TECHNICAL PUBLICATION NO. 86

CONTRACTOR FINANCIAL MANAGEMENT AND CONSTRUCTION PRODUCTIVITY IMPROVEMENT
- PHASE -
VOLUME II - CONSTRUCTION PRODUCTIVITY IMPROVEMENT

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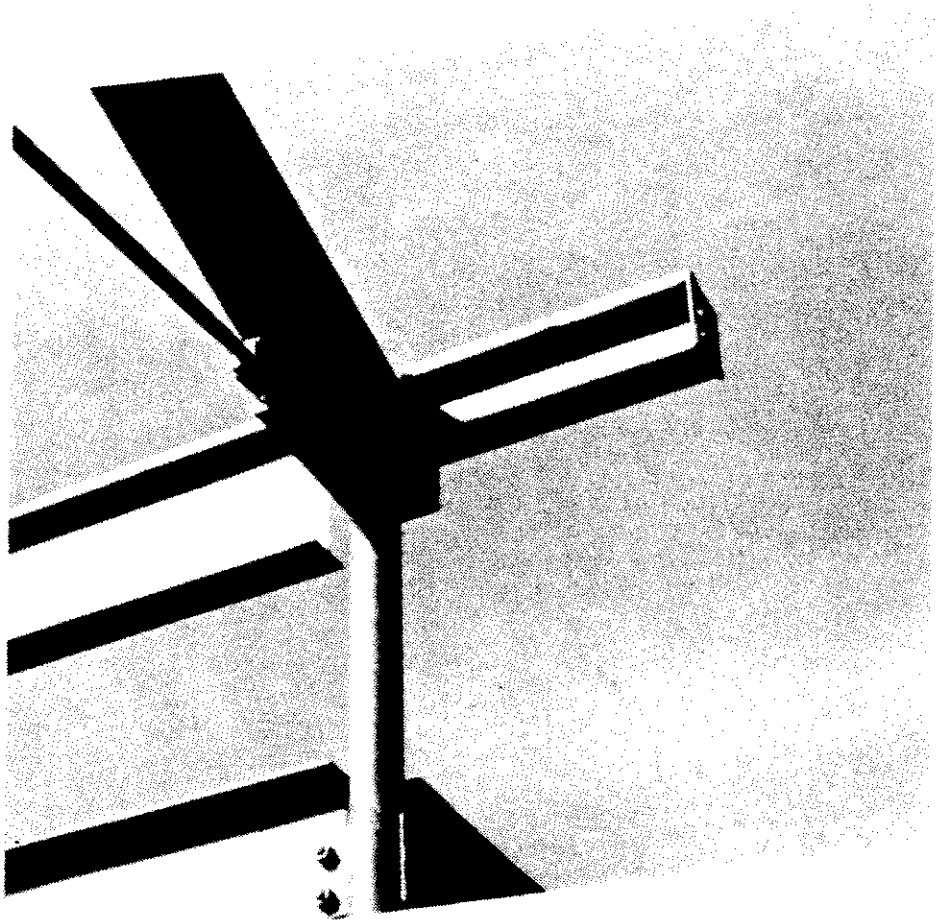

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School of Building Construction
University of Florida
1992

WORKSHOP FOR THE SMALL-TO-MEDIUM SIZE CONTRACTOR

R 89-14 REVISED

CONTRACTOR FINANCIAL MANAGEMENT AND

CONSTRUCTION PRODUCTIVITY IMPROVEMENT - PHASE I

VOLUME II - CONSTRUCTION PRODUCTIVITY IMPROVEMENT

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FLORIDA BUILDING CONSTRUCTION INDUSTRY ADVISORY COMMITTEE

FALL 1992

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EXECUTIVE SUMMARY

This short course is one of four workshops recommended for funding by the Florida Building Construction Industry Advisory Committee (BCIAC) to the State of Florida Commissioner of Education. Funds come from the set aside of the contractor's licensing fee for research and continuing education.

The BCIAC recommended development of four courses to constitute a continuing education program for the small and medium contractor. The courses are: (1) Construction Productivity Improvement, (2) Safety and Loss Control, (3) Change Order Estimating and Control, and (4) Contractor Financial Management.

Intent

The courses are intended to be taught on a regular basis by institutions eligible for BCIAC continuing education funding. Contractor associations, especially smaller chapters in conjunction with community colleges, can use the BCIAC materials to improve member education.

Scope

The table of contents provides details on the course's scope. Each course consists of a course manual and a video tape. The manual's main components are an introduction, each hour's instructional materials with case study problems and solutions, blank forms, and notes for the instructor, including lesson plans.

A brief but thorough video segment introduces the course and each lesson's important items. The video is intended to supplement the course instructor or moderator. As a minimum, a moderator is necessary for soliciting student comments and reviewing each hour's problems and solutions.

Methodology

The courses were developed in three phases over the following academic periods.

Precontract Phase (Summer 1990 - Spring 1991). During the recontract phase, a tentative course outline was prepared. Contact was made with small and medium contractors in Boca Raton, Gainesville, Jacksonville, Orlando, Sarasota, Tampa, Vero Beach, and West Palm Beach to ascertain their needs and ideas for inclusion in the course. Graduate Research Assistants (GRA) reviewed the literature and prepared preliminary course material.

Research Phase (Summer 1991 - Fall 1991). During the research phase, contractors were recontacted on specific questions and additional suggestions were solicited and the material revised. The format is similar to the continuing education courses of the Construction Industry Institute (CII). The materials were field tested at the Continuing Education Division, University of Florida and the Florida East Coast Chapter of Associated General Contractors of America, Inc.

Development Phase (Spring 1992 - Fall 1992). During the development phase, the research materials, including a supporting video tape, were completed and reviewed by the BCIAC.

Investigators

The principal investigator was Dr. Carleton Coulter III, Professor, M.E. Rinker, Sr. School of Building Construction, University of Florida. The co-investigator was Charles A. Kelley. Graduate students developing course materials were: Mark Meeske, Construction Productivity Improvement; John V. Ward, Jr., Safety and Loss Control; William Clark, Change Order Processing and Control; and Charles A. Kelley, Contractor Financial Management.

Acknowledgements

Appreciation is expressed to the BCIAC coordinators who freely gave of their time to review the materials and suggest improvements. BCIAC coordinators for the course materials were: Bruce Simpson (Vice Chairman of the Board, The Crom Corporation) for Construction Productivity Improvement, Safety and Loss Control, and Contractor Financial Management; and Mr. Thomas Mack (State Director, Florida Home Builders Association), Mr. Clifford Storm (Director, The Broward County Board of Rules and Appeals), and Mrs. Celeste Valdez (Vice President, Kalemeris Construction, Inc.) for Change Order Processing and Control. Forms are courtesy of JAC Construction Consultants, Palm Beach Gardens, Florida.

Obtaining Copies

A copy of this report and accompanying video may be obtained by contacting: Executive Secretary, BCIAC, M.E. Rinker, Sr. School of Building Construction, FAC 101, University of Florida, Gainesville, Florida, 32611, 904/392-5965.

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Spend a brief period introducing each other and learning what each participant wishes to learn from the course.

INSTRUCTOR'S BACKGROUND

1. NAME, POSITION, AND COMPANY
2. TYPE OF CONSTRUCTION OF CURRENT COMPANY
3. OVERALL EXPERIENCE
4. QUALIFICATIONS FOR MODERATING THIS COURSE

STUDENT'S BACKGROUND

1. NAME, POSITION, AND COMPANY
2. TYPE OF CONSTRUCTION OF CURRENT COMPANY
3. OVERALL EXPERIENCE
4. REASONS FOR ATTENDING THIS COURSE
5. EXPECTATIONS UPON COMPLETING THIS COURSE

Some of the most valuable suggestions come from attenders like yourself. Make this a better course by contributing your ideas with respect to each lesson's material.

GETTING YOUR MONEY'S WORTH

1. WRITE IN YOUR MANUAL IMPORTANT "TIPS" FROM THE INSTRUCTOR OR STUDENTS

2. HIGHLIGHT IMPORTANT ITEMS IN THE MANUAL

3. PARTICIPATE BY ASKING AND ANSWERING QUESTIONS

4. WORK IN GROUPS, INCLUDING HELPING OTHER GROUP MEMBERS

5. BRING UP CONCERNS OR PROBLEMS DURING CLASS OR AT BREAKS

6. INFORM INSTRUCTOR AT A BREAK IF COURSE CONTENT IS NOT WHAT IS EXPECTED

7. TRY TO GET AT LEAST ONE GOOD IDEA PER LESSON THAT YOU CAN TAKE BACK TO USE IN YOUR COMPANY

The instructor/moderator cannot read your mind. If the material does not meet your needs, please mention what you wish to know. The information is adaptable to most small contractors. You may have some special needs. The instructor can show you how to use the proposed ideas in your company or make other suggestions that may serve your needs.

ADMINISTRATION

1. COMPLETE THE REGISTRATION FORM
2. BREAKS ARE MID-MORNING AND MID-AFTERNOON
3. SMOKING OUTSIDE OF CLASSROOM IN DESIGNATED SMOKING AREAS
4. LUNCH TIME - USUALLY AN HOUR
5. NOTIFY INSTRUCTOR IF LEAVING EARLY
6. COMPLETE COURSE EVALUATION
7. RECEIVE ATTENDANCE CERTIFICATE

COURSE OBJECTIVES

1. UNIVERSAL ESTIMATING FORMULA (UEF)
2. PLANNING AND MAINTAINING PRODUCTION
3. JOB ORGANIZATION
4. WORK INFORMATION
5. MEETING THE LABOR BUDGET
6. DISCOVERING PRODUCTION DELAYS
7. DELAYS AND COST OVERRUNS
8. MEETINGS AND SHORT-INTERVAL SCHEDULE

The course covers the eight major topics listed above. Remember, try to get at least one good idea each lesson to improve your company's bottom line.

The complexity of course material application can be tailored to the size and specific requirements of the individual business concern.

Look for concepts to consider and apply, as well as the specific techniques discussed.

The presentation order of the material is not a consideration, all the topics (objectives) are interrelated and should be considered in a total context.

Note: Throughout this course "CPI" shall mean "Construction Productivity Improvement".

LESSON #1 UNIVERSAL ESTIMATING FORMULA (UEF)

OBJECTIVES

1. WHY JOBS GO WRONG
2. PRODUCTIVITY DEFINITION
3. UNIVERSAL ESTIMATING FORMULA

This workshop begins with a brief introduction to productivity improvement, lists common delays and cost overruns, and defines productivity. It concludes with a formula you can use for estimating production rates, crew budgets, labor budgets, and material quantities.

Productivity improvement is a sure fire way to improve profit. Many times, contractors take a job at a fixed price and then lose profit because of low production. In this course, you will learn common sense and contractor tested ways of increasing field production, so as to meet planned production schedules and attain planned profits.

There is another reason why you need to implement these approaches. Profits are easily lost due to delays. The only way to guarantee planned profit is to drive efficiency to the razor's edge. By stressing productivity improvement you will have an extra time cushion and consequent financial cushion when delays occur.

CPI PROFIT TIP #1

KNOW YOUR CURRENT PRODUCTION RATE AND COMPARE TO BUDGET

Each chapter has a profit tip. These tips come from contractors who are profitable year-after-year. Some of these firms have been in business for decades and some are in their second or third generation of ownership. Use this common sense wisdom presented at the start of each chapter to finish each job within budget and on schedule.

The key to a productive job is always knowing how much work you need to do per hour or day to keep within the budget. You can compare each day's production against the remaining labor budget. When production drops you can revise rates to meet the remaining budget. If there is a difference, you can make changes before you lose too much money.

NORMAL WORK VS PRODUCTIVE WORK

1.	NORMAL WORK	
	- PRODUCTIVE TIME	40%
	- SUPPORT TIME	30%
	- NON-PRODUCTIVE TIME	30%
2.	PRODUCTIVE WORK	
	- PRODUCTIVE TIME	60%
	- SUPPORT TIME	25%
	- NON-PRODUCTIVE TIME	15%

Productive time is when "bricks and mortar" are being placed -- i.e., construction is occurring. Support time is when the crew is preparing to do productive work, like measuring and moving materials. Non-productive time is when the crew is idle.

Notice that productive projects are 50% more efficient than normal projects. A 50% increase in efficiency translates into major labor cost savings.

PRIMARY CAUSES OF DELAYS & COST OVERRUNS	
1. DESIGN PROBLEMS	45%
2. DISRUPTIVE CHANGE ORDERS	35%
3. SUBCONTRACTOR & SUPPLIER PROBLEMS	15%
4. FAILED Q.C. & INSPECTIONS	5%

National studies indicate the foregoing major causes of delays and cost overruns which, uncontrolled, lead to lost profits. Notice that the primary cause is design problems, such as incomplete drawings or errors and omissions. The productive contractor always tries to get better construction information before starting work.

The second major cause is disruptive change orders. The profitable contractor learns to deal with changes in a systematic manner, so that the construction company receives every dollar to which it is entitled.

The third major cause is due to subcontractor and supplier problems, usually associated with selecting unqualified firms and not adequately coordinating their work.

Poor workmanship and failed inspections account for only five percent of lost profits.

1. In your experience, what are the major sources of delays and cost overruns?

2. Do you feel that you could overcome these problems or are you concerned that you may always experience such problems?

SEQUENCE OF LOST PRODUCTIVITY

1. MATERIALS DELAYS
2. SCHEDULE DELAYS
3. BUDGET/COST OVERRUNS
4. SUBSTANDARD WORKMANSHIP

There is a well defined sequence of how jobs begin to lose money. First, materials don't arrive and productivity drops. The contractor can have the crew work on other tasks for a short period of time but eventually production falls behind schedule.

Serious material shortages eventually effect the schedule. Schedule delays turn into budget and cost overruns. Finally, money becomes short and substandard workmanship is the only way the job can be finished within budget or at minimal loss.

The production savvy contractor is always alert to the possibility of this cascading set of problems.

1. Have you ever seen jobs with declining production start this way?

2. How would you put this information to use in your company?

DEFINITION OF PRODUCTIVITY

PRODUCTIVITY: AMOUNT OF WORK DONE FOR A SPECIFIC AMOUNT OF LABOR COST

EXAMPLE: 10 LF OF STUD WALL PER COST OF CARPENTER HOUR

Since we are talking about productivity improvement, it is necessary to define productivity. Although there are many definitions of productivity, the simplest and most useful definition in construction is: the amount of work done for a specific amount of labor cost. Labor cost can be related to either labor hours or labor days.

The important thing to remember is that you are defining production as a specific amount of work to be done for a specific dollar amount. For example, 10 LF of stud wall per cost of carpenter hour, or 10 LF of stud wall per $40.00 per hour. It is important you know this definition because it will be used in the universal estimating formula (UEF).

1. Have you ever seen production rates stated in this manner?

2. Does your company use production rates for either its estimating or for field cost control by the foreman?

UEF APPLICATIONS

1. PRODUCTION RATES
2. REVISED QUANTITIES
3. REVISED LABOR BUDGET
4. CHANGE ORDER ESTIMATE

If properly used, the universal estimating formula (UEF) can become a contractor's best friend. This common sense, arithmetic formula provides instantaneous answers for day-to-day questions on how to maintain production.

The UEF is primarily used to determine your production rate. When your labor budget changes, you can recalculate revised material quantities. When quantities change, you can recalculate a new labor budget. Finally, for that most difficult work item -- change orders, the UEF helps you determine crew rate, labor budget, and production quantities.

