

THE MANAGEMENT OF CHANGE IN CONSTRUCTION

by

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Submitted to the School of Urban Studies and Planning in
partial fulfillment of the requirements for the Degree of
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ABSTRACT

Change, or modifications to the work described in a construction contract, is often a very complex problem which is influenced by many factors such as time, human nature and contractual arrangements. Industry professionals indicate that, often, change not only dominates the process of construction but can carry large consequences to an Owner. As a result, construction contracts typically devote considerable language to establish guidelines for the process of change or, rather, how change is initiated and resolved.

This thesis will examine the process of change in construction first, to understand the frequency of change, second, to identify the issues which give rise most often to change, and third, to understand why certain types of changes are more difficult to resolve. Finally, this thesis will attempt to identify strategies that are used today which most effectively manage changes in construction.

In this study, first, research was conducted to find the most recent literature on the process of change. Second, a series of interviews were conducted with individuals representing different facets of the construction industry. An effort was made to draw as many perspectives as possible, and a distinction was made between the differences in public and private sector work and the different methodologies that are practiced in each.

This thesis concludes there are four different categories of change: Owner's Directives, Risk Sharing Events, Information Conveyance and Miscellaneous Events all of which are managed in different ways. Change is a necessary and inevitable part of the construction process, and it is better to accept the reality of change and therefore to plan for its management.

Thesis Supervisor: Dr. James Becker

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CHAPTER 1

CHANGES IN CONSTRUCTION

We live in a world where communication and information travels almost instantaneously, interest rates fluctuate on a daily basis, research and development constantly creates new building materials and market demands for real estate rapidly evolve and change. Through technology, the concept of time has changed dramatically over the last few decades, and this has had a significant impact on the construction industry. Fast Track construction techniques such as Design-Build arrangements are being used with greater frequency in the construction industry. In contrast to the traditional process where the plans and specifications are completed prior to the commencement of actual construction, these new techniques work out design details while construction is underway. As a result, fast track techniques tend to generate many more changes to the original design concept and intentions of the original contract ("scope"). In order for developers to survive in this environment, the ability to adapt to market demands, unforeseen conditions and human error during the design and construction phase of a project is an important component of success.

Change can carry major consequences. The number of

construction claims submitted annually to the American Arbitration Association has approximately tripled since 1973 (See Figure 1 on the following page). It is possible that these statistics reflect a society which has become more litigious, and certainly Contractors have become more astute in their practices of collecting payments. However, a more subtle but reasonable interpretation of this chart is that, since 1973, changes in construction have gradually increased which have had a similar impact on contract modifications, additional pricing and estimating, contract negotiations and scheduling problems. Most likely, this increase in claims is the result of some combination of these interpretations.

The most recent draft of the American Institute of Architects ("AIA") standard document for the General Conditions of the Contract for Construction, which is the 1987 edition of AIA Document A201 ("AIA Document A201 - 1987" or the "General Conditions"), has attempted to clarify the process of change. Figure 2 on page 8 gives a flow chart of the change process as defined in the 1987 edition of the General Conditions. Essentially, the change process can be initiated by the Owner, Architect or the Contractor. In either case, the need for a change in the contract must be communicated to the Architect who is responsible for transmitting a proposal to the Owner, which outlines the work to be performed, along with an estimate of the price from the

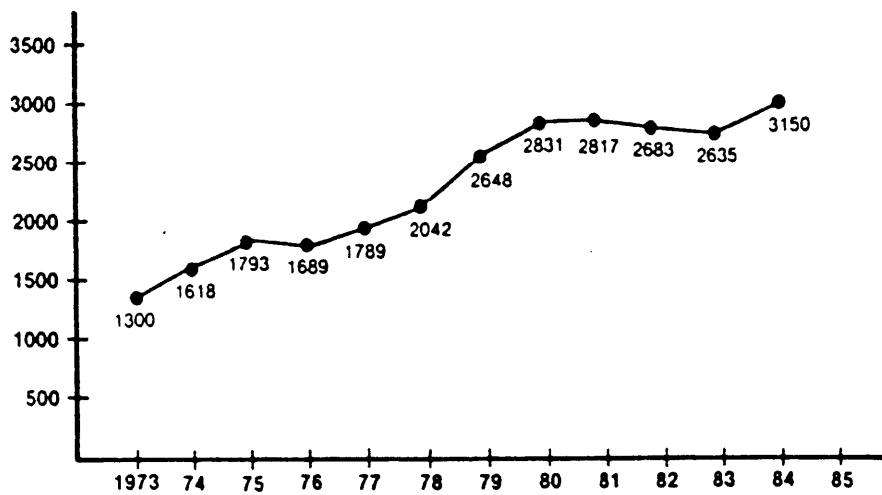
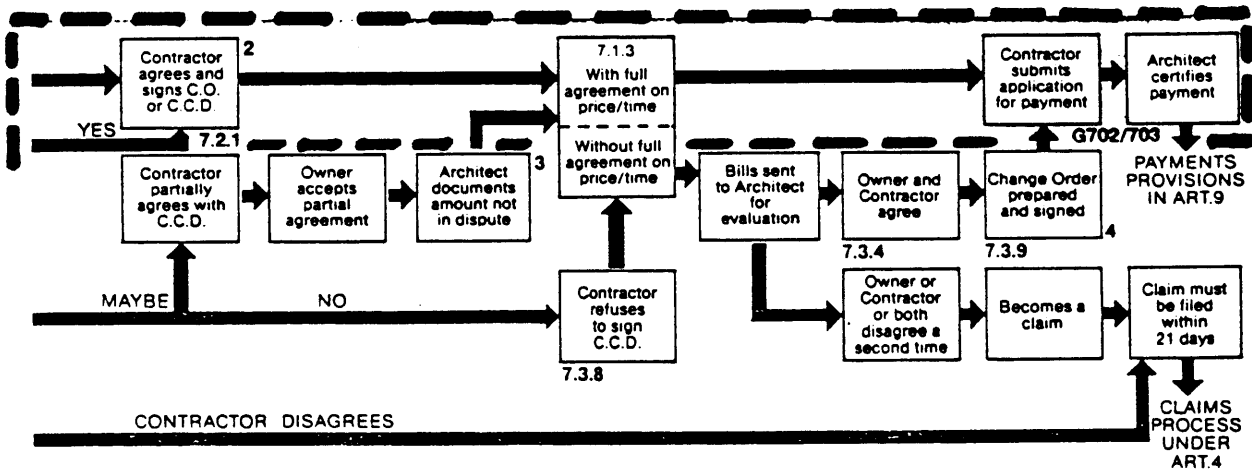
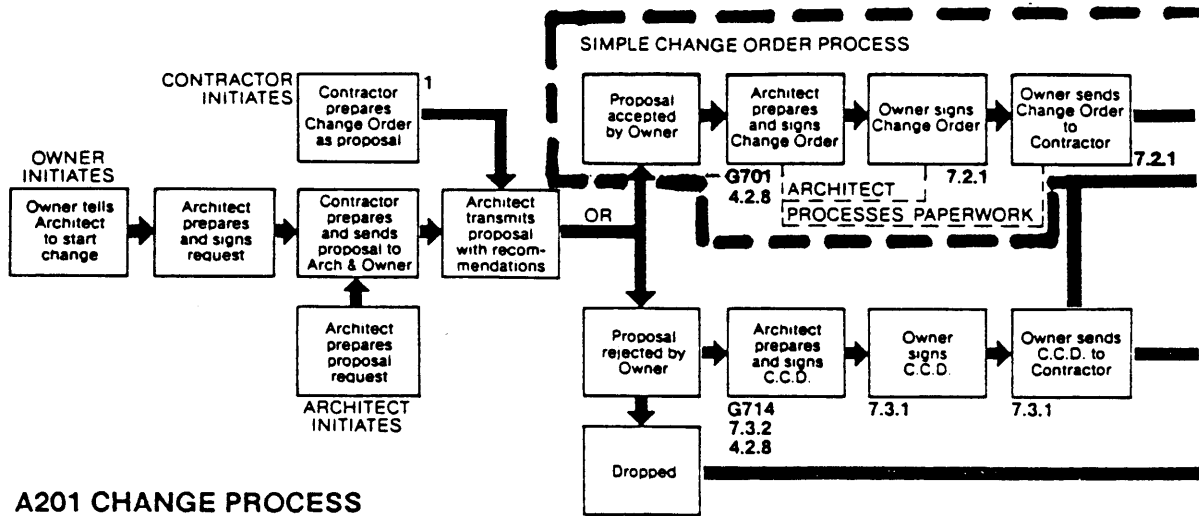


FIGURE 1 CASES SUBMITTED TO AAA NATIONALLY
(CIVITELLO, p.6)



ARCHITECTURE FEBRUARY 1988 91

FIGURE 2 FLOW CHART OF AIA A201 CHANGE PROCESS

Contractor. Also included in this proposal are recommendations by the Architect to the Owner as to what actions the Owner should take in regard to a specific change.

If the initial proposal for the change is accepted by the Owner, the process is simple and is indicated by the outlined area in Figure 2. In this case, the Architect, or any other designated party, prepares and signs the paperwork for a written "Change Order." Figure 3 on the following page is a copy of the standard Change Order form, AIA Document G701. Note that this form comes from the 1978 edition of AIA Document A201 which is similar to the 1987 form. A Change Order is defined in the General Conditions as follows:

...a written instrument prepared by the Architect and signed by the Owner, Contractor and Architect, stating their agreement upon all of the following:

- .1 a change in the Work.
- .2 the amount of the adjustment in the Contract Sum, if any; and
- .3 the extent of the adjustment in the Contract Time, if any. (AIA Document A201 - 1987, 7.2.1)

If the need to change the contract gives rise to a dispute between the parties, the process becomes more complicated as can be seen by the overall process outlined in Figure 2. If the proposal submitted by the Architect is rejected by the Owner, two courses of action may take place at this point. First, if the Owner or Architect initiated the

**CHANGE
ORDER**

AIA DOCUMENT G701

Distribution to:
 OWNER
 ARCHITECT
 CONTRACTOR
 FIELD
 OTHER

PROJECT:
(name, address)

CHANGE ORDER NUMBER:

TO (Contractor):

INITIATION DATE:

┌

┌

ARCHITECT'S PROJECT NO:

CONTRACT FOR:

└

└

CONTRACT DATE:

You are directed to make the following changes in this Contract:

Not valid until signed by both the Owner and Architect.

