DISPUTES

In the past five years, has your agency used any of the following techniques or procedures in an attempt to anticipate or identify disputes on an early basis?

1. Bid evaluation/comparisons

Yes  No

2. Preconstruction Meetings

Yes  No

3. Project Meetings

Yes  No

a. If yes, how regularly are they scheduled?

Weekly  Monthly  Nor Regular

It depends  Other (*specify*): \_\_\_\_\_

4. Mandatory Project Scheduling

Yes  No

5. Project Cost/Payment Forecasting

Yes  No

6. Regular review of project documentation to identify pending disputes?

Yes  No

7. Proactive management of problems at project meetings?

Yes  No

8. In your opinion, what are the three best ways to recognize or anticipate disputes on an early basis.

Bid Evaluation/Comparison

Project Meetings

Cost/Payment Forecasting

Documentation

Proactive Management at Project Meetings  
(Specify) \_\_\_\_\_

Preconstruction Meetings

Project Scheduling

Review of Project

Other

Please return completed questionnaire by September 2, 1996 to:

Joel T. Callahan, P.E.  
29327 Heathercliff Road  
Malibu, CA 90265

Thank you very much for your participation.

## APPENDIX B

### Responding Agencies

LA County Metropolitan Transportation Authority  
Los Angeles, California

San Diego Metropolitan Transit Development Board  
San Diego, California

San Francisco Municipal Railway  
San Francisco, California

Washington Metropolitan Area Transit Authority  
Washington, D.C.

Tri-County Commuter Rail Authority  
Ft. Lauderdale, Florida

Chicago Transit Authority  
Chicago, Illinois

Metra  
Chicago, Illinois

Regional Transportation District  
Denver, Colorado

Metropolitan Atlanta Rapid Transit Authority  
Atlanta, Georgia

Bi-State Development Agency  
St. Louis, Missouri

Port Authority Trans-Hudson Corporation  
Jersey City, New Jersey

Tri-County Metropolitan Transportation District of Oregon  
Portland, Oregon

Southeastern Pennsylvania Transportation Authority  
Philadelphia, Pennsylvania

Metropolitan Transit Authority of Harris County  
Houston, Texas

Massachusetts Bay Transportation Authority  
Boston, Massachusetts

New Jersey Transit Corporation  
Newark, New Jersey

MTA Metro-North Railroad  
New York, New York

Port Authority of Allegheny County  
Pittsburgh, Pennsylvania

Calgary Transit  
Calgary, Alberta, Canada

Montreal Urban Community Transit Corporation  
Montreal, Quebec, Canada

BC Transit  
Surrey, British Columbia, Canada

**THE TRANSPORTATION RESEARCH BOARD** is a unit of the National Research Council, which serves the National Academy of Sciences and the National Academy of Engineering. It evolved in 1974 from the Highway Research Board, which was established in 1920. The TRB incorporates all former HRB activities and also performs additional functions under a broader scope involving all modes of transportation and the interactions of transportation with society. The Board's purpose is to stimulate research concerning the nature and performance of transportation systems, to disseminate information that the research produces, and to encourage the application of appropriate research findings. The Board's program is carried out by more than 270 committees, task forces, and panels composed of more than 3,300 administrators, engineers, social scientists, attorneys, educators, and others concerned with transportation; they serve without compensation. The program is supported by state transportation and highway departments, the modal administrations of the U.S. Department of Transportation, the Association of American Railroads, the National Highway Traffic Safety Administration, and other organizations and individuals interested in the development of transportation.

The National Academy of Sciences is a private, nonprofit, self-perpetuating society of distinguished scholars engaged in scientific and engineering research, dedicated to the furtherance of science and technology and to their use for the general welfare. Upon the authority of the charter granted to it by the Congress in 1863, the Academy has a mandate that requires it to advise the federal government on scientific and technical matters. Dr. Bruce Alberts is president of the National Academy of Sciences.

The National Academy of Engineering was established in 1964, under the charter of the National Academy of Sciences, as a parallel organization of outstanding engineers. It is autonomous in its administration and in the selection of its members, sharing with the National Academy of Sciences the responsibility for advising the federal government. The National Academy of Engineering also sponsors engineering programs aimed at meeting national needs, encourages education and research, and recognizes the superior achievements of engineers. Dr. Robert M. White is president of the National Academy of Engineering.

The Institute of Medicine was established in 1970 by the National Academy of Sciences to secure the services of eminent members of appropriate professions in the examination of policy matters pertaining to the health of the public. The Institute acts under the responsibility given to the National Academy of Sciences by its congressional charter to be an adviser to the federal government and, upon its own initiative, to identify issues of medical care, research, and education. Dr. Kenneth I. Shine is president of the Institute of Medicine.

The National Research Council was organized by the National Academy of Sciences in 1916 to associate the broad community of science and technology with the Academy's purposes of furthering knowledge and advising the federal government. Functioning in accordance with general policies determined by the Academy, the Council has become the principal operating agency of both the National Academy of Sciences and the National Academy of Engineering in providing services to the government, the public, and the scientific and engineering communities. The Council is administered jointly by both Academies and the Institute of Medicine. Dr. Bruce Alberts and Dr. Robert M. White are chairman and vice chairman, respectively, of the National Research Council.