UEF FORMULA

FORMULA:

PR X LB = CR X Q

WHERE:

PRODUCTION RATE (PR) = UNITS/HR OR UNITS/DAY

LABOR BUDGET (LB) = $

CREW RATE (CR) = $/HR OR $/DAY

QUANTITY (Q) = UNITS

TIP:

1. WRITE DOWN THE FORMULA
2. SUBSTITUTE THE VALUES
3. SOLVE
4. CHECK COMPUTATIONS
5. UNDERLINE THE ANSWER

The UEF is shown above. The elements of the formula are production rate (PR) in units/hr or units/day, labor budget (LB) in dollars, crew rate (CR) in $/hr or $/day, and work quantities (Q) in units.

Here are two tips for using the UEF on the job site to maintain production.

1. Put the UEF on a laminated card for the foreman's use to calculate revised production rates on the job.

2. Tape the UEF to calculators in the office and on the site so everyone can find quicker answers to budget, crew costs, work quantities, and production rates.

Notice the tip on how to calculate. Contractors lose money by incorrect calculations. Using the above proven five step approach, you can insure that you don't throw money away due to arithmetic mistakes. As you work the formula and examples in the practical exercise, consider the many ways you can use the UEF in your company.

UEF EXAMPLE

GIVEN:

LABOR BUDGET = $15,000

CREW RATE = $150/HR

CONCRETE = 1,000 CY

FIND:

PRODUCTION RATE (CY CONCRETE/CREW HOUR)

EXAMPLE:

1. PR X LB = CR X Q

2. PR(CY/HR) X $15,000 = $150/HR X 1000CY

$$PR(CY/HR) = \frac{\$150/HR \times 1000CY}{\$15,000}$$

PR = 10 CY/HR

Shown above is an example using the UEF. Let's say the labor budget is $15,000, your crew cost is $150/hr, and there are 1,000 cubic yards of concrete placement. With the UEF, you can calculate a production rate to stay within budget and schedule.

In the above example, the formula is written, values are substituted, the equation is solved, computations are checked, and the answer is underlined. The production rate for this crew is 10 cubic yards/hour. If you were using 8 hour work days for durations, the production would be 80 cubic yards/day.

All things being equal, and the crew producing 10 cubic yards/hour, this crew will finish within budget, schedule, and scope. Remember:

1. Crews are constantly changing so you must recalculate the production rates for a revised crew size.

2. At all times, the foreman should know the crew's production rate.

CASE STUDY: CONSTRUCTION PRODUCTIVITY IMPROVEMENT

Problem #1: Universal Estimating Formula

You are the working foreman of a four man crew, installing metal stud wall in a three story, two building 50,000 SF condominium project. Calculate production rates and crew budget using the universal estimating formula. Best approach is to: (1) Write the formula, (2) substitute numbers, (3) solve, (4) check computations, and (5) underline the answer. The universal estimating formula is:

PR (UNITS/HR) x LB ($) = CR ($/HR) X Q (UNITS)

OR

PR X LB = CR X Q

Problem 1-1: Production Rate: Before the job you obtain the following information from the job estimate and budget. Calculate the crew's production rate.

Given:

Foreman	$40.00/Hr
2 - Carpenters	$50.00/Hr
1 - Helper	$10.00/Hr
Crew Rate	$100.00/Hr
Labor Budget	$150,000
Quantity	30,000 LF stud wall

Find: Production rate in LF stud wall/crew hour

Problem 1-2: Revised Production Rate: After the first month, you review the job cost report and find that you have spent 25% of the budget but only completed 20%. Calculate the new production rate necessary to get back on budget and schedule.

Given:

Crew Rate	$100/Hr
Spent Labor Budget ..	25%
Progress Quantity ..	20 %

Find: Revised production rate in LF stud wall/crew hour

Problem 1-3: Changed Labor Budget: At 50% complete you are back on schedule, but the superintendent tells you the crew is being cut by one carpenter. Calculate your new production rate?

Given:	Foreman	$40.00/hr
	1 - Carpenter	$25.00/hr
	1 - Helper	$10.00/hr
	Crew Rate	$75.00/hr
	Labor Budget	$75,000
	Quantity	15,000 LF stud wall
Find:	Production rate in LF stud wall/crew hour	

Problem 1-4: Change Order Budget: Upon nearing completion, the superintendent asks you to estimate the labor budget of a separate change order encompassing 5,000 LF using a one carpenter and one helper. You estimate the production rate at 15 LF/crew hour. Calculate the change order budget.

Given:	1 - Carpenter	$25.00/hr
	1 - Helper	$10.00/hr
	Crew Rate	$35.00/hr
	Production Rate ...	15 LF/crew hour
	Quantity	5,000 LF Stud Wall
Find:	Budget amount.	

CASE STUDY: CONSTRUCTION PRODUCTIVITY IMPROVEMENT

Solution #1: Universal Estimating Formula

Problem 1-1: Production Rate

PR X LB = CR X Q

PR X $150,000 = $100/HR X 30,000 LF

$$PR = \frac{\$100/HR \times 30,000\ LF}{\$150,000}$$

PR = 20 LF/HR

Problem 1-2: Revised Production Rate

Remaining Budget = 0.75 x $150,000 = $112,500
Remaining Units = 0.80 x 30,000 LF = 24,000 LF

PR X LB = CR X Q

PR X $112,500 = $100/HR X 24,000(LF Stud wall)

$$PR = \frac{\$100/HR \times 24,000\ LF}{\$112,500}$$

PR = 21.3 LF/HR

Problem 1-3: Changed Labor Budget

Remaining Budget = 0.50 x $150,000 = $75,000
Remaining Quantities = 0.50 x 30,000 LF = 15,000 LF

PR X LB = CR X Q

LF/HR X $75,000 = $75/HR X 15,000 LF

$$LF/Hr. = \frac{\$75/HR \times 15,000\ LF}{\$75,000}$$

Production Rate = 15.0 LF/HR

Problem 1-4: Change Order Budget

PR X LB = CR X Q

15(LF/HR) X LB = $35/HR X 5,000 LF

$$LB = \frac{\$35/HR \times 5,000\ LF}{15\ (LF/HR)}$$ >> OR >> Labor Budget = $11,667

LESSON #2 PLANNING AND MAINTAINING PRODUCTION

OBJECTIVES

1. SUBCONTRACT SCHEDULE OF VALUES
2. 30-60 DAY SCHEDULE
3. NOTIFICATION

This lesson explains how to plan and monitor production using the subcontract schedule of values and the thirty-day schedule. Discussed also is the importance of notifications when production delays occur and you need to get back on track.

Job coordination and control becomes easier with an easily understood schedule. With better planning at the outset, you can anticipate problems more easily and take corrective action sooner.

The two major ways to schedule and maintain production are by (1) a subcontract schedule of values, and (2) a 30-60 day schedule. Contractors of all sizes and types report these two schedules are essential for improving the bottom line.

1. Have you ever seen or used a subcontract schedule of values, and/or a thirty-day schedule?

2. Was there ever a situation where you were behind and needed to notify a subcontractor or supplier? How did you do so?

CPI PROFIT TIP #2

JOBS THAT ARE PLANNED WELL TEND TO FINISH

TO BUDGET, SCHEDULE, AND SCOPE

Early planning is probably the most important aspect of job management. By taking the time to think through each aspect of the project, many possible pitfalls can be identified and eliminated before they occur. Prior job planning should not be rushed because a little time spent in the beginning usually prevents possible large production losses later.

Good planning is merely first putting your thoughts on paper. Effective pre-job planning pays off because the job has not begun. Paper and pencil corrections are less expensive compared to correcting costly mistakes during the job. For example, it's easy to list all the materials before beginning work, rather than waiting until the day before and experiencing delays from materials shortages.

In the following pages you will learn why the schedule of values and the 30-60 day schedule help production, what they consist of, and how to use them.

1. What types of delays and cost overruns can be anticipated through detailed pre-job planning?

2. What construction activities or tasks best lend themselves to pre-job planning?

WHY A SUBCONTRACT SCHEDULE OF VALUES HELPS PRODUCTION

1. DEVELOPED JOINTLY BY GENERAL CONTRACTOR AND SUBCONTRACTOR
2. ESTABLISHES A "MEETING OF THE MINDS" BETWEEN THE GENERAL CONTRACTOR AND THE SUBCONTRACTOR
3. FORCES THE GENERAL CONTRACTOR AND SUBCONTRACTOR TO PLAN TOGETHER, ALONG WITH OTHER SUBCONTRACTORS AND SUPPLIERS
4. INCLUDED AS PART OF THE SUBCONTRACT
5. HELPS IN MONITORING START AND FINISH TIMES, CREW MANNING, AND PRODUCTION RATE
6. PROVIDES AN ACCURATE MEANS OF EVALUATING PAYMENT FOR PORTIONS OF THE WORK COMPLETED
7. PROVIDES VALUABLE INFORMATION FOR ESTIMATING AND PLANNING FUTURE JOBS

A subcontract schedule of values lists each major item of work and its costs. Other critical information is listed such as start and finish times, crew sizes, and production rates.

First, the schedule of values establishes a "meeting of the minds" which helps determine the scope and schedule of the project. Second, the general contractor and the subcontractor must work together in planning the schedule of values and integrate this with other subcontract schedules. Third, the schedule of values aids in monitoring start and finish times, crew manning, and production rates. Finally, by using the schedule of values, the payment draws are more correctly calculated, thus insuring proper payment and lessening disputes over what is to be paid.

1. What are the advantages of having the general contractor and the subcontractor plan the work together?

2. What other reasons do you see that make a schedule of values help production?

SUBCONTRACT SCHEDULE OF VALUES

1. COST CODE: 0331-2-J
2. CSI DIVISION: 0331
3. TASK: CONCRETE SLAB
4. QUANTITY: 400
5. UNITS: CUBIC YARDS
6. START DATE: 2/24/92
7. FINISH DATE: 2/28/92
8. DURATION: 5 DAYS
9. CREW SIZE: 5 MEN
10. MAN/CREW HOURS/DAYS: 5 CREW DAYS
11. PRODUCTION RATE: 80 CY/CREW DAY
12. BUDGET: $20,000
13. PERCENT THIS MONTH: 50%
14. PERCENT LAST MONTH: 0%
15. PERCENT PAYMENT: 50%
16. PAYMENT: $20,000
17. REMARKS: DEPENDENT ON 30 DAY CYLINDER TEST

When completing the subcontract schedule of values you should make certain all information is correct. An incorrect schedule of values will make the 30-60 day schedule incorrect. To calculate the daily production divide the quantity by the number of days (400 CY/5 days) = 80 CY/Day. To calculate the payment multiply the percent payment by the costs (50 % x $20,000) = $10,000.

Figure 2.1 Schedule of Values

SCHEDULE OF VALUES					
Job: #101 Jones Home		No. 101-92		Date: 2/2/92	
Subcontractor: ABC Concrete		Start: 2/24/92		Finish: 2/28/92	
1. Cost Code	0331-2J				
2. CSI Division	0331				
3. Task	Concrete Slab				
4. Quantity	400				
5. Units	CY				
6. Start Date	2/24/92				
7. Finish Date	2/18/92				
8. Duration	5 Days				
9. Crew Size	5 Men				
10. Crew Hours/ Days	5 Crew Days				
11. Production Rate	80 CY/ Day				
12. Budget ($)	$20,000				
13. % This Mon.	50%				
14. % Last Mon.	0%				
15. % Payment	50%				
16. Payment ($)	$10,000				
17. Remarks	Dependent on 30 day cylinder test				

WHY A 30-60 SCHEDULE HELPS PRODUCTION

1. DEVELOPED JOINTLY BY GENERAL CONTRACTOR AND SUBCONTRACTOR

2. ESTABLISHES A "MEETING OF THE MINDS" BETWEEN THE GENERAL CONTRACTOR AND THE SUBCONTRACTOR

3. FORCES THE GENERAL CONTRACTOR AND SUBCONTRACTOR TO PLAN TOGETHER, ALONG WITH OTHER SUBCONTRACTORS

4. INCLUDED AS PART OF THE SUBCONTRACT

5. HELPS IN MONITORING CONTROL ITEMS, SUCH AS PRODUCTION RATES

6. PROVIDES AN ACCURATE MEANS OF EVALUATING PAYMENT FOR PORTIONS OF THE WORK COMPLETED

7. PROVIDES VALUABLE INFORMATION IN ESTIMATING AND PLANNING FUTURE JOBS

The 30-60 day schedule is a bar chart listing each item of the subcontract schedule of values to be done each day. Other critical information is monitored such as production rates.

The advantages of the 30-60 day schedule are several. The schedule of values coordinates subcontractors as it requires prior planning as to which subcontractors work each day. It helps identify what materials must be available. By keeping the schedule up to date, you can easily identify what tasks are behind. Finally, it helps in comparing planned versus actual production.

The comparisons that can be made are between planned and actual: budget, schedule, quantities, crew/labor hours, and daily production. Remember these principles:

1. Know at all times the status of work when using the 30-60 day schedule.

2. Post the schedule on site to act as a control.

3. Update the schedule on a daily basis.

4. Use the schedule as a legal record.

30-60 DAY SCHEDULE

1. TASK: CONCRETE SLAB

2. DURATION: 5 DAYS

3. PLANNED PRODUCTION CONTROL ITEMS

- QUANTITY:	400 CY
- CREW SIZE:	5 MAN CREW
- MAN/CREW HOURS/DAYS:	5 CREW DAYS
- PRODUCTION RATE:	80 CY/DAY
- BUDGET:	$20,000

4. DELAY CODES

C = CHANGE ORDERS
D = DESIGN PROBLEMS
E = EQUIPMENT
I = INSPECTIONS
L = LABOR
M = MATERIALS
R = REWORK
S = SUBCONTRACTS
W = WEATHER
0 = OTHER

The 30-60 schedule assists in establishing days to be worked for each activity, as well as, recording critical items. Furthermore, the schedule is easy to read when looking at start and finish times, crew manning, and production rates. Finally, and perhaps most importantly, it forces the general contractor to coordinate subcontractors.

The 30-60 day schedule is taken from the master schedule, and is updated daily. It is initially prepared for 60 days and is reviewed every 30 days. It can also be used for notification if a subcontractor is not following the contract.

Figure 2.2 30-60 Day Schedule

30 - 60 DAY SCHEDULE												
Task	Quantity	Crew Size	Hours Days	Prod. Rate	Cost ($)	Mon. 2/24	Tue. 2/25	Wed. 2/26	Thu. 2/27	Fri. 2/28	Sat. 2/28	Sun. 3/1
Con-crete	400 CY	5 Men	5 Crew Days	80 CY /Day	$20, 000							
							100CY	100CY	100CY	100CY		

Shaded lines on the top indicates days scheduled. The shaded lines below indicates the days worked. The daily production is recorded below each day.

IMPORTANCE OF NOTIFICATION

1. NOTIFY SUBCONTRACTOR OF EACH AND EVERY DAY OF NO SHOW

2. NOTIFY ESPECIALLY IF MORE THAN 3% BEHIND SCHEDULE (SO PROBLEMS DO NOT GET OUT OF HAND)

3. SEND CERTIFIED/RETURN RECEIPT REQUESTED LETTER DAILY UNTIL PROBLEM IS CORRECTED

4. DOCUMENT NON-PERFORMANCE

5. PROTECT YOUR BACK CHARGE, CHANGE ORDER, DISPUTE, AND CLAIM RIGHTS

6. RECORD FOR BACK CHARGES, CHANGES, OR CLAIMS

Many contractors have difficulty with notifying others of non-performance. Mature business persons know the wisdom of notifications and the importance of protecting their legal and monetary rights.

