

Bulletin

Effects of Job Schedule Delays on Construction Costs

INTRODUCTION

A study of mechanical and electrical projects, conducted by MCAA and the National Electrical Contractors Association, has shown that significant delays in construction and distortions in planned schedules are uncommon and cannot be anticipated in bids. When they do occur, they have a devastating effect on construction costs, particularly labor.

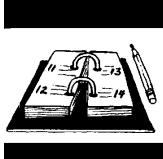
Delay-related factors account for a large majority—nearly 90 percent—of the total labor costs overrun experienced by these contractors on projects with schedule problems.

One-half of the delay-related excess costs are due to losses in labor productivity. Extra supervisory costs are the next most significant factor, and overtime premiums the least important.

In the study, total estimated prime costs equaled approximately \$115 million, ranging

from about \$17,000 to \$7,715,000 per contract and averaging nearly \$1,620,000. Total actual prime costs were about \$150 million, ranging from \$20,000 to nearly \$10 million per contract, and averaging about \$2,100,000. The total cost overrun and the average of individual overruns were both about 30 percent. The total labor costs overrun was 48 percent, but the average of labor cost overruns was 55 percent.

Estimated prime costs (including materials, labor, subcontracts and other direct job expenses) ratios of the total sample were typical of ratios for specialty contracting: 40.5 percent labor, 48.6 percent materials and 10.9 percent direct job expenses. Actual prime costs were distorted by the adverse effects of schedule disruptions on labor costs and direct job expenses: 46.5 percent labor, 41.7 percent materials and 11.8 percent direct job expenses. A summary of monetary data on the prime costs of mechanical projects is given in Table I.



**Table 1 Mechanical Projects
Summary of Monetary Data on Prime Costs**

(Dollar figures are in thousands. Percentages are expressed to the nearest whole percent and are derived from the totals and subtotals on this table.)

	Estimate	Actual	Overrun as Percentage of Estimated
Labor			
Total	\$12,509	\$18,887	51%
Average	544	821	
Range	35–1,519	40–2,821	
•% of Total Prime Cost	35%	43%	
♦ Delay-Caused Overruns	0	4,931	39%
♦ Loss of Productivity	0	2,992	24%
Materials			
Total	15,442	16,841	9%
Average	671	732	
Range	12–3,659	30–3,844	
•% of Total Prime Cost	44%	38%	
Direct Job Expense			
Total	7,238	8,499	17%
Average	483	567	
Range	4–2,168	12–2,387	
•% of Total Prime Cost	21%	19%	
•Total Prime Costs			
Total	45,963	59,946	30%
Average	1,768	2,306	
Range	58–5,546	70–8,087	

•Total Prime Cost figure does not equal the sum of Labor, Materials and Direct Job Expense because figures were not reported for those categories in some instances. Percentages were computed on the sum of Labor, Materials and Direct Job Expense of those making complete reports.

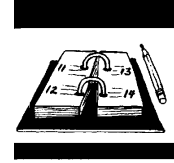
♦ Totals of delay-caused overruns and those specifically due to loss of productivity include these data only from reports that included labor cost estimates and actual total labor cost.

NATURE OF DISRUPTIONS

The study found that schedule delays and disruptions are not usually under the control of the specialty contractor, whether he is a separate prime contractor or a subcontractor. The specialty contractor's work, in most cases, cannot be performed until preceding work has been performed by other contractors or subcontractors. Moreover, the work of

specialty contractors is often significantly delayed or increased in scope due to such hindrances as:

1. Unexpected congestion in shared working areas by other trades who should have completed their work earlier.
2. Physical obstructions permanently installed out of sequence by other contractors.



3. Temporary physical obstructions that should have been removed prior to commencement of the mechanical or electrical work.
4. Interference by employees, customers or property of the owner when portions of the space are occupied before completion of mechanical or electrical work.

CAUSES AND EFFECTS OF DELAYS

Inadequate coordination by owners, general contractors and construction managers is the major cause of failure to maintain schedules, followed by administrative delays in correcting and clarifying ambiguous design documents. Poor design ranks third.

Contractors who have experienced serious schedule problems report that delays affect productivity of the work force most significantly. Next, they affect loss of momentum and productive rhythm, followed by the need for redundant mobilization and demobilization in various job areas and by employees.

The causes and effects of schedule disruptions can be avoided by:

- Planning more realistic schedules
- More effective enforcement by those having the authority to do so
- Better design
- More efficient administration.

No radical departures from conventional procedures are necessary, the study concluded. The means and expertise to implement these needed steps exist within the industry.

ANTICIPATING DELAYS IN BIDS

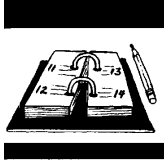
Contractors cannot normally anticipate delays and/or disruptions at the time of bidding. Experienced bidders may add to their estimates the cost of usual or normal delays and disruptions which are repeatedly encountered on projects of the same type, size and complexity or with the same owner. These occurrences can be anticipated and are not deemed serious or significant.

RECOVERING OVERHEAD

Contractor overhead costs are also significantly affected by delays. Unabsorbed overhead that is not allocable to other projects, which cannot be undertaken until a delayed project is finally completed, can be especially expensive, but this factor has been difficult to document.

Standard overhead procedures fail to recognize that overhead is actually more of a function of time than of prime cost. A \$50,000 contract that takes three years to complete probably requires more of the company overhead services than the \$100,000 job, completed in one year.

Many contracts pre-establish a maximum percentage, such as 15 percent, that can be applied to the prime costs of change orders to cover overhead. Such percentages often apply to general contractors and subcontractors uniformly and are seldom adequate for change orders of specialty contractors. Administrative costs are proportionately much higher for change orders than for the same amount of prime cost expended as part of the much larger original contract. Moreover, the administrative costs incurred by the subcontractor actually performing the change order work are a great deal higher



than those incurred by the prime contractor for work being performed under subcontracts.

One solution is to use the Eichleay formula, developed to allow contractors to recover “unabsorbed overhead”—continuing overhead that is not being absorbed by other work that cannot be undertaken, or by overhead reimbursements on the temporarily reduced prime costs on the contract. It can be used when it is difficult or impossible to prove actual allocation of company overhead to the specific project. It is generally accepted by the U.S. Court of Claims, Federal Boards of

Contract Appeals, and most state courts and arbitrators.

The Eichleay formula is based on the ruling of the Armed Services Board of Contract Appeals, Decision 5183, December 27, 1960, in an appeal of the Eichleay Corporation from a ruling of a contracting officer. It recognizes that overhead is a function of time as well as of prime costs and assumes that all field office overhead is being recovered as direct job expense.

The formula is described in Table 2.

Table 2 Eichleay Formula

1.	Billings for Delayed Contract Total Company Billings During Extended Period of Performance on the Contract (Contract Period)	×	Total Company Overhead During Contract Period
	= Overhead Allocable to the Contract		
2.	Allocable Overhead Actual Days of Contract Performance	=	Daily Overhead Allocable To Contract
3.	Daily Overhead × Number of Days of Delay = Amount Claimable for Unabsorbed Overhead		