

Quality and Productivity

Chapter 15



Quality and Productivity

Quality and productivity are closely related.

- **Quality is defined as meeting or exceeding the needs of the customer.**
- **Productivity is expressed as a measure of output per level of effort, or dollar value of output per level of effort.**

Quality



Everyone should recognize that intrinsic quality does still exist in construction, in the sense that some products are simply better than others. Some grades of lumber are straighter than other grades, for instance. Concrete can be made with different compressive strengths.

Quality

1.5.2.1 Strength Requirements

Specified compressive strength (f'c) shall be as follows:

**COMPRESSIVE STRENGTH
STRUCTURE OR PORTION OF
STRUCTURE**

3000 psi at 28 days All Concrete

Quality

Evaluation of Concrete Compressive Strength.

Compressive strength specimens (6 by 12 inch cylinders) shall be fabricated by the Contractor and laboratory cured in accordance with ASTM C 31 and tested in accordance with ASTM C 39.

Quality

The strength of the concrete will be considered satisfactory so long as the average of all sets of three consecutive test results equals or exceeds the specified compressive strength f'_c and no individual test result falls below the specified strength f'_c by more than 500 psi.

Quality

The shop drawing process is used to control the “quality” of the materials used by ensuring each installed product meets the requirements of the specifications.

Quality

Quality in construction is more than supplying the right materials.

Quality is also about finishing:

- **On time,**
- **Safely**
- **Within budget**
- **Without claims and litigation.**

Quality Standards

International quality standards are increasingly defined by the *International Organization for Standardization* (ISO) 9000 standards.

The principles advocated by ISO 9000 provide the framework for managing a quality system.

ISO 9000 2000 Principles

1. Focus on your customers.

- **Organizations must understand customer needs.**
- **Organizations must meet customer requirements.**
- **Organizations must exceed customer expectations.**

ISO 9000 2000 Principles

2. Provide leadership.

- Leaders must establish a unity of purpose and set the direction the organization should take.
- Leaders must create an environment that encourages people to achieve the organization's objectives.

ISO 9000 2000 Principles

3. Involve your people.

- **Organizations must encourage the involvement of people at all levels.**
- **Organizations must help people to develop and use their abilities.**

ISO 9000 2000 Principles

4. Use a process approach.

- **Organizations must use a process approach to manage activities and related resources.**

ISO 9000 2000 Principles

5. Take a systems approach.

- **Organizations must identify interrelated processes and treat them as a system.**
- **Organizations must use a systems approach to manage their interrelated processes.**

ISO 9000 2000 Principles

6. Encourage continual improvement.

- **Organizations must make a permanent commitment to continually improve their overall performance.**

ISO 9000 2000 Principles

7. Get the facts before you decide.

- **Organizations must base decisions on the analysis of factual information and data.**

ISO 9000 2000 Principles

- 8. Work with your suppliers.**
 - **Organizations must maintain a mutually beneficial relationship with their suppliers.**

Quality Assurance & Quality Control

- Quality Assurance and Quality Control are two different concepts that students should understand.**
- **Quality Assurance (QA)** refers to the management systems employed by construction companies to produce high quality work consistently.

Quality Assurance & Quality Control

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- **Quality Control (QC)** is about the inspection of work to ensure it meets the quality standards specified in the contract.

Total Quality Management

Total Quality Management (TQM) is a system of constant improvement, promoted by W. Edwards Deming. In his book, *Out of the Crisis*, Deming offers a theory of management based on his Fourteen Points.