Use notifications whenever there is a shortfall in any production control items such as under manning, underpayment, etc. Notify at the first instance of lost production, even if the job is undermanned for one day. If the job gets behind by 3% or more, you need to notify immediately so problems do not escalate.
When notifying, send a CERTIFIED/RETURN RECEIPT REQUESTED LETTER daily, until the problem has been corrected and production is back on schedule. Certified return receipt requested letters are a good legal means of documenting notification of non-performance. Furthermore, a daily notice is a complete and accurate record of each day of non-performance. By notifying, you have a record for back charges, changes, and claims.
Remember:

1. Set up an account with Western Union for quick delivery of your daily notices.

2. When notifying, you want to tell the subcontractor to "comply with the contract" and state why. For example, "The job is presently being undermanned. Please comply with the contract."

3. Always conclude with the following sentence. "Failure to comply may result in damages for delay or extension of time, or both. Please govern your actions accordingly."

CASE STUDY: PRODUCTIVITY IMPROVEMENT

Problem #2: 30-60 Day Schedule

You are the general foreman for a HVAC subcontractor completing work on a 50,000 SF condominium project. Your job description requires scheduling the work from the schedule of values, tracking daily production, and estimating the monthly payment from the schedule of values. Below is the current schedule of values for the last week of work.

SCHEDULE OF VALUES				
Job: Condominium		No. 101-92		Date: 6/30/92
Subcontractor: ABC HVAC		Start: 6/01/92		End:6/05/92
1. Cost Code	0157-250	0157-290	0157-425	0157-185
2. CSI Division	0157-250	0157-290	0157-425	0157-185
3. Task	Insulated Ducting	Vents & Returns	Controls	HVAC Units
4. Quantity	500	50	10	2
5. Units	LF	Units	Units	Units
6. Start Date	6/1	6/1	6/4	6/4
7. Finish Date	6/5	6/5	6/5	6/5
8. Duration	5 Days	5 Days	2 Days	2 Days
9. Crew Size	5 Men	2 Men	2 Men	3 Men
10. Man/Crew Days/Hrs.	200 Hrs.	80 Hrs.	32 Hrs.	48 Hrs.
11. Production Rate	100 LF /Day	10 Units /Day	5 Units /Day	1 Unit /Day
12. Budget ($)	$10,000	$2,000	$2,500	$4,000
13. % This Mon.				
14. % Last Mon.	0%	0%	0%	0%
15. % Payment				
16. Payment ($)	$10,000	$2,000	$2,500	$4,000
17. Total ($)				

Problem #2-1: 30-60 Day Schedule

Using the schedule of values previously provided complete the 30-60 day schedule below. The X's refer to the control item to be monitored daily to track production.

30 - 60 DAY SCHEDULE												
Task	Quantity	Crew Size	Man Hours	Prod. Rate	Cost ($)	Mon. 6/1	Tue. 6/2	Wed. 6/3	Thu. 6/4	Fri. 6/5	Sat. 6/6	Sun. 6/7
Duct												
				X								
Vent												
	X											
Controls												
		X										
HVAC												
					X							

Solution #2-1: 30-60 Day Schedule

Below is an example of how the 30-60 schedule is developed and how the job was posted for the week of June 1-7.

30 - 60 DAY SCHEDULE

Task	Quantity	Crew Size	Man Hours	Prod. Rate	Cost ($)	Mon.	Tue.	Wed.	Thu.	Fri.	Sat.	Sun.
						6/1	6/2	6/3	6/4	6/5	6/6	6/7
Duct	500 LF	5 Men	200	100 LF/ Day	10,000							
				X		100	100	100	100	100		
Vent	50 Units	2 Men	80	10/ Day	2,000							
	X						10	15	15	10		
Controls	10 Units	2 Men	32	5/Day	2,500							
		X								2	2	
HVAC	2 Units	3 Men	48	1/Day	4,000							
					X						2K	2K

CASE STUDY: PRODUCTIVITY IMPROVEMENT

Problem #2-2: Schedule of Values Payment

Using the solution to the 30-60 day schedule on the previous page complete the monthly payment from the schedule of values on the first page of this problem. Check your answer with the solution on the next page.

CASE STUDY: PRODUCTIVITY IMPROVEMENT

Solution #2-2: Schedule of Values Payment

Since you completed all the work for the month's schedule of values you should have 100% complete and be paid the full amount due for each scheduled item of work, assuming that the work was correctly installed and you passed all inspections.

SCHEDULE OF VALUES				
Job: Condominium		No. 101-92		Date: 6/30/92
Subcontractor: ABC HVAC		Start: 6/01/92		End:6/05/92
1. Cost Code	0157-250	0157-290	0157-425	0157-185
2. CSI Division	0157-250	0157-290	0157-425	0157-185
3. Task	Insulated Ducting	Vents & Returns	Controls	HVAC Units
4. Quantity	500	50	10	2
5. Units	LF	Units	Units	Units
6. Start Date	6/1	6/1	6/4	6/4
7. Finish Date	6/5	6/5	6/5	6/5
8. Duration	5 Days	5 Days	2 Days	2 Days
9. Crew Size	5 Men	2 Men	2 Men	3 Men
10. Man/Crew Days/Hrs.	200 Hrs.	80 Hrs.	32 Hrs.	48 Hrs.
11. Production Rate	100 LF /Day	10 Units /Day	5 Units /Day	1 Unit /Day
12. Budget ($)	$10,000	$2,000	$2,500	$4,000
13. % This Mon.	100%	100%	100%	100%
14. % Last Mon.	0%	0%	0%	0%
15. % Payment	100%	100%	100%	100%
16. Payment ($)	$10,000	$2,000	$2,500	$4,000
17. Total ($)				$18,500

LESSON #3 JOB ORGANIZATION

OBJECTIVES

1. SITE PREPARATION
2. SITE LAYOUT

This lesson explains the important items to consider in site organization that will avoid delays and improve production. We will especially focus on site preparation and site layout.

Why is site organization so important for increased productivity? Because, if you begin a job with a poor organization, the lack of site preparation and layout will always be working against your crew. For example, if you do not spot materials close to the work area, your crew wastes valuable time in moving the materials closer to the work space.

CPI PROFIT TIP #3

CONTRACTORS CAN MAKE MORE MONEY BY

EFFICIENT SITE PREPARATION AND JOB LAYOUT

THAN BY SHOPPING FOR THE LOWEST PRICE

By taking the time to think through a project, a contractor can generally avoid costly delays and cost overruns. A detailed and thorough site preparation and job layout can probably save a contractor as much money as by shopping for the lowest subcontractor bids. This is not to say that one should not always try to obtain the lowest prices possible in order to keep your bid competitive. But a poorly organized site will make not make much profit, regardless of low quotes.

1. Does your company have a standard procedure for organizing job preparation and layout?

2. What items are important to consider in organizing job preparation and layout?

WHY JOB ORGANIZATION IMPROVES PRODUCTION		
1.	INEXPENSIVE	- PLANS ON PAPER FIRST
2.	ANTICIPATES PROBLEMS	- CAN FORESEE CONFLICTS
3.	DEVELOPS SOLUTIONS	- MAY COME UP WITH A MORE PROFITABLE ALTERNATIVE
4.	COORDINATES TRADES	- PROVIDES SUFFICIENT CREW SPACE
5.	COMMUNICATES SOLUTIONS	- SHOWS ON PAPER HOW SITE IS ORGANIZED

By first sketching your site and job layout before beginning work production is improved in several ways. Planning on paper first is inexpensive. You can easily revise your approach without going thorough expensive and time consuming mistakes.

The solution is right on the paper. As you organize your job on paper you can see potential problems and develop solutions for these problems. Job organization also coordinates trades which is vital on larger projects and jobs with limited work space.

1. Do you believe the general contractor should thoroughly plan the job organization?

2. Is it useful for subcontractors to have a copy of the site and work layout so they can see the movement of crews and materials on and off the job?

PRIME CONTRACTOR LAYOUT RESPONSIBILITIES

1. HORIZONTAL & VERTICAL CONTROL

2. MOVEMENT OF MANPOWER & MATERIALS WITHIN, ON TO, AND OFF OF THE JOB SITE

The general contractor is responsible for the horizontal and vertical control of the job. Horizontal control means locating the building and laying out the interior work, such as the location of major shafts and walls. Vertical control is locating items in the vertical plane such as floor slabs windows. Control is necessary for subcontractors to locate where they are to do their work.

The general contractor is responsible for when crews come on the site, including where their materials are to be stored or located during work. Efficient control here eliminates conflicts such as crowded work space.

1. Do you see the advantages of an accurate and detailed horizontal and vertical control? What are the advantages?

2. Have you ever been on a job without sufficient horizontal and vertical control? What problems occurred?

3. Have you ever worked on a job where having materials stored close by helped production? What advantages were they?

SITE PREPARATION

1. PERMITS (INCLUDING ENVIRONMENTAL)
2. SITE ACCESS
3. UNDERGROUND UTILITIES
4. SITE UTILITIES
5. ADJACENT BUILDINGS
6. FENCING
7. COMMUNICATIONS
8. CONTROL POINTS
9. SAFETY AND ACCIDENT PREVENTION
10. FIRE PROTECTION

Site preparation consists of laying out the site so as to minimize movement of manpower, materials, and machines once work begins. A great part of site layout concerns checking out the site beforehand to allow sufficient time to have important items ready when needed, such as utilities and telephone.

1. Can you add other items to the above list that are important to have ready before you begin work?

2. In the above list, which items are the general contractor's responsibility and which are the subcontractor's responsibility? Which are both parties' responsibility?

SITE LAYOUT

1. JOB ENTRANCE
2. JOB TRAILER
3. PERSONAL VEHICLE PARKING
4. SUBCONTRACTOR TRAILERS
5. SUBCONTRACTOR MATERIALS STORAGE
6. DRINKING WATER
7. TOILETS
8. PEDESTRIAN WALKWAYS AND OVERHEAD PROTECTION
9. EQUIPMENT TRAFFIC PATTERN
10. MATERIALS DISPOSAL

The subcontractors should know where their materials are to be stored and how much space they have available.A good practice for efficient site layout is to have the subcontractors provide information as to their space and item needs on the site. The general contractor can compile and revise this information into an efficient overall plan of site layout.

Site layout is where a great deal of money can be saved beforehand. Placement and storage of materials is important. Every time material is handled time is spent and money is lost; therefore, careful placement of materials is crucial. Ten essential site considerations are listed above.

1. Can you think of other items that are important in site layout?

2. What procedures does your company follow when laying out the site?

CASE STUDY: CONSTRUCTION PRODUCTIVITY IMPROVEMENT

Problem #3: Site Layout

You are the superintendent in charge of construction of a 50,000 SF two-building condominium project composed of structural concrete with block exterior walls.

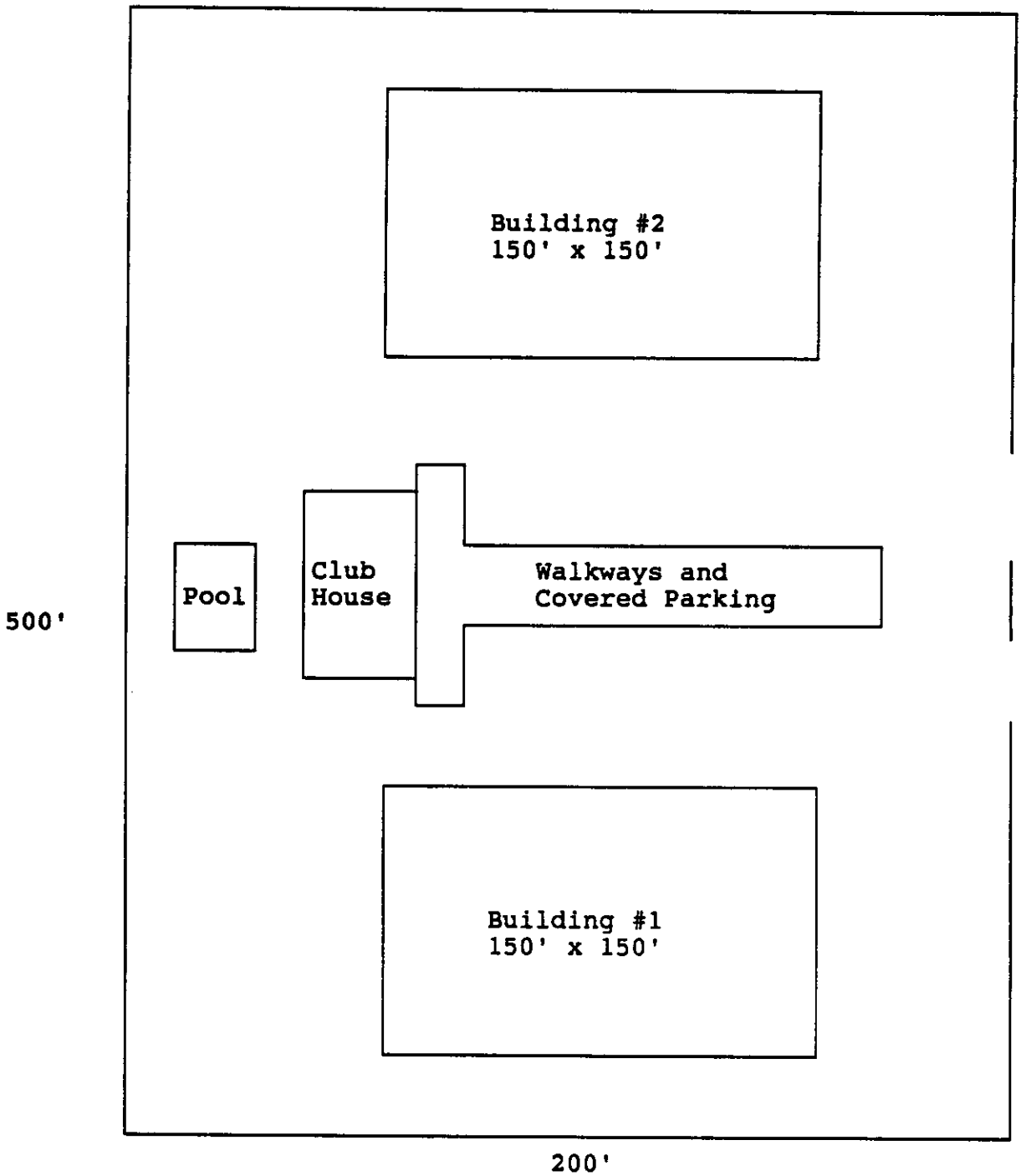
The site is in a restricted urban area adjacent to a major road. Because of this site congestion, you are able to build only one building at a time. There is no off-site parking and storage available.

The job must be turned over to the owner within 12 months. Building #1 must be completed in five months and building #2 by the end of the 10th month. The last two months will be for final site work, including pool, club house, parking, walkways, and landscaping. There is a $500 per day bonus or penalty for early or late completion.

You anticipate major problems of movement of manpower and materials onto the site. You decide to build on paper first by laying out the job site on paper. Using the attached schematic site number the location of the following items.

