

The Business Roundtable

January, 1983

**MORE CONSTRUCTION
FOR
THE MONEY**

SUMMARY REPORT
OF
THE CONSTRUCTION INDUSTRY
COST EFFECTIVENESS PROJECT

FOREWORD

For many years I have been directly concerned with the construction industry, in a way that ultimately became personal as well as professional. That interest took on a special focus in 1969 when, along with others who were dismayed by inflation in the cost of construction, I participated in the founding of the Construction Users Anti-Inflation Roundtable. In 1972, that organization merged with others into The Business Roundtable, now an association in which the chief executive officers of some 200 major corporations focus and act on a wide range of public issues. The Roundtable's Construction Committee carries on the work which we began in 1969.

Through the years the aim of these efforts in connection with construction has been to promote quality, efficiency, productivity, and cost-effectiveness in the industry. None of these efforts has been approached with greater depth, breadth, and intensity than the one which produced this report—the Construction Industry Cost Effectiveness Project.

As this report is published, the project has been in progress for more than four years. More than 250 people with expertise in construction, representing more than 125 companies as well as universities and industry organizations, have worked on project study teams. They have produced 23 separate reports on specific problem areas and, now, this summary report.

To some the construction industry may seem to be a relatively narrow special interest. It is not, and has not been treated as such by The Business Roundtable, whose member companies spend enormous amounts of capital, talent and effort in the construction of plants, office buildings, and other facilities. The Construction Industry Cost Effectiveness Project was approached as an effort to improve one major aspect of a great economic system, to advance the market philosophy of production and distribution, to improve work methods to the end of creating more for more people. It was approached with the realization that construction in one way or another touches the lives of all.

The rationale for this effort, then, can be summed up succinctly:

1. Construction is important to the economy as a whole and therefore to everybody. It affects costs, prices, and our international competitiveness both in our own and foreign markets.
2. Construction dollars are not being used effectively.

3. Declining cost effectiveness is not the fault of any one group. Owners, managers, contractors, unions, workers, suppliers, and governments all share the responsibility.
4. Cost-effectiveness in construction can be improved to the advantage of all without inequity to any group, if we recognize it as a national problem and seek cooperative instead of adversarial solutions.

Now the effort must turn to implementation of the recommendations in this report. To do this effectively will require the mind and muscle of many concerned people. For a few of those, I would like to make a personal point. As a former member of the club, I am convinced that no group can do more to make these recommendations work than the chief executive officers of American corporations. I urge them especially to read this report and think about it and act on it.

Roger M. Blough*
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MORE CONSTRUCTION FOR THE MONEY

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PREFACE

This report summarizes the findings and recommendations of 23 separate reports by study teams sponsored by The Business Roundtable's Construction Industry Cost Effectiveness (CICE) Task Force, and the results represent the point of view of owners. The teams analyzed how to make three types of construction more efficient: industrial facilities (including oil refineries and chemical-process plants), commercial structures (including office buildings), and power plants. There is no direct consideration of that portion of the construction industry which includes residential, government, farm, and private institutional construction. The report does not deal directly with other aspects of building, such as housing problems, land-use and land planning, or the impact of federal and state construction regulations other than compliance with building codes and ways to administer them more efficiently.

The text is aimed at a broad audience, including executives of companies with large annual capital outlays for construction, contractors and their principal executives, architects, engineers and construction managers, academia, professional societies, construction trade associations, labor union leaders, officers of civic groups concerned with development, and public officials involved in regulating construction or writing laws that affect it. The report has been written in non-technical language, in an effort to make it easily understood by not only construction experts but also concerned laymen.

Part One sets forth the myriad difficulties that hinder the construction process and are reducing the productivity of the industry.

Part Two reports in capsule form the various steps that the CICE study teams recommend to improve productivity and cost effectiveness and thus to help get more facilities for the money. Necessarily, it is somewhat more detailed and technical than Part One. Some recommendations will meet with broad agreement; others are clearly controversial, at least for some groups involved in construction. All of them, however, have been shaped with a single aim: economic effectiveness.

Finally, it should be noted that The Business Roundtable and its predecessor organization spoke out on construction industry matters long before the study reported herein was undertaken. This report does not include all previous policy positions and recommendations, but there is no conflict between them and this report

A brief Epilogue suggests what the next steps in the Roundtable's Construction Industry Cost Effectiveness Project should be.

PART ONE
WHAT'S WRONG

Chapter 1

THE MYRIAD CAUSES OF DECLINING EFFECTIVENESS

By common consensus and every available measure, the United States no longer gets its money's worth in construction, the nation's largest industry. Since the closing years of the Sixties, productivity in construction has been declining at a rate many industry leaders find appalling. The figures should not be regarded as precise because of statistical deficiencies in the data on which they are based (see Chapter 2), but they all contain the same disturbing message: a large and increasing gap has opened between the performance of construction and that of U.S. industry as a whole. In 1981, for example, the Commerce Department reported that productivity in new construction put-in-place had dropped from an index number of 100 in 1972 to an index of 82.9 in 1979—a debilitating decline of nearly 20%. The Houston-based American Productivity Center, measuring labor productivity in 11 large sectors of the U.S. economy over a span of three decades, found construction to be the most laggard performer by a wide margin. Since 1965, according to the Center, construction has been the only industry with consistently negative productivity growth. The average annual rate of change was minus 0.9% from 1965 to 1973, then dropped 3% a year from 1973 to 1979 and an alarming 8% a year in 1979-80.

One ominous consequence is that construction's share of gross national product has been declining. Historically it has run about 10% of GNP, but since 1975 that share has dropped to less than 6%. In physical terms, that gap may be even larger, since the Department of Commerce index of construction costs has risen from an index number of 100 in 1967 to 304 in 1980, while the consumer price index has climbed from the same index of 100 in 1967 to a 1980 level of 247.

The creeping erosion of construction efficiency and productivity is bad news for the entire U.S. economy. Construction is a particularly seminal industry. The price of every factory, office building, hotel or power plant that is built affects the price that must be charged for the goods or services produced in it or by it. And that effect generally persists for decades. To cite a homely example from the past, William Tabler, the architect of the New York Hilton Hotel and an expert on building codes, estimated not long after that 46-story, 2,207-room structure was completed in 1963 that unnecessary requirements and costs imposed by New York City's notorious building code would force the hotel to charge an extra \$5 per night for every room. At a time when the nation has been losing its erstwhile share of world markets for export goods, plunging productivity in construction, by driving up the cost of doing business and making

products in the U.S., makes it increasingly difficult for the rest of the nation's business and industry to retain—or regain—foreign markets and to compete against imports. These markets have become increasingly important to the U.S. economy.

"A Constant State Of Confrontation"

One major reason that construction is comparatively inefficient is its inordinate fragmentation. In round numbers, it has been a \$300 billion a year activity involving close to 1 million contractors, over 70 national contractor associations, more than 10,000 local and national labor organizations, about 5 million workers, and more customers (some of them very large companies) than anybody counts. Amid such splintering of decision-making power as these numbers assure, it is arguably more amazing that the industry makes the progress it does rather than that progress, or at least change, generally comes with glacial speed. Despite the prowess of the more than two dozen contractors who gird much of the free world, each doing more than \$1 billion worth of construction annually, and despite the sophistication of giant corporate clients for construction whose annual building bill runs to billions of dollars, too much of the industry remains tethered to the past, partly by inertia and partly by historic divisions such as management vs. Labor, union vs. open shop, business vs. government, sometimes one union vs. another or one contractor association vs. another. As J. Robert Fluor, chairman of Fluor Corp., the giant California-based construction organization, reminded a meeting of the CICE Task Force: "The bottom line of this adversarial dance is a constant state of confrontation."

The Business Roundtable believes this study to be the most comprehensive analysis ever made of both the causes of and some feasible steps to reverse construction's dwindling cost effectiveness. In formulating both its findings and suggestions, the CICE Task Force has been guided by a firm policy of casting no unnecessary stones of blame for difficulties in great part inherited from the past. The study teams have resisted the temptation to find scapegoats and have abjured quick fixes for deep-seated and complex problems. Over 250 seasoned construction experts representing more than 125 different organizations and companies have spent almost three years working on twenty-three separate study teams. Their focus, reflecting the types of construction that members of The Business Roundtable buy the most, has been on what hinders productivity in industrial facilities, office and commercial buildings, and power plants.

The study teams' 220 recommendations for action by owners, contractors, trade associations, labor, government, academia and others add up to a how-to-do-it handbook of practical steps to

enable the construction industry to give its customers more building for their money. Even if the recommendations are carried out only to a moderate degree, the study teams conclude the total savings should reach at least \$10 billion annually.

Surprisingly enough, the majority of the recommendations involve ways to manage construction projects better—for instance, more careful planning, improved communications, more effective supervision, more thoughtful personnel and manpower policies. More than half the time wasted during construction, the study teams have found, is attributable to poor management practices. A great many of the proposals are aimed at executives of companies that commission the building of industrial facilities, commercial structures and power plants—the owners. Again and again, the CICE study teams conclude, only if owners who pay the bills are willing to take extra pains and pay the often small extra cost of more sensible methods will they reap the benefit of more construction for their dollars.

A Hope For Some Help From The Unions

There are problems, too, in the role played by organized labor. Among them are the recurrent strife and job delays engendered by jurisdictional disputes among the AFL-CIO Building Trades' 15 unions about which is entitled to do certain jobs. But the main thrust of the findings and recommendations is to call on organized labor to act in its own job-creating interest by increasing productivity. By some estimates, open shop construction accounted for 60% of the national total in 1980, compared with only 30% as recently as 1973. In a recent analysis of data supplied by the Labor Department's Bureau of Labor Statistics, the Washington-based Construction Labor Research Council, a private organization supported by a number of contractor associations, reported that the number of craftsmen identifying themselves as union members had declined by 125,000 from 1973 to about 1.6 million in May 1980, while those identifying themselves as non-union workers had risen by 400,000 to nearly 3 million.

One might expect that the economic pressure of this historic shift would by now have prompted building trades unions to take vigorous steps to regain jobs for their members, especially by relieving union contractors of handicaps that are making them non-competitive with their open shop rivals. To be sure, there have been some encouraging cases in which union leaders have restored management flexibilities through national and/or project agreements, and have avoided costly work stoppages and inflationary wage settlements. Occasionally, local unions have agreed to remove restrictive language from their local contracts. But in most local unions where union contractors still have enough work to provide jobs for the outspoken minority of members who influence local union policies, business as usual appears to

prevail. That means, among other things, adamant opposition to change, continuing job disruption over jurisdictional issues and minor grievances, and excessive wage demands.

At the same time, there are some signs of changing attitudes. In half a dozen cities in recent years, voluntary local labor-management groups have had heartening success at reducing jurisdictional strikes, improving productivity on unionized projects and thereby making their communities more attractive places in which to build. This appears to be a promising route for future progress. St. Louis, which once might suffer three or four jurisdictional work stoppages per month, has experienced only one since 1972 in the construction trades, thanks in great measure to a local union management organization called PRIDE. The acronym stands for "Productivity and Responsibility Increase Development and Employment". In essence, that is the CICE Task Force's message too.

The study teams make no overall endorsement of open shop contracting, concluding that a vigorous construction industry requires its union sector, with its experienced and capable contractors and pool of skilled workers. Moreover, the study teams meticulously point out that many open shop contractors do not appear to manage their labor force as adroitly as they might, with a corresponding loss of potential productivity. The reports do stress the idea that the nation's interest will best be served by fair economic competition between open shop and unionized construction.

There is a clear need for leaders of the building trades unions to cooperate in ridding construction of cost-boosting practices and habits that, whatever their historic justification, make little sense in today's altered economic climate. Happily, there are indications that a number of top union leaders are receptive to these and some other proposals from the CICE study teams. For example, the late Martin J. Ward, then general president of the United Association of Plumbers and Pipefitters, advocated mergers to reduce the number of building trades unions from the present 15 to roughly four or five, a step that at least theoretically would obviate a great deal of jurisdictional struggle. In an interview late in 1981 with *Engineering News Record*, Ward observed: "The greatest challenge that the building trades have is the number of unions."

No major changes, as Ward was quick to point out, appear imminent, indeed there isn't even serious talk about any. Still, in the meantime, Ward continued doing what he could inside the plumber's union by spurring moves to merge local unions; the total number has been reduced by more than 100 (about 20%) over the past decade. As he saw it, such consolidations benefit both rank-and-file tradesmen and contractors. The latter have fewer hiring halls with which to deal, and a larger pool of craftsmen from which to draw; they also can pay identical wages and fringe benefits across a larger geographical area.

Tradesmen, Ward noted, escape "false barriers" of local jurisdictional boundaries, an arrangement that sometimes has left craftsmen, who have worked steadily for years, without enough time in any one local to acquire vested pension rights.

In a notable appearance to talk to a CICE project meeting early in 1982, J. C. Turner, general president of the International Union of Operating Engineers, agreed that consolidation among the international building trades unions is a good idea. "I've been tough about trying to eliminate jurisdictional strikes," he said. "I don't mind (if contractors) go to court, or arbitration." As for the CICE push for more efficiency and productivity, Turner said that the building trades look forward "to the opportunity in the coming months to discuss with you those sections of your reports where our participation would be in order." And he added that building unions "are willing to do our share in a cooperative venture to improve productivity.... We are well aware that the standard of living of our members rises and falls with the profits of our employers." A decade ago, even talk about such cooperation with management was all too seldom heard from union leaders.

Chapter 2

A BIZARRE LACK OF ACCURATE INFORMATION

In most economic matters, federal government statistics provide the definitive word about the fundamental facts. For decades that assumption has gone pretty much unchallenged in construction (as well as in other fields of endeavor). But a CICE study team, after delving into the way the figures are gathered and compiled, concludes that the government's numbers about the dollar volume of construction put-in-place monthly and annually are grossly inaccurate. They understate the total amount of public and private new construction by almost 25%, the study team concluded.

Most of the undercount is concentrated in two of the three sectors of primary interest to The Business Roundtable: industrial construction and office and other commercial buildings. Examining the figures for 1979 (the latest year for which final numbers were available when the computations were made), the study team estimated that industrial construction actually totaled \$69 billion rather than the \$14.95 billion reported by the Census Bureau, a discrepancy of 361%. For office and commercial buildings, the study team's estimate was \$37.4 billion, 50% higher than Census Bureau's figure \$24.9 billion.

Mainly because of these two numerical changes, the study team calculates that the true value of construction put-in-place during 1979 was about \$300 billion, rather than the \$229 billion that the government reported.

Correct figures for industrial, office and commercial building are important if the construction industry is to have accurate measurements of its aggregate productivity. It is necessary to know the true size of the industry before it is possible to set realistic targets for improving its performance.

There are two major reasons for the census undercount, the study team finds. First, the government defines "construction" in an outdated and inconsistent way in gathering the figures for the value of construction put-in-place. In computing the dollars spent for power plants, the government relies on corporate reports of capital expenditures, including equipment. The study team finds no fault with the census count in this sector: \$26.5 billion in 1979. But much of the equipment, even if it is installed by construction workers, is not counted as construction for other types of industrial buildings. Second, and more important, government data-gathering procedures do not collect all the information they are intended to collect. The Census Bureau bases its figures on a sample survey of building projects identified

by four different sources: 1) the F. W. Dodge reports of projects in 37 eastern states and the District of Columbia, 2) building permits valued at \$500,000 or more in 13 western states as reported by the Census Bureau's building permit survey, 3) building permits valued at less than \$500,000 in the same western states as reported by the Census Bureau's housing-starts survey, and 4) projects in western states where no building permits are required, also reported by the housing starts survey.

One difficulty seems to lie in the sampling techniques. Census procedures specify that all projects costing \$5 million or more are to be included in the sample—a monthly progress report required from owners or their architects or contractors. But several Roundtable companies report that the method falls far short of its goal. In the 1975-79 period, for example, one large company was asked for data about only nine projects of that size underway when it actually was building over 100 such projects. As a result, the company reported only \$239 million of construction outlays out of nearly \$2 billion that it spent on projects larger than \$5 million apiece. Moreover, some companies do not respond when requested because reporting is costly and is not compulsory.

The study team calls the government figure of \$14.95 billion for industrial construction in 1979 "absurdly low" for another reason as well. It is supposed to reflect the cost of construction for all manufacturing companies in the U.S. For that year, those companies shipped products valued at \$1,692 billion, according to the Commerce Department's monthly Survey of Current Business. It seems logically impossible to support that much business volume with construction amounting to a meager 0.88% of total business volume.