Signature of the Contractor indicates his agreement herewith, including any adjustment in the Contract Sum or Contract Time.

The original (Contract Sum) (Guaranteed Maximum Cost) was \$
 Net change by previously authorized Change Orders \$
 The (Contract Sum) (Guaranteed Maximum Cost) prior to this Change Order was \$
 The (Contract Sum) (Guaranteed Maximum Cost) will be (increased) (decreased) (unchanged)
 by this Change Order \$
 The new (Contract Sum) (Guaranteed Maximum Cost) including this Change Order will be ... \$
 The Contract Time will be (increased) (decreased) (unchanged) by () Days.
 The Date of Substantial Completion as of the date of this Change Order therefore is

Authorized:

 ARCHITECT

 CONTRACTOR

 OWNER

 Address

 Address

 Address

BY _____

BY _____

BY _____

DATE _____

DATE _____

DATE _____

AIA DOCUMENT G701 • CHANGE ORDER • APRIL 1978 EDITION • AIA® • © 1973
 THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVE., N.W., WASHINGTON, D.C. 20006

G701 — 1978

FIGURE 3 AIA STANDARD CHANGE ORDER FORM

change but do not agree with the Contractor's price, the Owner can order the work to proceed in lieu of this agreement, on a time and materials basis. On the other hand, if the Contractor initiated the change, the Owner may refuse to acknowledge the change altogether, and if the Contractor still disagrees, he may file a Claim which is defined in the General Conditions as follows:

4.3 Claims and Disputes. A Claim is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. Claims must be made by written notice. The responsibility to substantiate Claims shall rest with the party making the Claim. (AIA Document A201 - 1987, 4.3.1)

A detailed discussion of the resolution of such Claims is included in Chapter 3: Settling Changes in the Work.

If the Owner orders the work to proceed, he will do so by issuing a "Construction Change Directive" which is defined in the General Conditions as follows:

7.3 Construction Change Directive ("Directive"): A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work and stating a proposed basis for adjustment, if any, in the Contract Sum or Contract Time, or both. (AIA Document A201 - 1987, 7.3.1)

Figure 4 on the following page is a copy of the standard AIA Construction Change Directive form. Note that the form is

**CONSTRUCTION CHANGE
AUTHORIZATION**

- Owner
- Architect
- Consultant
- Contractor
- Field
- Other

AIA DOCUMENT G713 (Instructions on reverse side)

PROJECT:
(name, address)

CONSTRUCTION CHANGE
AUTHORIZATION NO:

OWNER:

DATE OF ISSUANCE:

TO:
(Contractor)

ARCHITECT:

CONTRACT FOR:

ARCHITECT'S PROJECT NO:

In order to expedite the Work and avoid or minimize delays in the Work which may affect Contract Sum or Contract Time, the Contract Documents are hereby amended as described below. Proceed with this Work promptly. Submit final costs for Work involved and change in Contract Time (if any), for inclusion in a subsequent Change Order.

Description:

Attachments: (Here insert listing of documents that support description.)

The following is based on information provided by the Contractor:

Method of Determining Change in the Contract Sum: _____
(lump sum, unit prices, cost plus fee or other)

<input type="checkbox"/> Fixed	} Change in Contract Sum of \$ _____	<input type="checkbox"/> Fixed	} Change in Contract Time of _____ days
<input type="checkbox"/> Estimated		<input type="checkbox"/> Estimated	
<input type="checkbox"/> Maximum		<input type="checkbox"/> Maximum	

ISSUED:	AUTHORIZED:	CONFIRMED:
BY _____	BY _____	BY _____
Architect	Owner	Date Contractor Date

AIA DOCUMENT G713 • CONSTRUCTION CHANGE AUTHORIZATION • MARCH 1979 EDITION • AIA®
©1979 • THE AMERICAN INSTITUTE OF ARCHITECTS, 1735 NEW YORK AVE., N.W., WASHINGTON, D.C. 20006 G713 — 1979

FIGURE 4 AIA STANDARD CONSTRUCTION CHANGE AUTHORIZATION FORM

entitled "Construction Change Authorization" which comes from the 1979 edition of AIA Document A201. This form is substantially similar to the 1987 form.

At the Owner's request that the work proceed in lieu of a Change Order, the Architect will prepare and sign the Directive which is then sent back to the Owner for authorization. Then, the Owner will send the Directive to the Contractor who will proceed with the work described, regardless of whether he agrees with the terms of the Directive or not.

The Contractor may, however, agree in part or in full with the Directive and may acknowledge that fact in writing. In the case of partial agreement, the Architect will document the amount of work which is not in dispute. On the other hand, if the Contractor refuses to sign any part of the Directive, he must still proceed with the work and subsequently send a requisition to the Architect for evaluation. Once the work is performed, if the Owner agrees to the terms of the requisition, a Change Order will be prepared and signed. If the Owner and Contractor disagree for, basically, the second time, the Contractor's bill becomes a Claim.

If the necessary agreements have been reached and a Change Order has been signed by all parties, the Contractor will submit an application for payment which the Architect

will certify. If no agreement is reached, a Claim must be filed which is described in the General Conditions as follows:

4.3.3 Time Limits on Claims. Claims by either party must be made within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later. Claims must be made by written notice. An additional Claim made after the initial Claim has been implemented by Change Order will not be considered unless submitted in a timely manner. (AIA Document A201 - 1987, 7.3.1)

A) The Necessity and Inevitability of Change.

If the plans and specifications are complete, then there should be no lack of clarity and coordination, but the documents are never sent out totally clear because of time constraints. Owners are driven by market forces - they want it done yesterday. Then, during the project they always seem to come up with some idea to save money, or the Contractor makes some suggestion to save money or do something more efficiently. So you see, for a variety of reasons, it is almost impossible to have a job without Change Orders.

- Project Manager for an Architectural firm.

When an Owner attempts to address change, two questions should be asked. Is change preventable, and if so, at what price? In order for a project to be completed without change the following issues must be resolved prior to commencement of construction. First of all, an Owner must have a precise picture and understanding of exactly what the characteristics of the project should be and exactly what the project should look like. Second, all information regarding the physical characteristics of the site must be available and incorporated

within the procedures and scheduling of the construction process. Third, all plans and specifications must be entirely complete, entirely accurate and completely void of any misinterpretation by any of the parties involved in the process. Finally, the process itself must not incur any events (unusually bad weather, labor strikes, etc.) which would constitute a reasonable basis for a Claim.

The reality of these issues are that, even in the absence of adversarial events, in order to gather all the information necessary to reach this level of perfection, the amount of time and money spent would be grossly inefficient to all the parties involved. "The practice of ordering changes in the work of the construction Contractor after the work has commenced has long been common in the construction industry, principally because of the indeterminate character of the final design. Unlike a manufactured product, a building is usually one of a kind, built without a prior prototype or full-scale working model. Inevitably, changes will have to be made during the course of construction, either because unforeseen problems arise or simply because some new opportunity is discovered, which, if exploited, could benefit the Owner's completed project." (Ellickson, p.89)*

*References to Footnotes in this thesis are acknowledged by the first word to each reference, which is listed in alphabetical order in Appendix A - References.

It is the opinion of this author that Changes in the Work are not only inevitable, but that to most efficiently allocate the resources of all the parties involved, it is better to accept change and anticipate its management rather than try to prevent it.

B) The Impacts of Change and Why They Are Difficult to Manage.

At any time without invalidating the contract and by a written order and without notice to the sureties, the Owner may order changes in the work consisting of additions, deletions or other revisions. Upon request, the Contractor shall supply the Owner promptly with a detailed proposal for the same, showing quantities of and unit prices for his work and that of any Subcontractor involved ... Upon receipt of the written order, the Contractor shall proceed with the work when and as directed.
(Civitello, p.56)

- Sample change clause from a Contract Document.

Why is this simple clause responsible for so many problems, cost overruns, damages, claims, and the source of so much friction in the construction process? The change clause is an unusual feature of a construction contract which makes it unique from other types of contracts. Prior to 1987, section A201 of the AIA documents gave the Owner the right to direct a complete deviation from the contract's original intent, and, at the same time, it allowed for an equitable adjustment to the contract for the change taking place. "In the 1987 edition of A201, a Change Order is 'based upon the

agreement among the Owner, Contractor, and Architect.' Unlike the Change Order as defined in the previous edition (1976), a Change Order no longer embodies the unilateral right of the Owner to change the scope of the construction work. This was the result of recognition that most changes, documented by Change Orders, are in fact signed by the two prime parties and the Architect and indicate the agreement of the parties to the change. The Owner's right to change the scope of work regardless of the Contractor's agreement has been retained but is now embodied in the new term 'Construction Change Directive'." (Ellickson, p.89)

Because of the fact that parties frequently disagree on the adjustments to the contract price and time, the Contractor can be ordered to make the changes prior to an equitable agreement. This instrument saves time during the process of change. However, since no price has been established for the changed work, this form is also an invitation for negotiation and a subsequent claim between the parties.

Owners argue that Contractors thrive on changes, and that they recognize contract ambiguities and other sources of change as an opportunity to gain control, enhance their bargaining position and increase their profit margins on a job. "Each Change Order presents a marvelous opportunity (for the Contractor) to increase total control over both the Owner and the affected Subcontractors through the strategic

manipulation of information passing in both directions."