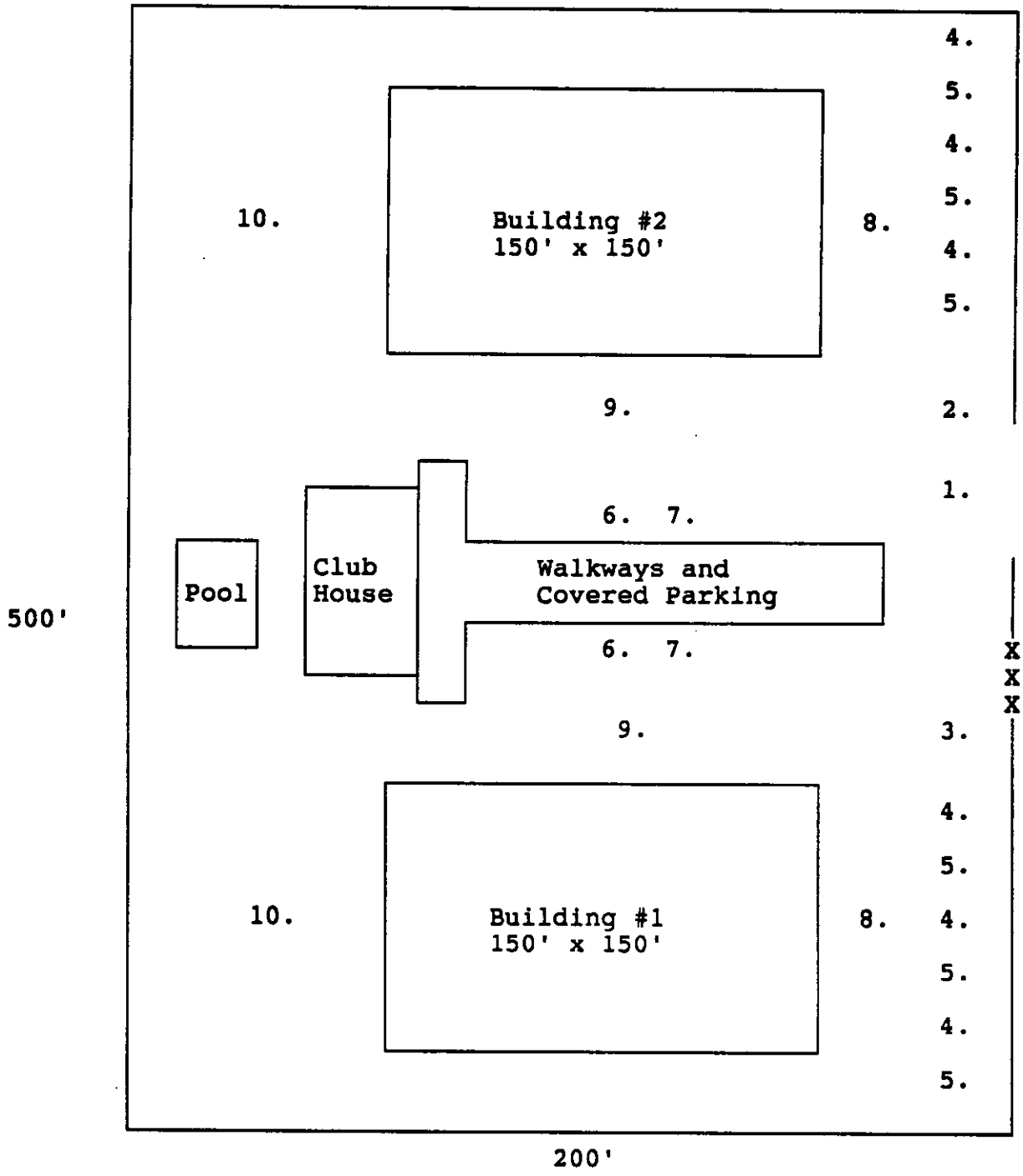
1. Job Entrance
2. Job Trailer
3. Personal Vehicle Parking
4. Subcontractor Trailers
5. Subcontractor Materials Storage
6. Drinking Water
7. Toilets
8. Hoist
9. Crane
10. Materials Disposal

Problem #3: Site Layout



1. Job Entrance
2. Job Trailer
3. Personal Vehicle Parking
4. Subcontractor Trailers (6)
5. Subcontractor Materials Storage (6)
6. Drinking Water (2)
7. Toilets (2)
8. Hoist (2)
9. Crane (2)
10. Materials Disposal (2)

Solution #3: Site Layout



1. Job Entrance
2. Job Trailer
3. Vehicle Parking
4. Subcontractor Trailers
5. Subcontractor Materials Storage
6. Drinking Water
7. Toilets
8. Hoist
9. Crane
10. Materials Disposal

LESSON #4 JOB LAYOUT

OBJECTIVES

1. TIMING
2. NOTIFICATION AND RESPONSE TIMES
3. JOB LAYOUT
4. WORKMANSHIP DETAILS

This lesson explains the information necessary for the crew to do its work in a productive manner. The foreman has a great deal of responsibility on a job site. It is vital that he has the appropriate information available to him at all times so that he can make informed decisions.

Information the foreman and crew must have are: timing information, notification and response times, work layout information, and workmanship details. This lesson explains each of these information requirements in detail.

CPI PROFIT TIP #4

SINCE YOU CANNOT READ MINDS, YOU NEED TO FIND OUT

WHAT HAS TO BE DONE

To successfully complete any job the contractor must know at all times what exactly must be done. Incorrect or lack of information can cause jobs to be delayed. Frequent meetings and checking coordination among the general and subcontractors are excellent ways of knowing what is happening on the job site and can eliminate communication shortfalls.

Problems often arise due to the repeating of information from the foreman to the crew. Sometimes, a foreman can forget important details or specifics are changed or left out all together.

1. What ways do you use to keep current?

2. How can you know exactly what following work must be completed on the job?

TIMING INFORMATION THE FOREMAN MUST KNOW

1. FINISH TIME OF PRECEDING CREW
2. START TIME OF OWN CREW'S TASK
3. DURATION OF OWN CREW'S TASK
4. FINISH TIME OF OWN CREW'S TASK
5. START TIME OF FOLLOWING CREW

A thorough understanding of timing requires the foreman to know: when the preceding crew is to be finished, the start time of his crew's task, the duration of his crew's task, the finish time of his crew's task, and start time of the following crew. This understanding is essential for proper, timely completion of the specified task. If the foreman doesn't completely understand the timing sequence, the job is likely to be delayed because it started late, took too long, or was not ready for the next crew.

1. Why is it important to know the activities of the preceding and following crews?

2. Should the crew be told the anticipated duration of their activity? Why or why not?

NOTIFICATION AND RESPONSE TIMES

LEAD TIME:	INCLUDES NOTIFICATION, RESPONSE, AND START TIMES
NOTIFICATION TIME:	TIME FOR FOREMAN TO PLAN AND ORDER 5 M'S (MANPOWER, MATERIALS MACHINERY, MONEY, AND MANAGEMENT INSPECTIONS)
RESPONSE TIME:	TIME FOR 5 M'S TO ARRIVE AT THE CREW'S WORK SPACE
START TIME:	TIME TO BEGIN WORK

Beginning work on time requires sufficient notice for the crew to begin work, called lead time. Lead time has three timing considerations. First, notification time or time to get ready to do work. Second, response time, time to arrive at the work area. Third, start time or time to begin work. Every company and task has different times for each lead time.

The foreman should be provided with a listing of all the notifications and response times. For example, the foreman must notify the company four days before using materials. Two days are for notification and two days are to respond by delivering materials to the site. Sufficient lead time will ensure that the project stays on schedule.

1. What are the advantages of knowing lead time, notification time, response time, and start time?

2. Does your company take into account notification and response times?

2. What are the advantages of knowing lead time, notification time response time, and start time?

WORK LAYOUT

1. KNOW LAYOUT DIMENSIONS
2. COORDINATE LAYOUT WITH OTHER TRADES
3. PRE-PLAN MATERIALS FLOW
4. HANDLE MATERIALS ONLY ONCE (IF POSSIBLE)
5. USE THE RIGHT TOOL FOR THE RIGHT JOB
6. USE THE RIGHT MAN FOR THE RIGHT TOOL
7. USE QUALIFIED WORKERS
8. PLAN AND GET FIRST 15 (LF, SF, CY) APPROVED BEFORE CONTINUING WORK

Accurate work layout allows the job to go as scheduled. For example, a masonry foreman needs to know where to build, as well as, the location of any openings and tie-in's. With this information, the foreman can begin to develop answers to questions of how much materials to use, who should do the work, and where to spot materials.

The foreman should know all of the above information before beginning work. This important work layout information is usually recorded on the short-interval schedule, explained in the last lesson.

Remember:

1. The foreman should have answers to all these items before the crew begins to work.
2. If any of this information is lacking it will result in the possibility of delay and/or poor workmanship.

WORKMANSHIP INFORMATION THE FOREMAN MUST KNOW

1. PRIOR CREW'S WORKMANSHIP STANDARDS
2. FOREMAN'S CREW WORKMANSHIP STANDARDS
3. FOLLOW-UP CREW'S WORKMANSHIP STANDARDS
4. MANPOWER REQUIREMENTS AS PER PROJECT SCHEDULE
5. MATERIALS REQUIRED AND SUPPLIED
6. QUALITY CONTROL STANDARDS
7. INSPECTION TIMES AND STANDARDS

To obtain agreement on workmanship standards, the first 15 feet of any work should be inspected by the general contractor and subcontractors, and when necessary the owner an the designer. This allows checking of the quality before a major amount of work is completed. Checking also ensures that the general contractor and subcontractor agree on workmanship standards. Finally, it helps the owner and the designer understand what workmanship the owner will receive for his money. Early agreement saves huge amounts of money later.

1. Have you ever had to go back and change work because the workmanship standard was not agreed upon?

2. What is the advantage of stating in the contract that the first 15 feet (lineal feet or yards, square feet or yards, or cubic feet or yards) be inspected?

CASE STUDY: CONSTRUCTION PRODUCTIVITY IMPROVEMENT

Problem #4: Foreman's Information Needs

You are the foreman for the masonry subcontractor on the two-building condominium project. In two weeks, you will begin the first floor exterior reinforced concrete. You have a four man masonry crew of four masons, one mason's helper plus yourself. You are a working foreman engaged in layout and setting corners.

Problem #4-1:

A. Timing Information: Join with the person next to you to work the following problem. One person assume the role of the masonry foreman and the other as the superintendent.

As the masonry foreman, list the major questions regarding timing you ask the superintendent upon arriving on the job for the first time. As superintendent, list some of the information you supply the foreman at the weekly job site meeting.

1. _____
2. _____
3. _____
4. _____
5. _____

B. Workmanship Information (1st Floor): As the masonry foreman list the major questions regarding workmanship you ask the superintendent upon arriving on the job for the first time. As superintendent list some of the workmanship information you supply the foreman at the weekly job site meeting.

1. _____
2. _____
3. _____
4. _____
5. _____

CASE STUDY: CONSTRUCTION PRODUCTIVITY IMPROVEMENT

Solution #4-1: Foreman's Information Needs

A. Foreman's Questions:

1. What crew do I follow?
2. What is the starting date and time?
3. How long do I have for this work?
4. When is the finish date?
5. What crews follow my work?

B. Superintendent's Answers:

1. Scope of work or target for the next week.
2. Status of subcontractor's materials
3. Status of subcontractor's materials.
4. Status of impinging or impending changes.
5. Trades that must be coordinated.

CASE STUDY: CONSTRUCTION PRODUCTIVITY IMPROVEMENT

Problem #4-2: Workmanship Information

Join with the person next to you to work the following problem. One person assume the role of the masonry foreman and the other as the superintendent.

As the masonry foreman list the major questions regarding workmanship you ask the superintendent upon arriving on the job for the first time. As superintendent list some of the workmanship information you supply the foreman at the weekly job site meeting.

A. Foreman's Questions:

1. _____

2. _____

3. _____

4. _____

5. _____

B. Superintendent's Answers:

1. _____

2. _____

3. _____

4. _____

5. _____

CASE STUDY: CONSTRUCTION PRODUCTIVITY IMPROVEMENT

Solution #4-2: Workmanship Information

A. Foreman's Questions:

1. What are the quality standards for this job?
2. Who inspects and when?
3. What materials are supplied by others and status?
4. What are the general problems with quality on this job?
5. What are inspection standards?

B. Superintendent's Answers:

1. Quality standards as per the contract.
2. Results of mockup inspection by A/E and owner.
3. Redone work or quality disputes.
4. Rejected or failed inspections.
5. Status of inspection schedule.

LESSON #5 MEETING THE LABOR BUDGET

OBJECTIVES

1. HOW TO KEEP SCORE ON THE LABOR BUDGET
2. FOREMAN'S LABOR BUDGET

In a prior lesson you learned how to keep on schedule by using a schedule of values and a 30-60 day schedule. In this lesson and the next you will learn how to keep score using the foreman's labor budget, labor time card, and the foreman's delay analysis. When correctly completed and used, these three forms are valuable tools for monitoring production and spotting the source of delays and cost overruns.

A practical exercise at the end of each lesson provides hands on experience in becoming familiar with these useful forms for improving production.

CPI PROFIT TIP #5

KEEPING SCORE ON THE LABOR BUDGET

HELPS SPOT DELAYS AND STAY WITHIN BUDGET

To build to budget, scope, and schedule the foreman must have a well understood target. For example, to accurately meet the labor budget, the foreman must know the labor hours for each task. The foreman also has to know the scope of work, including workmanship standards. The foreman must know when to begin work, how long to work, and when the job must be completed. Possibly, most important of all, the foreman must have a means of monitoring the labor hours in order to keep within the budget for each task.

HOW TO KEEP SCORE ON LABOR HOURS AND DELAYS

1. FOREMAN'S LABOR BUDGET
2. LABOR TIME CARD
3. FOREMAN'S DELAY ANALYSIS

In a prior lesson, you learned how to keep score by calculating the production rate and using schedules. The three principal ways to keep score on labor costs are the (1) foreman's labor budget, (2) labor time card, and (3) foreman's delay analysis.

1. The foreman's labor budget helps the foreman track labor hours against the budget. By seeing how hours are being spent and what hours remain, the foreman can better plan the work to keep within budget.

2. The labor time card helps the foreman identify whether the time spent is productive or non-productive.

3. The foreman's delay analysis helps the foreman identify the weekly productive and non-productive time.

This lesson emphasizes how to keep score with the foreman's labor budget.

WHY THE FOREMAN'S LABOR BUDGET HELPS KEEP SCORE

1. PROVIDES THE FOREMAN WITH A LABOR HOUR TARGET
2. TRACKS DAILY HOURS WORKED ON EACH TASK
3. SHOWS TOTAL WEEKLY HOURS
4. SHOWS REMAINING HOURS
5. COMPARES PERCENT MAN HOURS SPENT TO PERCENT TASK COMPLETION
6. INDICATES WHERE JOB IS OVER BUDGET
7. FORCES FOREMAN AND SUPERVISOR TO ACT

Profitable contractors report that foremen adequately tracking labor hours are a major factor in increasing production which in turn improves the bottom line.

At first, the idea of providing the foreman with the means of tracking labor costs may seem simple. Actually its revolutionary. Many firms do not wish the foreman or anyone else to know the labor hours for each task. Contractors fear that competitors may learn of the task's labor hours. Actually, the man hours per task is important, but each job is different. Crew composition, skill, and labor rates vary between companies. Therefore, labor productivity varies between jobs, so the man hours for a task is not such critical information as it would first appear.

Best is to let the foreman know what is expected in man hours per task and provide the means of tracking hours, than to not provide any information at all and hope the crew stays within budget.