Construction Productivity: A Dubious Statistic

The Harvard/MIT Joint Center for Urban Studies was retained by the CICE Task Force to provide an examination of construction productivity measurement by federal government agencies. It found that the government does compile construction productivity indexes, but their accuracy is subject to serious doubts, partly because of the apparent under reporting of the total value of construction put-in-place, and partly for technical statistical reasons. Despite their deficiencies, the Commerce Department published a set of productivity indexes for construction in May 1981, showing that productivity for construction put-in-place had declined from an index number of 100 in 1972 to 82.9 in 1979—a worrisome drop of nearly 20%.

The Bureau of Labor Statistics, on the other hand, for many years has declined to publish its own quarterly computation of construction productivity because the Bureau recognizes that the measure may have serious defects.

In contrast to the government's flawed performance at producing overall measures of construction productivity, most large contractors have formal programs for measuring labor productivity on their own job sites, and some have amassed enough data to construct productivity indexes that they use to keep track of trends over time and/or in varied locations. Useful as these are to individual companies, they do not necessarily reflect how the industry as a whole is performing, nor is the information shared or made available to others.

The Frustrating Gaps In Labor Supply And Demand Information

Owners and contractors need the best information they can get about future supply and demand for construction labor when they are planning projects. Owners, in particular, need labor supply information as much as three years in advance of construction in order to devise contracting strategies. Currently, both owners and contractors rely almost entirely on local sources—chambers of commerce, contractors' associations, local unions, local management, vocational schools, and industrial commissions—for the information they use. Five crafts often tend to be in short supply: asbestos workers, boilermakers, electricians, iron workers and pipefitters.

Curiously enough, both the federal and state governments publish a considerable amount of information about the number of employees involved in construction, but neither owners nor contractors make much use of it. Much of the federal data (and some of the state data as well) about labor supply appears in formats unsuited for construction planning. Some federal data appear too long after the fact to be useful. As for labor demand, the Labor Department not long ago launched a Construction Labor Demand System aimed at forecasting the volume, type, and regional location of construction, as well as the accompanying on-site labor needs, by crafts. But the study team questions whether the information is sufficiently complete to be reliable, especially for industrial construction outside the electric generating field. Most states publish projections of future labor demand for three years ahead, but the data appear to be inadequate to provide high quality forecasts. In sum, despite the varied efforts by the federal and state governments to assemble and make available information about the supply of and demand for construction labor, the results do not add up to a tool that the construction industry uses, partly for lack of confidence in the timeliness and accuracy of the data, and partly because so much information is presented in a form owners and contractors find ill-suited to their needs.

Chapter 3

SHORTCOMINGS OF MANAGEMENT

As might be expected of an industry whose regulation by government goes back at least 4,000 years, construction wears barnacles that would do credit to an Egyptian pyramid built underwater. "The heart of the matter," as Task Force Chairman Bob Greeson has said of the reasons for construction's waning cost effectiveness, "is the whole building process."

Unhappily, construction's tangle of problems, much though it resembles ancient history's Gordian knot (which was untangled with the slash of a sword by Alexander the Great), will be solved thread by thread, if it is to be solved at all, given today's U.S. governmental system. At the moment, management can tug, twist or pull more threads than any of the other players on the construction stage. Accordingly, we look first at the shortcomings of construction management, perhaps the most numerous, though probably not the most intractable difficulties that keep construction efficiency well below its potential.

The Heavy Costs Of Poor Safety Performance

Construction is one of the nation's most hazardous occupations. Work related injuries and illnesses—including fatalities—occur at a rate 54% higher than the average rate for all U.S. industries. With 6% of the nation's work force, construction accounts for 10% of all occupational injuries and 20% of work-related fatalities.

Owners of projects pay a hefty bill for construction's poor safety performance: \$8.9 billion in 1979, or about 6 1/2% of the \$137 billion total cost of industrial, utility and commercial construction in that year. That loss, calculated by the study team, includes both the direct and indirect costs of accidents. The direct costs (insured) include medical expenses and premiums for worker's compensation benefits, liability and property losses. The indirect costs, which are not insured, make up the bulk of the total. They include reduced productivity, delays in project schedules, administrative time and expense, and damage to equipment and the facility under construction. On top of that, there is the possibility of punitive damages awarded in lawsuits, for which no estimate was made.

Accidents usually occur because of a workman's carelessness, or clumsiness, or human miscalculation. But everybody is responsible for safety. The topic qualifies as a management responsibility because, as research by Stanford University's Department of Civil Engineering shows, accidents are to some extent controllable by all levels of management. Contractors, of course, are responsible for safety on job sites. But owners' attitudes - and diligent attention—can make an important difference in the probable results.

The Perverse Effect Of Scheduled Overtime

Faced with real or threatened shortages of manpower, or pressured by an impatient owner, contractors have been known to put the construction of immense industrial facilities on a long sustained scheduled overtime basis. The arrangement does serve to attract craftsmen, sometimes from hundreds of miles around. But in terms of efficiency, it is enormously counterproductive. It is also a frightful waste of the owner's money. And from the standpoint of the industry as a whole, it usually amounts to irresponsible behavior.

Reaffirming a report originally published in 1971, the study finds that:

- Putting job site construction on scheduled overtime disrupts the area's economy, magnifies any apparent labor shortage, reduces labor productivity and inflates construction costs without any speedup of the completion date.
- If a schedule of 60 hours or more a week continues for more than about two months, productivity plunges so much that the completion date for a project stretches beyond what it would have been with the same crew working a 40-hour week.

Citing a Labor Department study of how morale and fatigue are affected by long working hours, the study notes:

- The longer the hours, the more scheduled work time is lost to absenteeism.
- As hours increase, so do injuries—not only in absolute numbers but also per hour of work.
- On a sustained basis, after eight hours of work a day and 48 per week, it usually takes three hours of work to produce a normal two hours of output, provided the work is light. If the work is heavy, it takes two hours of extra work to do a normal hour of work.

Heavy overtime, by the CICE Task Force's estimate, was more common in the late Sixties than it is today, as word of its negative effects has spread. The National Constructor's Association, whose members build many intricate and costly types of industrial plants, such as refineries and chemical process plants, surveyed 60% of its members about overtime for a Roundtable task force in the late Sixties. The NCA found that 23% of their contracts, comprising 20% of their dollar volume, were being run on a scheduled-overtime

basis. That meant 20% of labor costs totaling \$2.8 billion—\$560 million—was being spent for overtime pay. Two thirds of the overtime schedules had been established to attract labor, only a third were intended to maintain or accelerate construction schedules. The number of hours of work per week varied, with 50 hours a conservative average. At 50 hours a week, reports the CICE task force, "the inflationary effect on construction labor cost was 60% of the cost for a normal 40 hour week." Without overtime, the same amount of construction could have been done for \$340 million of labor cost instead of \$560 million.

The ratio of work performed with regular overtime schedules has not been re-surveyed in recent years, but the task force estimates that it has dwindled from 20% to about 10%, so "there is still considerable potential for improvement."

Undertrained Foremen And Demotivated Workers

No sensible airport manager lets a person take off at the controls of an airplane unless he can show that he is trained and currently qualified to pilot that craft. To be sure, flying a plane requires special skills and an ability to make quick judgments. In a totally different way, the same principle applies to the job of being an effective foreman of a construction crew. Yet in a recent survey among 130 contractors—both union and open shop—only 13% reported that they give any training in the art of supervising before assigning an individual as a foreman, the first level of construction supervision. And most of the training that the 13% receive covers technical and administrative matters. Scant attention is paid to the "do's" and "don'ts" of managing people. Small wonder that the construction industry finds itself in trouble at a particularly key point.

Effective supervision by foremen is widely considered prerequisite to efficient performance by any work group. Foremen (and their supervisors, general foremen) control, influence or have the greatest impact on most of the ingredients of productivity. When one examines the potential for increased productivity, the need for more highly motivated, cost conscious and responsible foremen comes up again and again. Conversely, the inability of foremen to plan work, communicate with workers and direct work activities adequately is judged by CICE study teams to be an important contributor to declining cost effectiveness in construction. Several teams have found that in unionized projects the problem is further compounded by the fact that foremen and general foremen are members of the same local unions as the employees they supervise. Such foremen consider the union business manager to be their de facto employer, and look to him for wage bargaining, pensions, and their next job. It follows that their motives and actions often conflict with management efforts to increase productivity. (This topic is discussed in more detail in Chapter 4, "Problems Involving Organized Labor".)

At a time when construction workers seem to take less pride in their work than they did in years past, it is the sad finding of a CICE study team that foremen are no longer able today to motivate the average craftsman. As the work force changes—and the old work ethic weakens—today's bright, well educated and independent worker demands reforms in the traditional rigidities of construction organization, in supervisory roles, communications networks, and systems of reward.

An all too lengthy list of things that can and do go awry on construction job sites seem to turn off craftsmen—demotivate is the word that experts use. The dozen most common complaints are: 1) unavailability of materials, 2) confusion at the project site, 3) incompetent supervisors (i.e., foremen or general foremen), 4) breakdowns in communications, 5) re-doing work already completed, 6) unavailability of tools or equipment, 7) disrespectful treatment by supervisors, 8) lack of recognition for work well done, 9) too little participation in decision making, 10) lack of cooperation among crafts, 11) incomplete engineering drawings, and 12) restrictive or burdensome procedures and regulations.

One needn't be a genius to get the point instantly that many of the things that turn craftsmen off are management's fault—at one level or another. So the latest word on how to handle personnel for big industrial construction jobs is that it may be very difficult for management to accentuate the positive side of motivation, but executives at all levels need to strive to eliminate the negatives. They are perhaps more important psychologically, anyway.

The demotivated worker also turns out to be the chief problem in two other endemic causes of shriveling productivity in construction: absenteeism and job turnover. Craftsmen stay away from work, or quit entirely, far more frequently because of excessive re-work on the job, poor supervision, unsafe working conditions, or uncomfortable relations with their boss than they do for personal or family illness. In a survey commissioned by a CICE study team, over 1,000 craftsmen at eight different large industrial projects cited their reasons for missing a day's work (or more). The reasons were tabulated on a scale of 1 for minimal importance, 10 for tops. Unsafe working conditions rated a 9. Excessive rework and lengthy travel to and from the job site rated 8. Poor craft supervision got a 6. Personal or family illness got a mere 4. Among reasons for quitting, ranked the same way, relationship with the boss was at the top, with a 10. Overtime availability on another job rated 7. Poor craft supervision rated 6, sloppy overall job management 5 and poor planning 4.

Rankings did not differ between union and open shop workers, nor by geographical area. The results were also unaffected by the worker's age, except that those over 50 years old were more apt to be absent

from work because of lengthy commuting distances. Clearly there are opportunities available to management to lessen the demotivators which contribute to high absenteeism and turnover in construction.

Pinching Pennies On Training And Education

The building trades unions over the years have bargained their way into an apparently adequate supply of funds from contractors to support the training of apprentice craftsmen, trade by trade. But open shop construction is starved for money to train its workers. In 1980, some \$230 million a year was pouring into union training programs, while less than 10% of this amount was being spent to train open shop workers. Yet open shop contractors, according to the latest estimates, do 60% of all construction. Moreover, more than \$8 million of the meager sum for open shop training was being provided by five large open shop contractors. Only a small fraction of open shop contractors train their own employees or contribute to the 30-odd association-run training programs.

The consequence of contractor apathy, plus a considerable amount of ignorance among owners about the situation, is a looming shortage of trained craftsmen that may well sharply limit the capability and growth of open shop construction later in the Eighties. Indeed the shortage may affect union construction as well. In its annual construction industry report issued in April, 1980, the Department of Labor forecast that 2.4 million new construction craftsmen will be needed by the end of the decade: 900,000 to fill new jobs and 1.5 million to replace retirees and those who shift into other lines of work. But training programs were turning out only an average of 50,000 craftsmen annually. At that rate, there could be a 1.9 million person shortage of construction workers by 1990.

Vocational education in schools, a potential resource for helping to close this gap, has been sadly under used. Every state in the union runs a vocational education system, but these are providing other industries with a greater share of their trained (or partly trained) recruits than those who go into construction. Moreover, high school pupils being trained for construction are almost exclusively oriented to building houses or small commercial structures.

Given the observable impact of management mistakes on the morale and work performance of craftsmen on project sites, it is perhaps not surprising that within the industry itself today's planning, management and supervision of field construction is widely regarded as inadequate. Until recent years, most university education for project managers (who run an entire job from inception to completion) and construction managers (who take charge of the on-site building process) has played second fiddle to education for other professional pursuits, notably engineering and architecture. As a result, many former craftsmen,

foremen and general foremen have moved up to become managers, much as many able businessmen in the past evolved from shrewd horse traders. Management skills have been learned by trial and error, with many trials and lots of errors.

Gradually, a confusing variety of four-year curricula in project and construction management has developed at a number of universities. Most of them grew out of and are affiliated with engineering or architecture departments. Graduate education for project and construction managers came into being in the mid Fifties; a 1979 survey by the Associated General Contractors found some 45 schools with graduate programs. Still, a study team survey indicates that the demand for university trained project managers and construction managers—undergraduate and graduate—may well exceed the supply by about 2,500 persons a year—or 25%—over the coming five years.

Neither owners who buy construction nor contractors are much involved in construction education, and the industry's contributions to universities for construction research are minuscule. In 1980, contributions for all types of engineering research at universities totaled \$620 million—four-fifths of it from federal agencies. But a study survey found slightly less than \$1 million for university construction research—from all sources. And counting both education and research grants, construction companies give universities a mere \$1.8 million annually.

A Cold Shoulder For Improved Technology

The disinterest of owners, contractors, architect-engineer firms, and so on in university research is all of a piece with their diffidence toward unfamiliar new technology. The construction industry adopts technological innovations far more slowly than it could—and probably should. Some promising new technology goes unused for many years due to "institutional barriers" to wide dissemination. And that torpid pace of change is one more reason why construction costs have been rising so rapidly in recent years.

The organization of the industry, splintered as it is into myriad segments each more concerned with its own presentation than overall advances, may well account more than any other single reason for this inertia. Moreover, an array of institutional barriers blocks the spread of new technology from where it originates to places where it might be used to cut building costs and increase productivity. A CICE study team identifies the major impediments as these: restrictive building codes and technical standards, some labor agreements and craft jurisdictional issues, liability and other legal considerations, lack of

profit motive or other compelling incentives, counterproductive contractual relationships and government regulations, industrial inertia, and communication difficulties. The list, long familiar to most construction executives, typifies the intertwining of problems that tend to tether construction to the past.

Even among the sectors of construction studied by the CICE project, there are considerable differences in the rate of technological progress. Commercial construction appears to be well in the lead over the past two decades, despite the absence of any visible research and development structure. Intense competition has prompted developers, designers and owners to work together to cut costs. Computerized design systems save expensive time in planning, for instance, and contracts written with performance specifications enable contractors and their subcontractors to adopt practical new techniques.

In contrast, the spread of new construction technology has been comparatively modest in general industrial construction, process-industry (refineries, chemical and cement plants, etc.) and power plants. Buyers of factories are usually more interested in a trouble-free facility than one made less costly by a new technology that has not yet become standard practice. Companies that own process plants focus on improving the technology of the process or the product, rather than on better ways to erect the maze of equipment and controls that forms a plant. Electric utilities have a jointly funded research institute, but so far it spends only about 2 1/2% of its \$200 million a year budget on ideas applicable to construction.

Neglected though they have been, improvements of many kinds are sorely needed in construction technology. Nobody has been bringing inventive genius together with imaginative management, equipped with money. A University of Texas study sponsored by the CICE Task Force ferreted out 17 specific types of problems, solutions to which would help to cut the cost of commercial buildings, light and heavy industrial projects and power plants.

They went about it thoroughly. To begin with the background, construction has long lagged behind most other industries in technical progress. Perhaps the biggest reason is that the largest and most costly kind of construction, power plants and heavy industrial facilities, are unique in two ways: each lies on a different piece of land and hardly any two are technically alike, though elements of many are somewhat similar. Construction companies have considered, probably justifiably, that money spent on research was not money well spent. They couldn't use the findings often enough to repay the cost. Even today, there is a scarcity of information about the opportunities for using better technology in construction. And there has been a corresponding lack of interest in the topic. When the Associated General Contractors mailed, through its Education and Research Foundation, a questionnaire to 1,200 contractor members in 1975 to assess research needs in construction, there were only 148 responses.