(Civitello, p.211) Understandably, when a Contractor quotes a price on a Change Order, he is not subject to the competitive bidding environment which he faced on his original bid. By contrast, for additional work, the Contractor is allowed a more comfortable situation through which he can apply proper margins for overhead and profit. A Project Manager for an Architecture firm states:

One of the least desirable features of Change Orders is that the Owner pays a premium, because the General Contractor has a certain schedule, and he is not interested in upsetting that schedule.

On the other hand, some Contractors argue that, on balance, they lose money on Change Orders. The approvals process for changes in the work can be substantial, requiring several levels of signatures from the Owner, Architect and even the lending institution which causes delays. Most importantly to a Contractor, however, it disrupts the progress and scheduling of construction. "If work flow is upset by a Change Order, conditions such as maneuverability and float availability to the Contractor are upset, and the trades have less float and schedule leeway within which to schedule the details of the work." (Suhanic, p. F.3.2) A manager at a large construction company further explains:

We hate Change Orders, and, contrary to what most people think, we don't make money on Change Orders. It interrupts the schedule, and our best profits are made by a smooth and simple process. However, if an Owner wants a change, he's entitled to get a fair

estimate.

Subcontractors share the concerns about scheduling coordination but also worry about getting paid. When changes are ordered by Directive, the reality is that the Work is not always documented properly. A Subcontractor explains:

Written Change Orders are slow in coming from the Owner. 99% of the time, we don't get the paper work before we proceed. Sometimes, after we perform the work, the Owner doesn't recognize the work as a Change, and we don't get paid. It often becomes a paper chase.

Time is so critical to an Owner that he needs the flexibility to be able to make changes and have them implemented quickly. But changes disrupt the smooth flow of the project which takes time to sort out. Sometimes work has taken place which must be removed and replaced. To add further confusion, given the pressures of time, the reality is that sometimes work must proceed in lieu of written documentation which exacerbates the problems of lack of coordination. Finally, there is also friction added to the working relationships when Subcontractors worry about getting paid for their work. Changes in construction, cause so many problems, and the correlation between these problems adds to the complexity of a change.

C) Construction Contracts and Their Influence on Change.

A large part of the conflict which surrounds change is identifying when the boundaries of the scope of the original work has been violated. In an attempt to avoid such conflict, contracts typically include guidelines which test the grounds for work which would constitute a change. However, quite often, the gray areas can be so large that it is difficult to reasonably anticipate language which should be included in a contract to explicitly define all of these boundaries.

A large part of how Change Orders are estimated, negotiated and implemented depends on the type of contracts that are used on a project. The type of contracts often used today facilitate fast track work in the absence of fully coordinated documents. Essentially, there are two types of contracts which are modified to accommodate the needs of a project, Stipulated Sum ("Lump-Sum") and Cost of the Work Plus a Fee ("Cost-Plus") contracts. The process of change is significantly different in these two arrangements.

In Lump-Sum contracts, a Contractor agrees to perform work at a price at which, over the actual cost, he feels optimistically will provide him with an acceptable profit. Given the availability of time, an Owner would always prefer to lock the Contractor into a specific price and specific date

of completion. However, in this contractual arrangement, a Contractor basically works for himself, and an adversarial working relationship has been established. When changes in the work occur that reduce the profit margin below his original expectation or that which he feels is acceptable, the Contractor has a greater incentive to push Change Orders. Every dollar that a Contractor can negotiate, on the margin, in a Change Order corresponds to a dollar of profit. He may defend his position on each Change Order by maintaining that the proposed changes constitute a change in the scope of the original contract. As a result, negotiations frequently take place regarding what constitutes a change, and if so, what the price of that work should be.

In Cost-Plus contracts where a Guaranteed Maximum Price ("GMP") has been established, the Contractor is reimbursed for costs and is paid either a fixed or negotiated fee for his services. In contrast to Lump-Sum contracts, the Contractor has limited upside but unlimited downside risk as to his profitability. The Contractor has less of an incentive to cut corners or make extra money on Change Orders. However, when significant changes occur, the Contractor will try to raise the ceiling price to protect his fee.

It can be argued that Lump-Sum contracts, by nature of the contractual obligation, foster more Change Order requests than Cost-Plus arrangements. In Cost-Plus contracts, a

Contractor's primary incentive is to maintain the profit margins which were originally established. When changes occur, the Contractor's perspective on those changes will be less adversarial, and he will be primarily interested in maintaining the allowances for overhead and profit and protecting his guarantee. Here, a Contractor has more incentive to work with the Architects and Engineers to suggest more efficient ways to complete the work.

The reality is that the type of contracts used are often dictated by the regulatory process for public work and the local market and job complexity for private work. When work is abundant and Contractors are busy, they can dictate more Cost-Plus work. By contrast, when work is slow and bidding is competitive, Owners can dictate more Lump-Sum work.

D) The Concept of Time.

Time is a factor in the construction process in many different ways and it surrounds the process of change. First of all, the construction process is an imperfect science where the ability of human beings to perform proper work is restricted. The requirements to construct a project are sometimes compromised to save time. "If the Owner must have a building in the shortest possible time, the abilities of the Architect/Engineer to fully design it, detail it, and

adequately form the contract documents will be restricted. The results are that the Contractor is faced with estimating, bidding on, and building from incomplete documents." (Maher, p.245)

Second, time is also an important factor in the implementation of change. Changes in the work cause delays and disrupt the sequential order of events in the construction process. Owner's argue that the Contractor's pricing response time is too slow which causes delays. Contractors claim that, often, they are hit with so many changes, and Owners expect a response on all Change Orders immediately. More often than not, when the need for a change is recognized, the work is performed by Directive. A member of a large developer explains:

During construction, time just seems to disappear. Most of the time, [the process] can't afford to wait for the Contractor to submit an estimate. In order to save time, we prefer to use a Directive and settle on the price at a later date.

By contrast, Contractors argue that getting approvals and the necessary written authorizations from Owners for changed work is what causes the delays.

Contractors also lose time as a result of changes, and they recognize that this loss warrants compensation in addition to physical changes. Because of the complexity of changed work, time extensions are difficult to quantify, and they are often a source of Claims. In any event, a majority

of work from changes are performed without an executed Change Order or an estimate in price. This is acknowledged as a standard industry practice, and in a good working relationship, most Owners and Contractors accept this procedure.

Third, an extension of time may be a Change Order itself. Construction contracts generally call for completion of the original work within a specific period of time. However, if an event occurs which restricts the Contractors ability to complete a project in the allotted period, that loss of time may constitute grounds for a Change Order by the Contractor. "The contract should spell out situations which will permit a Change Order extending the time for performance. Usually the basis for a Change Order extending time for completion is some objective fact such as a natural disaster, a strike, or inability to get the necessary materials. Some contracts contain a so-called 'Act of God' or 'force majeure' clause which entitles the Contractor to a time extension for delays beyond the Contractor's control." (Cushman, p.358) Acts of "force majeure" will be discussed in Chapter 3.

Finally, people are naturally resistant to change, and they need time to resolve it in their own minds and within their organization. Time is a critical factor in construction which surrounds the process of change.

E) Personalities and Working Relationships: The Human Factor.

Compounding the problems of time and contractual agreements are human nature and the personalities of the people that make up the working relationship of the job. Part of what makes a smooth construction process is teamwork, and when good working relationships are established, the process continues at a steady pace. When changes are introduced, they not only adversely affect the construction schedule but they tend to sour business relationships. A Project Manager in the public sector explains:

Change Orders get in the way of comfortable working relationships. Disputes create tension, and until they are resolved, they permeate the working relationships. I think you have to have meetings to deal with changes. Let all sides argue, get it all out, and then put it aside. There's a psychology to it - you have to understand that changes will arise that are difficult to resolve, and you've got to be able to let it go. Things can get heated, but you have to separate it from the rest of the job.

All parties involved in the construction process are, by nature, reluctant to admit their mistakes. For example, Owners, recognizing better ways to achieve their desired results, may try to pass on the responsibility for changes to the Architect and Contractor by stating that their interpretation of sections in the documents were misguided. Architects, recognizing document deficiencies and conflicts,

become embarrassed and may unreasonably defend their positions on design issues. Contractors, at times, perform incorrect work, and while recognizing their mistakes, they try to place the blame on lack of document clarity or Architectural coordination. Reputations are at stake and often salvaged. A member of a construction firm explains:

We have an open book policy where we try to let all the parties know exactly what we're doing. But we're human so people have to understand that we're capable of making mistakes. It's the little things that get in the way - weird things like egos.

Each job carries a unique set of working relationships which depends on the personalities of the key decision makers. As a result, standard working procedures are often waived in order to facilitate decision making and Change Order processing. A Contractor, says:

Personalities have a lot to do with how the Change Order process is managed and carried out. Some Owners make fast decisions; however, sometimes the approval process is so slow that it's better to work by Directive than wait for a written authorization. That's part of the business relationship and something you have to gauge for yourself.

When parties to a construction contract lose faith in the credibility of other parties to perform, channels of communication breakdown and all the difficulties associated with the process of change are exacerbated. Human nature is an element which permeates the process of change and often cannot be anticipated.

F) Thesis Methodology.

To begin this study, first of all, research was conducted to find the most recent literature on the process of change from books and periodicals. Second, a series of interviews were conducted with individuals representing both the public and private perspective of the construction industry. An effort was made to draw out as many perspectives as possible by interviewing individuals in the various positions of Owner, Architect, Contractor and Subcontractor. Also, a consistent distinction was made between the differences in public and private sector work and the different methodologies that are practiced in each.

As you have seen, a detailed use of quotes has been utilized in the first Chapter and will be utilized throughout this thesis. These quotes consist of a paraphrasing of notes taken during meetings or phone conversations with each professional. Because of the contrasting viewpoints, each quote is attributed in generalized fashion. However, in the Acknowledgement at the beginning of this document, the individuals interviewed are listed in alphabetical order.