1. Is your company afraid that the estimated man hours per task might provide competitors with an unfair advantage?

2. Does your company provide the foreman with information as to each task's man hours?

FOREMAN'S LABOR BUDGET

1. JOB NUMBER AND TITLE
2. SUPERVISOR'S NAME
3. WORK PERIOD
4. COST CODE
5. CONSTRUCTION TASK
6. MAN HOURS BUDGETED
7. PRIOR MAN HOURS
8. PRIOR MAN HOURS REMAINING
9. DAILY MAN-HOURS
10. MAN HOURS THIS WEEK
11. MAN HOURS TO DATE
12. MAN HOURS REMAINING
13. PERCENT MAN HOURS SPENT
14. PERCENT ESTIMATED COMPLETE
15. PERCENT OVER OR UNDER BUDGET

Look at the sample foreman's labor budget on the next page.

Figure 5.1 Foreman's Labor Budget

FOREMAN'S LABOR BUDGET						
Job: #101 Jones Home		Foreman: A. Smith			Date: 3/18	
Cost Code		3110	3110	3200	3300	3305
Task		Forms	Strip	Steel	Conc.	Cure
1. MH Budget		500	100	500	200	100
2. Prior MH		300	20	200	50	20
3. Prior MH Remaining		200	80	300	150	80
Monday	3/11	50				
Tuesday	3/12		20			
Wednesday	3/13			50		
Thursday	3/14				25	
Friday	3/15					10
Saturday	3/16					
Sunday	3/17					
4. MH This Week		50	20	50	25	10
5. MH to Date (2+4)		350	40	250	75	30
6. MH Remaining (1-5)		150	60	250	125	70
7. % MH Spent (5/1)		70%	40%	50%	37%	70%
8. % Complete Estimate		80%	30%	70%	55%	65%
9. % Over/Under (8-7)		10%	-10%	+20%	+18%	-5%
Foreman s/ A. Smith						

The foreman estimates row #8 - % complete estimated. For example, under the forming task, the estimated percent complete for the week is 80%. To determine the % over or under, subtract the man hours spent from the % complete estimated. For example, the forming task is (80% - 70%) or 10 % under budget.

HOW TO GET THE FOREMAN'S LABOR BUDGET STARTED

1. USE FORM IN THIS MANUAL AND REVISE FOR YOUR COMPANY'S NEEDS
2. PRINT FORM WITH COST CODES AND TASKS ON THE BACK OF FORM
3. TRAIN FOREMEN TO USE LABOR BUDGET
4. STRESS THE NEED FOR ACCURATE REPORTING FOR ESTIMATING
5. REQUIRE LABOR BUDGET FORM'S USE AND CHECK
6. REVIEW FORMS EACH WEEK
7. TAKE ACTION ON TASKS THAT ARE GOING OVER LABOR BUDGET
8. REWARD GOOD PERFORMANCE

Things get done that management wishes to get done. Only you as a manager can convey the importance of completing within the labor budget. By developing a labor budget and training foremen in its use, you send a big message on the need to control labor costs.

You can only reap the rewards of the foreman's labor budget by insuring that all concerned know how to use the form effectively. The first step to insure payback is to train your supervisors in the form's use.

Stress that you are more interested in learning how the job is going than in correcting the foreman for poor job management. Stress that accurate cost reporting is necessary for estimating.

After training, each week review job progress by reviewing each completed labor budget for the week. When labor overruns start to occur, take appropriate action.

Finally, reward those foreman who complete within budget.

CASE STUDY: CONSTRUCTION PRODUCTIVITY IMPROVEMENT

Problem #5: Foreman's Labor Budget

You are the concrete foreman on the two building condominium project. Shown below is the labor budget for the week, indicating the hours worked by your crew and your estimated percent complete. Complete the form to determine how much ahead or behind the labor budget you are for each construction tasks.

FOREMAN'S LABOR BUDGET						
Job: Condominium		Foreman: A. Smith			Date: 3/18	
Cost Code		3110	3110	3200	3300	3305
Task		Forms	Strip	Steel	Conc.	Cure
1. MH Budget		500	100	500	200	100
2. MH to Date		300	20	200	50	20
3. MH Remaining						
Monday	3/11	100				
Tuesday	3/12		40			
Wednesday	3/13			100		
Thursday	3/14				50	
Friday	3/15					20
Saturday	3/16					
Sunday	3/17					
4. MH This Week						
5. MH to Date (2+4)						
6. MH Remaining (1-5)						
7. % MH Spent (5/1)						
8. % Complete		80%	30%	70%	55%	65%
9. % Over/Under (8-7)						
Foreman s/ A. Smith						

CASE STUDY: CONSTRUCTION PRODUCTIVITY IMPROVEMENT

Solution #5: Foreman's Labor Budget

Notice that you are ahead in placing steel, pouring concrete, and curing, but behind in stripping.

FOREMAN'S LABOR BUDGET						
Job: Condominium		Foreman: A. Smith			Date: 3/18	
Cost Code		3110	3110	3200	3300	3305
Task		Forms	Strip	Steel	Conc.	Cure
1. MH Budget		500	100	500	200	100
2. MH to Date		300	20	200	50	20
3. MH Remaining		200	80	300	150	80
Monday	3/11	100				
Tuesday	3/12		40			
Wednesday	3/13			100		
Thursday	3/14				50	
Friday	3/15					20
Saturday	3/16					
Sunday	3/17					
4. MH This Week		100	40	100	50	20
5. MH to Date (2+4)		400	60	300	100	60
6. MH Remaining (1-5)		100	40	200	100	40
7. % MH Spent (5/1)		80%	60%	60%	50%	60%
8. % Estimate Complete		80%	30%	70%	55%	65%
9. % Over/Under (8-7)		0%	-10%	+10%	+5%	+5%
Foreman s/ A. Smith						

LESSON #6 DISCOVERING PRODUCTION DELAYS

OBJECTIVES

1. LABOR TIME CARD
2. FOREMAN'S LABOR ANALYSIS

Keeping track of labor hours is a major aid to finishing within budget, but more is required to increase production. You must discover the production bottle necks on each job.

This lesson describes a common sense, contractor tested approach to recording and analyzing other labor hours that provide meaningful answers on how to increase production. Using the labor time card and foreman's labor analysis, you will learn the real reasons for delays and cost overruns. Armed with this valuable information, you can take meaningful corrective action. In the long run, if you keep taking corrective action, you will drive efficiency to the razor's edge and improve the bottom line.

CPI PROFIT TIP #6

GETTING BEHIND THE NUMBERS ALLOWS YOU TO AVOID

DELAYS AND COST OVERRUNS

There is an old, construction saying, "Getting behind the numbers will set you free." Just identifying a percent over budget for a task is not enough. You must learn the reasons for production bottle necks. Armed with the actual cause for a delay you are in a position to take intelligent corrective action. For example, if the delay is caused by materials you can insure materials are on the job beforehand. If the delay is due to lack of skilled labor, you are in the position to assess what it is costing you not to have the job manned correctly.

Making it easier to get behind the numbers is the purpose of the labor time card and the foreman's labor analysis. Both these forms record sufficient information for any company to learn where they need to improve field production.

WHY THE LABOR TIME CARD HELPS KEEP SCORE

1. TRACKS LABOR HOURS BY CONSTRUCTION TASK
2. TELLS WHAT IS YOU MOST PRODUCTIVE WORK
3. RECORDS PRIMARY REASONS FOR DELAYS AND COST OVERRUNS
4. PROVIDES INFORMATION TO IMPROVE PRODUCTION
5. GIVES FEEDBACK TO ESTIMATING
6. REQUIRED FOR CHANGE ORDERS AND DIRECTED CHANGES
7. REQUIRED FOR CLAIMS
8. IMPROVES THE BOTTOM LINE

Every construction company has some type of labor time card. Time cards are required for pay and workers insurance. The labor time card recommended in this workshop is an improvement on the traditional type of time card used in most companies.

First, regardless of the type of time card used, all time cards should have the cost codes printed on the back. Time cards with pre-printed cost codes can provide sufficient information to document and better justify claims. Pre-printed cost codes also insure more accurate labor cost reporting.

Second, by recording reasons for lost production, you accurately pinpoint the cause for cost overruns. Again, you have the most accurate documentation possible, further supporting your case for changes, disputes, and claims.

Finally, the labor time card provides data for the foreman's labor analysis.

WORKER'S TIME CARD

1. JOB NUMBER AND TITLE
2. SUPERVISOR'S NAME
3. DATE
4. COST CODE
5. CONSTRUCTION TASK
6. MAN HOURS THIS WEEK
7. MAN HOURS NON PRODUCTIVE
8. MAN HOURS PRODUCTIVE
9. PERCENT PRODUCTIVE HOURS
10. PERCENT NON-PRODUCTIVE
11. REASON FOR DELAY

Refer to the labor time card on the next page.

Figure 6.1 Labor Time Card

LABOR TIME CARD						
Name: W. White		SSN: 213-34-5678			Initials:	
Job: #101 Jones Home		Foreman: A. Smith			Date: 3/18	
Cost Code		3110	3110	3200	3300	3305
Task		Forms	Strip	Steel	Conc.	Cure
Monday	3/11	6				
Tuesday	3/12		6			
Wednesday	3/13			6		
Thursday	3/14				6	
Friday	3/15					6
Saturday	3/16					
Sunday	3/17					
1. MH This Week		6	6	6	6	6
2. MH Non-Productive		2C 2L	2I	4M	4M	2I
3. MH Productive (1-2)		2	4	2	2	4
4. % Productive (3/1)		33%	67%	33%	33%	67%
5. % Non-Productive (2/1)		67%	33%	67%	67%	33%

C = Change 2	D = Design	E = Equip.	I =Inspect. 4	L = Labor 2
M = Mat'l 8	R = Rework	S = Subcont	W = Weather	O = Other

Worker S/ W. White Foreman s/ A. Smith

The foreman keeps each worker's time card, recording daily information on hours worked and reasons for delays. Notice that the reasons for the day's delay is indicated by a code, such as I = failed inspections. The delays for all tasks is totaled for the week. Finally, at the end of the week, the worker signs the time card. Notice that you are ranging from 33% to 67% non-productive time.

WHY THE FOREMAN'S LABOR ANALYSIS HELPS KEEP SCORE

1. TRACKS LABOR HOURS BY CONSTRUCTION TASK
2. TELLS WHAT IS YOU MOST PRODUCTIVE WORK
3. RECORDS PRIMARY REASONS FOR DELAYS AND COST OVERRUNS
4. PROVIDES INFORMATION TO IMPROVE PRODUCTION
5. GIVE FEEDBACK TO ESTIMATING
6. REQUIRED FOR CHANGE ORDERS AND DIRECTED CHANGES
7. REQUIRED FOR CLAIMS
8. IMPROVES THE BOTTOM LINE

The foreman's labor analysis is a logical extension of the labor time card. By weekly totally each task's man hours, both productive and delay hours, you and your foreman can tell what is really happening to your labor costs.

The foreman's labor analysis is also used for the same reasons as the labor time card. First, the analysis insures more accurate labor cost reporting. Second, by recording reasons for lost production, you accurately pinpoint the cause for cost overruns. Finally, the analysis provides data for changes and claims.

FOREMAN'S LABOR ANALYSIS

1. JOB NUMBER AND TITLE
2. SUPERVISOR'S NAME
3. DATE
4. COST CODE
5. CONSTRUCTION TASK
6. MAN HOURS THIS WEEK
7. MAN HOURS NON PRODUCTIVE
8. MAN HOURS PRODUCTIVE
9. PERCENT PRODUCTIVE HOURS
10. PERCENT NON-PRODUCTIVE
11. REASON FOR DELAY

Refer to the foreman's labor analysis on the next page.

Figure 6.2 Foreman's Labor Analysis

FOREMAN'S LABOR ANALYSIS						
Job: #101 Jones Home		Foreman: A. Smith			Date: 3/18	
Cost Code		3110	3110	3200	3300	3305
Task		Forms	Strip	Steel	Conc.	Cure
Monday	3/11	150				
Tuesday	3/12		70			
Wednesday	3/13			100		
Thursday	3/14				50	
Friday	3/15					75
Saturday	3/16					
Sunday	3/17					
1. MH This Week						
2. MH Non-Productive		5C 5L	10I	10M	20M	10I
3. MH Productive (1-2)						
4. % Productive (3/1)						
5. % Non-Productive (2/1)						

C = Change 5	D = Design	E = Equip.	I =Inspect. 20	L = Labor 5
M = Mat'l 30	R = Rework	S = Subcont	W = Whether	O = Other

Foreman s/ A Smith Supervisor s/ B. Jones

The foreman maintains the labor analysis, using information from the time cards. Notice that the reasons for the day's delay is indicated by a code, such as I = failed inspections. The delays for all tasks is totaled for the week.

CASE STUDY: CONSTRUCTION PRODUCTIVITY IMPROVEMENT

Problem #6-1: Labor Time Card

You are the concrete foreman on a two building condominium project. Your crew is responsible for forming, placing reinforcement, pouring concrete, curing, and stripping forms. Below is the labor time card for W. White, one of your crew, showing the total hours to be paid. Listed also are the non-productive hours and the reasons for the delay.

Complete the time card to determine the percent of productive and non-productive time.

LABOR TIME CARD						
Name: W. White		SSN: 213-34-5678			Initials:	
Job: Condominium		Foreman: A. Smith			Date: 3/18	
Cost Code		3110	3110	3200	3300	3305
Task		Forms	Strip	Steel	Conc.	Cure
Monday	3/11	8				
Tuesday	3/12		8			
Wednesday	3/13			8		
Thursday	3/14				8	
Friday	3/15					8
Saturday	3/16					
Sunday	3/17					
1. MH This Week						
2. MH Non-Productive		2C 2L	2I	4M	4M	2I
3. MH Productive (1-2)						
4. % Productive (3/1)						
5. % Non-Productive (2/1)						

C = Change 2	D = Design	E = Equip.	I = Inspect. 4	L = Labor 2
M = Mat'l 8	R = Rework	S = Subcont	W = Whether	O = Other

CASE STUDY: CONSTRUCTION PRODUCTIVITY IMPROVEMENT

Solution #6-1: Labor Time Card

Notice that you are averaging about 60% productive time and 40% non-productive time.

LABOR TIME CARD						
Name: W. White		SSN: 213-34-5678			Initials:	
Job: Condominium		Foreman: A. Smith			Date: 3/18	
Cost Code		3110	3110	3200	3300	3305
Task		Forms	Strip	Steel	Conc.	Cure
Monday	3/11	8				
Tuesday	3/12		8			
Wednesday	3/13			8		
Thursday	3/14				8	
Friday	3/15					8
Saturday	3/16					
Sunday	3/17					
1. MH This Week		8	8	8	8	8
2. MH Non-Productive		2C 2L	2I	4M	4M	2I
3. MH Productive (1-2)		4	6	4	4	6
4. % Productive (3/1)		50%	75%	50%	50%	75%
5. % Non-Productive (2/1)		50%	25%	50%	50%	25%

C = Change 2	D = Design	E = Equip.	I = Inspect. 4	L = Labor 2
M = Mat'l 8	R = Rework	S = Subcont	W = Whether	O = Other

CASE STUDY: CONSTRUCTION PRODUCTIVITY IMPROVEMENT

Problem #6-2: Foreman's Labor Analysis

Based on the crew's labor time cards for the week, you prepare a foreman's labor analysis. Below is the foreman's labor analysis, showing the hours of non-productive time and the reasons for delay.

Complete foreman's labor analysis to determine the percent of productive and non-productive time.