The CICE study fared far better, undoubtedly in part because colleagues queried colleagues. Of 53 companies asked to respond to a questionnaire, 36 replied. In many companies, answers were sought from more than one person, though never more than one per corporate division. In all there were 133 responses.

Again using the 1 to 10 scale (1 for easiest, 10 for most difficult in this case), the respondents were asked to assign a number to 15 different kinds of construction difficulties or inefficiencies that might be found in 17 specific phases of construction (e.g., earthwork, structure, piping, insulation, fireproofing, etc.). Naturally, the spots that got the highest numbers—or "indicator ratings"—ought to be ripe for technological improvement. But that was only half the calculation. Some operations could be inefficient, but amount to only a tiny part of a project; others could be more efficient but represent a huge portion of a project. So the "indicator ratings" were multiplied by the percentages of project cost that applied to each process or procedure.

Questionnaires which covered 128 separate project sources also provided cost information. Data on these projects provide an interesting thumbnail sketch of the considerable differences in the kind and cost of work involved in the four sectors of construction studies:

SECTOR	SURVEYS RETURNED	AVERAGE PROJECT COST (MILLIONS)	AVERAGE PEAK LABOR FORCE
Building	8	\$25	300
Light Industrial	16	\$120	600
Heavy Industrial	68	\$190	900
Power Plants	36	\$470	1,600

Finally, the study team extracted from the data—considering cost, complexity and time required for installation—insights about what portions of construction offer the highest potential for cost cutting via technological research. Result: piping, electrical work and installation of mechanical equipment. But in each of the four sectors, the opportunities for cost saving via better technology are different. In buildings, improvements are most needed in structure, enclosure skin, interior finishes and electrical work. In light industrial projects, again in descending order of priority: structure, piping and electrical work. For heavy industrial projects, it is piping, electrical and then mechanical equipment. In power plants, the pecking order is piping, mechanical equipment and then electrical work.

Finally, the University of Texas researchers interviewed 51 craft superintendents and field engineers at 14 sites in the Southwest, Midwest, West, and mid-Atlantic states to pinpoint precise construction inefficiencies and opportunities for improvement. The overall conclusion: dramatic economic gains might well flow from research and technological improvement in eight areas: 1) piping, 2) installation of mechanical equipment, 3) electrical work, 4) structure, 5) vessels, 6) heating, ventilating and air conditioning, 7) installation of special equipment, and 8) instrumentation. (Discussion of the specific problems that need solving the most, and some suggestions for improvements, appear in Chapter 8).

Modern Management Systems: A Little-Used Tool

Critics complain, with considerable justification, that the construction industry has been sluggish in adopting modern management systems to plan and build projects. Many contend this inaction is a primary cause of long delays in schedules and big cost overruns that have plagued construction— especially large and complex projects in recent years.

There is no lack of up-to-date, cost-effective management systems that can give project managers all the controls they need. But they are not yet generally used. The big losers are owners, who would in the long run reap a reward of lower costs, faster schedules and better quality. Many owners, apparently unaware of the economic payoff of modern management systems, remain unwilling to pay the cost of operating them.

What's needed, briefly stated, are much more accurate and timely controls over design, planning and scheduling, budgeting, procurement, material logistics, and quality assurance. Among other things, this requires more extensive use of computers to help control decision making and its timing. These steps grow increasingly important to enable owners and contractors to control costs as today's utility and industrial projects become increasingly more complex.

Two cases in point illuminate the need for improved management systems:

1. The critical-path method (CPM) of scheduling—in which the time required for every step in building a project is plotted on a time chart, thus revealing every point where long lead-time items could delay the entire project—has been used by some builders for about two decades now. Yet a CICE study team finds the technique is still not being used to its full potential.
2. The materials and equipment built into industrial and commercial facilities and power plants cost an estimated \$82 billion in 1979— some 60% of the total cost of those structures. But a

CICE survey concludes that a significant part of the labor cost that also went into that construction was wasted because materials and equipment were not available at the site when they were needed. That is the kind of foul-up modern management systems can minimize.

The same kind of gulf that separates different sectors of construction into quasi-independent duchies can often be found inside a single large project (except in housing, where developers tend to take full charge). All too often chances to cut schedule time and costs are lost because construction operates as a production process separated by a chasm from financial planning, scheduling, and engineering or architectural design. To close that gap, some owners and contractors mesh their expertise with that of engineers in a "planned constructability program." A seasoned project manager or construction manager sits with engineers as they labor at their drawing boards and helps them avoid cost-boosting gaffes. Too many engineers, separated from field experience, are not up to date about how to build what they design, or how to design so structures and equipment can be erected most efficiently.

Chapter 4

PROBLEMS INVOLVING ORGANIZED LABOR

Exclusive Jurisdiction: A Brake On Efficiency

The idea that each task in construction should be reserved for members of a particular union is a major source of costly inefficiencies in union shop construction. Exclusive jurisdiction, indeed, may well be the greatest handicap—certainly the most central one—that union contractors face as they try to avoid further losses in their shrinking share of the construction market.

The problem is a very old one. The building trades unions have insisted from their early years that they alone must determine what work should be performed by each craft. Over the years these definitions have grown more and more detailed as construction techniques, equipment and materials have grown more complicated, raising new conflicts among unions. Questions about work assignments have been settled by acceptance of previous local trade practice, by agreements between the unions involved, and by union-controlled dispute settlement machinery that has produced so-called "decisions of record". In recent years, employers have been brought into the voluntary dispute settlement apparatus, but unions have continued to dominate its procedures. Thus, efforts by the Impartial Jurisdictional Disputes Board have in aggregate only worsened the problems they were supposed to resolve by developing ever more precise assignments to one union or another of work that several crafts would appear qualified to perform. Moreover, the Board has failed to follow its original intention of setting nationwide precedents with its decisions. The resulting crazy quilt pattern of local decisions, with work approved for one craft in one place assigned to another craft in another locale, clearly identifies work that both crafts are qualified to handle. Today the voluntary disputes settlement plan is in temporary suspension and one major contractor organization has withdrawn. Efforts to reconstitute it are under way.

A small number of jurisdictional disputes have been brought before the National Labor Relations Board for settlement. NLRB decisions usually have been based on employer preference and considerations of efficiency. Even so, most employers consider the NLRB an impractical way to get a settlement because the Board takes so long to act, if it chooses to act at all.

Despite the National Labor Relations Act's ban on jurisdictional strikes, and a common perception (probably unfounded) that their frequency has been greatly reduced, jurisdictional disputes still flare into picket lines and work stoppages. In any case the construction industry remains saddled with an even greater cost: inefficient work assignments routinely made not based on efficiency but to comply with

precedents and jurisdictional agreements, and thus to avoid disputes. The walls around each craft remain in place, inhibiting new techniques and new technology.

Generations of exclusive jurisdiction have also shaped an industry structure matching the sharply defined craft-lines. Single-craft employer associations have become a part of the problem. Together with unions, they have a self-interest in maintaining the status quo, which encourages fragmented collective bargaining. Single-craft employer groups have tended to support established craft jurisdictions and expansive jurisdictional claims by their union counterparts.

There being a paucity of either private or public data about almost all aspects of jurisdictional disputes, a CICE study team commissioned Stanford University's Civil Engineering Department to identify the key areas of such struggles. A long and complicated mail questionnaire sent to 440 owners and contractors drew responses from 184—a satisfactory 42% return. They identified six prime areas of jurisdictional conflict. In descending order of importance they are:

- Setting equipment
- Materials-handling support
- Operation of small equipment
- Power rigging of material and equipment
- Installation of supports, restraints and backing
- Erection of scaffolding

To put it bluntly, it doesn't take a lot of skill to do most of those things. As the study team puts it: "The most troublesome aspect of jurisdictional problems involve mainly which trade should set things up so another can do highly specialized work—or the converse, which trade should do what almost any able-bodied worker could do."

Samuel Gompers, the AFL's founder and first president, apparently anticipated what has in fact ensued long after his death in 1924. In his annual report to the AFL convention in 1902, he warned: "Beyond doubt, the greatest problem, the danger, which above all others most threatens not only the success, but the very existence of the American Federation of Labor, is the question of jurisdiction."

The Stanford survey also made, as far as the CICE Task Force or the university has discovered, the first effort to learn what jurisdictional exclusivity, and all the wasteful practices it fosters to avoid strife,

actually costs contractors and owners. How many man-hours would have been saved, compared with those actually worked, if work had been assigned in a more logical way? The survey yielded about 400 examples of inefficient work assignment because of jurisdiction. These included 75 examples in which the potential savings were clearly quantified by the respondent. In the aggregates the responses showed that substantial savings would be available to union contractors if they were not saddled with accepted jurisdictional practices. Whatever the accuracy of the survey, the finding of the study team is that the industry's adherence to the concept of exclusive jurisdiction adds appreciably to the cost of construction projects built with organized labor, because of the combined effects of jurisdictional disputes and inefficient assignments made to avoid disputes.

This is an emotional and complex issue for both contractors and unions, but the implication is clear: unless there is substantial change, unionized construction will not be competitive in the marketplace. If so, a lot of union craftsmen will be jobless, work for open shop contractors, or switch into other lines of work.

Lopsided Collective Bargaining Agreements

Do local collective bargaining agreements with construction unions impose undue costs on union contractors? Not universally, the Roundtable finds, but restrictive provisions costly to union contractors are widespread across the U.S. and among major crafts. Owners and contractors are not sufficiently sensitive to the continuing cost of these restrictions, which seriously hamper the ability of union contractors to meet open shop competition.

The Washington-based Construction Labor Research Council studied some 20% of all U.S. agreements with the major trades at the request of the CICE Task Force. The 883 agreements covered some 950,000 union construction workers. The Council found provisions that create "excessive costs" aggregating many millions of dollars a year. Among those with the highest annual cost to the construction industry are:

- Excessive Overtime Rates: Nearly 40% of local agreements specify double time for all overtime, whereas time-and-a-half is widely considered to be a reasonable premium for overtime work on weekdays and Saturdays.
- Daily Work Shifts Of Less Than Eight Hours: Many local agreements in the Northeast and West Coast call for a 7 1/2-hour workday, an arrangement that automatically increases fixed costs (overhead, equipment rental, interest charges, etc.) per hour of work actually performed.

- Excessive Crew-Size Requirements: Some local labor agreements specify minimum crew sizes for particular work, regardless of the actual need. One of the most common examples is work involving cranes or other lifting equipment. In recent years, spurred by contractors, unions have begun to relax some of these work rules. In St. Louis, for instance, pipefitters no longer insist that four men handle 4-inch pipe (never mind how long it is) when fewer can actually do the hefting. Still, many arbitrary manning rules continue in effect, even when not required by labor agreements (see page 38).

A number of other contractual provisions have nearly as great an impact in inflating labor costs. Among them are pay for non-working time (e.g., coffee breaks), subsistence and travel pay (sometimes wholly justified, but often required inequitably and not needed to attract labor), and excessive shift-differential pay.

The Handicap Of Skilled Pay For Semi-Skilled Work

The major economic advantage enjoyed by open shop contractors, who have snared most of the last decade's growth in U.S. construction, is their freedom to use a high percentage of semiskilled workers, paid accordingly. Typically, 40% or more of the craft work force in open shops are helpers, or some similar label for workmen with less than journeyman skills. Most union contractors are able to use no more than 10% of their craft labor as lower cost apprentices.

This ratio doesn't fit the facts of life about construction. In each craft— carpenters, electricians, ironworkers, pipe fitters, operating engineers and some ten others—there is a wide range of work requiring a wide range of skills. Much work in almost all crafts requires a high degree of skill, training and experience. But at least 40% to 50% of construction work requires a minimum of skill and can be efficiently and safely done by helpers or subjourneymen (who may have skills only in a specific area which can be easily and quickly learned). Using journeymen at tasks for which their skills are not required wastes both talent and money.

The differences in the ratio of journeymen to workers of lesser skills can give open shop contractor labor-cost savings as great as 20% on some jobs, a study team concludes. A long-range but unquantifiable benefit may be equally important for open shop contractors, for some of them have a new way to develop skilled manpower to meet future needs, which are expected to increase. They have demonstrated an ability to train considerable numbers of workmen, including minorities and beginners, in a relatively short time by a variety of successful methods. If adopted, the same techniques could be equally successful

for training union sub journeymen. No two open shop companies among those interviewed by a study team used the same formula to pay helpers, who can be considered synonymous with sub journeymen in union shop contracting. But beginner pay is usually set at or close to the wage for common laborers. Pay increases depend on learning and performance. Inexperienced beginners usually start as "go-fers", doing unskilled menial work. Next they advance to holding, fitting, cutting or some other semi-skilled activity, according to their ability. Formal training, voluntary and conducted outside of paid working hours, is usually held at job site facilities, vocational schools where available or, in some cases, at a company's home office. Normally it takes helpers in the mechanical crafts 18 to 24 months to move up to journeyman with formal training, or 36 to 44 months without it. In the so-called basic trades, reaching journeyman status generally requires 15 to 18 months with formal training or 32 to 36 months without it.

In union construction, few sub journeymen appear to be used, even though several trades in recent years have recognized the concept and established the classification. Most local unions that are willing to refer sub journeymen from their hiring halls will do so only when their available supply of journeymen is exhausted and often they must be laid off if journeymen later want the jobs. During periods of labor shortages the gap has often been filled by semiskilled workers who are not full fledged union members but who receive temporary work permits. In most cases, permit workers are paid full journeyman wages—which tends to create a morale problem among apprentices working at the same site for less money.

In areas where the use of sub journeymen is permitted under union agreements the study found that contractors made little use of this cost-saving feature. Once a contractor lands a job in a traditional union area, he is usually reluctant to push to apply sub journeyman clauses for fear of rocking the boat. Many owners, once embarked on a large project, are reluctant to urge their contractors to invoke sub journeyman clauses lest such action cause labor unrest and delay completion of the project.

In a few areas, unions and contractors have applied broad unrestricted sub journeymen clauses to some projects with favorable results. The study found that in instances where the maximum ratio of sub journeymen was used over the full period of the project, high productivity was maintained and significant reductions in labor costs were achieved. The contractors were convinced the use of sub journeymen in the union sector can and should be expanded. They stressed that maximum efficiency would depend on the contractors playing an active role in the recruiting, screening and training of sub journeymen and in schooling project management in the proper use of these employees.

The Hazards Of Local Union Politics

Before 1959, many local construction unions were run in autocratic fashion, with the business manager wielding most of the power. Passage that year of the Landrum-Griffin Act, aimed at a wide spectrum of abuses, checked the power of union officials over individual members and created steps to safeguard union assets from possible corrupt practices. Among its many provisions, the law gives members the right to due process and the right to sue their union for violating that right. It also requires that elections for local union officials be held at least every three years, imposes restrictions on campaigning and the use of union funds and communication channels in elections. The building trades' 10,000 local unions became more democratic, and statesman-like efforts of union officials to suppress unreasonable demands were inhibited. Local business managers now must do a balancing act: satisfy the desires of their members for more pay, yet keep union contractors in business so their members will get jobs .

At least three kinds of politically motivated union activities can add significantly to a contractor's costs: 1) electioneering on the job site, 2) patronage, and 3) post-election disruptions, including disarray in union hiring halls, most common if the incumbent slate has been defeated by a narrow margin. The cost impact varies widely depending on the size of the job, the insecurity of incumbent union officials and the managerial competence of the contractor.

Electioneering on the job site obviously takes time away from work. But more subtle moves sometimes occur. For instance, incumbent officials may try, within the limits of their ability, to move their supporters to positions where they can be especially helpful. As a result, foremen and general foremen, followed by a coterie of journeymen, sometimes quit one job and move to another with the approval of local union officials. Sometimes incumbents may cause travelers (from another local of the same union) or permit workers (who have no vote) to be replaced by local members who have been out of work or who are called back into the area so they will vote in the election. The immediate job disruption caused by this turnover is obviously costly.

Sometimes incumbents or their opponents pursue grievances—even those that they realize have little merit—in an effort to win votes. The issues may be work rules, employment conditions, jurisdiction, or something else about which the members are sensitive. Besides the management and worker time lost trying to settle contrived disputes, settlements can have a continuing cost impact if employers make concessions to win labor peace.

Patronage, when used with restraint, can add to work force stability and the orderly administration of local unions, which can increase job-site productivity. On the other hand, it can also have detrimental effects. Even though union hiring hall procedures are quite structured, the business manager generally has some leeway in deciding which member goes to the short job and which to the long job, possibly with promised overtime. Within that latitude, large projects typically draw a percentage of journeymen who are not productive workers—at a cost to the owner in productivity, low quality work and lowered morale for his work force.