Having introduced the process of change and its complexities in this Chapter, the next Chapter will identify the major issues which give rise to Change Orders. These

issues will be categorized in a way that will hopefully shed light on understanding change and lead, in Chapter 4, to a discussion on the strategies that are most successful in mitigating the consequences of change. It seems as though for every argument in construction, there is an opposite argument which is equally compelling. For each category of issues that give rise to change, the thesis will examine arguments on both sides from parties that carry those opinions. In doing so, the issues which carry the most consequence, and the issues which are most difficult to resolve will be exposed.

Having discussed the complexity of the construction process through which change evolves, Chapter 3 will discuss the problems that are encountered in resolving change and strategies that are used to resolve Change Orders.

Chapter 4 will attempt to integrate the literature found in the research, with the methods uncovered in the interview process, to identify strategies which are used throughout the construction process to mitigate the consequences of change. This Chapter will explore the role that construction contracts play as well as the use of contingencies that are built into each contract to anticipate change. Finally, this Chapter will take a look at working relationships between different parties and how they can be improved to facilitate the process.

In conclusion, Chapter 5 will summarize the major

findings of the thesis. It will also draw conclusions about the many influencing factors and the lessons that can be drawn from this study.

Chapter 2

THE MAJOR CAUSES OF CHANGE AND THE PROBLEMS THEY CREATE

Many people have tried to understand the specific causes of change in the construction process, and much has been written about the best ways to react to these situations. The purpose of this Chapter is to take a step back and identify the issues and circumstances which give rise to change, and, to understand the complexities of each. Particular attention is paid to why certain issues occur and which ones are most difficult to resolve.

There are so many reasons for change ranging from the obvious to the obscure. Andrew M. Civitello, in his book, Contractor's Guide to Change Orders, discusses change from the Contractor's perspective. Because the Contractor, most often, encounter's change inadvertently, the approaches which Civitello recommends to deal with each change are reactive rather than proactive. By taking a pragmatic approach to solving specific problems, the author offers the following ten categories as causes of Change Orders:

1. Design Errors
 - a. Contradictions, discrepancies, impossibilities, inconsistencies.
2. Changes in market conditions.
 - a. Specified product becomes unavailable.

- b. New products become available, offering price advantages or other benefits.
 - c. New information becomes available, affecting the choice of specified materials.
3. Changes in the Owner's requirements.
 - a. Scope of work.
 4. The uncovering of undisclosed existing conditions.
 5. The uncovering of unknown existing (latent) conditions.
 - a. Unexpected soil variations.
 - b. Conditions uncovered during alterations to an existing structure.
 6. Suggestions to initiate better, faster, or more economical construction.
 7. Change in designer preference.
 8. Discrepancies in the contract documents have described situations contradicting the intent of the project.
 9. Change in external requirements.
 - a. Building codes.
 - b. Using agency needs or preferences (public projects).
 10. Final coordination with N.I.C. (not in contract) equipment.
 - a. Space.
 - b. Mechanical and electrical provisions. (Civitello, p.71)

In Alfred P. McNulty's book, Management of Small Construction Projects, the author takes a step closer to proactive decision-making by looking at larger issues that create change. McNulty cites that "An increase in cost can come about through changes generated by (1) changed needs in the Owner's program, (2) unforeseen requirements of governing bodies, (3) unforeseen field conditions, (4) the Architect finding additional elements necessary to complete his design,

and (5) CM (Construction Manager) failure to include certain work in any contract." (McNulty, p.169)

In order to establish a meaningful relationship between the issues which give rise to changes and the strategies that most effectively manage these issues, it is important to identify categories that can be approached proactively by the Owner, Architect and Contractor. Therefore, this Chapter simplifies the categories of change in order to facilitate the understanding of actions that can be taken to approach them. An Owner can recognize and make a conscious decision on the following issues to either manage or share in the anticipation of certain events.

A) Owner Directive: Change in the Scope of the Work.

Article 7 - Changes In The Work. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly. (AIA Document A201 - 1987, 7.3.1)

There are costs and benefits to an Owner for changing his mind, and as long as the net result is positive, the Owner has an incentive to exercise that flexibility. Owners essentially compete to build a better mousetrap, and, during the construction process, they are constantly looking for ways to save cost, reduce time and upgrade their product to enhance

its value and marketability. Many things can happen which convince the Owner to make a change in the scope of the work. For example, the pricing of certain products can change or even become obsolete. New information can become available which might suggest a change in demand causing the Owner to reconsider part of the project design.

An experienced Owner understands that, from his perspective, changes are often a healthy part of a construction strategy. A reasonable number of low-cost changes can create more benefit than harm. A developer offers a good example:

One of the best ways to prevent changes is to spend the time to make sure the documents are tight. But that time can be very expensive. If we build a project fast-track, it might cost us \$1,000,000 more in changes (than we otherwise would have had). However, delivering that same project early could bring us \$3,000,000 in additional rent. This is something that you always battle with.

In addition to collecting rent sooner, another argument that could be made for earlier completion is the reduction of construction period interest which is almost always higher than interest on permanent financing. So, clearly, there are many ways to benefit from fast-track construction which can outweigh the additional costs associated with changes in the work.

Today, Owners and Contractors often engage in a "savings clause" as part of their contract which increases the likelihood of Owner directed changes. A "savings clause" is

an arrangement where the Contractor agrees to perform an ongoing value engineering service on the Owners behalf, and any resulting savings are shared among the parties in predetermined percentages. In contrast to Architects, where cost considerations can take a secondary role during the design phase, Contractors are a good source for providing cost saving services. Including a "savings clause" in the contract increases the likelihood that an Owner directed change may occur.

In addition to value engineering or cost-saving substitutions, Owners sometimes choose to eliminate work altogether. "Deductive Change Orders usually involve a deletion of a specific part of the work and the amount of the deduction will normally be determined by merely deleting the portion of the bid dealing with the work deleted. Here, however, disagreements frequently arise regarding whether the Contractor's overhead, profit, and distributable expense allocated to the work deleted may properly be deducted from the contract price." (Cushman, p.359) An Architect points out the realities that Owners face on deductive Change Orders.

When an Owner makes a change to save money or deletes certain work, he never gets a dollar for dollar savings compared to the original bid. Owners are better off not changing their mind. A Contractor will always figure out a way to make his money. This is a good argument for tight documents.

Owner directed changes, in many cases, account for over half

of the physical changes and often over half of the total dollars spent on changes from the original work. In Lump-Sum contracts, Contractors anticipate an Owner changing his mind and, by taking positions that these changes are outside the original scope of the work, the Contractor seizes the opportunity to increase his profit on the job. However, recognizing that in the Owner and/or Architect's opinion, some changes will fall within the scope of the original contract, Contractors build in contingencies to cover these shortfalls.

A Contractor explains:

Generally, we view Change Orders as an opportunity to make money. But that's the way it should be. If we didn't make money on them, then Owners would make changes left and right. That would kill the scheduling. I want the Owner to know that he can't make a lot of changes.

Friction occurs between the Owner and Contractor because they each have different perspectives when agreements are not easily reached. Given the opportunity, a Contractor will try to capitalize on changes to maximize his profit. Sometimes, when a Contractor consistently argues about Change Order pricing, the Owner worries that perhaps the Contractor bid the job too competitively and is trying to recoup losses caused by an overly optimistic bid. A developer suggests:

When a Contractor is losing money, you'll start seeing numerous Change Orders. He'll nickle and dime you to death.

The Contractors perspective is that some Owners don't like to

admit that their original plans were shortsighted. When they discover that changes are necessary to make the project work, Owners will try to pass that additional cost to the Contractor. Other Owners are simply more responsible when it comes to paying for their own changes. A member of a construction management firm says:

When an Owner changes his mind its usually clear cut, and while most Owners will stand up for their changes, some are less honorable.

If the Owner/Contractor relationship is good, the Owner knows that he can ask for a change, get a reasonable price and a timely response. In turn, the Contractor respects the Owner's need to be flexible and is willing to cooperate with the change request. At the same time, the Contractor feels comfortable that he will be compensated fairly.

B) Risk Sharing Events.

The concept of risk sharing is fundamental to understanding how contracts are priced and the way contractual agreements dictate certain approaches to the construction process. Owners and Contractors each have certain tolerance for risk and at any point in time, during the negotiation of a new contract, each party evaluates the cumulative risk that they are exposed to prior to engaging in an agreement. In consideration of the contract, the parties will each assess

the chances that unforeseen events will occur and then make a conscious decision as to how they will incorporate or share these low probability events. After making that assessment, the parties will negotiate the allocations of risk and establish a price which is essentially the market clearing price for incurring those perceived risks. This section discusses these low probability events and the perspectives which make them difficult to resolve.

(B.1) Unforeseen Conditions.

4.3.6 Claims for Concealed or Unknown Conditions. If conditions are encountered at the site which are (1) subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, then notice by the observing party shall be given to the other party promptly before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both..." (AIA Document A201 - 1987, 4.3.6)

The uncovering of unknown conditions are a frequent source of Change Orders. This is a broad category which includes any physical condition that could not have been reasonably foreseen given the information readily available

about the site and improvements to take place. Typical unforeseen conditions relating to the site are items discovered in the subsurface which necessitate a change in the means and methods which were reasonably anticipated and programmed.

An Owner must evaluate how much of the risk he is willing to accept for the occurrence of unforeseen conditions. If he is willing to accept more risk, the contract price will be lower. On the other hand, if the Owner chooses to pass on more of the risk, the Contractor will charge a higher price for the work. The Owner can spend money, up front, to get more information about the conditions of the site. With more information, he can make a better assessment of how much risk to accept. However, there is a price for this information, and the Owner must balance this tradeoff.

Unforeseen conditions frequently produce Change Orders which are particularly difficult to resolve. "Whereas it is often easy to agree that certain dimensions have changed, it is much more difficult to agree on whether or not unexpected geologic conditions warrant a contract modification."

(Halligan, p.274) When these conditions are discovered, quite often, they require a modification in the means and methods as originally planned. This translates into work which is not only a surprise to the Owner but also potentially very expensive.