FOREMAN'S LABOR ANALYSIS						
Job: Condominium		Foreman: A. Smith			Date: 3/18	
Cost Code		3110	3110	3200	3300	3305
Task		Forms	Strip	Steel	Conc.	Cure
Monday	3/11	100				
Tuesday	3/12		50			
Wednesday	3/13			100		
Thursday	3/14				100	
Friday	3/15					50
Saturday	3/16					
Sunday	3/17					
1. MH This Week						
2. MH Non-Productive		5C 5L	10I	10M	20M	10I
3. MH Productive (1-2)						
4. % Productive (3/1)						
5. % Non-Productive (2/1)						

C = Change 5	D = Design	E = Equip.	I = Inspect. 20	L = Labor 5
M = Mat'l 30	R = Rework	S = Subcont	W = Whether	O = Other

CASE STUDY: CONSTRUCTION PRODUCTIVITY IMPROVEMENT

Solution #6-2: Foreman's Labor Analysis

Notice that your two largest causes of non-productive time are materials shortages and inspection problems.

FOREMAN'S LABOR ANALYSIS						
Job: Condominium		Foreman: A. Smith			Date: 3/18	
Cost Code		3110	3110	3200	3300	3305
Task		Forms	Strip	Steel	Conc.	Cure
Monday	3/11	100				
Tuesday	3/12		50			
Wednesday	3/13			100		
Thursday	3/14				100	
Friday	3/15					50
Saturday	3/16					
Sunday	3/17					
1. MH This Week		100	50	100	100	50
2. MH Non-Productive		5C 5L	10I	10M	20M	10I
3. MH Productive (1-2)		90	40	90	80	40
4. % Productive (3/1)		90%	80%	90%	80%	80%
5. % Non-Productive (2/1)		10%	20%	10%	20%	20%

C = Change 5	D = Design	E = Equip.	I = Inspect. 20	L = Labor 5
M = Mat'l 30	R = Rework	S = Subcont	W = Whether	O = Other

LESSON #7 DELAYS AND COST OVERRUNS

OBJECTIVES

1. DELAYS AND COST OVERRUNS

2. SOLUTIONS

This lesson will address correcting the causes of lost production. Several suggestions are made concerning the correction of the four primary causes of delays and cost overruns. It is important to know the most common reasons for lost production. Only by spotting potential problems can the contractor take steps to avoid delay and cost overrun pitfalls.

This lesson affords the opportunity to add your suggestions in addition to the solutions recommended. Keep in mind the other solutions presented in previous chapters and see if you can come up with a new way you have not used before to overcome delays and cost overruns.

CPI PROFIT TIP #7

SPOT POTENTIAL DELAYS AND COST OVERRUNS EARLY

AND CORRECT WHAT YOU CAN

No job goes smoothly. The productive minded contractor tries to correct as many problems as possible. In construction, there is never enough money to go around, and the contractor is always under time constraints. People are constantly under pressure to produce. The only way to come out ahead is to try to spot potential problems and correct them if you can.

In certain instances, you may not have the time to correct a problem. However, you can report the problem to someone who can handle it, or you can call in an outside consultant. Additional time and money spent correcting a problem now often pays huge dividends later.

1. What types of problems do you deal with on a regular basis?

2. Are there any steps that could be taken to avoid these problems in the future?

PRIMARY CAUSES OF DELAYS AND COST OVERRUNS	
1. DESIGN PROBLEMS	45%
2. CHANGE ORDERS	35%
3. SUBCONTRACTOR PROBLEMS	15%
4. QUALITY CONTROL AND INSPECTIONS	5%

Design problems make up 45% of delays and cost overruns. It is critical to check drawings immediately to insure their accuracy. Change orders are also an area of concern. Changes account for 35% of delays and cost overruns. Change orders should be documented and started as soon as possible to avoid delays.

Subcontractor problems result in 15% of delays and cost overruns. Every contractor should have a policy for qualifying subcontractors and suppliers. Finally, quality control and inspections represent 5% of delays and cost overruns. A hands-on approach by management can alleviate many of these problems.

Detailed solutions for these delay and cost problems follows.

TEN WAYS TO SOLVE DESIGN PROBLEMS

1. SPOT ERRORS DURING ESTIMATING
2. NOTIFY DESIGNER IN WRITING
3. CHECK DIMENSIONS
4. BUILD ON PAPER FIRST
5. PRECONSTRUCTION CONFERENCE
6. PROVIDE A SAMPLE TO USE AS A STANDARD
7. FINE ENGINEER IF DRAWINGS ARE NOT TO STANDARD
8. USE PREVIOUS DRAWINGS IF APPLICABLE
9. SPEND THE TIME UP FRONT ON DRAWINGS
10. TRY FOR DESIGN/BUILD (PARTNERS)

Notify the owner and designer early of design errors. The sooner the notification the quicker the solution. Early notice also protects your rights in changes and claims. Start checking dimensions from the outside to the inside. Have a set of check prints in the office to see if the designer has provided answers. A good practice is to work with an architect who has field experience.

1. What are the advantages of working with designers who have field experience?

2. Does your company believe the sooner design problems are spotted the sooner the job will be completed?

TEN WAYS TO SOLVE CHANGE ORDER PROBLEMS

1. WRITTEN NOTICE TO OWNER
2. ACCURATE ESTIMATING
3. CHANGE ORDER FILE
4. REVIEW MEETINGS
5. CHANGE ORDER PROCESSING
6. SPOT POTENTIAL CHANGES EARLY
7. STAY IN CLOSE CONTACT WITH ARCHITECT
8. KEEP TRACK OF CHANGES THAT OCCUR FREQUENTLY AND ANTICIPATE THEM IN THE FUTURE
9. MAKE ADDENDUM TO THE CONTRACT WHEN CHANGES ARISE
10. ALLOW TIME IN THE CONSTRUCTION SCHEDULE FOR CHANGES

Changes can effect production dramatically if not spotted early and documented. Change orders need to be handled systematically.

It is a good practice to require one meeting a week when necessary to go over changes in the contract; include the owner, general contractor, subcontractors, and designers.

1. What problems can change orders cause?

2. Does your company have a procedure for tracking change orders?

TEN WAYS TO SOLVE SUBCONTRACTOR PROBLEMS

1. PRE-QUALIFY SUBCONTRACTORS
2. CHECK FINANCIAL STRENGTH
3. NEGOTIATE PRICE
4. SUBCONTRACT SCHEDULE OF VALUES
5. WRITTEN SCOPE OF WORK
6. COORDINATE WORK AMONG SUBCONTRACTORS
7. REQUIRE SHORT INTERVAL SCHEDULE
8. AT FIRST SIGN OF PROBLEMS GIVE WRITTEN NOTICE TO "COMPLY WITH THE CONTRACT"
9. REQUIRE A BOND
10. REQUIRE GOOD COMMUNICATION

A qualified subcontractor is worth the cost. A qualified subcontractor keeps the job on schedule.

Pay subcontractors promptly. This enables the subcontractor to order materials early and obtain discounts. However, only pay for work that is completed.

Subcontractors will usually correct unsatisfactory work because payment is being withheld.

1. Has your company ever had delays due to a subcontractor? Did you hold his check? If not, what method did you use to get the work completed?

2. Does your company have a procedure for providing notice to subcontractors for unsatisfactory workmanship?

TEN WAYS TO SOLVE QUALITY CONTROL AND INSPECTION PROBLEMS

1. AGREE ON STANDARDS BEFOREHAND
2. CHECK TEST SECTIONS
3. LEARN INSPECTOR'S STANDARDS
4. MAINTAIN GOOD RELATIONS WITH THE INSPECTORS
5. MAKE THE FIRST 15 (LF, LY, SF, SY, CF, CY) YOURS
6. HAVE PERIODIC MEETINGS TO DISCUSS QUALITY CONTROL STANDARDS
7. RETAIN WORKERS WHO TAKE PRIDE IN THEIR WORK
8. PERFORM IN-HOUSE INSPECTIONS BEFORE THE INSPECTOR WALKS THE SITE
9. MAINTAIN A HANDS-ON APPROACH TO MANAGEMENT
10. CHECK AND RE-CHECK

Quality control should begin from day one on a project. Good workmanship is the responsibility of site personnel but also middle and upper level management.

Quality control standards should be made available to and understood by all personnel. It is a good practice to have a section in all subcontracts stating your company's quality standards. A standard provision may stop routine problems from reoccurring.

1. Does your company have a defined quality control system? If not, how does your company control quality?

2. What are the main problems in maintaining quality control?

CASE STUDY: CONSTRUCTION PRODUCTIVITY IMPROVEMENT

Problem #7: Delays and Cost Overruns

You are the site superintendent on the two building condominium project. While the job is being estimated you review the company's past projects. Listed below are the most common reasons for delays and cost overruns based on past projects. You plan to use this information to make recommendations to the project manager and company owner on productivity improvement, especially for this important job.

Working with a fellow student list your recommendations under the primary causes of delays and cost overruns covered in this lesson. First, list the problem and then the solution.

A. Design Problems

1. Incorrectly dimensioned drawings.
2. Uncoordinated drawings.
3. Missing details.
4. Lack of site drainage.
5. Errors and omissions.

B. Change Orders

1. Insufficient utility system spaces.
2. Incorrect door and window schedule.
3. Higher water table than indicated on drawings.
4. More unsatisfactory soil than indicated on drawings.
5. Changing owner requirements for finishes.

C. Subcontractor and Supplier Problems

1. Disagreement on work completed and payment amount.
2. Non-uniform standards of workmanship.
3. Suppliers sending wrong materials or quantities.
4. Late submission of submittals and drawings.
5. Too many punch list deficiencies.

D. Quality Control and Inspections

1. Lack agreement with subcontractors on workmanship standards.
2. Unapproved substitute materials.
3. Incorrect quality of work for follow-on trades.
4. Uncoordinated inspections.
5. Disagreement with owner, designer, and inspectors on Q.C.

CASE STUDY: CONSTRUCTION PRODUCTIVITY IMPROVEMENT

Problem #7: Delays and Cost Overruns

A. Design Problems

1. _____
2. _____
3. _____
4. _____
5. _____

B. Change Orders

1. _____
2. _____
3. _____
4. _____
5. _____

C. Subcontractor and Supplier Problems

1. _____
2. _____
3. _____
4. _____
5. _____

D. Quality Control and Inspections

1. _____
2. _____
3. _____
4. _____
5. _____

CASE STUDY: CONSTRUCTION PRODUCTIVITY IMPROVEMENT

Solution #7: Delays and Cost Overruns

A. Design Problems

1. Obtain subcontractor comments/suggestions during estimating.
2. Request clarifications during estimating.
3. Review unsolved problems during contract negotiation.
4. Correct dimensions by building on paper first.
5. Use set of check prints to record designer changes.

B. Change Orders

1. Review potential changes during estimating and negotiation.
2. Recommend changes in writing sufficiently in advance.
3. Work on changes on critical path first.
4. Maintain a change order control log.
5. Meet with owner and designer weekly on design and changes.

C. Subcontractor and Supplier Problems

1. Provide subcontractors with written scope of work.
2. Include schedule of values as part of subcontract.
3. Establish a submittal schedule.
4. Review procurement schedule weekly with subcontractors.
5. Meet weekly with current job subcontractors on procurement.

D. Quality Control and Inspections

1. Establish policy of "Do it right the first time."
2. Inspect the first 15 feet of work.
3. Get early agreement on workmanship with subcontractors.
4. Establish workmanship standards with owner and designer.
5. Review inspections weekly with subcontractors.

LESSON #8 MEETINGS AND SHORT-INTERVAL SCHEDULING

OBJECTIVES

1. MEETINGS
2. SHORT-INTERVAL SCHEDULE

This may be the most important lesson in the workshop. Increased productivity requires coordination. Coordination is best done face-to-face in the form of meetings. You will learn the best kinds of meetings and agendas. You can then decide what is most useful for your company.

Production improvement can only be achieved by better preplanning at the crew level. If the foreman prepares a short-interval schedule for next week's work, potential problems will be spotted in time to effect correction.

1. Do you think meetings are worth while? Do you have them?
2. Do you think crew preplanning is advantageous? Do your foremen preplan their work?

CPI PROFIT TIP #8

PRIOR PLANNING PREVENTS POOR PRODUCTION

The central idea of productivity improvement is getting manpower, materials, machinery, money, and management instructions into the crew's hands in the right quantities, at the right time, and the right place. Preplanning ensures that this coordination will occur. The best way is to preplan on paper first by means of meetings and short-interval scheduling.

1. What do you see as the major advantages of preplanning?

2. Does your company preplan its jobs? If not, why not?

ADVANTAGES OF MEETINGS

1. REVIEWS PROGRESS TO DATE
2. HELPS SET GOALS
3. IDENTIFIES PROBLEMS
4. DEVELOPS SOLUTIONS
5. ASSIGNS RESPONSIBILITY
6. ESTABLISHES A "MEETING OF THE MINDS"
7. OBTAINS COMMITMENT

Face-to-face communication is the most effective way of communicating ideas and goals. This kind of communication is most often done at meetings. A meeting can be between two people, say the general foreman and a foreman, or a job site meeting with several subcontractors. In meetings uncertainties can be "hammered out" and new ideas discussed.

Meetings keep all parties involved in the ongoing construction process. Subcontractors coming on the job can meet other subcontractors. Commitments and guarantees between subcontractors are more binding when they are done face-to-face at the weekly job site meeting.

1. Do you see any other advantages to meetings?

2. Does your company regularly hold meetings? If so, with who and when?

IMPORTANT MEETINGS

1. PRECONSTRUCTION
2. WEEKLY JOB SITE
3. WEEKLY OWNER/DESIGNER
4. FOREMAN'S SHORT-INTERVAL SCHEDULE
5. MONTHLY COMPANY REVIEW

These five meetings are important for running a productive job. The preconstruction meeting has as its objective getting agreement between the owner, designer, and contractor on how the job will be managed. If the preconstruction meeting is successful all parties know what is expected of them and the job should start correctly.

The weekly job site meeting allows the superintendent to meet with the subcontractors and review or amend the schedule for the next weeks.

The weekly owner/designer meeting reviews any changes necessary to maintain job progress.

The foreman's short-interval schedule is between the superintendent and the foreman with respect to the next week's construction requirements.

The monthly company review allows the company owner to intensively review job progress and discover company-wide ways to cut costs and increase production.

1. Does your company hold any of the above meetings?

2. What is the benefit of holding the above sequence of meetings?

BEST MEETING SCHEDULE

DAY	TYPE OF MEETING
MONDAY	COMPANY MANAGEMENT
TUESDAY	CONSTRUCTION MANAGEMENT - PROJECT MANAGERS
WEDNESDAY	JOB SITE MEETINGS - PROJECT MANAGER - SUPERINTENDENT - SUBCONTRACTOR FOREMEN - SUBCONTRACTOR FOREMEN WITHIN NEXT TWO WEEKS
THURSDAY	OWNERS MEETING - OWNER - DESIGNER - PROJECT MANAGER
FRIDAY	SUPERINTENDENT'S MEETING - REVIEW SHORT-INTERVAL (SCHEDULE WITH EACH FOREMAN)

It takes time for decisions at the company level to finally reach the field, including the crew level. The above orderly meeting progression allows each management level time to react and information to flow down to the various management levels. The information discussed in the meetings allows every level to do its job in increasing production.