There are at least two additional problems involving building trades unions for which labor and management may well deserve roughly equal blame, or at least share responsibility.

Local Labor Practices That Waste Man-hours And Money

Inefficient work practices not required by collective bargaining agreements pervade the union sector of industrial, commercial and utility construction. Many practices persist though specifically prohibited by local labor agreements. On average, these practices inflate labor costs in unionized construction by 15%, by the estimate of a group of 325 owners and contractor executives. The same experts, mostly senior executives with some 20 years of construction experience, estimated that with sufficient effort about half of that waste could gradually be eliminated.

These practices range from non-productive work time and output limitations to favoritism for shop stewards and excess manning requirements. Most of these practices are the product of labor pressure, plus acquiescence by contractors and owners. Contractors and owners certainly share responsibility for their continuation. Such practices are tolerated to appease labor, help recruit scarce employees, or avoid confrontations. Stress on money rather than work-practice issues during bargaining has contributed to the problem, as has the recurrent failure by owners and contractors to hammer out a clear mutual understanding of job rules and expectations before work commences.

Top union leadership seldom condones the unwritten rules that boost costs, and many comments received by the study team singled out weak management as the prime culprit for keeping them alive. Many of those questioned reported that inefficient local practices expand geometrically as the number of workers on a project increases. And cost-plus construction was labeled a breeding ground for the problem.

Inefficient Local Labor Practices

Nonproductive Work Time

1. Late starts
2. Early quits
3. Excessive time for wash up and putting away tools
4. Unauthorized breaks
5. Place of work is the change shack, or company property lines
6. Abuse of visits for medical aid
7. False weather excuses

Additional Time Payments

8. Guaranteed overtime for specialty craftsmen
9. Overtime for total craft if anyone works overtime
10. Welder qualification pay beyond time spent testing
11. 40-hour guarantee for general foremen, foremen or steward

Premiums, Travel Pay, Incentives, etc.

12. Wage payments above basic rate for welders, instrument men or foremen
13. Contract welding rigs
14. Apprentice payments above classification
15. High time hazard pay, clothes repayment
16. Pipe sketch men at foremen rate of pay
17. Overtime lunches and eating on company time
18. Travel pay and/or subsistence

Employment Practices

19. Restrictions on contractor's choice of foremen and general foremen
20. Exclusive use of union hiring hall
21. Pressure to lay off non-local personnel first

Work Restrictions

22. Restrictions on equipment and materials obtained from nonunion sources
23. Restrictions on repairs by specialty firms
24. Unnecessary limitation of work within crafts
25. Limitation of type of work by apprentices
26. Deliberate slowdown of work
27. Maximum number of welds per day or similar productivity restrictions
28. Restrictions on use, erection and dismantling of scaffolding
29. Use of more equipment than needed

Jurisdictional Disputes

30. Composite crews with more men than necessary
31. Payment for work not performed
32. Failure to proceed with work while waiting resolution

Steward

33. Non-working stewards
34. Remain for overtime work when not essential
35. Remain after rainout
36. Building trade stewards on large projects
37. Involvement in hiring and termination
38. Payment over scale, or other favors
39. Contact with union for manpower requirements
40. Last one in lay-off
41. Involvement in disputes with other than employer

Manning Requirements And Standby Time

42. Teamster drivers on job site pickups
43. Nonessential material checking and receiving
44. Journeyman pipe fitter to work with welder
45. Welder refusing to work without helper
46. Use of survey crew for layout when workload does not justify
47. Foreman pay where there are manning cutbacks
48. Minimum numbers on rigging crews
49. Crews on elevators
50. Master mechanics by ratio system
51. Lack of apprentices
52. Crew sizes demanded outside of labor agreement
53. Excessive numbers of supervisors
54. Excessive levels of supervisors
55. Unneeded personnel for cleaning, testing, and startup
56. Observing work of technicians or client personnel
57. Temporary heating and lighting

Of 57 inefficient local practices identified by the CICE study team, in eight categories, both owners and contractors identified nonproductive work time as the most frequent. Almost 80% of the respondents mentioned such examples as late starts, early quits, excessive time for washing up and putting away tools at the end of shifts, and unauthorized breaks (mostly for coffee or smoking). And 26% of the respondents reported that these practices occur, even though prohibited by union contracts.

Three-fourths of the respondents reported having observed deliberate work slow-downs—the most common work restriction. They usually occur in an attempt to force scheduled overtime, prolong a job, or press for resolution of a jurisdictional dispute. A wide variety of inefficient manning practices show the

common characteristic of using more workers, often at higher pay rates, than are actually required to perform a given task. These include the routine use of journeymen for work that could be done as well by workers with less skill. Preferential treatment of stewards and unnecessary expansion of their role were also widely reported.

Divided Loyalties Among Foremen And General Foremen

The biggest obstacle to effective, goal-oriented and cost-conscious supervision of craftsmen on unionized jobs is that foremen and general foremen are members of the same bargaining group as the men they supervise. It is a brake on productivity seldom found in other major industries.

Union membership—combined with the often transient nature of construction employment—generally means that a foreman or general foreman feels his first loyalty is to his union. As was noted briefly in earlier discussion of undertrained foremen (page 23), union foremen look to the union business manager for wage bargaining, pensions, assurance of fair treatment, and their next job assignments. Their management role becomes quite limited. A supervisor on one project may become a journeyman on the next.

Accordingly, foremen and general foremen may avoid handling (and contractors may avoid delegating to them) such normal supervisory functions as establishing manning schedules, performance measurement, and dealing with grievances and discipline—even though in other industries foremen and general foremen normally handle such duties. It follows that motivating foremen and general foremen to control wasteful work practices or initiate productivity improvements is often difficult on union construction work.

Most national labor agreements, project agreements and even some local agreements give union contractors extensive rights about the source, selection, number and pay of supervisors—including foremen and general foremen. But these rights often are not exercised by management because management is timid, intimidated by local unions, concerned about keeping the goodwill of the local union, is not encouraged by its top management, or is inhibited by the owner. While bargaining for supervisors is not mandatory under federal labor law, over many years numerous management prerogatives have been bargained away or effectively forfeited by inaction or adherence to historic practice. The gradual but relentless attrition of management's rights, the study team finds, is a "substantial contributory cause of ineffective supervision in unionized construction and the consequent steady rise in costs."

The construction marketplace adds an extra dimension of difficulty to all these problems. Most large industrial construction is done by traveling contractors (those who operate nationally), partly because they have the large managerial cadre required for such projects. But this means that their workload in any one locality fluctuates greatly. Concerned with the high cost of retaining and relocating foremen and general foremen from project to project, as well as with labor stability, traveling contractors have few other options except to draw first- and second-level supervisors from local unions. The local business agent may persuade the contractor that the general foreman he recommends will help a lot to keep the job running smoothly. In turn, the general foreman is likely to recommend preferred individuals as foremen. Even though a local labor agreement may give the contractor the sole prerogative of picking every foreman, a general foreman's recommendations about his immediate lieutenants are unlikely to be overruled lest squabbling hinder progress on the job.

Local contractors may escape these effects. By providing stable employment and following good management practices, many are able to develop and retain entirely competent supervisors. Though members of the same union as the men they supervise, they feel less dependent on a referral by the business agent for their next job. Still, when local contractors take on a project that substantially exceeds the capacity of their steady foremen and general foremen, they too must turn to the local union for more help—with the same range of consequences.

Chapter 5

THE STULTIFYING ROLE OF GOVERNMENT

Government regulation has a major effect on both the cost and quality of construction. It affects almost every step of the building process. Until about two decades ago, most of the regulation came primarily from local governments through zoning controls and building codes. But today state governments and the federal government have important roles as well, and the scope of their laws and rules reach far beyond the domain of building codes, which are intended mainly to assure safety.

Consider the range of regulatory areas that affect construction: accessibility by the handicapped, aesthetics, boilers, consumer protection, demolition, environmental protection, explosives, financing, floodplains and wetlands, food handling, fuel storage, historic districts, liability, material and equipment acceptance, sanitary and storm sewers, streets and roads, signage, soil conservation, wages and more.

Not only are at least three levels of government involved in regulating construction (sometimes four, including counties), but many different departments, agencies, boards and commissions at each level of government get in the act. The result is overlapping, duplicative, and sometimes conflicting regulations that constrain construction. The net result is a formidable barrier to efforts to increase productivity through improved technology—in materials, products, components, subsystems and systems, and in the organization and management of construction processes. Among these problems, the CICE Task Force, in keeping with its guiding philosophy of restraining its efforts to examining problems where progress appears within reasonable hope of achievement, has confined itself in this study to just a few.

Government Limits on Training Innovation

That there should be any government limitations on how construction craftsmen are trained will perhaps strike some readers as an unwarranted intrusion on private enterprise, until they realize that it is not unusual for the people or activity being regulated to seize control of the apparatus and use it to their own ends. This is the case with construction training. The limits are imposed by the Labor Department, mainly at the behest of organized labor, anxious to preserve what grip it has on the route to becoming a construction journeyman.

It is by no means an all embracing hold. The little recognized fact is that less than one-third of construction craft workers, including those who are union members, learn their trade through apprenticeship. And too few people understand how the Labor Department impedes the use of modern

skill teaching methods for construction training. The department does it through the combined effect of its administration of the 1931 Davis-Bacon Act and the regulations promulgated by its Bureau of Apprenticeship and Training (BAT), originally set up under the 1937 National Apprenticeship Act, better known as the Fitzgerald Act. Moreover, Labor Department regulations covering apprenticeship also influence the actions of state apprenticeship councils, while the Davis-Bacon Act has helped foster adoption of "little Davis-Bacon Acts" in 41 states. Under the controversial Davis-Bacon Act, the Labor Department sets prevailing wages for workers on federally financed or federally assisted projects, which generally constitute at least a third of all construction. Usually union scale has been determined to be the "prevailing rate" in a given locality. That is hardly a coincidence. As Derek Bok, then dean of the Harvard Law School, now president of Harvard University, and John T. Dunlop, the veteran labor mediator, longtime member of the Harvard faculty, and former Secretary of Labor, wrote in their insightful book, *Labor and the American Community* in 1970: "The building trades have been particularly concerned over the position of solicitor in the Department of Labor, because the solicitor has watched over the administration of the Davis-Bacon Act... The building trades have also sought a voice in appointments to the Bureau of Apprenticeship so that they can keep informed of the Bureau's activities and influence changes that might adversely affect their interest in apprentice programs. Elsewhere in the Labor Department, the federation has usually succeeded in having at least half a dozen persons with a union background appointed to key posts, and no major position in the department has been filled without prior consultation with the AFL-CIO."

Under the Davis-Bacon Act, apprentice rates of pay are approved only for apprentices registered in BAT programs, all other work must be paid at journeyman scale. So very little government-aided construction has been done by open shop contractors, despite estimates that they now do 60% of all construction. In the unionized sector, the use of helpers and trainees, common practice before the Davis-Bacon Act was passed, all but disappeared by the Fifties.

The building trades unions and contractors, through bargaining, have formed joint apprenticeship committees, thus perpetuating the centuries old apprenticeship system for training craftsmen. Labor and management share the administration in varying degrees, but union membership is always prerequisite for an individual to enroll in jointly sponsored apprenticeship training. The training itself lasts three to five years—considerably longer than up-to-date training under open shop conditions. Moreover, pay increases according to time served, not skills acquired.

BAT's reach goes beyond apprenticeship. Whether a union is involved or not, BAT or a state apprenticeship council recognized by the Labor Department sets training standards and certifies the fitness of training programs. Until recently, neither BAT nor state councils have been willing to approve anything that did not follow the old formula. In 1980 the BAT gave its approval to a unilateral training program which places greater emphasis on task training and advancement based on competency. However, the old limits essentially remain, even though construction has become increasingly specialized and the training of workers to perform specific tasks in many cases has proved to be more efficient in bringing necessary talent to bear on construction work.

Recently the Reagan Administration has made a start in the direction the Roundtable Construction Committee seeks by proposing that two helpers be allowed for every three journeymen on construction subject to the Davis-Bacon Act (in open shop construction, helpers on average already account for 35% of some trades and 50% of others). The Labor Department estimated the resulting savings at \$363 million a year for the approximate \$43 billion spent for construction covered by the law. This change, along with others that the Labor Department said would save another \$222 million annually, was being fought in federal court by the building trades unions when this book went to press.

The Tangled Maze Of Building Code Administration

There is considerable potential for improving the administration and enforcement of building codes across the nation, though the problems are so diverse that no single panacea will suffice. Owners of power plants, petrochemical plants and major manufacturing facilities usually hire their own construction inspection teams. Building officials widely regard such construction as self-policed. A Roundtable survey among owners and contractors involved in these types of construction found that few have much contact with local building officials, those who do generally reported themselves satisfied with the service provided.

The situation is less rosy for other types of construction. In some localities, a lack of funds allocated to building departments leads to staff vacancies and delays in permit issuing, plus inconsistent enforcement of regulations. But overall, building department budgets seem to reflect the amount of construction going on, or sought by communities as part of an economic development effort.

One of the most pervasive problems in building-code enforcement is a widespread lack of qualifications among building officials at all levels: administrators, plans examiners and inspectors. This also contributes to delays and inconsistent enforcement.

Building-code administration appears to improve considerably in states with state building codes, especially when, as do six of the 21 states with mandatory codes, the states also enforce mandatory certification and education requirements for code-enforcement personnel. Yet there is a drawback to mandatory state building codes. All too often, they serve to increase the Balkanization of the nation's patchwork of conflicting code provisions—a topic not studied by the study team because the National Institute of Building Sciences is already doing so.

Only one-third of the nation's local building departments publish information about their procedures and requirements. By itself, this has become a major—and especially irritating—source of delay in obtaining building permits for some contractors. Far too few building departments hold pre-application conferences for major projects and/or have set up convenient facilities for "one-step" permit issuance.

PART TWO
WHAT NEEDS TO BE DONE

Chapter 6

SHARPENING MANAGEMENT'S TOOLS AND TECHNIQUES

A common thread runs through most of the CICE Task Force study teams' conclusions and recommendations as to how owners and contractors, sometimes separately but often together, can take sensible steps to improve the efficiency of construction. In the simplest phrase, they add up to MORE TEAM WORK. There needs to be more training and education, more joint research and development to speed new technology, more sharing of cost data, more intergroup communication, and more understanding about bargaining with labor. There needs to be more strenuous and skillful managerial effort.

Measuring Productivity

Since no satisfactory measurement of industry-wide construction productivity is now available, and, moreover, since a single measure of proxy would not suffice for such a complex industry, two things should be done:

1. The federal government should remedy its data-gathering shortcomings (see Chapter 2 for details)—a job that the Task Force calculates can be done at small cost.
2. Private industry should devise several of its own measures of construction productivity, including separate ones for logical segments of the industry. There is no one "best way" to measure on-site productivity. The main point is to begin collecting data available from owners and contractors regularly and systematically now, and translating it into the needed yardsticks.

Toward this end, the productivity study team is preparing two "how-to-do-it" manuals. The first will explain the principles of measuring productivity on job sites, ways to control productivity and will offer examples of systems that have been successful. The second manual will explain how work sampling and foreman-delay surveys can pinpoint reasons for low productivity. Both are techniques for quantitatively determining how much time is spent working, as opposed to time spent unproductively or lost through delays (e.g. materials undelivered, another crew using same space, questions about unclear engineering details, etc.).

If private industry productivity data are to be collected and published, owners will have to do it or it won't be done. The study team estimates that a staff of two professionals (plus clerical help) could begin with an annual budget of about \$250,000—provided a substantial number of companies provide information regularly.

Labor Supply Information

Federal and state sources gather and publish a mass of data which should be helpful to owners and contractors in planning projects. But it is presented in a format unsuited for construction planning and is not issued in a timeframe to be useful. Consequently neither owners nor contractors are making use of it.

The CICE study team proposes a pilot study with one or more states to determine the feasibility of a new reporting system which would provide more useful information at a cost, it is hoped, that would be less than what is currently being spent.

Ways To Improve Construction Safety

In addition to the humanitarian reasons for preventing personal injury and loss of life, there is a hefty economic cost when construction accidents occur. It amounts to an estimated \$8.9 billion, or 6 1/2% of the money spent in 1979 for industrial, commercial and power plant construction, and gives both contractors and owners every incentive to bear down harder on safety. Especially owners, for they pay the bill, one way or another. The study team figures that a "reasonable reduction in the frequency and severity of accidents" would lower the annual bill by \$2.75 billion—or 8% of the direct construction-labor payroll. Considerable evidence suggests that target is well within the industry's reach, given the requisite effort.