Every human being experiences a fear of the unknown, and Owners worry about incurring unforeseen conditions where there is no turning back. Some Owners feel that these conditions present the greatest opportunity for a Contractor to take a windfall from a Change Order. A developer states:

An unforeseen condition is the most difficult (change) to accept ... It's an open ticket for the Contractor to overcharge.

Contractors, on the other hand, regard unforeseen conditions as complex problems that are difficult to resolve. They argue that estimating the cost of this work involves a greater degree of complexity, and these Change Orders incur more extensive negotiations and often lead to claims. A Contractor states:

Change Orders that occur from unforeseen conditions are the most difficult to resolve. There are so many factors that come into play, but the most important thing is that the client (Owner) usually pays for it, and it can be expensive. What makes the situation even more complex is that, as a Contractor, sometimes we worry about performing this type of work. Private developers don't often budget for these things, and we wonder if they can handle the cost."

What causes the large gray area with unforeseen conditions is the question of fairness and responsibility. For example, what conditions can a Contractor be expected to reasonably anticipate in the subsurface of a site? An Owner must, first, balance the tradeoffs of risk and cost. For every increment of risk that the Owner passes on to the Contractor, the Owner will pay a higher price for the

contract. But, second, when unforeseen conditions actually occur, an Owner may find that enforcing the contract language is not always the quickest path to resolution. A member of a construction firm says:

Owners try to place all the risk on the Contractor ... But very few Contractors will take that much risk, and there's usually a gray area about responsibility. Unfortunately, there's no contract language that can treat everyone fairly. When unforeseen conditions occur, it's up to the (parties) to treat each other fairly.

(B.2) Acts of Force Majeur.

4.3.8.2 Claims for Additional Time. If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time and could not have been reasonably anticipated, and that weather conditions had an adverse effect on the scheduled construction. (AIA Document A201 - 1987, 4.3.8.2)

Delays and Extensions of Time. If the Contractor is delayed at any time in progress of the Work by ... labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control ..., then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine. (AIA Document A201 - 1987, 8.3.1)

There are many events that cannot be reasonably anticipated and are beyond the control of the Contractor such as unusually bad weather or the inability to get necessary construction materials. The General Conditions provide language for such "Acts" which would constitute grounds for a Change Order by the Contractor.

The strategy for an Owner to deal with these Acts is similar to that for unforeseen conditions. An Owner must evaluate how much of the risk he is willing to accept for these events. The more risk he accepts, the lower the contract price will be. On the other hand, if the Owner chooses to pass on more of the risk, the Contractor will charge a higher price for the work. In contrast to unforeseen conditions, however, there is less opportunity to obtain information that will help the Owner make an assessment of how much risk to accept. In the absence of this information, the Owner must weigh the costs and benefits of gambling on the occurrence of these events.

C) Information Conveyance and Job Coordination.

Effective conveyance of information is an essential part of coordinating the construction process and has become increasingly so in recent years. In fast track construction where phases and elements of a project are designed on an ongoing basis, mismanagement of information can be disruptive and devastating. The accuracy, timeliness and congruence of information helps to maintain the proper sequential flow of work necessary to deliver a project on time and on budget. This section describes situations which disrupt the proper flow of information and disturb the construction process to a

degree which warrants a Change Order.

(C.1) Contract Document Discrepancies and Conflicts.

4.2.12 Administration of the Contract.

Interpretations and decisions of the Architect will be consistent with the intent of and reasonably inferable from the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions so rendered in good faith. (AIA Document A201 - 1987, 4.2.12)

This category of changes covers all areas of document coordination and implementation including design errors, disagreement of facts between documents, and lack of proper detail causing discrepancies in contract document interpretations.

A comparison can be made between the public and private sectors which exemplifies the need for good documents. In public sector work that is implemented through traditional Lump-Sum bidding, the design process takes much longer than that of private sector work which gives the Architect and Designers an opportunity to provide a more complete set of plans and specifications. A Project Manager for a state agency states:

We try to tighten the specifications package as much as possible to eliminate false interpretations. Things are refined to the point where most Change Orders I get, I knew were coming. That is to say, I know the documents well enough to anticipate where

they lack details and where ambiguities are likely to arise.

By contrast, in private work, the Architect is given less time to provide a detailed set of documents void of any conflicts.

"... On balance, the greater percentage of project changes will be the result of some kind of error or deficiency.

Whether it is the lack of or failure to secure complete information, plain mistakes in the documents, oversights, or inconsistencies, a large portion of the changes will by their nature assign the mistake to someone or some company."

(Civitello, p.70) These types of Change Orders can be a source of embarrassment for the Architect. An Architect states:

An Architect feels most uncomfortable with document conflicts. The Architect always gets blamed - in fact, the Contractors love it when conflicts arise in the documents because it passes the responsibility to the Architect.

"Change Orders bruise reputations and egos. They tend to deflate the 'professional' self-image of the designer, and they invariably cost the Owner money and time. By their nature, they create friction." (Civitello, p.70) The Architect further explains:

Change Orders come about when the plans and specifications are not buttoned up properly in the beginning. But some changes are inevitable. Construction is a very unpredictable process. The first thing that comes up are concealed conditions (bad materials, unknown sewer lines, etc.). An Owners budget is always stretched and there's never enough time to properly tighten the documents.

(C.2) Communication and Interpretation Gaps.

Compounding the problem of design errors is that contract document language is often not explicit enough, leaving room for different interpretations of the intent of the work to be performed. A building is a concept which has no model, and the construction of that concept must be drawn and explained. A Contractor takes stacks of plans and specifications which are prepared by the Architect, in the shortest possible time, and is trained to interpret them to his benefit. A Contractor's bid is based on his interpretation of the documents which outlines his understanding of the work to be performed. As a result, communication gaps evolve between the Architect and the Contractor, and the interpretations become broader between the literal and implied meanings of a contract.

One example of this situation involves city building codes. During construction, it is not uncommon for a building inspector to disapprove of work on the basis that his interpretation of the code on a particular element differs from that of the Designer. This event would cause the Contractor to seek a Change Order on the grounds of a change in scope.

D) Miscellaneous Events.

In addition to the categories listed above, there are many miscellaneous events which can occur that would give rise to a change. For example, construction usually involves a number of activities which take place simultaneously, and that makes the process vulnerable to all kinds of accidents or hazardous events. These events cause a Contractor to address situations which were not anticipated in the original contract.

The General Conditions, for example, discuss guidelines for events that would constitute an emergency on the job.

10.3 Emergencies. In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Paragraph 4.3 (Claims and Disputes) and Article 7 (Changes in the Work). (AIA Document A201 - 1987, 10.3)

From time to time, these hazardous events may require the Contractor to perform additional work which, arbitrarily, may not be covered by insurance. These situations may lead to casualty and safety Claims, and, according to the General Conditions, the Contractor would be entitled to a Change Order.

E) Summary:

This Chapter has looked at issues which give rise to Change Orders and has placed them in four basic categories that can be approached proactively by an Owner.

- 1) Owner Directive
- 2) Risk Sharing Events
- 3) Information Conveyance
- 4) Miscellaneous Events

Each of these issues presents problems that must be handled in different ways. In some cases, the issues are clear cut where all the parties agree that a Change Order is warranted. For example, an Owner recognizes that he has added work to the original contract. If the work is complex, it can be difficult to resolve; however, if the work is simple, this type of change would usually find a quick resolution. By contrast, other cases present issues that are more subtle which can lead to extensive negotiation and ultimately, claims. For example, with unforeseen conditions that necessitate a change, often it becomes a question of what conditions should have reasonably been anticipated by the Contractor. This example could be difficult to resolve.

The issues themselves are compounded by many factors which were discussed in Chapter 1, contractual obligations, time and human nature - specifically, each party to the contract may carry a different perspective of the problem. It

is much easier to reach a solution when everyone understands and agrees on the issues.

Chapter 3

SETTLING CHANGES IN THE WORK

The previous Chapter focused on issues of change and their relationship to contractual obligations of parties. Prior to that, Chapter 1 demonstrated that, in many cases, the process of change can be simple, where the resolution takes a very rational approach. However, what has also been shown is that, quite often, there is a great disparity between contractual obligation and the practical application on a job. In these cases, often, the resolutions are not quite so rational. The fact of the matter is that the General Conditions are not fool proof, and, in many cases which give rise to a dispute, there is no language which could reasonably have been anticipated to avoid conflict.

It is important to understand that the resolution of complex changes is not necessarily an issue of identifying a detailed methodology which is used to determine the proposed value of a change. Rather, construction is a business, and the resolution of Claims may be nothing more than a business transaction with all of the related posturing and negotiation. In reality, one party must come up with a proposal which includes an estimate of the work performed or to be performed. In reaction to this proposal, the other party will likely

evaluate his position on this change relative to his objectives for the entire job and develop a broader strategy on that basis.

Let us first look at the AIA guidelines to identify standard procedures for resolving change, recognizing that, in the real world, there are many variations which take place. "The administrative burden to ensure that the change process goes according to the construction contract lies with the Architect. A201 says, 'The Architect will prepare Change Orders and Construction Change Directives...' It is up to the Architect to control the process and, when necessary, to develop further implementing procedures. A201 provides a basic framework for the change process; it does not detail a step-by-step approach. Because of the varying circumstances of each project, these must be developed on a project-by-project basis by the Architect in consultation with the Owner and Contractor.

The 1987 edition of A201 was revised purposefully to prevent the Contractor and the Owner from taking advantage of each under the Change Order procedure, first by adding provisions that would steer the parties toward mutual agreement about changes, whenever possible, as pointed out above. Second, when mutual agreement cannot be achieved, then procedures are spelled out for the Architect's determination of the fair price and time adjustments - and, if that fails,

for determination by a detailed claims procedure set out in Article 4 (Administration Of The Contract)." (Ellickson, p.90)

This Chapter will describe the problems of resolving change through a negotiating process and the different perspectives that Owners and Contractors have for resolving dispute. This negotiating process is seen as an iterative process in which one party proposes and the other responds and where the essence of the proposal is an estimate of the impact of the change. Finally, when a dispute cannot be resolved among the parties, the General Conditions outline steps that are outside to the parties of the contract - Arbitration and Litigation.