1. Does your company have all of its meetings on one day?

2. What are the advantages of having meetings spread out throughout the week?

IMPORTANCE OF JOB SITE MEETING

1. COORDINATES SUBCONTRACTOR ACTIVITIES
2. CONVEYS WORKMANSHIP STANDARDS
3. MINIMIZES RESPONSE TIMES
4. AVOIDS DELAYS & COST OVERRUNS
5. FULFILLS CONTRACTUAL REQUIREMENTS

Job site meetings improve field coordination among subcontractors. More problems can be solved with a weekly meeting. Subcontractors are more easily coordinated. Problems are reviewed directly on site and solutions are easily arrived at. Lead times are also minimized.

Contractors holding job site problems avoid delays and cost overruns.

Meetings on site also fulfill the prime contractor's contractual requirement for subcontractor coordination.

1. How often do you have meetings on the job site?
2. What are the advantages of having a meeting with the owner on the site?

JOB SITE MEETING COMPONENTS

1. ATTENDERS
   - PROJECT MANAGER
   - SUPERINTENDENT
   - FOREMEN
     - SUBCONTRACTORS ON SITE
     - SUBCONTRACTORS DUE ON SITE WITHIN TWO WEEKS
3. AGENDA
4. MINUTES OF EACH MEETING

Meetings on the job site should include the project manager, superintendent, and foremen. When necessary, subcontractors on the site and subcontractors due on the site within the next two weeks should be included.

The project manager or superintendent should prepare an agenda to be discussed and resolved. Minutes of each meeting should be taken, distributed to all parties, and retained as project records.

1. Why do you want subcontractors to be at the meetings?

2. Why is it important to have an agenda and to record minutes of each meeting?

MINIMUM AGENDA

EVERY MEETING SHOULD COVER THE STATUS OF:

1. PRIMARY CAUSES OF DELAYS AND COST OVERRUNS
   - DESIGN PROBLEMS
   - CHANGE ORDER STATUS
   - SUBCONTRACTS
   - QUALITY CONTROL AND INSPECTIONS
2. SCHEDULED VERSUS ACTUAL PROGRESS
3. WORK FOR NEXT WEEK
4. OTHER IMPORTANT ITEMS
   - PAYMENTS
   - SAFETY

At every meeting, try to resolve the primary causes of delays and cost overruns: design problems, change order status, subcontractor and supplier problems, and quality control and inspections.

Start with the minutes of the last meeting noting progress on solving previous problems and coordination for next week. Also, cover payments and safety.

1. Do you cover these items in your meetings? What items does your company address?

2. Why is it important to cover these issues?

SHORT-INTERVAL SCHEDULE

FOREMAN'S PLAN FOR EACH DAY OF THE NEXT WEEK SHOWING:

1. DAYS AND DATE
2. START AND FINISH TIMES
3. TASKS
4. QUANTITY
5. PRODUCTION RATE
6. MANPOWER
7. MACHINES AND TOOLS
8. MEASUREMENTS

The short-interval schedule is an excellent way to have the foreman think through a job. The foreman must consider items such as: tasks, manpower, materials, machines and tools, information requirements, subcontractor coordination, and inspections.

By requiring this schedule to be completed and reviewed by the superintendent or other officer of the company, indecision can be eliminated prior to working. Problems are addressed and solved. The foreman will have complete knowledge of the scope of work for the following week, including sufficient time to prepare for the week's work.

1. Does your company use a short-interval schedule?

2. What items does/should your company include in a short-interval schedule?

Figure 8.1 Short-Interval Schedule

SHORT-INTERVAL SCHEDULE								
Job: #101 Jones Home				No. 101-92			Super. S/ J. Jones	
Sub: Structural Framing				Week of: 6/1/92			Foreman: S/ S. Smith	
Day/ Date	Start End	Work Item	Quan-tity	Prod. Rate	Man-power	Matls.	Tools/ Mach.	Measure-ments
Mon. 6/1	8:00 5:00	North Framing	160 LF	20 LF/ Hr.	3 Carp. 1 Labr.	400 BF 2'x 4'	1 Skill Saw	As per dwgs.
Tues. 6/2	8:00 5:00	East Framing	160 LF	20 LF/ Hr.	3 Carp. 1 Labr.	400 BF 2'x 4	1 Skill Saw	As per dwgs.
Weds. 6/3	8:00 5:00	South Framing	240 LF	30 LF/ Hr.	4 Carp. 1 Labr.	600 BF 2'x 4'	1 Table Saw	As per. C.O. #2
Thur. 6/4	8:00 5:00	West Framing	240 LF	30 LF/ Hr.	4 Carp. 1 Labr.	600 BF 2'x 4'	1 Table Saw	As per. C.O. #2
Fri. 6/5	8:00 5:00	Misc. Framing	80 LF	10 LF/ Hr.	2 Carp. 1 Labr.	200 BF 2'x 4'	1 Skill 1 Table	As per C.O. #3
Sat. 6/6	8:00 12:00	Owner's Inspect.						
Sun. 6/7								
Remarks: Pick up Change Order #2 and #3 on Monday.								

ADVANTAGES OF SHORT-INTERVAL SCHEDULING

1. FORCES PLANNING WHERE IT IS MOST NECESSARY
2. IDENTIFIES PROBLEMS BEFORE HAND
3. OBTAINS SUBCONTRACTOR COMMITMENT
4. ALLOWS CHECKING WITH SUBCONTRACTOR'S OFFICE

The short-interval schedule offers 4 primary advantages. It forces preplanning. It identifies problems prior to their occurrence. It obtains subcontractor commitment, and it provides time to check with the subcontractor's office.

Production can be greatly increased by use of the short-interval schedule. Once implemented, it becomes a foreman's daily planner. It is a tool that will assist the foreman as well as the company. The schedule can be modified to fit your company's specific needs.

1. Why is it important for the foreman to be thinking ahead?

2. What are the benefits of the short-interval schedule to the foreman? To the company?

CASE STUDY: CONSTRUCTION PRODUCTIVITY IMPROVEMENT

Problem #8: Short Interval Schedule

You are the foreman of a foundation crew for part of the two building condominium project. Besides yourself, the crew consists of 2 carpenters, 2 carpenter's helpers or laborers, plus backhoe operator with backhoe. Steel reinforcement is to be done by ABC Steel. Your crew assists in pouring concrete.

Next week's work is to excavate, form, set steel, and pour concrete for a 100 LF of foundation wall 3' x 3'. Prepare a short interval schedule that helps you plan for the week. Steel will be set on Thursday and concrete poured on Friday. Make necessary assumptions regarding materials and production rates.

CASE STUDY: **CONSTRUCTION PRODUCTIVITY IMPROVEMENT**

Problem #8: **Short Interval Schedule**

SHORT-INTERVAL SCHEDULE								
Job: Two-Story Condominium				No. 101-92			Super. S/ J. Jones	
Sub: Structural Concrete				Week of: 6/1/92			Foreman: S/ S. Smith	
Day/ Date	Start End	Work Item	Quan-tity	Prod. Rate	Man-power	Matls.	Tools/ Mach.	Measure-ments
Mon. 6/1	8:00 5:00							
Tues. 6/2	8:00 5:00							
Weds. 6/3	8:00 5:00							
Thur. 6/4	8:00 5:00							
Fri. 6/5	8:00 5:00							
Sat. 6/6	8:00 12:00							
Sun. 6/7								
Remarks: ABC Steel will fabricate and place steel reinforcement. ABC will deliver to site on Tuesday at 1:00 PM. Steel foreman to check forms Wednesday at 1:00 PM.								

CASE STUDY: **CONSTRUCTION PRODUCTIVITY IMPROVEMENT**

Solution #8: **Short Interval Schedule**

SHORT-INTERVAL SCHEDULE								
Job: Two-Story Condominium				No. 101-92			Super. S/ J. Jones	
Sub: Structural Concrete				Week of: 6/1/92			Foreman: S/ S. Smith	
Day/ Date	Start End	Work Item	Quan-tity	Prod. Rate	Man-power	Matls.	Tools/ Mach.	Measure-ments
Mon. 6/1	8:00 5:00	Dig Footer Form Work	100 LF 100 LF	25 LF/Hr. 13 LF/Hr.	1 Oper. 2 Carp.	300 BF Forms	1 Backhoe	3' x 100'
Tues. 6/2	8:00 5:00	Form Work	100 LF	13 LF/Hr.	2 Carp. 1 Labor	300 BF Forms		
Weds. 6/3	8:00 5:00	Set Forms	200 LF	26 LF/Hr.	2 Carp. 1 Labor	Ties		
Thur. 6/4	8:00 5:00	Set Steel	100 LF	13 LF/Hr.	ABC Steel	ABC Steel	ABC Steel	ABC Steel
Fri. 6/5	8:00 5:00	Pour Concrete	35 CY	7 CY/Hr.	2 Carp. 3 Labor		Trowels Floats	
Sat. 6/6	8:00 12:00							
Sun. 6/7								
Remarks: ABC Steel will fabricate and place steel reinforcement. ABC will deliver to site on Tuesday at 1:00 PM. Steel foreman to check forms Wednesday at 1:00 PM.								

BLANK FORMS

SCHEDULE OF VALUES					
Job:		No.		Date:	
Subcontractor:		Start:		Finish:	
1. Cost Code					
2. CSI Division					
3. Task					
4. Quantity					
5. Units					
6. Start Date					
7. Finish Date					
8. Duration					
9. Crew Size					
10. Crew Hours/ Days					
11. Production Rate					
12. Budget ($)					
13. % This Mon.					
14. % Last Mon.					
15. % Payment					
16. Payment ($)					
17. Remarks					

30 - 60 DAY SCHEDULE												
Task	Quantity	Crew Size	Hours Days	Prod. Rate	Cost ($)	Mon.	Tue.	Wed.	Thu.	Fri.	Sat.	Sun.

FOREMAN'S LABOR BUDGET						
Job:		Foreman:			Date:	
Cost Code						
Task						
1. MH Budget						
2. Prior MH						
3. Prior MH Remaining						
Monday						
Tuesday						
Wednesday						
Thursday						
Friday						
Saturday						
Sunday						
4. MH This Week						
5. MH to Date (2+4)						
6. MH Remaining (1-5)						
7. % MH Spent (5/1)						
8. % Complete						
9. % Over/Under (8-7)						
Foreman s/						

LABOR TIME CARD						
Name:		SSN:			Initials:	
Job:		Foreman:			Date:	
Cost Code						
Task						
Monday						
Tuesday						
Wednesday						
Thursday						
Friday						
Saturday						
Sunday						
1. MH This Week						
2. MH Non-Productive						
3. MH Productive (1-2)						
4. % Productive (3/1)						
5. % Non-Productive (2/1)						

C = Change	D = Design	E = Equip.	I =Inspect.	L = Labor
M = Mat'l	R = Rework	S = Subcont	W = Whether	O = Other

FOREMAN'S LABOR ANALYSIS						
Job:		Foreman:			Date:	
Cost Code						
Task						
Monday						
Tuesday						
Wednesday						
Thursday						
Friday						
Saturday						
Sunday						
1. MH This Week						
2. MH Non-Productive						
3. MH Productive (1-2)						
4. % Productive (3/1)						
5. % Non-Productive (2/1)						

C = Change	D = Design	E = Equip.	I =Inspect.	L = Labor
M = Mat'l	R = Rework	S = Subcont	W = Whether	O = Other

SHORT-INTERVAL SCHEDULE								
Job:				No.			Super.	
Sub:				Week of:			Foreman:	
Day/ Date	Start End	Work Item	Quan- tity	Prod. Rate	Man- power	Matls.	Tools/ Mach.	Measure- ments
Mon.								
Tues.								
Weds.								
Thur.								
Fri.								
Sat.								
Sun.								
Remarks:								

CONSTRUCTION PRODUCTIVITY IMPROVEMENT

INSTRUCTOR NOTES

INSTRUCTOR NOTES

This course is intended primarily for the small contractor, grossing less than approximately $5 million annually. However, larger contractors can also gain important profit making tips. The course will have attenders with construction experience ranging from a few years to several decades. Attenders will include a wide range of positions, including foremen, superintendents, project managers, general superintendents, office personnel, and company owners. the instructors biggest problem will be to keep this diverse audience interested.

Based on teaching this course and companion courses, implementing the following suggestions may make instruction less difficult and more effective for the instructor while being more appealing and worthwhile to the student.

There are two kinds of instructors. One type of instructor is the lecturer who may not wish to use the accompanying video tape, but teach directly from the manual. The advantage of this approach is that informal contact and interaction is increased between the instructor and student.

The other type of instructor is the moderator who will use the video tape to present each lesson's content. Afterward viewing each lesson's video tape, the moderator will cover the respective lesson's material in more detail if necessary, usually by asking for student questions and comments.

Both the lecturer and moderator will explain the case study problems and solutions provided with each lesson, including asking for student questions and comments.

Although this is an eight hour course, nothing prevents it being made longer or shorter, including conducting the course over a period of several days.

EFFECTIVE INSTRUCTION

Following are some guidelines for making instruction more effective and better ensuring that the students feel attendance is worthwhile.

1. **Know the Material:** The best way to allay your fears or nervousness in teaching is to be well prepared. Read and become thoroughly familiar with all the material, including each lesson's problems and solutions. Use a highlighter to mark important material in your manual which you wish to emphasize. Make additional notes in your manual. Preparation helps ensure you cover each lesson's important points.

2. **Meet Student Expectations:** During the course introduction session, ask each student to state their expectation(s) from attending the course. Ask frequently (after each lesson, before each break, and at end of the course) "What important ideas or tips did you learn?" Poll each person, asking them to state what they believe to be worthwhile. Use this positive response technique to stress important points, summarize material, and motivate attenders.

3. **Increase Communications:** Communication is a key element in successful learning. Make certain you have a room that accommodates your audience, as to size, acoustics, lighting, and comfort. It is helpful to have an instructor's table in front of the class with student tables in a U shaped arrangement facing the instructor's table. Try not to overly impose the instructor's table between yourself and the students. You can sit on the instructor's table, thereby increasing the informality of the arrangement. Movement by the instructor helps keep the presentation flowing and maintain student interest.

4. **Use Visual Aids:** Use the accompanying video tape to introduce the material. Make view graphs (for use with overhead projector) of the manual's key points, important figures, and problem work sheets and solutions. Place the overhead projector on one side of the instructor's table, thus making it easier to explain the materials while maintaining eye contact with the students. Have available (placed on the side opposite from the projector) a blackboard and/or an easel with blank chart paper. The blackboard and/or chart paper can be used to further illustrate points which are not adequately addressed by the manual or your view graphs.

5. **Lesson Plans:** Included in this section of the manual are lesson plans for each of the course's eight lessons. The lesson plans are designed with one hour allotted for each lesson. Review the lesson plans to get an idea of how much time to spend on each lesson's respective objectives. The time allocations may be considered relative guidelines if more or less than one hour is to be used for a lesson. For example, if 6 minutes is assigned to a particular lesson topic, then it is approximately 10 percent of the lesson's assigned time based on the lesson plan allotted time of one hour.

CLASS ADMINISTRATION

Consider the following key elements in conducting your workshop.

1. **Cooperate with Sponsor:** Make certain you meet all your contract arrangements with whomever is sponsoring the course,

including meeting the sponsor's expectations of you as an instructor.

2. **Inspect Classroom:** Inspect the classroom the day before class. Explain to whomever is in-charge what arrangement you wish, leaving a list of what needs to be done prior to class commencement.

3. **Registration:** Registration usually commences a half-hour before starting the first lesson. Have available for the students a registration table with registration or sign-in forms (if required), manuals, name tags, pencils, and highlighters for students.