The first thing an owner can do is to hire contractors who already have a good safety record, because it is apt to continue. Several relatively objective measures of past safety performance are available, notably the experience-modification rate that is applied to workers' compensation premiums and the figures kept by the Occupational Safety and Health Administration on the incidence of illness and recordable injuries among each contractor's workers. Contractors can provide copies of this data.

To be sure, contractors seldom win jobs just because of stellar safety records. If an owner finds reason to hire a contractor who has a relatively poor safety history, he can increase the chances for improving that record if he requires the contractor to follow acceptable industrial safety practices. An owner can provide safety and health guidelines the contractor must follow, for instance. He can require the contractor to name a responsible supervisor to coordinate on-site safety. He can conduct safety audits during construction. He certainly should require prompt reporting and full investigation of accidents, not just for legal reasons, but so as to figure out how to ward off repetition.

Research for the CICE project, coupled with available public and private statistics, shows that safety programs pay off in economic terms. Data from a sample of contractors in 1980 indicated that it usually takes about 2 1/2% of direct labor costs to administer a construction health and safety program. The costs include: 1) salaries for safety, medical and clerical help; 2) safety meetings; 3) inspections of tools and equipment; 4) orientation sessions; 5) site inspections; 6) personal protective equipment; 7) health checks such as respirator-fit tests; and 8) other supplies and equipment.

Over the latest four years for which data were available, the OSHA recordable-injury incidence rate for this sample of contractors was only 36% of the average rate for the entire construction industry, as compiled by the National Safety Council. These contractors thus experienced workers' compensation losses averaging 6.1¢ per hour worked. If their accidents had been at the national average, with workers' compensation losses accordingly larger, the cost would have been nearly triple, or 16.9¢ per hour worked. Looking at lost workday cases, again measured by OSHA vs. National Safety Council averages, the disparity is even more dramatic. The sample of contractors studied reported only 2.7% of the average lost workday rate for the industry. Extending the earlier comparison about workmens' compensation costs, the national average comes out to \$2.26 per hour worked, 37 times as much as the actual 6.1 per hour that the sampled contractors paid.

The survey also showed that when owners nudge contractors to better safety performance, it can pay off. The owners surveyed were separated into one group with contractors who had above-average OSHA accident incidence rates and a second group with contractors who had below the industry average rates. Information from owners about the specific content of their safety programs for contractors was correlated with the groupings with illuminating results:

- All owners with better-than-average construction safety records require their contractors to get work permits for specially hazardous work. Owners in the other group either do not require work permits or let permits remain in effect for a long time.
- All the safer owners—let's call them Group A—either consider the contractor's safety record or use safety statistics in awarding negotiated contracts. Half the owners in Group B don't consider safety records before awarding contracts.

- All the owners in Group A conduct formal site inspections, about 60% of them audit contractors' safety practices regularly. Owners in Group B take action only when danger appears imminent.
- All owners in Group A use some form of goal setting for contractors to reduce accidents. In Group B, only 15% set goals.
- In Group A, about 75% keep statistics separately by contractor. More than 60% of Group B maintains no construction-accident statistics.
- In Group A, 75% have a construction-safety department to monitor and meet with contractors about job safety. Only a third of the owners in Group B have a construction-safety manager.
- More than half of the safer owners are involved in training sessions about plant hazards and safety procedures for construction-site supervisors and workers. Only 10% in the other group are involved in any safety training.

Tips On Overtime Work, If It Must Be Used

The case against scheduling sustained amounts of regular overtime seems overwhelming in terms of lost productivity per workhour. Still, there are times and places where overtime cannot be avoided. In such cases, there are ways to minimize the drag on output.

Owners and contractors should bear in mind some physiological fundamentals. Within narrow limits, workmen use energy at a rate pre-established by long adaptation. When their hours of work per day or per week are changed abruptly, they undergo an adjustment period. Studies show that scheduled overtime at first produces a sharp drop in productivity, followed by a substantial recovery by the end of the first week. This recovery level of productivity may remain fairly steady for two or three weeks. Then it begins a sharp decline, which generally continues for about six weeks. Productivity levels out at a low point after nine to twelve weeks of sustained overtime. All this is perfectly normal for human beings.

In remote locations, where overtime may be a necessary incentive to recruit labor at all, it is often necessary to house and feed the workforce at or near the job site. Under such circumstances, some authorities contend the absence of a daily commute to work helps offset the fatigue and resulting decline in productivity from sustained overtime.

Under other circumstances, two or three shifts are often more productive than extended overtime for a single shift. Or an additional crew can be used, as is common in offshore platform work, to provide

continuous construction (e.g., each man works 14 days, then takes seven days off). Where work is scheduled seven days a week, an occasional Sunday shutdown for rest may result in recovery of productivity that more than offsets the lost workday.

Motivation For Improved Productivity

Though the average foreman, as was noted earlier, may not have the skill (or training) to motivate workers psychologically to strive for higher productivity, there is a great deal that higher levels of management can do toward the goal. The most important item is to avoid demotivators, notably wasted time on the job through no fault of the worker. Perhaps the second most important element is good communication—both up and down the chain of command. There needs to be more communication between craftsmen and on-site management, for example. The chain of command in many labor agreements—from superintendent to general foreman to foreman to pusher to craftsman—has grown too long and on large projects often involves too many people to let instructions get through accurately. As several academic studies have shown, the accuracy of communications declines the more people are involved in the chain. Supervisors must be allowed through personal contact to help create attitudes among the work force that will make craftsmen feel members of a team, not mere nameless numbers.

Formal feedback systems such as a suggestion box, interviews and questionnaires, and particularly foreman delay surveys are very helpful, for they let management evaluate its own performance, identify problems, discuss solutions, and take immediate steps to keep a job within the budget and schedule.

Under a contract with the University of Texas, assisted by personnel from the University of Missouri, research was conducted to determine motivation techniques used successfully both inside and outside the construction industry. Based on this effort and their own experience, the study team found that five motivational techniques—goal-setting, incentives, work facilitation, positive reinforcement, and worker participation—have been widely used to increase productivity in manufacturing. Most of them appear adaptable to construction, but with some differences.

Goal Setting is probably the least used method in construction. But it can be used, at least in open shop contracting. The important elements are that the goal should be specific, attainable, and neither too high (which gives workers little incentive to try) nor too low (which will yield only low output). Letting workers have a role in setting goals helps induce them to attain those goals. Fair treatment, of course, is imperative.

Incentives, generally tangible rewards for productivity safety, low absenteeism, or superior quality work are used in the open shop sector. Unions generally oppose their use—and one chronic complaint among top performers is that this gives them no incentive for superior performance. Some open shop contractors use profit-sharing as an incentive, although there are problems with administering it equitably.

Work Facilitation involves such items as employers showing more trust of employees, improving job content, making work more interesting, and educating workers about the importance of productivity and profits if the company is to offer continuing, or repeat, employment. Here construction differs from most manufacturing. Assembly-line workers generally feel little identification with the finished product; construction workers (except perhaps on a very large, complex job) can see the product rise around them. Thus a construction craftsman will often be motivated if he gets proper instruction, equipment, tools and materials to do his job right.

Positive Reinforcement, which should always be used, is probably the least expensive motivational method available. A pat on the back from a supervisor can have a big psychological payoff. Awards given to individuals or crews appear to be an effective way to cut down on absenteeism and job turnover and to improve productivity.

Worker Participation takes many forms. Quality circles, in which labor management committees meet and talk, let workers identify and help solve problems affecting their work. They often lead, among other things, to cost-saving ideas, more job satisfaction, more attention to safety, more cohesive work teams, and improved quality control. Indeed, this kind of participatory decision making may well be the most effective single method yet devised to improve the motivation of foremen and craftsmen. And a motivated work force can have a major effect on the success of the entire project.

Reducing Absenteeism and Turnover

A brake on productivity in any business, absenteeism and employee turnover can hit construction severely hard for three reasons: 1) work must generally be performed in a planned sequence; 2) every member of a scheduled crew often must be on the job for the work to proceed; and 3) expensive rented equipment may be idled if a key employee fails to show up.

Compounding these problems, the levels of absenteeism and turnover in construction, as observed by a CICE study team, are often much higher than in more stable industries. On large projects during periods

of high labor demand, absenteeism as high as 20% and annual turnover reaching 200% were reported. If these levels could be cut in half—a reasonable goal—labor-cost savings would range from 5% to 10%.

The problem applies to both open shop and union projects; no major differences were found in either the levels or reasons for absenteeism or turnover. Construction workers cited a variety of "demotivators" including poor supervision, unsafe working conditions, sloppy management and poor planning, among the leading reasons why they skip work or quit. Obviously, these are conditions that management can change. The five motivational techniques discussed in the preceding section offer effective tools. Other practices, routine in many industries but often ignored in construction, can also help to reduce these twin plagues:

- Screen applicants and reject those with a history of absenteeism or job-hopping.
- Establish a clear policy of firing chronic absentees, make sure that employees know about it, and be consistent in applying it.
- Keep attendance records for all employees, watch these records to spot signs of trouble, and investigate to find out the reasons.

It is, of course, up to construction employers to take most steps to reduce absenteeism and turnover, but owner understanding, interest and stimulus are also needed.

The Rewards Of Modern Management Systems

Simply stated, the economic incentive for adopting more modern management systems—for owners—is a potential for saving 20 or more times the extra cost of installing and using the systems. But the savings come bit by bit, here and there, and the process requires a good deal more sophistication and perhaps more management effort than many buyers of construction now display.

A study team assisted by the Texas A&M Research Foundation to prepare, receive, and analyze data from a widely distributed questionnaire delved into the four basic management systems required for planning and overseeing the construction of projects: 1) planning and scheduling; 2) cost estimating, budgeting and control accounting; 3) quality assurance; and 4) materials management.

Planning and scheduling needs to be more precise and more detailed than it is now at many companies. And more owners should offer incentives to contractors such as bonuses for completing work ahead of schedule or below the budgeted cost. Owners should require contractors to use a critical-path method

(CPM) in planning their own work. If everything (including what follows) is done just a bit better, it should be possible, on average, for construction time on projects to be reduced by 10%. This would yield an average 3% saving to the owner, mainly because he will reap an earlier return on his investment.

Cost estimating, budgeting and control accounting: One of the most common problems is that owners assume more accuracy for early estimates of project costs than is warranted by experience. Many early estimates are notoriously low. The main reason is that the figures are thrown together before the scope of the work is fully defined, in which case estimates about amounts of materials and labor required are all too likely to be wide of the mark. Fast-track construction also increases the risk of unpleasant cost surprises. A survey of owners who are Roundtable members, plus some of the nation's 100 largest engineering contractor firms, shows that the average project expenditure for estimating and budgeting is 0.65% with another 0.75% spent on cost accounting and cost control. Most respondents indicated that these outlays should be increased to achieve cost effective programs. Yet still more must be done, beyond obtaining accurate estimates and a way to control costs. The most important source of savings is design, where there is a potential for cutting project costs by 2 to 4%. In all, provided owners spend a bit more wisely, project cost savings ranging from five to eight times the added expense could be wrested from improved cost estimating, budgeting and control accounting.

Quality assurance: Very few owners track how effective their quality assurance efforts are. They should, and they should also require that designers, contractors, and vendors have cost effective quality assurance and quality control programs in order to pre qualify to bid. To keep track of what actually happens, owners should set up a quality assurance team of their own. Disputes involving liability, negligence, claims for errors and omissions, and governmental citations have been increasing rapidly and quality control can help to minimize such risks. Computerized data processing is, of course, essential for sizable projects.

Materials management: Today's arrangements for this phase of construction aren't good enough, says the study team. Indeed, they lag far behind those commonly used by manufacturers. Personnel are often improperly picked and trained. Too little use is made of new, cheap micro-computers and software. To avoid tardy ordering of critical items, owners should closely monitor purchasing actions by their own organizations and those of their contractors. Based on responses to a survey among owners and contractors, the study team concludes that an average 6% of project labor costs could be saved by improved materials management.

Planning and scheduling, cost estimating and control, quality assurance/quality control, and materials management are interrelated functions of project management. Systems for the four functions should be designed so that each system is self-contained and reports data required for control of that function. However, for maximum benefit, the systems should be tied together so that a change of data in one system will be reflected immediately in the other related systems.

A Place for Construction Technology

A related managerial improvement—meshing construction know-how and up-to-date construction technology into engineering—offers even larger rewards if it's done right, according to another study team. The return should amount to 10 or 20 times the cost, or \$1 million for a \$50,000 outlay on a \$30 million project. A case study of a recent \$12 million addition to a food-processing plant illustrates the possible savings from this "constructability" process and illuminates how it works:

The owner's engineering department did all phases of engineering through the detailed design. Construction was managed by a general contractor, working on a cost-reimbursable contract. The general contractor used lump-sum subcontractors for all the civil work and did the process installation himself. His site-operations manager was named constructability coordinator. He was assigned full-time at the engineering office for four months and for two months traveled from the construction site. Specialists from the contractor's home office and his on-site organization were called in to advise on specific technical problems.

The constructability coordinator had these major roles and responsibilities:

- Review all proposed packages of design to identify potential cost savings or time savings and work with the engineers to devise ways to achieve them.
- Coordinate the content of all engineering packages issued to subcontractors .
- Coordinate the timing when engineering packages were issued and when equipment was delivered so as to dovetail with construction needs and priorities.
- Call in specialists to study specific technical problems.

Both the owner's project manager and construction manager gave the constructability expert active support. The constructability program cost \$32,000 for personnel and travel. Conservatively stated, the cost savings totaled \$540,000.

A Role For Better Construction Contracts

As has happened across a broad spectrum of U.S. businesses, legal costs have been rising in construction, particularly because contracting practices are growing more complicated. And few items have more impact on the cost of a project than the contractual arrangements. So owners have ample financial incentive to analyze whether they can make better contractual arrangements than they have been making.

The return can be impressive. A representative sample of major owners and contractors estimates that the way construction contracts are written can add about 5% to the cost of typical projects. Conversely it seems probable that many owners could save that 5%, and perhaps more, through more astute contractual arrangements.

Owners have three goals: the most economical (not necessarily the cheapest) cost, specified quality and completion on schedule. These goals often clash with one another, and trade-offs must be made. The contractor obviously wants to make a profit but he may have other objectives such as reducing his liability exposure on the project, and satisfying long term needs such as survival, growth, a greater market share, even prestige.

In devising his contract strategy, the owner should first assess the general risks, along with any special risks peculiar to the project. Then he should decide rationally which risks his organization has the experience and capability to assume. Then he is ready to settle on a strategy to match his objectives and resources with those of the contractor.

What kind of contract should be used? A fixed-price contract usually keeps costs within the budget, but the total time to get the project completed stretches because there must be a complete definition of the project's scope and essentially a complete design before that kind of a contract can be awarded. A cost-reimbursable contract will cut project time by permitting construction to start while engineering is still under way, but the owner will have to take a more active managerial role to control costs. And there are numerous hybrids and variants of the two types of contract, each with advantages and drawbacks, some of them subtle. In particular, owners should avoid using superior bargaining power to enforce contract language that seriously conflicts with a contractor's goals. If they do, an adversary relationship may arise between the owner and contractor—a poisoned atmosphere in which the contractor may lose his incentive to try hard to meet the owner's objectives for the project. The most successful contracts have at least one fundamental in common, whatever their precise form: thoughtful and meticulous preparation by the owner *before* the contract is let.

Chapter 7

PLUGGING THE GAPS IN TRAINING AND EDUCATION

Improving Supervisory Training

The inadequate training of foremen and general foremen, whether union or open shop, contributes to the steady rise of construction costs and dwindling productivity. The missing element is seldom their technical skill as craftsmen (which may win them the job) but rather too little schooling in such supervisory techniques as communicating with workers and planning their work.

Training is most effective in lifting productivity when it is aimed at a specific need. The common chorus of complaints in the industry about training is that it is too general and doesn't fit what happens at job sites. Case histories from major contractors with well-honed training programs consistently show substantial savings resulting from higher productivity on the project. A CICE study team concludes that owners who support contractors' training programs for foremen and general foremen can reasonably expect a return on that investment of "at least three to one". Another indication of the economic return: most big companies that have devised their own programs consider them to be proprietary information giving them a competitive advantage. Accordingly, they decline to make the content available to others.

Despite the need for training tailored to each situation, at least a dozen subjects are common to most projects. Owners should be aware of them when discussing training with contractors.