A) Estimating Change.

What is a fair estimate for changed work? Should a Contractor's compensation for a change be consistent with work performed under the original contract? In theory, an adjustment to the contract price for a Change Order should produce an "equitable adjustment" to all parties. "The meaning of this term of art is that the contracting parties should remain in the same financial position in which they were had the change not occurred, regardless of whether or not that position was one of profit or loss." (Cilensek, p J.1.1)

Although this sounds simple, it is often very difficult

for parties to reach an agreement on a fair resolution, because each party may have a different perspective about the change which would affect their proposal. For example, Owners may be trying to stay within a certain budget for the total project which would make them focus on the cumulative costs for all changes. As a result, the cumulative costs, to date, might affect their proposal for a single change. By contrast, a Contractor who was faced with a competitive bid situation will always try to optimize his position, and frequently this translates into maximizing his profit. Further, a Contractor is very dependent on his Subcontractors and he values those relationships. A Contractor's estimate for a change can be dictated by the pricing he receives from his Subcontractors.

Whatever the circumstances, it is no secret that Change Orders are priced differently from work performed under the original contract. "(Original) estimates are based on the cost of the work in a normal planned sequence. Change Order estimates often involve a modification of the plans and specifications originating sometime during the progress of the work. This difference can become quite significant depending on the timing of the change notification." (McMahon, p. C.5.1) Contract changes require unique pricing because they create many difficulties which sometimes are not obvious to an Owner. Specifically, they:

- Disrupt orderly sequences.

- Interfere with planned deliveries.
- Void prior coordinations.
- Change schedule logic.
- Change methods for work not otherwise directly addressed by the change.
- Cause a Contractor to remain mobilized on the site longer than originally anticipated.
- Contribute to disproportionate administrative costs resulting from backtracking and rework. (Civitello, p.65-66)

A Contractor expects to be compensated for these subtleties which can be difficult to quantify and verify. A Contractor's compensation for changed work essentially consists of three components:

- "1. Direct costs (labor, materials, supervision, etc. - the hard costs).
2. Indirect costs (home office overhead, delays, opportunity costs, lost profit - the soft costs).
3. Consequential costs (damages) (interference, disruption, resequence).

Their applicability to a particular change are matters of degree. Their appropriate inclusion in the respective change proposal is a matter of business judgement, applied within the context of the owner-contractor relationship." (Civitello, p.66)

B) NEGOTIATING CHANGE.

As mentioned previously in this Chapter, in order to understand the range of approaches which are used to resolve change, it must be recognized that negotiating the Change Order process is no different than typical business negotiation. The parties to a contract will constantly step back and evaluate their position on a particular change relative to their objectives for the entire job and, on that basis, develop a negotiating strategy.

To shed light on the disparity between theory and practical application, let us first examine the more rational approach to resolving a complex change. "Normally, Change Orders are formalized by revised plans, sketches, and/or specifications. The Contractor and the Owner's representative separately prepare estimates for the change, and later meet to negotiate an equitable cost adjustment. At this point, both parties have expended considerable effort which cannot be recouped. To save further costs, they defend their position vigorously and if no agreement is reached, must return to their office to recalculate the costs. The process can sometimes take several meetings and several recalculations, while progress on the project is delayed." (McMahon, p. C.5.3) When asked to give an Owner's perspective on how change is negotiated, one developer replied:

First, we ask if the Contractor has a real claim for a Change Order. Then we examine his suggestions to see if they are the right solution to the problem. Then, we dive into the claim to see if he is padding it. The Contractor has a leg up because it's up to the Owner to disprove the price. Sometimes it's not worth our time to challenge the price ... If the Contractor is losing money, we end up fighting everything.

Another developer explains:

When a change becomes known, we press to get it included in the scope of the work. However, if we're unsuccessful, I prefer to make the Contractor start the work, because I feel comfortable knowing that we have unit prices and wage rates established. However, 70% to 80% of the time, the Contractor's price is taken. Contractors are in the business to make money, and they'll make it one way or another. I try not to challenge the Contractor's estimates unless I know I can win. If we show them fair consideration (on Change Order compensation), then they won't have a problem proceeding with the work on a Directive.

A member of a construction firm offers a Contractors perspective.

For many Change Orders, more often than not, it's a disagreement in concept rather than price. It's a question of, "Are you entitled to this change"?

Under pressure from the Associated General Contractors (AGC), the 1987 edition of the AIA Documents was revised with respect to payments to a Contractor for changed work. The revision recognizes that payments to a Contractor are sometimes unreasonably withheld and allows for payment of amounts "not in dispute." (Ellickson, p.90) This is likely to

have a significant impact on Change Order pricing negotiations. "It is possible, for instance, that the Owner and Contractor may agree on the basic cost of the changes but not on the overhead and profit. It seems reasonable that the Contractor should be paid for the basic costs that are 'not in dispute.' The other amounts (profit and overhead) could be determined later by the Architect and, if one party disputes the Architect's decision, by arbitration.

Some critics of the new A201 have pointed out that this new provision allowing for payment of amounts 'not in dispute' under the CCD (Construction Change Directive) in effect converts the CCD to a time and materials contract change." (Ellickson, p.90). In reality, the Architect is the arbitrator of first resort who can make a determination of fact. However, most often, disputes do not reach that level, because they are resolved by the parties through some business judgment.

An experienced Contractor will manage Change Orders to maximize his profit. Large-cost items tend to be more lucrative than small-cost items, and the timing of these changes can have a significant impact on the Owner's bottom line. "... A great number of small-cost items of work that is issued at the end of a job is likely to be a losing proposition for a Contractor, particularly if he is bound by contract to contractually fixed percentages of markup for

changed work. On the other hand, a bulletin that contains a small number of large-cost items issued early in the job can be very profitable for the Contractor." (Maher, p.247) A developer states:

The later it is in the job, the tougher [the pricing issue] is to deal with. At that point, everyone is trying to make their last buck on the job.

Change negotiations can vary depending on the complexity of the work to be performed. Complex changes, by virtue of the number of parties involved, require more time for the Contractor to submit an estimate and inevitably take longer to resolve. An Architect explains:

In general, the Change Orders which are the most difficult to resolve are the ones which involve many trades. These are the most difficult to schedule, price and negotiate. A Contractor would prefer to see changes that involve the fewest subs. A General Contractor is very dependent on his subs. Also, trades which are labor intensive, like painters, are more flexible than trades that work with materials, particularly where there is lead time required to purchase those materials.

Many construction contracts call for the establishment of unit prices and labor rates. This makes it easier to verify Change Order pricing. When a price is challenged, the Owner typically asks for more backup to substantiate the price. However, a member of a construction company suggests that the answer is not that simple:

Unit prices and rates simplify Change Order pricing, however, for some trades, unit rates are not applicable for additional work. Sometimes you can't get unit rates without a lot of repetitive work.

Nevertheless, a Contractor can expedite Change Order negotiations by breaking down each activity into smaller components and pricing each activity separately. For a Contractor, "the more detailed the breakdown, the greater the chances of maximizing the bottom line of the final change proposal. The greater the number of items, and the smaller the amount for each individual item, the less argument will be generated." (Civitello, p.351)

It is apparent that, if authorizations for changed work could be made fast enough so as not to disrupt the construction process, and if a price could be established and agreed upon prior to commencement of the work, then very little negotiation would take place on a Change Order. However, most often, the lack of time permits only the authorization of the work and to a lesser extent, a determined adjustment in the contract sum. As a result, changed work tends to be performed on a time and materials basis or essentially a Cost-Plus arrangement. By and large, the changed work proceeds by a Directive from the Owner, and this situation opens the door for pricing negotiation between the Owner, Contractor and Subcontractors.

To help resolve the situation, Contractors and

Subcontractors submit a breakdown of their time and materials costs which verify their pricing of the change.

However, at any point in time during a job, a Subcontractor is doing work in different areas of the project. Therefore, it is often difficult for an Owner to assess the percentage of completion of a Subcontractor's work. Further, Owners complain that a Subcontractors records are not explicit enough, and when questions arise about a bill, it can take weeks to find out the proper information to verify the accuracy of the items.

In any event, if the pricing is thought to be out of line, these breakdowns are frequently challenged. In this situation, the Owner - Contractor relationship is similar to that of Contractor - Subcontractor. "Owners experience the same feelings of loss of control. The tickets are difficult to check, the work has to be watched closely, and the totals always seem to add up to more than originally expected."

(Civitello, p.246) A Contractor explains how the situation can be handled with Subcontractors:

As you get familiar with the trades, you can estimate the pricing for certain trades. When a price comes in, I usually have sufficient data to support or challenge that price.

By contrast, Subcontractors argue that Owners don't pay promptly enough for Change Order work. They claim that an Owner will do anything to avoid paying early. Owners will keep their money in interest bearing accounts until it is

absolutely necessary to pay a Subcontractor, and they withhold money, claiming that they need more information to verify the completion of certain work and accuracy of the billing. Changes are often done by verbal order to save time, and sometimes there are many changes going on at once. Subcontractors say this makes it difficult to submit bills which are straight forward and easy to understand.

In an effort to resolve this situation, a Project Manager in the public sector explains that he tries to anticipate the problem of negotiating Change Orders, and he makes the following observation:

When a change is made by a Directive, we require the Contractor to submit a Lump-Sum price prior to completion of the work. This gives us a better opportunity to clear up any misunderstandings and reach an agreement on the price of the work.

