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CRAFT LABOR PRODUCTIVITY



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Craft Labor Productivity

**Prepared by
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Craft Productivity Improvement Research Team**

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Executive Summary

Construction craft productivity improvement can be achieved in multitude ways. Which are best? Construction Industry Institute (CII) Research Team 143 searched for a solution to this complex subject.

This research summary describes a study by CII that compares two strategies for improving construction labor productivity. One strategy, the buffer strategy, stresses the importance of providing large stockpiles (buffers) of design, material, and construction equipment to craft workers. Large buffers provide flexibility to a production system by allowing worker to shift from one task to another when material shortages, design defects, or other impediments are encountered. The second strategy, the production planning strategy, provides effective craft production by ensuring that all necessary productive resources are available for craft workers. The production planning strategy encompasses all jobsite activities that directly support craft labor. Production planning is the domain of project material expeditors, field planners, and field engineers who ensure that craft workers have the materials and information needed for production activities. Production planning is the bridge between project planning and actual construction work.

Most construction firms use both strategies on their jobsites. However, increased use of buffers (e.g., larger stockpiles of materials, design and equipment) reduces the need to plan production in detail by introducing flexibility into the production system. Conversely, precise production planning reduces the need for large buffers by ensuring that the correct materials, designs, and equipment are available for craft workers.

This publication offers readers a chance to compare these two strategies for productivity improvement. Both techniques have advantages and disadvantages. The ultimate goal is to choose the strategy that improves craft productivity and leads to successful project planning, execution, and start-up.

Introduction

Field labor continues to be one of the largest costs and most significant variables in a construction project. CII Research Team 143, Craft Productivity Improvement, was initially chartered to “identify craft productivity improvement methods and to reliably and authoritatively evaluate the impact of these ideas on actual job site productivity.” RT 143 investigated the effectiveness of using earlier acquisition of project resources and increased production planning as a way to improve jobsite productivity. In particular, the effect of actions — providing design information and construction materials earlier in the construction process and providing more construction equipment and non-manual worker support to the work crews — was studied.

Productivity History

There is widespread agreement on the need to improve productivity as cited in the original Construction Industry Cost Effectiveness (CICE) reports by The Business Roundtable. Much has been accomplished since then through implementation of CII’s “Best Practices,” which clearly have reduced project costs. Has actual labor productivity in terms of output per work-hour changed?

Construction industry labor productivity changes in the last 20–30 years remain controversial and subject to strongly held opinions. Little absolute data are available due to the uniqueness and proprietary nature of each project. The Center for Construction Industry Studies Report No. 7, *U.S. Construction Labor Productivity Trends 1970-1998*, shows an increase in productivity, measured as output/dollar, due primarily to depressed real wages, but also to technological advances in its sampling of six representative tasks.

The Bureau of Labor Statistics maintains productivity indices for all significant sectors of the economy except for the construction sector due to lack of suitable data. Other government data show greater than 50 percent productivity increases for U.S. manufacturing and mining industries in terms of worker output. A 16 percent decline, however, is seen in construction industry worker productivity.

Research Basis

Construction labor productivity is not increasing at a rate commensurate with increases in the rest of the economy. What can be done to improve field labor productivity? A conventional approach to improve productivity is to provide large stockpiles of engineering design, materials, and construction equipment. This strategy improves labor productivity by providing multiple alternative work tasks and assignments. If one work task is unavailable due to material shortages, changes or other impacts, other work assignments can be made. In this research, an approach that relies on large stockpiles of production resources is referred to as the “buffer strategy.”

Another means to improve labor productivity is to invest more heavily in persons who support the production workers. Field expeditors, field engineers, and field planners can ensure that all necessary productive resources are purchased and available for the craft workers. This is called the “production planning strategy.” Production planning encompasses all jobsite activities that directly support craft labor. Production planning is not pre-project planning nor is it project scheduling. Production planning is the domain of non-manual field staff who ensure that craft workers have the materials and information needed for production activities.

This research compared the effectiveness of these two strategies. The strategies are complementary: increased use of buffers (e.g., larger stockpiles of materials, design and equipment)

reduces the need for detailed production planning by introducing flexibility to the production system. On the other hand, precise production planning reduces the need for large buffers by ensuring that the correct materials, designs, and equipment are available for the craft worker. So the question is, “Should one pay for increased buffers or should one pay for increased production planning?”

To answer this question, the research team focused on piping and electrical crafts for industrial construction projects. In industrial construction projects, piping and electrical crafts usually consume the most field labor hours and are on the schedule critical path. RT 143 measured the effect on worker productivity for these two crafts as a function of four factors:

1. Relative availability of engineering design (design buffer)
2. Relative availability of the right materials to be installed (material buffer)
3. Amount of construction equipment to support that craft/crew's work (equipment buffer)
4. Relative availability of non-supervisory construction support personnel including field engineers, planners, and expeditors (production planning buffer)

These four elements are important in providing craft workers with the resources necessary for efficient production. Many factors affect jobsite labor productivity, however. A comprehensive list of factors that affect labor productivity is shown in Table 1 (next page). As one might expect, jobsite labor productivity varies greatly depending upon such elements as design quality, worker skill, and project location. To the extent possible, these were controlled in the research.