Fourteen Points

- 1. Create and publish to all employees a statement of the aims and purposes of the company.**
- 2. Learn the new philosophy.**
- 3. Understand the purpose of inspection, for improvement of processes and reduction of cost.**

Fourteen Points

- 4. End the practice of awarding business on the basis of price tag alone.**
- 5. Improve constantly and forever the system of production and service.**
- 6. Institute training.**
- 7. Teach and institute leadership.**

Fourteen Points

- 8. Drive out fear. Create trust.
Create a climate for innovation.**
- 9. Optimize toward the aims and
purposes of the company, the
efforts of teams and groups.**
- 10. Eliminate exhortations for the
work force.**

Fourteen Points

- 11. Eliminate numerical quotas for production. Instead, learn and institute methods for improvement.**
- 12. Remove barriers that rob people of pride of workmanship.**

Fourteen Points

- 13. Encourage education and self-improvement for everyone.**
- 14. Take action to accomplish the transformation.**

Quality and Contractor Selection

The owner's greatest impact on quality is through contractor selection. Private owners do not resort to using the low bid system because they know that the system can produce the poorest construction quality, with the greatest number of change orders, claims, and litigation.

Quality a Contract Requirement

PART 3 EXECUTION

3.1 GENERAL

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with the Contract Clause titled "Inspection of Construction."

Quality a Contract Requirement

The project superintendent will be held responsible for the quality of work on the job and is subject to removal by the Contracting Officer for non-compliance with quality requirements specified in the contract.

Quality and Contractor Selection

Government agencies are searching for ways to improve upon the low bid system so they can begin to reap the same benefits now reserved for private owners who select their contractors based on qualifications.

Quality and Contractor Selection

Government agencies are beginning to try alternate selection systems such as best value procurement, construction management at risk, and competitive negotiation.

Productivity



Productivity

Two definitions of productivity

- **one that defines productivity in terms of the amount of work produced**
- **one that defines productivity in terms of the dollar value of the work produced.**

Productivity



Productivity =

Units of output (or output dollar value)

worker – hour

Productivity

Contractors usually prefer the work output related definition because they can make changes to affect the worker-hours of effort.

Owner Effect on Productivity

- The owner selects the designer and sets the standards for the design and**
- **can impose a facility design that is **difficult to construct****
 - **can select the contractor or method used to select the contractor**
 - **can select the type of construction contract.**

Jobsite Management Impacts Productivity

- Is the construction management organization set up in an efficient manner?
- Does management have adequate information?
- Does the company use a system that integrates **scheduling, accounting, and cost control**?

The Site Impacts Productivity

The layout of the site impacts productivity.

- **Materials placed too far from the point where they are needed cause wasted time.**
- **Should reinforcing steel be cut and bent on site?**
- **How is access to the site controlled?**

Productivity Factors

- **Labor and equipment combinations**
- **Weather**
- **Constructability of the design**
- **Length of the work day**
- **Day shift vs. night shift**
- **Efficiency of the tools and equipment**

Productivity Factors

- **Effort expended by the labor force**
- **Level of training of crews**
- **Number of crews working in the same space**
- **Government regulations**

Studying Productivity

Work sampling is used to determine if the size and composition of crews should be altered. Random observations are made and activity noted. Activities are classified as:

- **productive direct work**
- **productive support work**
- **non-productive work.**

Studying Productivity

Motion studies, which originated in the manufacturing industry, are designed to determine the best way to accomplish a task.

Studying Productivity

Time studies are used to determine the amount of time devoted to individual activities in the completion of a task. The purpose is to figure out which activities might be shortened or eliminated.

Studying Productivity

Productivity can be analyzed by studying the field progress records and the hours worked from payroll records.

Studying Productivity

It is sometimes more economically efficient to require crews to work overtime even given that their the hourly productivity for those hours after the initial 8 hours may be somewhat reduced.