Planning	Material Control
Organizing Work	Human Relations
Scheduling	Motivation
Safety	Leadership
Quality Control	Effective Communications
Directing & Coordinating	Problem Solving & Method Improvement

For those who aren't sure what kind of training they should run, or have their contractors run, there is a managerial technique called Needs Analysis that can be employed to help make the decision. It is a matter of attacking the right targets with precision.

Who actually pays for training varies. In some instances either the owner or contractor takes on the burden alone; in others they share the cost.

Better get it clear early and make it part of the legal contract for every job. Still, one thing is even more vital than the training; "You can't make chicken soup out of chicken feathers," as one study team leader observes. In other words, choosing the right person to be a supervisor is crucial.

Open shop contractors face a special problem in training craftsmen: too little money is spent on training at that level. Except for the largest open shop contractors, most training is conducted by trade associations and is open to all contractors. Most current programs cover four trades: carpentry, electrical, plumbing and sheet metal; a few programs also teach iron working, bricklaying and cement finishing. And most of these association training activities are geared to housing, commercial or light industrial work.

Owners should encourage local open shop contractors to develop more—and broader—training programs, since open shop construction is growing faster (so far) than manpower in sight for it. Needed still more is a broad based legal way to finance open shop training nationally, so uniform standards can be established about its content. The CICE study team suggests that contractors might voluntarily include in each bid a cost in cents per man-hour worked, to be set aside for training. Naturally, organizational arrangements would have to be worked out—no small task— before that will happen.

The Promise Of Vocational Education

Vocational education in the public schools, that widely overlooked and much under used resource for training, could in the long run be harnessed to accelerate construction training to avert a looming manpower shortage. The CICE study team recommends beginning with efforts to create a formal group to improve communications between construction leaders and vocational education officials on a durable basis. Separate subgroups may be needed to deal with secondary school training and adult training. State education officials in most states would welcome expanded support for, and use of, vocational education, even if this raises total school budgets slightly. Before broad-based national progress can be made, however, several philosophical differences will have to be resolved or accommodated, including potential objections from the building trades unions and from some specialty contractors.

Increased Management Skills Through Education

Improving the education of tomorrow's construction executives in universities and colleges can make an extremely important contribution to increasing cost-effectiveness in construction. If more and better education led to a reduction of only 1% in project costs, some \$1.3 billion a year would be saved in the commercial, industrial and utility sectors alone. Many contend that improved education can yield far larger savings than this.

Owners and contractors have differing preferences in educational background for their project managers and construction managers. Owners generally favor a bachelor of science degree in engineering, while contractors usually prefer a degree in building construction. Still, both agree on the need for a combination of technical skills and construction-management courses. Therefore, university-level education, to be truly effective, should combine academic and on-the-job training.

Undergraduate courses need to be upgraded and standardized to better meet the industry's needs, with assistance from owners and architect/engineer and construction management companies. There is a serious question whether a four-year engineering program meets the construction industry's needs, because it leaves too little classroom time to encompass all the subjects that are vital to both engineering and construction management. In any case, owners, architect/engineers and construction-management firms which have non-graduates in responsible construction and project management positions should consider providing incentives to encourage such employees to obtain a bachelor's degree.

Graduate education in construction management needs a push from owners, architects, engineers and contractors to get more of it established. The same groups also should offer incentives to encourage employees to get a master's degree.

The entire relationship between academia and construction needs to be strengthened, with greater involvement by owners and contractors in the educational process. Industry ought to increase its financial support of academic institutions substantially, among other ways, by specifically designating financial contributions for construction programs. Needs, which vary among schools, include scholarships, research grants, summer jobs for students and faculty, guest lecturers, and rotational assignments between construction industry personnel and the academic community. Employers of project managers and construction managers should devise career paths for employees so that in years to come all will have both the academic and on-the-job training that these two demanding jobs require.

Chapter 8

HARNESSING RESEARCH AND TECHNOLOGY

Technological progress is probably more difficult in construction than it is in most other industrial fields, because the construction industry is broken into so many virtually independent parts and pieces. For instance, contractors that build roads, dams and bridges usually do only that. Those who erect buildings rarely venture into heavy earth moving. Refinery and other process-technology construction is a specialty of its own, with some exceptions. Nor are most owners of one kind of construction (except for office buildings and warehouses) apt to be owners of another.

One result of limited spheres of influence and limited geographical range is a void in information channels linking the entire industry. So information about new technology has to be fed a drop at a time into a lot of places, rather than into a central organization that spreads it where it's needed.

A CICE study team concludes that if much is to be accomplished to speed the snail's pace of new technology from inventor to wide use in construction, owners will have to take the lead. No other participant in the industry has either the money, or the incentive. Presumably owners would need to undertake joint action, since their own interests diverge, and few can recapture the cost of innovating from a single use. Still, the study team reports documented returns ranging from 10:1 to 20:1 are common for time and labor-force training spent putting new construction technology to work in specific projects.

The study team urges owners to collaborate in forming—or helping to form—a national institute to gather information about innovation and transfer the data to organizations that could use it. The plan, in part, is to try to involve potential users of promising ideas in financing their development to the point of commercial use. Naturally, such an effort should make use of existing professional, trade and government research organizations, and capitalize on their contributions rather than competing with them.

There is no shortage of specific problems for innovative scientists to tackle. *Piping*, for instance, appears to be the most inefficient among the major areas of construction. Alignment is often difficult and time-consuming because of the close tolerances required. Tools often have to be made on the job site—an awkward place for that kind of work—to align large diameter pipe. Flexible pipe would allow greater tolerances as would flexible bends. Can some genius combine strength of steel with the stretch of rubber? Another useful device would be an inter-flange connection device that would permit slight alterations in the direction of a pipe. Perhaps more accurate alignment equipment could be devised. On some sites the

old fashioned plumb bob and level are still the standard tools for this tricky job. Laser technology looks promising as a more up-to-date technique.

Connections require a quarter of the total time for installing pipe—at least in industrial projects and power plants, where there can be miles and miles of piping. Most of the problems involve welding. Though not all of today's available welding technology is being fully used, unsolved problems remain. One is the bulkiness of welding equipment; some piping superintendents report that it takes a crew—a welder and a pipe fitter—an hour or more to dismantle their apparatus and move it to the next location. Is there a way to engineer around it? Maybe an improved design for the connection. Standardized connections, using the same size bolts for most situations, would help. So would a flange with a built-in gasket, if one could be developed.

At congested sites, lifting pipe into place can be an awkward job. Cranes, when they can be used, require a lot of space to maneuver, both on the ground and in the air. Communication between the crane and the crew doing the installation sometimes leads to coordination problems. If the inefficiencies in installing pipe could be reduced to a process as efficient as the average of all other operations, the cost saving would reach an estimated \$5 million for a typical power plant.

Installing mechanical equipment—a major cost in heavy industrial projects and power plants—involves complicated difficulties in alignment and leveling. Tolerances in alignment are sometimes as minute as 1/3,000 of an inch. The job is complex, requires great skill and depends heavily on accurate technical information in the hands of the crew. One key to successful alignment is tools that are entirely internally controlled. Computer chips and lasers should enable crews to make more accurate measurements. It would be helpful if a device were developed to align piping and shafts to tolerances programmed into its memory, avoiding tedious and time consuming manual alignment. Alternatively, perhaps materials could be devised that don't require such close tolerances. Flexible joints or self aligning joints would make it much easier, quicker and less costly to install rotating equipment, which is very sensitive to any pressure placed on it by piping or rotating shafts that are improperly aligned.

Tolerances for leveling may be as small as 1/8th of an inch between ends. And the available tools, such as hydrosets, are usually not accurate enough, so using them is time consuming and requires great skill. Laser technology appears to hold promise for doing this a better way.

In ***electrical work***, number 3 on the priority list of tasks that cry for technological improvement, installing cable raceways and testing are the most complicated and awkward parts of the job. One reason is that

raceways must be put in place—mainly by hand—at a time when numerous craftsmen from other trades are competing to use the same space the electricians need. Flexible conduit would solve some of these problems, and plug-in connectors would also help.

Pulling wire through conduits remains a sensitive and troublesome task despite recent improvements. For one thing, it is still hard to avoid damaging the wire even though most crews use improved wire-protection material and lubricants such as soapstone. The operation has been speeded up— a bit—by mechanical tuggers. But they don't respond to tension on the wire, so the operator cannot always tell if the wire snags. What's needed is a tugger with built-in drag, like a fishing reel. Mineral-insulation cable eliminates the need for conduit, but the appropriate uses for it are quite limited. Could somebody invent a wire puller that could be used as the conduit is installed—perhaps with adhesive slip-ring connectors? It would not only reduce the risk of wire damage in pulling, but would eliminate that return trip by an electrical crew to do the wire pulling long after the conduit is in place.

The study team also identified some areas where the potential for technological improvement is low. Don't bother about roofing, plumbing (except for pipe fitting), insulation, coatings and painting, or fireproofing.

On balance, what construction needs is a lot more research and development to promote technological progress in construction. If you assume that the potential cost benefit ratio should be at least 100 to 1, the study team concluded, an industry-wide outlay of \$20 million per year would be justifiable only for R&D on three items: piping, installing mechanical equipment, and electrical work.

Chapter 9

MAXIMIZING WORKER PRODUCTIVITY

The long-term interests of unionized construction workers will be best served if unions cooperate actively in removing unnecessary impediments to efficient performance by contractors for whom they work. These obstacles to productivity have been reducing the number of jobs available for union craftsmen by shifting construction away from union toward open shop contractors. The trend promises to continue, and might accelerate unless changes are made. Many union leaders already recognize this in principle but the slow pace of change needs to be accelerated so that an effective competitive balance can be regained between union and open shop construction. The list of problems is comparatively long, but for each there are remedial steps on which the CICE Task Force feel reasonable men can agree.

Restricting The Impact Of Exclusive Jurisdiction

Representatives of both owners and contractors at projects need to become much more knowledgeable about jurisdictional matters, their rights and roles in assigning work and in the resolution of jurisdictional disputes. Contractors need to gain the freedom to assign work in the most efficient way to any workers who can do it safely. Jurisdictional agreements should be revised to permit this. Any successful plan for resolving jurisdictional disputes must include union recognition that there is work common to more than one craft union. Owners should support contractor efforts toward this end, and they should not hesitate to use available legal actions, including filing charges of unfair labor practices with the National Labor Relations Board or suing for damages, when faced by unlawful pressures or illegal jurisdictional strikes on their projects.

Over the long run, some mergers of international unions are needed to reduce both structural and political deterrents to more flexible work assignments. Better means are needed to resolve jurisdictional disputes locally. Voluntary settlement of such conflicts seems logically preferable to any solution imposed by law. But a voluntary disputes-settlement plan that reinforces inefficient practices is worse than no voluntary mechanism at all. Any system that relies on historical precedent as the basis for work assignments will impede improvements in construction efficiency.

Open shop contractors need to be vigilant in operating their employee classification systems to avoid importing dubious jurisdictional practices from the union sector. They should recognize that increased training and use of multi-skilled journeymen and multi-craft supervisors offer a potential for further productivity gains.

The National Labor Relations Board should speed up its sluggish procedures for handling jurisdictional issues. It should stop allowing a union disclaimer of work to halt a case before the Board unless the union pledges to refrain from unlawful conduct or the Board takes remedial action. The Board should also stop deferring to a voluntary disputes-settlement system unless the voluntary system is operating effectively.

Improving Local Bargaining Agreements

Owners and contractors need to pay a lot more attention to the continuing cost of restrictive provisions—such as excessive overtime rates, excessive requirements for crew sizes and pay for non-working time (e.g., coffee breaks)—in local bargaining agreements. Reason: they are not only widespread but also detract from a union contractor's ability to meet his open shop competition. Unions, too, need to recognize the long run economic price of these constraints: fewer jobs for their members.

In bargaining, contractors need to come to the negotiations armed with cost studies of the more serious restrictions. They should give non-wage items as much attention as wage demands in reaching settlements, with the goal of trading off wage increases in exchange for work-practice improvements of equal value. Owner support is essential.

Expanded Use Of Subjourneymen

As national and local union leaders recognize that the extensive use of helpers has been a key reason for the great growth of open shop contracting, they should conclude that including a broad sub journeyman clause in local labor agreements will help them to obtain more work for their members. Such clauses are most effective when they provide for a maximum ratio of subjourneymen to journeymen during the entire life of a project, rather than restrictive agreements that let subjourneymen be hired only after available journeymen are employed. Effective use of subjourneymen can be achieved only if contractors actively participate in recruiting, screening and selecting individual subjourneymen so as to staff their projects with qualified workers.

Toward this end, two timeframes for action seem logical. For the short run, unions and contractor associations should try to arrange for more extensive use of subjourneymen on large projects where project agreements and/or special agreements allow their use. For the long run, unrestricted sub journeyman provisions, giving contractors the right to decide what ratio of subjourneymen to journeymen to use on widely differing kinds of projects, need to be written into locally bargained union contracts.

Since the use of only journeymen and apprentices is a deeply embedded practice, change cannot be expected to come easily. Indeed, it will require commitment by all who are convinced that more efficient use of manpower is essential to the health of the construction industry.

Minimizing The Divided Loyalties Among Foremen And General Foremen

Federal labor law does not require employers to bargain with unions about supervisors, though it does leave them free to do so if they choose. That makes solutions fairly obvious to the problem that so often arises when foremen and general foremen are members of the same local union as the craftsmen they supervise: their motives and actions conflict with management efforts to increase productivity because they view the union business agent as their de facto employer and look to him for wage bargaining, resolution of their own grievances and—more important— their next job.

An ancient precept applies: no man can serve two masters. The CICE study teams recommend that contractors bargain harder to get foremen and general foremen out of local labor agreements. If such a major change were adopted abruptly, however, many union contractors would be left with too few of these first- and second-level supervisors. So the study team suggests a two-step approach:

1. As an immediate objective, contractors should seek to bargain out of labor agreements all references to supervisors above the first level of foreman. And contractors should arrange to handle, independent of unions, the recruiting, hiring and training of all supervisors above first-level foreman—that is, general foremen and up.
2. As a long-term objective, contractors should seek to bargain out of labor agreements all references to first-level supervisors as well. However, they should—indeed they will need—to retain the flexibility to draw foremen from the ranks of craftsmen (via the hiring hall), to meet peak and temporary needs, and to use such foremen again as journeymen during slack periods. Owners have a vital role to play here, too. They should encourage contractor efforts to expand the managerial role of foremen and general foremen, to increase cadres of salaried supervisors (foremen and above), to reward top performers with bonuses or other merit-based incentives. Owners should encourage contractor efforts to bargain for changes in labor agreements where necessary to meet these goals. As a further step, owners should consider giving preference, in qualifying contractors to bid for contracts, to those who support the training and development of a larger and better qualified pool of supervisors.

As a part of a contractor push at the bargaining table to regain lost or neglected rights, quite a few restrictions on the managerial role of supervisors should also be expunged from labor agreements. Among them: any reference to ratios, numbers and grades of supervisors; restraints on supervisors' rights to plan and schedule work, to determine crew sizes and composition, to establish methods, to discipline the work force, and to set performance standards and measure how craftsmen meet them.

To make such arrangements work better over the long run, contractors should strive to provide continuity of employment for supervisors. And it would be helpful if a supervisory referral system were established independent of union hiring halls, thus creating a pool of supervisory talent available to all contractors.

Reducing Wasteful Local Labor Practices

Many inefficient work practices (not specifically permitted or actually banned by local bargaining agreements) probably started as a result of union pressures, but union leaders often agree that their members' interest— more jobs—would be better served if the practices ended. A number of practical steps should help owners and contractors move toward that goal. For instance, owners and contractors should confer before construction begins and reach an understanding about job rules, work practices and labor relations strategies. That understanding can then buttress the contractor's position in his pre-job conferences with unions. After work begins, both owners and contractors should audit the job site, using the study team's checklist of 57 varieties (see page 38) of costly and inefficient work practices. The audit can then be used as the basis for a plan, devised by the owner and the contractor to eliminate at least the most costly items.

Contractors should avoid settling disputes by making concessions about work practices. Instead they should use grievance procedures that are contained in most labor agreements. Owners should encourage and support such action, instead of acquiescing for the short-run benefit of speeding completion of one project. Contractor supervisors should recognize that the role of a union steward is properly limited to representing his fellow employees in disputes with his employer. They should neither tolerate unrelated activities by stewards, nor delegate management duties to them (as some now do). Traveling contractors ought to familiarize themselves with construction practices in each locality where they work, so as to avoid importing inefficient habits from other areas.