When changes arise, an Owner will try to follow the path of least resistance or the procedure which saves the most time and money. An interesting comparison is made between establishing a price for the changed work, in advance, versus proceeding on a time and materials basis. Requiring a Contractor to submit a price to be approved by the Owner reduces the Owner's risk of increased cost. However, this process may cost valuable time, and, in addition, if the changes are not simple or explicitly understood, the Contractor may include a contingency fee in his estimate. By

contrast, by proceeding with a Change Order through a Directive on a time and materials basis saves time, but a Contractor has many ways to increase the cost of the work at his own benefit like charging more hours on the job than necessary. It is largely an issue of control. Which arrangement gives the Owner more control? There is no right answer because it depends on a number of other variables as well. However, for simple changes where there are very few unknowns, it is easier to get a clear adjustment in the contract sum. For a complex change involving many trades, an Owner would probably be better off proceeding on a time and materials basis and monitoring the work carefully.

The Owner perceives the Contractor "... (and perhaps correctly so) as operating without any risk, and therefore without motivation to complete the item with any appearance of cost efficiency. The results of all this can range from simple Owner bad feelings about the whole arrangement to delays in Change Order approval and dispute over time and materials components." (Civitello, p.246) An Architect explains:

You have to identify the scope of the changed work to avoid conflict. Scope out exactly what you want done and clarify it with the Contractor. Then you can have your discussion about price. If the scope is sloppy, you're asking for a disagreement, but if it's tight, the negotiation will run smoothly.

"A good agreement should not only spell out the work and the

dollars involved, but should also describe the understanding behind the written words. It should also include a procedure for measuring costs in the event that additions or deletions become necessary." (Civitello, p.327)

When changes arise, unless there is a simple resolution in the beginning, everything leads to negotiation. Sometimes, the negotiation takes place before the work proceeds. Other times, the work proceeds on a time and materials basis which will lead to a negotiation of actual costs. In reality, everything is a series of tradeoffs, and each party will develop a strategy on a particular change relative to their objectives for the entire job.

C) Arbitration and Litigation.

4.5.1 Controversies and Claims Subject to Arbitration. Any controversy or Claim arising out of or related to the Contract, or the breach thereof, shall be settled by arbitration in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association, and judgement upon the award rendered by the arbitrator or arbitrators may be entered in any court having jurisdiction thereof, except controversies or Claims relating to aesthetic effect and except those waived as provided for in Subparagraph 4.3.5 (Waiver of Claims). Such controversies or Claims upon which the Architect has given notice and rendered a decision as provided in Subparagraph 4.4.4 shall be subject to arbitration upon written demand of either party. Arbitration may be commenced when 45 days have passed after a Claim has been referred to the Architect as provided in Paragraph 4.3 (Claims and Disputes) and no decision has been rendered. (AIA Document A201 - 1987, 4.5.1).

If, in the end, a resolution of a dispute cannot be reached among the parties in a construction contract, the General Conditions outline a further recourse, arbitration. Another alternative, of course, is litigation which is a strategic call for each party that carries pros and cons. The court system can be expensive and time consuming to the extent where arbitration is preferred. Arbitration is usually a quicker process that utilizes a panel which is more sophisticated than the average jury, and the rulings are equally binding.

However, there are many different opinions about the use of judicial remedies to resolve contract disputes. In reality, the threat of litigation is often used as a negotiating tactic, particularly by parties who are perceived to have greater "staying power."

For this reason, most conflicts are resolved among the parties, and they do so for a good reason. Going to court is expensive, time consuming and nonproductive. Most people in the construction industry are well aware of these facts, and they try diligently to avoid judicial recourse.

D) Summary:

This Chapter has looked at the art of settling changes. The complexity of change often makes it difficult for a Contractor to come up with an estimate which is easily

accepted by the Owner. As a result, negotiating change can be a long and arduous task which cannot be simplified in rational terms. Negotiating changes is no different from other business negotiations involving contract changes. Parties to a contract must evaluate their position on a particular issue relative to their objectives for the entire job.

In the end, if a dispute cannot be resolved among the parties, the judicial system remains a remedy but not the preferred one. An experienced Owner or Contractor will work diligently to avoid this recourse. The consequences can be endless and devastating. Strategically, judicial remedies are often used as a threat during negotiation of a change. A reasonable argument can be made that a Contractor has an advantage in negotiating change. The Contractor submits the price, and it is up to the Owner to disprove that price. When conflict arrives, the Owner knows that judicial remedies are always possible, and they are usually a painful experience. It is almost always in the Owners best interest to resolve a change out of court.

Chapter 4

STRATEGIES TO MITIGATE THE CONSEQUENCES OF CHANGE

In previous Chapters this paper has addressed the complexity of change, the different issues which give rise to change and the typical problems confronted in settling changed work among the parties to a contract. The purpose of this Chapter is to identify some guidelines which have been effective to proactively deal with changes in construction. This Chapter will draw on key segments of literature on construction and change and integrate them with the practical experience of a group of professionals in the construction industry. Specifically, this Chapter will address the relationship of construction contracts to change, the proper use of contingencies in contracts to anticipate changed work and the value of good working relationships on the job.

It is important to understand that every project has a unique set of variables and working relationships which necessitate the need for flexibility and creative solutions. Unfortunately, there are no right answers, nor are there consistent patterns of explicit procedure and behavior which are infallible. The concept of change is simply too complex, and there are many different methodologies to approaching change which are equally successful. This Chapter will

identify a few of those examples.

A) Contracting Strategy.

Everyone may agree that the Contractor is entitled to a change, but if he sits on it, the Owner may lose weeks. There must be a mechanism to get the decision in the Owners hands quickly. It's always in the General Contractor's interest to respond quickly, but the fact is they don't always do. A construction contract should provide that, in the event of a Change Order, the Contractor must immediately notify the Owner and Architect, stating an estimate of time and cost to complete the work. This notification must be made within 10 days or else the Contractor waives the right to a claim.

- A Partner, with a Boston law firm, who specializes in construction contracts.

Construction contracts play an important role in the process of change because they establish the foundation of the working relationships. Contracts establish the obligations of the parties to perform certain requirements, but they also create certain mechanisms through which the process of change is approached and managed. "It is axiomatic that the contract should set procedures for the issuance and control of Change Orders including their initiation, approval, and processing." (Cushman, p.357) There are many different forms of contracts which carry different incentives depending on the contractual obligations. The following will be a discussion of different types of contracts and the problems and incentives they create.

Lump-Sum. Lump-Sum contracts are the easiest to understand with regard to the original work, but they cast a different light on the Change Order process. A Contractor is forced to manage work within given allocations of money and time. However, this creates an adversarial relationship with the Owner and gives the Contractor an opportunity to make more money on changes. Every dollar, on the margin, of a change represents a potential dollar of profit for the Contractor.

Lump-Sum contracts can carry a longer approvals process for Change Orders because, quite often, negotiation takes place as to whether the work was intended as part of the original scope of the contract. The Contractor's price is based on his understanding and interpretation of the plans and specifications prepared by the Architect. When the work begins, the Contractor inevitably confronts situations that he did not anticipate when preparing his original bid, and, for significant changes, it is always in his best interest to contend that these conditions constitute a Change Order.

Cost-Plus. In a Cost-Plus contract, the contractor is reimbursed for the actual costs of the work, plus he is paid a percentage fee or 'markup' on those costs. The contractor has less of an incentive to cut corners, however, the longer the job takes, the more money he may make. A member of a construction company supports the use of Cost-Plus contracts:

From the Contractors perspective, a Cost-Plus

arrangement deals with changes better because the work just goes ahead with less interruption. In any event, as we said before, time is always critical, and most often, a change is implemented through a Directive which is essentially a Cost-Plus arrangement.

Guaranteed Maximum Price. The Cost of Work plus a Fixed Fee contract, where there is an upset limit, is also known as a Guaranteed Maximum Price contract. The Contractor guarantees the client a maximum price for the work, and typically his fee is either, 1) a negotiated fixed fee or 2) a percentage of construction costs. However, his fee or profit is a dollar amount that is fixed beforehand. "In contrast to the Lump Sum contract, then, if direct costs are less than anticipated, the owner benefits by not expending those funds. If they are greater than anticipated, the contractor is still obligated to absorb the overrun. Typically the Guaranteed Maximum Price is higher than the Lump Sum for an equivalent project, because the contractor has less participation in the upside (savings) of a good contract, while still accepting all of the downside (overrun) risks." (Macomber, p.12)

With GMP contracts, the Owner is in a better position to achieve a team effort. However, this does not relieve the potentially adversarial relationship among the parties. It merely mitigates the adversarial nature of the job.

Design-Build. A Design-Build arrangement for an Owner usually consists of a contractual agreement with a contracting

firm that has design capabilities as well. Traditionally, public contracts have been Lump-Sum arrangements with all construction documents in place prior to commencement of the bidding process. Theoretically, this would give the public agency maximum control and provide lower cost construction for the municipality. In recent years, however, public and private entities have begun using more fast-track contractual arrangements like Design-Build. "The principal advantage to the Owner with this arrangement is simplicity of composition. Only one contract entity need be dealt with, and responsibility for all performance is as clearly pinpointed as possible - directly and to a single company." (Civitello, p.12) A Project Manager for a state agency explains further benefits.

Although conventional construction contracts have lower risk or exposure to changes, we prefer the Design-Build because of the time we save. On average, I think we complete projects with 20% - 25% less time. Our projects are often built with time demands. For example, the Prison is being built under a court order schedule. Also, with Design-Build, we find a better cohesive working relationship because the Architect and Contractor work together during the design phase to work out all the details.

"A serious disadvantage from the Owner's point of view is that there is no sensible watchdog mechanism to confirm proper performance of the Design-Build company. Inspection of the work and evaluation of changes may become a complicated,

ineffective operation if the Owner cannot have complete confidence in the competence and integrity of the Design-Build Contractor.

It is for these reasons that construction management, both in its pure form and in the many variations that exist, has been becoming increasingly popular. This is particularly true for projects that would normally have a long and/or complex design phase." (Civitello, p.12) Construction Management, in its pure form, is essentially the use of consulting services rendered on a fee basis. The growth of this service reflects the growing importance of the industry's adaptation to fast track construction techniques.