Studying Productivity

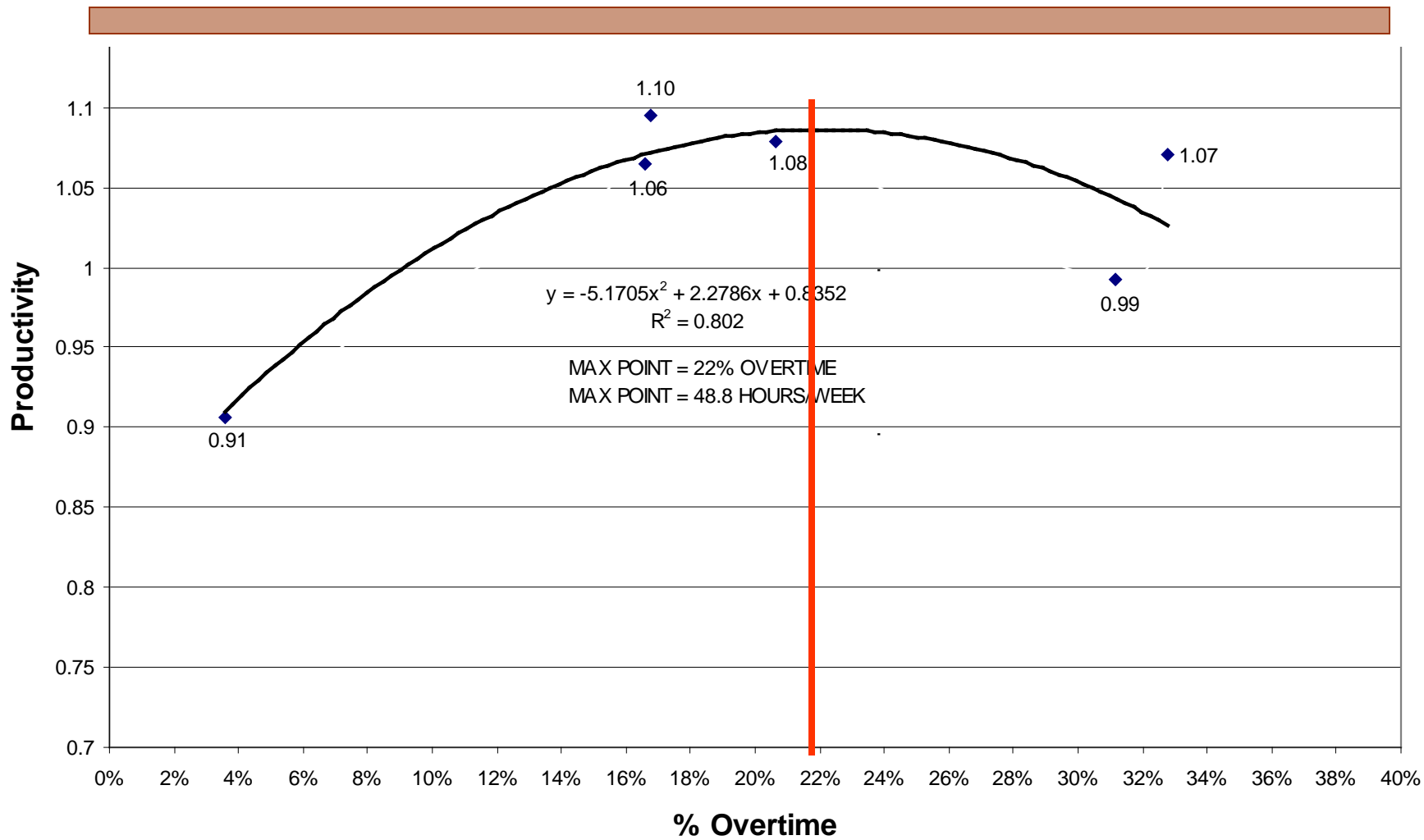
The question that must be examined is - how much is produced in the total work duration.

Remember some of the earlier work hours in a shift are devoted to mobilization or set up, moving materials, learning.

Studying Productivity



Studying Productivity



Studying Productivity

Maximum productivity for this crew is attained at approximately 22% overtime.

This crew is most productive working a 49-hour workweek.

Studying Productivity

This amount of overtime **may not produce the lowest labor costs (because of overtime premium pay), but it does produce the maximum productivity.**

Chapter 15 Homework

Due next class

– **15.1**

– **15.3**

– **15.5**

– **15.7**