In choosing contractors, owners would do well to consider each potential contractor's past record at eliminating inefficient work practices. More important, owners need to set realistic schedules for projects in order to avoid labor shortages and resulting pressures that lead to an increase in inefficient work.

In toto, inefficient local labor practices probably inflate labor costs in unionized construction by 15%, the study team estimates. As a realistic possibility, the team figures that half of that waste might be eliminated, with co-ordinated owner and contractor effort and union recognition that their members will not profit in the long run by insisting on waste.

Living With Local Union Politics

There are several ways that contractors can minimize the cost impact of local union politics, the most common forms of which are electioneering on the job site, patronage and post-election disruption inside the union including disarray in the hiring hall. The counter-measures require sensitivity, firm and equitable management practices and a few ounces of prevention. For instance:

- Contractors should consistently enforce the idea of a fair day's work for a fair day's pay. Consistent and even-handed enforcement of job-site rules can prevent worker discussions about forthcoming union elections from reaching proportions that decrease the pace of construction.
- Both contractors and owners need to be aware of union election dates, because they can affect the output of work, especially before a hotly contested election. Contractors should be prepared to withstand the often flimsy challenges to their right to manage that sometimes crop up just before union elections. To decrease job disruption from turnover, they might even consider imposing a hiring moratorium for two to four weeks before and after local union balloting.
- In negotiating local labor agreements, contractors ought to seek the option to hire directly, instead of binding themselves to use only a union hiring hall. And they should consider all union referrals as job applicants. They should keep a readily available file of former employees, and avoid re-hiring poor workers. They should obtain work histories from new applicants to permit selective reference checking.
- Newly hired workers should be considered as probationary employees—a standard practice in many other fields of endeavor. Where feasible (e.g., welders), new hires should be tested for competency. During their first week or two on the job, all new employees should be observed carefully; those that do not perform satisfactorily should be discharged.

Union leaders, in the self-interest of efficiency that over the long run yields more jobs for their members, should consider changing the date of contract expiration if it falls close to the date for union elections. (Many international union constitutions specify the month for local union elections, so changing that would be a difficult process.) However, if changing the date when a local labor agreement expires for one craft would move its expiration away from that of other crafts, the disadvantages might outweigh the benefits .

Chapter 10

LIFTING THE CLUMSY HAND OF GOVERNMENT

More Accurate Federal Construction Statistics

These are prerequisite to any believable measurement of the total productivity performance of construction, the nation's largest segment of business activity. The Commerce Department and Labor Department together need to make at least three, and perhaps four, comparatively simple changes in collecting and presenting construction statistics and measuring productivity. The study team predicts that the cost would be so small as to be insignificant while the reward would be great.

Census should adopt a more accurate method of collecting the facts about the value of industrial construction put-in-place and of construction classified now as "other non-residential". The study team recommends minor revisions in procedures already used by Commerce's Bureau of Economic Analysis for its quarterly figures on private outlays for new plant and equipment. These figures should be substituted for the present Census Bureau figures, which the study disputes as grossly inaccurate. Such a change would also cut the burden of making reports to the government for some companies. Census should regroup the categories presented in its reports about the value of construction put-in-place so logical components of construction are more apparent, rather than fogged by a welter of detail. Industrial construction, because of its size and importance to the economy, should be upgraded from a subsection of non-residential building and be presented as a category of its own with two sub segments: durable-goods manufacturing construction and non durable goods manufacturing construction. Census reports on the value of nonresidential buildings and public utilities should be made more useful by lumping minor segments together. And the definitions of some portions of nonresidential construction would acquire a lot more meaning to owners, contractors and economists—and be more logical to all concerned—if they were revised to conform more closely with the standard industrial coding numbers so widely used in other federal reports and programs.

The Bureau of Labor Statistics should expand the sectors of construction covered by its Labor and Materials Requirements reports to include, among other things, industrial, utility and commercial construction, which are not now covered at all. To keep the cost of this statistical effort as low as possible, BLS should gather less data about each project.

The federal government should continue to compile an aggregate productivity index for construction, but the index needs more data from such categories as nonresidential and force account construction. Federal

statisticians also need to do more work to make sure that figures on construction output and the man-hours expended on it cover identical periods of time and the same universe of activity.

As a final important statistical fix, the study team recommends an experiment to help Commerce improve the amount of useful data from its mail surveys of selected industrial and commercial projects (on which those arguably inaccurate published estimates of the value of such construction put-in-place are based). The form on which owners report their monthly dollar outlays would be modified so as to collect once a year the number of construction man-hours spent on each project; the information would come from contractors, or in some cases, owners. The study team suggests testing the idea, which it feels has merit, on a small scale to see whether the resulting data is as useful as it promises to be and how much time and effort it demands of responding companies. Private industry might be willing to do the testing, the study team believes.

Simultaneously, private enterprise should begin to gather data that will yield productivity indexes for logical segments of the industry, for localities and even for individual projects. Owners should cooperate or participate in the collection and issuance of this kind of data, and a private organization should supervise the entire effort.

Reducing Government Limits On Training Innovations

The problem, the CICE study team concludes, centers in the way the Labor Department administers the 1931 Davis-Bacon Act requiring that "prevailing wages" be paid on federally aided construction and the 1937 Fitzgerald Act covering apprenticeship. Davis-Bacon regulations require journeymen wages for all workers except those enrolled in apprenticeship programs approved by Labor's Bureau of Apprenticeship (BAT).

Officials administering both federal and state prevailing wage laws need to recognize that a great deal of construction work does not require the skill of a journeyman. Helpers and sub journeymen should be permitted along with apprentices. And BAT should critically re-examine its criteria for approving construction-apprenticeship programs in the light of changing technology and new techniques.

Joint labor-management apprenticeship committees should modernize the traditional systems now used for training. They ought to adopt techniques, courses and schedules that let apprentices advance in pay based on proved skills, not on the length of their training.

Both the Labor Department and states with "little Davis-Bacon" prevailing wage laws need to recognize that subjourneymen and helpers often work independently with the tools of their craft, not necessarily assisting a journeyman or under his direction.

Steps To Improve Building Code Administration

In some big cities the content of building codes, especially their reliance on specified methods of construction rather than performance standards, has been condemned for decades as an outrageous cost booster for almost all kinds of construction. In keeping with its long established policy of not duplicating work that is already being done by other organizations, however, the CICE Task Force concluded that this topic should not be addressed in this project. The National Institute of Building Sciences, (NIBS) a congressionally-created but now privately financed organization, is already deeply involved in the matter. Moreover, NIBS is working to reduce unnecessary federal regulations that affect the construction industry. There is a lot to be done about improving the administration of local building codes, which are sometimes underfunded, and almost everywhere administered by earnest but low paid officials who need more-training and whose sometimes dilatory processes are a thorn in the industry's side.

To help overcome the lack of qualifications among building-code officials at all levels—administrators, plan reviewers and inspectors—professional standards of excellence need to be established and education and training programs should be expanded to help practitioners meet those standards. As matters stand, undertrained building officials do an inconsistent job of enforcing building codes, and often take too long to make decisions. Only six states enforce mandatory certification and education requirements for code-enforcement personnel, but their track record at improving code administration suggests that other states would do well to follow that formula.

Owners, contractors and trade associations should consider helping the Council of American Building Officials, the umbrella group for the private model code-writing groups, to develop a nationally accepted education program for code administrators.

Because only one-third of building departments publish information about their procedures, while time-saving pre-application conferences and one-step permitting are even rarer, owners, contractors and others should help state and local construction groups to get local code officials to:

- Publish procedures and regulations about how to get building permits.

- Establish pre-application conferences where contractors and/or owners can learn precisely what approvals are needed from other regulatory agencies before a building permit, the final stop in a long line of hurdles, can be issued. This would help owners and contractors to set more realistic schedules for project planning.
- Establish one-stop permitting arrangements to cut the red tape in approving construction projects. One promising model is New Jersey's one-stop service.

Chapter 11

HIGHLIGHTS OF AN ACTION PLAN

The findings and recommendations of the Construction Industry Cost Effectiveness Project are as diverse, interlocking and complex as the Construction industry itself. Taken as a whole, they make up a detailed action plan for fundamental across-the-board change. But, unfortunately, they cannot be implemented as a whole. Some are simple, some difficult. Some can be done overnight, some will take years. Some are up to a few decision-makers, others are in the hands of thousands. They must be implemented one at a time by whatever means exist or can be devised. Each of them will require, at the least, conscious attention and continuing effort.

To facilitate that, this chapter assembles key findings and recommendations from all sectors of the study. It provides a quick overview and a ready reminder of the kind and scope of action that is needed. It is not a definitive list, and its treatment of each "problem" and "action" is in a shorthand form that will become more meaningful as it becomes more familiar. References indicate the specific individual report in which fuller information can be found. **See the inside back cover for titles. Individual reports can be obtained from The Business Roundtable, Suite 2222, 200 Park Avenue, New York, NY 10166.**

Implicit in the whole body of recommendations is a rigorous examination of past practices and an openness to change. New concepts and new ideas are seriously needed in an industry which has actively and passively resisted them in the past. The highlights which follow outline a new approach to the construction process. Taken seriously, they will not only produce positive results in themselves but will also create a driving force for beneficial change and an atmosphere that is hospitable to it.

INFORMATION GAPS

Problem: *The Commerce Department's monthly and annual compilations of the value of new construction put-in-place appear to report less than 25% of the actual amount of industrial construction, and only about 65% of office and other commercial construction. Actual total construction may be understated by about 25%. Yet accurate statistics about the amount of construction being done are prerequisite to any believable measurement of total productivity performance in the nation's largest segment of private business. (Report A-1)*

Action:

By The Federal Government: The Commerce Department should make several relatively simple changes in their collection and presentation of construction statistics, yielding much more accurate figures.

By Owners Collectively: Participate in industry efforts to persuade the government to make the changes, the cost of which is projected to be so small as to be insignificant, cooperate thereafter in modified requests for data.

Problem: *Credible construction productivity data is not now available. Owners do not have norms to judge performance on their projects. (Report A-1)*

Action:

By The Federal Government: Government agencies should develop a long-term plan to improve aggregate construction industry productivity measures.

By Owners Collectively: Assist in establishing a privately funded and operated construction productivity center to collect and correlate productivity data from construction sites, and to disseminate appropriate reports to owners and their contractors.

Problem: *Accurate, up-to-date information about the supply of skilled craftsmen for major projects is so hard to obtain that it is difficult to predict the impact of a proposed project on its area, and equally difficult to predict whether labor supply will affect the project's scheduled completion. (Report D-5).*

Action:

By Owners And Contractors Jointly: A pilot study should be made to see whether presently available information on labor supply can be assembled and published in a more usable form in a test state. Next, the information should be made widely available to owners and contractors to test whether they will actually use the data in planning construction projects. If all this testing is deemed successful, other states should be asked to provide similar expanded data.

MANAGEMENT

Problem: *The high cost of construction's deplorable safety record. (Report A-3)*

Action:

By Owners Individually:

- Give financial support to contractors' efforts to have an effective safety program, realizing that results will require persistent management commitment.

- Make safety an important consideration in choosing contractors to bid on projects, and review their history of safety performance. Before bidding, explain to potential contractors what is expected in safety.
- Get more involved in safety at construction projects, among other ways by setting safety and health guidelines that contractors must follow, requiring special permits for hazardous work, conducting safety audits during construction, and requiring prompt and thorough investigation of all accidents.

Problem: *Scheduled overtime, unless used briefly and sparingly, reduces labor productivity, magnifies labor shortages, increases absenteeism and accident rates, inflates construction-labor costs and disrupts the economy of the affected area—all without bringing material gains in the completion date of a project. (Report C-2)*

Action:

By Owners Individually: Avoid insisting that projects be completed on a hurry-up basis if it will require extensive and regular overtime. Do not allow contractors to use scheduled overtime as a recruiting lure.

Problem: *Scheduled overtime sometimes is necessary because of special situations, despite resulting productivity losses. (Report C-2)*

Action:

By Owners And Contractors Jointly: If work in excess of 40 hours a week is unavoidable because of special situations, such as remote locations or emergency reconstruction, owners and contractors should plan to use some of these ways to ease the impact of falling productivity:

- Hire a second or third shift for critical work items.
- Authorize hiring of an extra crew to allow scheduled time off without interrupting work on the project (e.g., each man works 14 days, then takes 7 days off, as is common on offshore work).
- In projects that must run seven days a week, shut all work down periodically over a Sunday or a weekend, since the resulting gains in productivity may more than offset the lost working time.

Problem: *Construction productivity often suffers from high levels of absenteeism and job turnover. Some contractors report turnover rates as high as 200% a year. Absentees sometimes amount to 20% of a project's work force. (Report C-6)*

Action:

By Owners Individually:

- Require contractors to make periodic reports on absenteeism and turnover.

- Encourage and support innovative efforts by contractors to communicate with and motivate their work force.

- Make sure that contractors have carefully planned and well executed safety programs.

By Owners Jointly With Contractors: Working together, identify and alleviate irritants that promote absenteeism and turnover among workers (e.g., distant or ill-kept parking lots, undue limits on smoking, inadequate places to eat lunch).

By Contractors Individually:

- Screen job applicants and reject those with a history of job-hopping.
- Keep attendance records for every employee and monitor the records for signs of trouble. Establish a clear policy of firing chronic absentees, and let the policy be known in advance.
- Maintain good communication with workers, including face-to-face visits on job sites.

By Labor Unions:

- Recognize that active involvement in discouraging absenteeism and turnover is in their self interest.
- Modify referral procedures at hiring halls to discourage absenteeism and turnover. For instance, for a pre-determined period (perhaps 30 days), prohibit referrals to another job of any worker who has quit without good reason or who has been fired for excessive absence from work.

Problem: An increasing lack of worker motivation is partly to blame for reduced productivity, increased absenteeism, and faster job turnover. Unmotivated—or even demotivated—craftsmen make it more difficult to build efficiently and on schedule. (Report A-2)

Action:

By Owners: Site management must completely understand, support and put into effect a multi-faceted motivation program. Demotivators, such as late design, design changes and work environment should be recognized and controlled.

By Contractors:

- Implement a construction labor motivation program and provide supportive management.
- Promptly detect and correct demotivators within the contractor's control, such as lack of tools, materials and instruction.
- Provide open communication lines and formally recognize efficient work practices.

Problem: Too many foremen and general foremen, untrained or under-trained in managing people and other supervisory skills, lack the capability of planning work, and communicating with craftsmen and directing their performance. (Report A-4)

Action:

By Owners Individually:

- Recognize that formal training for foremen and general foremen, properly conducted, pays for itself and more. So support contractors' training efforts.
- Have a clear agreement, embodied in the legal contract, about who will pay training costs, or how the costs will be shared.

By Owners Jointly With Contractors: Working together, devise methods to evaluate the effectiveness of training programs so that both owners and contractors may judge how effective training was for each project.

By Contractors And Their Associations: There is a need for more analysis of specific training needs, with the findings distributed widely. Additional training programs also should be created to cover the diverse skills required in construction.

Problem: *Slow adoption in construction of modern management systems to plan and build projects, especially large ones, has become an important cause of serious delays and cost overruns. (Report A-6)*

Action:

By Owners Individually:

- Accept the need for modern, cost effective management systems to plan, execute, and control projects.
- Be aware of responsibilities and prerogatives as related to use of management systems. Establish specific schedule, cost, and QA objectives prior to requesting bids.

By Owners And Contractors Jointly: Assist in the development of industry guidelines for planning and scheduling, cost, quality assurance, and materials management systems.

Problem: *Many owners don't relate that significant savings on projects can be realized through a more astute approach to contractual arrangements. (Report A-7).*

Action:

By Owners Individually:

- Accept the fact that contracting is complex.
- Recognize astute contract preparation and execution can yield improved project cost effectiveness.
- Take actions to develop appropriate expertise.

- Develop a formal contracting plan in depth as a means of arriving at a logical method of risk management based on the project objectives.

TRAINING AND EDUCATION

Problem: *Many project and construction managers have inadequate ability for planning, managing and supervising field construction operations. (Report A-5)*

Action:

By Owners And Contractors Jointly

- Encourage employees to get a bachelor's degree in construction management or engineering and provide incentives for employees to win a master's degree in construction programs.
- Give substantially increased financial support (i.e., grants) to universities and colleges, with the money earmarked specifically for construction programs, research, scholarships, etc.