B) Building In Contingencies For Change.

Change is so widely acknowledged in the construction industry that almost all important activities anticipate and integrate changes into their procedures, and this alone makes the process more manageable. "Because the fact is that they are integral to every construction project, the Owner has an obligation to provide for their eventuality. Responsible project funding will incorporate some additional percentage (often 7% to 10%) of the project bid amount to be set aside to be available to accomodate legitimate changes as they occur." (Civitello, p.18-19) The construction process inherently

carries significant risk, and Owners should take every opportunity to incorporate margins of safety. A Developer explains:

We do our own estimating in house, so we know what the price should be before we send it out for bids. You have to build in the right contingencies for various items:

- 1) Have you worked with this Contractor before? If so, then the contingency would be lower.
- 2) How familiar are you with the site? Is it a difficult site? The more unknowns, the higher the contingency.
- 3) How flexible is the lender? A less flexible lender would require more contingency.
- 4) How complete are the drawings? If you believe your documents are very tight, then you don't need as large a contingency.
- 5) What is the aptitude of the Architect? This is the same analysis as the Contractor. If you know that he performs good work, and he has a good understanding of the project, then you don't need as much contingency.

For public work in Massachusetts, municipalities do not permit Contractors to include contingency fees in their bids. In theory, this would allow the state to lower its costs for construction contracts. However, on balance, this process may prove to be more expensive. A Project Manager from the public sector explains:

Because we don't allow a contingency fee in the bidding, we are opening the doors for Change Orders. I'm not sure this is necessarily the best way, but that's the way the State does it. By eliminating a

contingency in the bids, we probably don't get the best price. Also, Contractors are more likely to submit a Change Order on smaller items.

Because change permeates the process of construction, building in proper contingencies can help manage change and lessen its consequences. Experienced Owners understand that margins of safety are necessary to deal with the set of circumstances that are unique to each job.

C) Improving Working Relationships to Better Manage Change.

In as much as construction contracts shape the working environment of a job so do the personalities and working relationships which have been established. Certainly one of the best ways to manage change is to prevent change. This would require good team work. An Architect explains his role during the design phase:

During the design phase, we try to work closely with the Engineers and Contractors and make the tightening process an ongoing thing. It has to be a team effort. After we have drafted the contract documents, we get a fresh pair of eyes from our office to review them thoroughly. They will generally pick up 90% - 95% of the conflicts.

In fast-track construction techniques such as Design-Build, team work is particularly important to work out document details and minimize Change Orders. A Contractor says:

In Design-Build situations, we work closely with the Architect to detail the plans and specifications. Architects generally don't design with cost in mind, and a Contractor can offer good cost saving services. They have to work well together to provide the cleanest documents.

Another Contractor agrees:

We try to help the Architect, as much as possible, to get the proper specifications. There has to be teamwork, and the Architect has to get assistance in the design phase.

However, changes will always occur simply because of the overall complexity of the process as described in previous Chapters. Depending on the complexity of the work, the Change Order process usually involves many different parties and many people at different levels of authority to carry out the task. "It is obvious that the parties involved in a construction project must be aware of changes made to the project's contract, but often they must also be made aware of proposed changes so that they may adjust their thinking and operations to the consequences of the potentialities, even if they are not directly affected or involved in the change." (Maher, p.249) A member of a construction firm explains:

Communication is very important. The earlier you can identify a change, the better you can plan for it. I don't like to be surprised with a change after we have performed work and committed materials and labor. The more time you have for advanced warning, the easier it is to resolve the issue.

Good team work is essential to be able to manage the process of change effectively. A member of one construction firm suggests:

We like to think that the Architects and Owners that we work with are above board. There has to be good communication. Everybody has to be up to date on what the Architect is doing. The Architect should keep the Owner informed of any communication or passing of information that takes place with the Contractor. Too often, the Owner is left in the dark, and when he gets the bill for a Change Order it comes as a surprise. It has to be a team effort, and if you have good teamwork, then the changes will run smoothly ... If the atmosphere is right, people understand each other's position. All the parties want to make money."

A member of a different construction firm -

You have to prove yourself and earn the right to be trusted. You must demonstrate that you're working on the Owner's behalf.

D) Summary:

This Chapter has looked at selected segments of literature on construction and change and has attempted to integrate those with comments from professionals in the industry. There are no specific solutions to or methodologies of approaching change, however, this Chapter has identified some examples of guidelines which have proven to be successful in managing and mitigating the consequences of change.

First, contracts should set guidelines and procedures for the process of change. Second, certain types of contracts lessen the adversarial role of the Contractor and help create

more of a team approach to building the project. Third, building in proper contingencies can help manage change and lessen its consequences. Finally, taking steps to promote teamwork and better communication will help to establish better working relationships to manage change.

Chapter 5

SUMMARY AND CONCLUSION

Changes in construction are a function of so many factors that they are virtually inevitable. In order for a project to be completed without change, the Owner, Architect and Contractor must have a complete understanding of exactly what the finished product will look like, and they must be able to communicate all of these ideas effectively to all other parties involved in the process. A building begins as merely an idea with no exact prototype to copy. There are simply too many unknowns which cannot be reasonably anticipated without substantial up-front investigatory cost, and almost always, this cost will exceed the resulting benefit.

Construction contracts, by virtue of the incentive they create, have a major impact on how change is implemented and negotiated. It is interesting to weigh the pros and cons of Lump-Sum versus Cost-Plus contracts. Lump-Sum contracts are the easiest to understand. However, a Contractor is essentially working for himself, and this can easily create an adversarial relationship on the job. If a Contractor is given the opportunity to optimize his position, he may capitalize on Change Orders to try to maximize his marginal profit.

Cost-Plus contracts lessen the adversarial role of the Contractor and help create more of a team approach to building the project.

Time is a very important factor in construction, and it surrounds the process of change. It can be argued that the lack of time is a major cause of change. In recent years, due to the increasing use of fast track construction techniques, concessions are sometimes made on the completeness of documents in order to begin construction earlier. The lack of document completion and coordination opens the door for differing interpretations of the work. Time is also an important factor in the implementation of Change Orders. One of the precious commodities of a job to a Contractor is the sequential order of activities. Change Orders interrupt that sequence so that Contractors feel compensation is warranted. This creates an array of problems in estimating and negotiating the pricing of change.

Human nature permeates the process of change to a degree that can be disastrous. For example, when changes occur from design errors and document conflicts, Designers are sometimes embarrassed. Egos and reputations are often at stake. The reality in construction is that the process is no more perfect than the human beings themselves, and on any job there may be thousands of individuals involved.

In order to establish a meaningful relationship between

the issues which give rise to changes and the strategies that most effectively manage these issues, it is important to identify categories that can be approached proactively by the Owner, Architect and Contractor. Therefore, this thesis has simplified the categories of change in order to facilitate an easier understanding of actions that can be taken to approach them. An Owner can recognize and make a conscious decision on the following issues to either manage or share in the anticipation of certain events.

1) Owners Directive.

There are costs and benefits to an Owner for changing his mind, and as long as the net result is positive, the Owner has an incentive to exercise that flexibility.

2) Risk Sharing Events.

The concept of risk sharing is fundamental to understanding how contracts are priced and the way contractual agreements dictate certain approaches to the construction process. When Owners and Contractors negotiate a contract, the determined sum is essentially the clearing price for perceived risks in the event of incurring low probability events. These events are generally clarified as 1) unforeseen conditions and 2) acts of force majeure.

3) Information Conveyance.

Effective conveyance of information is an essential part

of coordinating the construction process and has become increasingly so in recent years. In fast track construction where phases and elements of a project are designed on an ongoing basis, mismanagement of information can lead to human errors, confusion and lack of coordination which can be disruptive and devastating. The accuracy, timeliness and congruence of information helps to maintain the proper sequential flow of work necessary to deliver a project on time and on budget.

4) Miscellaneous Events.

In addition to the categories listed above, there are many miscellaneous events which can occur that would give rise to a change. Construction usually involves a number of activities which take place simultaneously, and that makes the process vulnerable to all kinds of accidents or hazardous events. From time to time, these hazardous events may require the Contractor to perform additional work which, arbitrarily, may not be covered by insurance. These situations may lead to casualty and safety Claims, and, according to the General Conditions, the Contractor would be entitled to a Change Order.

The subtlety of some issues which give rise to change add to all the factors which can make change difficult to resolve. Some changes simply cannot be reasonably anticipated without

considerable investigation that time often does not permit. Therefore, the evolution and implementation of change is a very complex problem. There is no simple consensus about how it should be handled. In fact, depending on the profession of the individual, there are vastly different perspectives of each issue which gives rise to a change. Estimating and negotiating Change Orders can be a tremendous task, and although the new edition of the General Conditions (AIA Document A201 - 1987) has taken steps to facilitate agreements between the Owner and Contractor, skeptics argue that the 1987 draft has conceptual flaws which create more problems and actually exacerbate some issues aimed at resolution. (Sapers)

Nevertheless, most industry professionals agree that the best solution to settling changes is neither arbitration nor litigation but, rather, to try to resolve the issues among the parties. Settlement is a far better solution than arbitration and litigation. Taking a claim to court is, by and large, nonproductive, time consuming and expensive to the extent that the costs usually outweigh the benefits.

Finally, one of the original goals of this thesis was to determine the ways to most effectively manage changes in construction. However, there are no answers nor are there consistent patterns of explicit procedure and behavior which are beyond reproach. There are only examples of procedure and behavior which have been successful. Unfortunately, given the

vast number of variables which are unique to each project, these examples cannot be applied to all cases. In reality, there are so many factors which must come together to build a project on time and on budget. It is a wonder sometimes that buildings even get built. Change, as the process of building itself, is very complex, and there are many different methodologies to approaching change which are equally successful. Change is a necessary and inevitable part of the construction process, and it is better to accept the reality of change and therefore to plan for its management.

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