4. **Name Tags and Place Cards:** Provide a name tag and place card for each student. By calling on each person by name from time to time, you can increase individual participation and enhance student-instructor rapport.

5. **Note Taking Materials:** Provide pencils and highlighters for note taking. If the manual is printed each page single sided, advise students that they may make notes on the blank page opposite the material in question. If the manual is printed double sided, students can make notes at the bottom of the page or in the margins.

6. **Breaks:** Hold regular breaks at least every two hours. Breaks are usually five to fifteen minutes.

7. **Smoking and Refreshment Policy:** Allow smoking outside the classroom at breaks, not in the classroom. If possible, have coffee and other refreshments available at the back of the classroom or in the corridor. Place the refreshments so as not to disturb attenders during class.

MATERIAL PRESENTATION

Following are some techniques in teaching which may be helpful when presenting the workshop.

1. **Voice, Repetition, and Motivation:** Practice your presentation. During the introduction session, ask if everyone can hear you. Emphasize and repeat important words and concepts, especially those that concern the topic you are explaining. Repetition is a good teaching method. Motivate students by mentioning savings, such as improved bottom line. If you do not sound convincing, then the students will not be convinced.

2. **Body Language:** Body language plays a major part in influencing the students attention and willingness to learn.

If you are nervous, your audience will be nervous. The best way to make your audience relax is to be relaxed yourself. Stand unaffectedly, feet slightly apart, do not rock back and forth; move smoothly and purposely before your audience as you speak.

3. **Hand Gestures:** Control your hands and use them to ease the effort of instruction. Avoid making fists, hand wringing, or other nervous gestures. Avoid grasping at clothes or placing your hands in your pockets. Use smooth flowing, deliberate gestures to emphasize points.

4. **Eye Contact:** Frequent individual eye contact is invaluable for keeping your audience with you. Eye contact with each attender is a key to keeping everyone progressing with you as you teach the workshop. Vary eye contact, do not just scan back and forth from left to right. Talk to one side of the audience, then to the other, moving frequently at random among your audience.

5. **Focus Attention:** Eye contact must be made with the students to capture their attention. When attention is given to the individual student, the student will return the attention. Once attention focuses, the listening and learning processes are enhanced. Focus on one individual at a time, speaking to that person until the point or thought is complete. Then move on, to the next individual or switch to the opposite side of the room.

6. **Regaining Contact:** If you feel you are losing someone, or they are not convinced, or they do not understand, then move closer to that person. Ask them specific questions, but not to the extent of producing uneasiness in the student. Then provide a direct specific answer if you can, or offer to get back to them after you have further researched the matter. Hint: in some cases it is best to ask another class member to answer the question. Hearing the answer from one's peers often boosts learning and retention.

7. **Blackboard:** Use a blackboard and/or chart paper to explain material, including working computations and drawing sketches. Place the blackboard and/or easel with chart paper on the side of the room opposite overhead projector.

8. **Overhead Transparencies:** Use overhead transparencies (view graphs). Explain each transparency in a systematic manner. For example, state: "This is the foreman's labor budget. Along the top is information regarding the project. Along the left side is information for each task, including cost code and construction task."

9. **Pointer:** Use a retractable pointer. Place the retracted

pointer on overhead transparencies to emphasize important items. Use the extended pointer to indicate important items on the blackboard and chart paper.

COURSE CONTENT

Following are suggestions for dealing with the varied backgrounds of your students.

1. **Student Background:** Quickly learn each student's background and expectation(s) from attending the course. Try to meet each student's specific expectations each hour.

2. **Course Content:** Explain that the course was developed from contacts with smaller contractors like themselves. Materials were developed in an attempt to meet the average contractor's needs. Explain that the material has been field tested, including the updating of previous course material.

3. **New Ideas:** Some of the ideas presented in the course may be new to you or the student. Explain that these approaches are the result of input by successful contractors. Most of the material can be used as presented or is easily adaptable to individual situations.

4. **Material Adaptation:** Do not hesitate to adjust the focus to the background and comprehension of your particular class. If you have mostly superintendents and foremen, stress the practical field aspects of job management. If you have company owners and project managers, stress how to implement the material at the managerial level. Remember students are there to learn, so do not hesitate to present any of the material, even if it is new to you. Just present the material in a manner that is tailored to the needs of that particular class.

5. **Student Manual:** The course material is developed so that you and the student have everything in one manual. It is generally best to start the class by covering the courses objectives and reasons why each objective is important. Then start each lesson by addressing that lesson's objectives and why they are important.

   When you print the student manual, omit this section, "Instructor Notes".

6. **Read Manual:** You can ask the students to read certain material in the manual and then explain it in more detail. Reading varies the instructional technique.

7. **Student Teams:** Have student's work the case study problems in teams (groups of two or three, depending on the size and

experience level of the class). Teaming students often improves the learning process as students learn from their peer's experiences.

8. **Explain the Case Study Problems:** Be certain to thoroughly explain the case study problems. Many attenders may not have been in a classroom in many years and consequently may not be sure what is expected of them during the case study problem solving portion of the lesson. Walk around the class, review how well individuals and teams are solving the problem. Provide individual assistance as needed. If you see that most students are making the same mistake, stop work and re-explain how to address the problem. Ensure everyone knows that the case study problems are a learning experience only and not a means of student grading or evaluation. Make everyone comfortable with this portion of the lesson.

9. **Student Solutions:** Ask attenders to present their individual or group solution to the class. Student solutions facilitate the learning process.

SPECIAL INSTRUCTIONS

1. Have students express their thoughts on what they have learned.

2. Summarize the course for the class.

3. Have students complete the evaluation form for your report to the BCIAC.

4. Award certificates of completion.

CHECKLIST

The following checklist may be useful for class logistics.

A. Administration

( ) Student roster

( ) Registration forms

( ) Student manuals

( ) Pencils and highlighters

( ) Name cards and place cards

( ) Certificates of completion

B. Classroom

( ) Instructor's table

( ) Student tables and chairs appropriately arranged

( ) Blackboard, chalk, eraser

( ) Chart paper, easel, marking pens

( ) Waste paper basket

( ) Overhead projector

( ) TV and video cassette player

C. Refreshments

( ) Table, table cloth, napkins

( ) Coffee pot, coffee, cups

( ) Sugar, cream, stir sticks

( ) Waste paper basket(s)

( ) Soap and paper towels in rest rooms

LESSON PLAN: INTRODUCTION

CONSTRUCTION PRODUCTIVITY IMPROVEMENT

A. **SUBJECT:** Introduction to Workshop

B. **OBJECTIVE:** To familiarize the student with the instructor's background, each fellow student's background, getting your money's worth from the course, course administration, and course objectives.

C. **LOCATION:** Classroom

D. **LESSON OUTLINE:**

SUBJECT:	TIME REQUIRED:
1. Introduction Objectives	1 MIN
2. Instructor's Background	3 MIN
3. Student's Background	10 MIN
4. Getting Your Money's Worth	5 MIN
5. Course Administration	4 MIN
6. Course Objectives	2 MIN
7. Student Questions	5 MIN

E. **STUDENT ASSIGNMENT:**

1. Read Introduction.
2. Student's Background.
3. Student Questions.

F. **TEACHING AIDS:**

1. Introduction Objectives
2. Instructor's Background
3. Student's Background
4. Getting Your Money's Worth
5. Administration
6. Course Objectives

LESSON PLAN #1

A. **SUBJECT:** Universal Estimating Formula

B. **OBJECTIVE:** To familiarize the student with why jobs go wrong, definition of productivity, and the universal estimating formula.

C. **LOCATION:** Classroom

D. **LESSON OUTLINE:**

SUBJECT:	TIME REQUIRED:
1. Why Jobs Go Wrong	10 Min.
2. Definition of Productivity	10 Min.
3. Universal Estimating Formula	10 Min.
4. Problem #1-1 thru #1-4	15 Min.
5. Solution #1-1 thru #1-4	15 Min.

E. **STUDENT ASSIGNMENT:**

1. Read Lesson 1.
2. Complete the problem and explain the solution.

F. **TEACHING AIDS:**

1. Lesson #1 Objectives
2. CPI Profit Tip #1
3. Primary Causes of Delays and Cost Overruns
4. Sequence of Lost Productivity
5. Definition of Productivity
6. UEF Applications
7. UEF Formula
8. UEF Example
9. Problem 1-1 thru 1-4
10. Solution 1-1 thru 1-4

LESSON PLAN #2

A. **SUBJECT:** Planning and Maintaining Production

B. **OBJECTIVE:** To familiarize the student with the subcontract schedule of values and the 30-60 day schedule, and the importance of notification.

C. **LOCATION:** Classroom

D. **LESSON OUTLINE:**

SUBJECT:	TIME REQUIRED:
1. Subcontract Schedule of Values	10 Min.
2. 30-60 Day Schedule	15 Min.
3. Importance of Notification	5 Min.
4. Problem #2-1 and #2-2	15 Min.
5. Solution #2-1 and #2-2	15 Min.

E. **STUDENT ASSIGNMENT:**

1. Read Lesson 2.
2. Complete the problem and explain the solution

F. **TEACHING AIDS:**

1. Lesson #2 Objectives
2. CPI Profit Tip #2
3. How To Plan and Maintain Production
4. Project Completion Phases
5. Why a Subcontract Schedule of Values Helps Production
6. Subcontract Schedule of Values
7. Why a 30-60 Day Schedule Helps Production
8. 30-60 Day Schedule
9. Importance of Notification
9. Problem 2-1 and 2-1
10. Solution 2-1 and 2-2

LESSON PLAN #3

A. **SUBJECT:** Job Organization

B. **OBJECTIVE:** To familiarize the student with the importance of site preparation and sit layout.

C. **LOCATION:** Classroom

D. **LESSON OUTLINE:**

SUBJECT:	TIME REQUIRED:
1. Site Preparation	10 Min.
2. Site Layout	10 Min.
3. Problem #3	10 Min.
4. Solution #3	10 Min.

E. **STUDENT ASSIGNMENT:**

1. Read Lesson 3.
2. Complete the problem and explain the solution.

F. **TEACHING AIDS:**

1. Lesson #3 Objectives
2. CPI Profit Tip #3
3. Why Site Layout Improves Production
4. General Contractor Responsibilities
5. Site Preparation
6. Site Layout
7. Problem #3
8. Solution #3

G. **SPECIAL INSTRUCTIONS**

You may choose to take a 10-20 minute break after lesson #3.

LESSON PLAN #4

A. **SUBJECT:** Work Information

B. **OBJECTIVE:** To familiarize the student with important aspect of information timing and work layout.

C. **LOCATION:** Classroom

D. **LESSON OUTLINE:**

SUBJECT:	TIME REQUIRED:
1. Information Timing	15 Min.
2. Foreman's Information Needs	15 Min.
3. Problem #4-1 and #4-2	15 Min.
4. Solution #4-1 and #4-2	15 Min.

E. **STUDENT ASSIGNMENT:**

1. Read Lesson 4.
2. Complete the problem and explain the solution.

F. **TEACHING AIDS:**

1. Lesson #4 Objectives
2. CPI Profit Tip #4
3. Job Layout
4. Workmanship Information the Foreman Must Know
5. Timing Information the Foreman Must Know
6. Notification and Response Times
7. Problem #4
8. Solution #4

G. **SPECIAL INSTRUCTIONS**

After Lesson #4 break for an hour's lunch. Let students know of nearby places to eat.

LESSON PLAN #5

A. **SUBJECT:** Meeting the Labor Budget

B. **OBJECTIVE:** How to determine whether or not the crew hours are within the labor budget.

C. **LOCATION:** Classroom

D. **OUTLINE:**

SUBJECT:	**TIME REQUIRED:**
1. How to Keep Score on the Labor Budget.....	15 Min.
2. Foreman's Labor Budget	15 Min.
3. Problem #5	15 Min.
4. Solution #5	15 Min.

E. **STUDENT ASSIGNMENT:**

1. Read Lesson 5.
2. Complete the problem and explain the solution.

F. **TEACHING AIDS:**

1. Lesson #5 Objectives
2. CPI Profit Tip #5
3. How to Keep Score on Labor Hours and Delays
4. Why the Foreman's Labor Budget Helps Keep Score
5. Foreman's Labor Budget
6. How to Get the Foreman's Labor Budget Started
7. Problem #5
8. Solution #5

LESSON PLAN #6

A. **SUBJECT:** Discovering Production Delays

B. **OBJECTIVE:** To familiarize the student with the labor time card and foreman's labor analysis.

C. **LOCATION:** Classroom

D. **LESSON OUTLINE:**

SUBJECT:	**TIME REQUIRED:**
1. Labor Time Card	15 Min.
2. Foreman's Labor Analysis	15 Min.
3. Problem #5-1 and #5-2	15 Min.
4. Solution #5-1 and #5-2	15 Min.

E. **STUDENT ASSIGNMENT:**

1. Read Lesson 6
2. Complete the problem and explain the solution.

F. **TEACHING AIDS:**

1. Lesson #6 Objectives
2. CPI Profit Tip #6
3. Why the Labor Time Card Helps Keep Score
4. Labor Time Card
5. Why the Foreman's Labor Analysis Helps Keep Score
6. Foreman's Labor Analysis
7. Problem #6-1 and #6-2

LESSON PLAN #7

A. **SUBJECT:** Delays and Cost Overruns

B. **OBJECTIVE:** To familiarize the student with the most common delays and cost overruns and some solutions.

C. **LOCATION:** Classroom

D. **LESSON OUTLINE:**

SUBJECT:	TIME REQUIRED:
1. Delays and Cost Overruns	10 Min.
2. Solutions	10 Min.
3. Problems #7	10 Min.
4. Solution #7	10 Min.

E. **STUDENT ASSIGNMENT:**

1. Read Lesson 7.
2. Complete the problem and explain the solution.

F. **TEACHING AIDS:**

1. Lesson #7 Objectives
2. CPI Profit Tip #7
3. Primary Causes of Delays & Cost Overruns
4. Ten Ways Solutions to Design Problems
5. Ten Solutions to Change Order Problems
6. Ten Solutions to Subcontractor Problems
7. Ten Solutions to Q.C. and Inspection Problems
8. Problem #7
9. Solution #7

LESSON PLAN #8

A. **SUBJECT:** Meetings and Short-Interval Schedule

B. **OBJECTIVE:** To familiarize the student with the project meeting agendas, suggested times, and the key participants. Also, to familiarize the student with the components and advantages of the short interval schedule.

C. **LOCATION:** Classroom

D. **LESSON OUTLINE:**

SUBJECT:	**TIME REQUIRED:**
1. Meetings	15 Min.
2. Short-Interval Schedule	15 Min.
3. Problem #8	15 Min.
4. Solution #8	15 Min.

E. **STUDENT ASSIGNMENT:**

1. Read Lesson 8.
2. Complete example short interval schedule.

F. **TEACHING AIDS:**

1. Lesson #8 Objectives
2. CPI Profit Tip #8
3. Advantages Of Meetings
4. Important Meetings
5. Best Weekly Meeting Schedule
6. Importance of Job Site Meetings
7. Job Site Meeting Attenders
8. Minimum Agenda
9. Advantages of Short-Interval Schedule
10. Short-Interval Schedule
11. Problem #8
12. Solution #8

G. **SPECIAL INSTRUCTIONS**

1. Have students express their thoughts on what they have learned.
2. Summarize the course for the class.
3. Have students complete the evaluation form for your report to the BCIAC.
4. Award certificates of completion.

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