By Owners, Contractors, Architect/Engineer, And Construction Management Companies Jointly:

- Develop formal and comprehensive programs of combined classroom and on-the-job training for continuing education aimed at improving the skill and competitiveness of the work force over the short run.
- Support higher faculty salaries by urging university administrators and, if necessary, state legislatures to offer incentives to attract top quality teaching personnel.

By Academia:

- With help from owners, contractors, architect-engineer and construction-management companies, upgrade and standardize undergraduate construction programs to better meet the industry's needs. Provided that curricula continue to offer adequate instruction in math and science, high priority should go to courses in nine fields:
 - Written and oral communication
 - Principles of management, including decision making
 - Managing construction methods and equipment
 - Business ethics
 - Estimating
 - Productivity measurements and improvement skills
 - Principles of contract law, including contract documents
 - Principles of operations planning and control
 - Use of computers for managerial control
- Provide more opportunities for Ph.D. programs in construction, so as to train additional faculty and research personnel.

Problem: *Vocational education in public schools (high school and beyond), which might help the construction industry escape a threatening labor shortage in the years ahead, is sadly underused to train construction craftsmen. (Report D-3)*

Action:

By Owners, Union Contractors And Their Trade Associations: Support a broad-based national group to improve communication between construction leaders and vocational-education officials as to the training needs of the industry. Separate subgroups may also be needed to deal with training in secondary schools and adult continuing education.

By Open Shop Contractors And Their Associations: Working with educators, increase efforts to expand craft training for industrial construction through vocational education.

Problem: *In open shop construction, far too little money is spent training craftsmen, partly because no broad funding method is available to collect training funds. Less than 10% of the industry's annual funds for training are spent on open shop training, although open shop construction now accounts for an estimated 60% of the industry total. (Report D-4)*

Action:

By Owners And Open Shop Contractors Jointly:

- Devise a broad-based program to collect funds to support open shop training of open shop contractors individually and jointly.
- Establish open shop craft training centers in metropolitan areas to provide training of construction skills—broadly supported by local contractor associations.
- Work on devising an appropriate mechanism to raise funds for open shop training programs.

By Owners Individually And Jointly:

- Recognize the need to support open shop craft training programs.
- Be willing to accept a charge based on direct field labor hours to be used in mutually agreed upon open shop craft training programs.
- Support promising national curriculum development programs, such as the Associated Building Contractors' "Wheels of Learning".

TECHNOLOGY

Problem: *There is a lack of knowledge by owners with respect to opportunities for cost reductions and shortened schedules by integrating advanced construction methods and materials into the planning, design and engineering phases of the project. (Report B-1)*

Action:

By Owners Individually: Write contracts that give contractors an incentive to mesh engineering and construction expertise with the process called "constructability", which can often save 10 to 20 times the cost it adds to a project.

By Owners Jointly: Make concerted efforts to help overcome the shortage of experts in "constructability" by helping to develop training materials and encouraging universities and colleges to add this facet of construction management to their undergraduate curricula.

By Academia: "Constructability" skills need to be added to undergraduate curricula in construction management.

Problem: *The construction industry has not kept pace with most other industries in the development of technology for use within the industry. Too much new and promising technology goes unused or is little used. (Report B-2)*

Action:

By Owners Jointly: A new type of organization is needed to shorten the delay between technical innovation and its widespread adoption in construction. The organization, among other things, should act as a central clearinghouse to gather information about what's needed and what is available and to release the information to companies that might profit from it.

Problem: *Many costly and time consuming tasks common to much industrial, commercial and power plant construction cry out for better technology. (Report B-3)*

Action:

By Owners And Contractors: Consider starting a national research and development effort to promote technological advances in construction. With a benefit-cost ratio of 100 to 1 as a guideline, an industry-wide outlay totaling \$20 million a year would be justified for three areas: piping, electrical work and installation of mechanical equipment.

LABOR

Problem: *Exclusive jurisdiction, the idea that only members of a particular union should be permitted to perform any given task in construction, is a major source of costly inefficiencies. Looming even larger than the delays and costs of work stoppages because of jurisdictional disputes are inefficient work assignments that contractors make to avert disputes. (Report C-1)*

Action:

By Owners Individually:

- Encourage and support contractor efforts to assign work in the most efficient way.
- Use available legal actions, including damage suits, without hesitation when faced by unlawful pressures on projects.

By Union Contractors Individually:

- Make sure to use the available flexibility in work assignments and avoid creating precedents that may limit future assignments.

- Recognize that jurisdictional strikes are unlawful and be ready to take appropriate legal action (damage suits or formal charges of unfair labor practices) if necessary.

By Union Contractors Jointly: Press unions during bargaining and in pre-job discussions for more freedom to assign work, especially within those areas that have been frequent sources of jurisdictional disputes. Seek acceptance of the obvious fact that there are bodies of work within the capabilities of more than one craft.

By Open Shop Contractors Individually:

- Exercise care in operating employee-classification systems to avoid importing dubious jurisdictional arrangements from the union sector.
- Increase training and use of multi-skilled journeymen and multi-craft supervisors.

By Owners And Contractors Jointly:

- Push for long-term reduction in the number of AFL-CIO Building and Construction Trades unions, perhaps from today's 15 to four at first, in order to minimize opportunities for jurisdictional arguments.
- Support efforts to create better means to resolve disputes locally, recognizing that no settlement system assigning work on the basis of historical precedent can let construction operate efficiently.

By Labor Unions:

- Local union leaders should recognize that the long term self-interest of their members in having jobs will be served by decreasing the cost burden of arbitrary jurisdiction lines.
- Mergers of some international unions are needed to reduce today's large number (15) of separate craft organizations and thus to lower the structural barriers to common sense work assignments by contractors.

Problem: Foremen and general foremen, when members of the same union as workers they supervise, tend to have divided loyalties. This limits their managerial role, and reduces their effectiveness in controlling wasteful work practices and promoting improvements in productivity. (Report C-3)

Action:

By Owners Individually:

- Encourage contractors to exercise fully their rights under existing labor agreements in selecting and handling their foremen and general foremen.
- Support contractors' efforts in bargaining to regain managerial rights that have been bargained away, and to remove references to supervisors in future labor agreements.

By Contractors:

- Refuse to bargain about further erosion of contractors' legal right to treat supervisors, including foremen and general foremen, as management representatives.
- Seek to remove, in future collective bargaining, any restrictions on the managerial role of supervisors, including:
 - Restrictions against hiring foremen from sources other than the union hiring hall.
 - References to ratios, numbers and grades of supervisors.
 - Restraints on contractors' rights to plan and schedule work, determine crew sizes and composition, establish methods, discipline the work force, or set and measure performance standards.
 - References to supervisor compensation, except for a minimum for first-level foremen.

Problem: *Restrictions on efficient use of construction craftsmen, written into local labor agreements, are widespread in the U.S. and costly . They also make it harder for union contractors to meet open shop competition. The four most common (and costly) restrictions are excessive rates for overtime, limitations on length of workday or work week, pay for time not spent working (e.g., coffee breaks and early quits) and subsistence and travel pay. (Report C-4)*

Action:

By Owners Individually: Support contractor efforts to rid local labor agreements of featherbed rules.

By Contractors Jointly: Become more aware, as a group, of the costs imposed by these constraints, come to negotiating sessions better armed with data about these costs, and give non-wage demands first priority in bargaining. Adopt the goal of limiting wage increases to the equivalent of savings gained by improvements in non-wage provisions.

Problem: *Inefficient work practices not required by collective bargaining agreements—and many that are specifically prohibited—jeopardize unionized construction of industrial, utility and commercial projects. It is estimated that, taken together, such practices add some 15% to union labor costs. (Report C-5)*

Action:

By Owners Individually:

- In choosing contractors, consider their past performance at eliminating this kind of inefficient work practices.
- Schedule projects with realistic completion dates to avert manpower shortages and consequent pressures for completion, which promote the growth of inefficient practices.
- Realize that large direct-hire work forces, which exceed a contractor's normal cadre of able supervisors and journeymen, tend to beget inefficient practices.

By Contractors Individually:

- Avoid settling disputes by making concessions on work practices; instead, make more use of established grievance procedures.
- Refuse to delegate managerial duties to union stewards.

By Owners And Contractors Jointly:

- Hold pre-construction conferences to reach an understanding about job rules, work practices and labor-relations strategies.
- Audit job sites regularly for inefficient practices, using the CICE project's checklist of 57 varieties of such practices, and attempt to eliminate the most expensive ones.

Problem: At least 40% or 50% of all construction work requires only a minimum of skill (or a limited skill easily learned) and can be safely as well as more economically done by helpers or subjourneymen. Union contractors will have to make more extensive use of subjourneymen if they are to overcome the major advantage in labor costs which the use of helpers gives to open shop contractors. (Report D-1)

Action:

By Owners Individually:

- Analyze current and prospective projects, and make their desires about the use of subjourneymen known. Appropriate language about using subjourneymen can be included in bid documents for individual projects.
- Where a project agreement is envisaged, consider requiring a specific plan to use subjourneymen, and have it incorporated into the contract.
- Monitor projects to make sure that contractors use subjourneymen to the maximum feasible extent.

By Contractors Individually:

- Recognize that clauses in collective bargaining agreements permitting the use of subjourneymen are essential if union contractors are to remain competitive with open shop rivals.
- Establish training programs to develop qualified subjourneymen. Keep individual records of each worker's performance and raise his or her pay accordingly above a starting level of, say, 40% of the journeyman rate.

By Contractors Jointly:

- Strive, in collective bargaining, first to arrange for more use of sub journeymen on large projects where project and/or special labor agreements seem appropriate.

- Seek, over the long run, to get wide use of sub journeymen without restriction written into locally bargained contracts with the building trades.

By Unions Individually And Jointly: Recognize that the extensive use of helpers has been a key reason for the growth of open shop contractors, and therefore agree to the inclusion of a broad sub journeyman clause in labor agreements so as to help obtain additional work for union members.

Problem: *Local union politics sometimes lead to actions such as electioneering on the job, patronage or post-election disarray in union hiring halls that increase costs especially if contractors tolerate abuses or make concessions to avert conflicts. (Report C-7)*

Action:

By Owners And Contractors Jointly: Be aware of dates for upcoming local union elections and make cooperative plans accordingly to minimize the impact.

By Contractors Individually:

- Consistently enforce a policy of a fair day's work for a fair day's pay.
- Regard all union referrals as job applicants, keep readily available work histories from new applicants to permit selective reference checking.
- Consider new hires to be on probation temporarily, and if feasible, test them for competency. Observe new hires carefully for the first week and discharge those performing unsatisfactorily.
- Consider imposing hiring moratoriums for two to four weeks before and after local union elections, especially if they are hotly contested.

By Unions: Labor officials should be aware of the potential impact of union elections on job site costs. Where feasible, they should consider creating a time gap between local union elections and local contract negotiations.

REGULATION

Problem: *The Federal Government has limited the use of modern training methods by its administration of the controversial Davis-Bacon Act and standards promulgated by its Bureau of Apprenticeship. (Report D-2)*

Action:

By Owners Individually Or Jointly:

- Seek to cause Federal and State regulators to permit use of subjourneymen or helpers on government financed work.
- Seek to cause the Bureau of Apprenticeship to continue modification to its apprenticeship standards to allow advancement and graduation based on proven skills.

By Contractors Jointly With Building Trades Unions Through Their Joint-Apprenticeship Committees:

- Seek to modernize the traditional systems of apprenticeship training within each craft.
- Use training techniques, course content and schedules that promise advancement based on skills acquired, not the length of the training.

By Federal And State Governments:

- Recognize that much construction work does not require journeymen skills. Change prevailing wage law regulations to permit extensive use of subjourneymen or helpers.

Problem: *Too many building code officials—at all levels—are inadequately trained (and sometimes voted too little money) to perform their jobs well, which leads to dilatory and inconsistent decisions about permission to build. (Report E-1)*

Action:

By Owners Jointly With Contractors And Their Trade Associations: Consider helping the Council of American Building Officials—the umbrella group for the private, model-code-writing groups—to develop a nationally accepted education program for code officials. They should also endorse state legislation requiring certification and appropriate training of building officials.

Problem: *Only one third of the nation's local building departments publish information about their procedures—an omission that spawns needless confusion—while time-saving pre-application conferences and one-stop permit issuing are even rarer. (Report E-1)*

Action:

By Owners And Contractors Jointly, With Their Trade Associations: Make efforts through state and local construction groups to get code officials to publish data about their procedures and regulations and establish pre-application conferences to review regulatory red tape, thus enabling owners and contractors to set more realistic construction schedules.

EPILOGUE WHAT'S NEXT

The U.S. construction industry has built the greatest production machine the world has ever seen. The mines, mills, foundries and factories it has created enabled Americans to enrich their lives and defend their freedom to a degree no people have known before.

Yet, as shown in this report, the industry's capacity to build as well in the future is being undermined, not by external forces but by default and shortsightedness within. The work that defined the problem has also outlined the beginnings of a solution. The recommendations that are summarized in the preceding pages are specific, practical steps to return the industry to its historical effectiveness. More than that, they are a pattern for concepts and attitudes that can shift the direction and momentum of forces at work in the industry.

This project was never just a fact-finding effort and there was never an assumption that action would flow from information alone. Persuasion, motivation, encouragement and assistance were all part of the original plan. Providing them is the task to be undertaken throughout the industry now that the study is complete. The Business Roundtable teams have shifted their emphasis to this new phase, but involvement by all elements of the industry is essential. So is the close, direct attention of senior leadership in user, contractor, worker and governmental organizations.

Ten billion dollars a year is a powerful incentive, not because it can be put in the bank but because, if it's not wasted, it can buy that much more of the up-to-date production capacity the nation needs.

And that's worth working for.

APPENDIX

A. CONSTRUCTION INDUSTRY COST EFFECTIVENESS TASK FORCE

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E.I. du Pont de Nemours & Co., Inc.

Thomas E. Dailey
R.E. Dailey & Company

Warren J. Ferguson
Puget Sound Power & Light Company

William A. Gabig
Shell Oil Company

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Union Carbide Corporation

Robert R Hukill
Sun Company

Richard F. Kibben
The Business Roundtable

H. Edgar Lore
Dravo Corporation (Retired)

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Potomac Electric Power Company

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Jack E. Turner (Chairman 1977-1978)
The Dow Chemical Company

Raymond E. Williams
American Telephone & Telegraph Company

John W. Williamson
American Telephone & Telegraph Company

Carroll H. Dunn, Project Director
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The Associated General Contractors of America	General Motors Corporation
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Construction Labor Research Council	Kellogg Corporation
Constructors Association of Sabine Area	Koppers Company, Inc.
	Liberty Mutual Insurance Company
	Limbach Company
	LOOP, Inc.

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R.E. Dailey & Company
Daniel Construction Company
Davy-McKee Corporation
Diamond Shamrock Corporation
DM International

Lummus Company
Charles Maeschers & Company, Inc.
Charles T. Main Company
MDC Systems
The Mid-Gulf Business Roundtable
Mid-Ohio Valley Industrial Council

Mobay Chemical Corporation	State of Florida, Department of Education
Mobil Corporation	State of Ohio, Department of Vocational Education
Monsanto Company	State of Oklahoma, Department of Vocational and Technical Education
Nashville Machine Company, Inc.	Stone & Webster, Inc.
National Constructors Association	Structural Systems, Inc.
National Vocational Education, Professional Development Consortium	Sun Company
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Pennsylvania State University	Union Boiler Company
Phillips Petroleum Company	Union Carbide Corporation
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Potomac Electric Power Company	United Engineers & Constructors, Inc.
PPG Industries, Inc.	United States Steel Corporation
Procter & Gamble Company	University of Florida
Public Service Company of Indiana	University of Houston
Pullman Kellogg	University of Michigan
Rust Engineering Company	University of Missouri
Sargent Electric Company	University of Tennessee
Schal Associates, Inc.	University of Texas
B.F. Shaw Company	Urban Investment & Development Company
Shell Oil Company	Utah Power & Light Company
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Sordoni Construction Company	Washington Public Power Supply System
Southern Bell Telephone & Telegraph Comp:	H.E. Weise, Inc.
Southwestern Bell Telephone Company	Western Electric
Stanford University	Weyerhaeuser Company
	H.B. Zachry Company

* Roger M. Blough, an attorney, was Chief Executive Officer of United States Steel Corporation until his retirement from that position in 1969. He was Chairman of the Construction Users Anti-inflation Roundtable from its founding in 1969 until it became part of The Business Roundtable in 1972. He is now an Honorary Member of The Business Roundtable Policy Committee.