APPENDIX

PROJECT DISTRESS DIARY (PDD)

Project Name: _____

Project No.: _____

Location: _____

_____

_____

Project Manager (electrical):

_____

Project Superintendent (electrical):

_____

Contract Award Date (prime contract): _____

Notice to Proceed (prime contract): _____

Duration or Completion Date (total project):

_____

INTRODUCTION

One of the worst project scenarios is for an electrical contractor to learn near the end of the project that his or her firm did or is going to lose money. Late notification does not give the contractor the opportunity to avoid the losses or at least to lessen the damages. Late notification also means that it is less likely that the required notice was given to the prime contractor or owner.

Fortunately, the early warning signs or **red flags** on most projects occur early and often. Sensitivity to these signs will provide the early detection to allow alternate strategies to be applied.

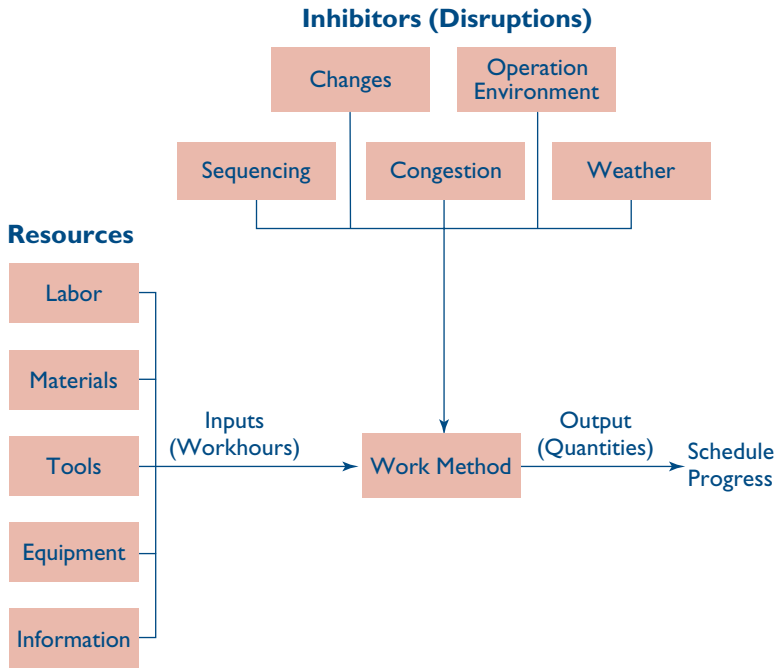
PURPOSE

The purpose of this manual is to serve as a repository of information that will provide early warning signs of project distress. Much of the focus in the Project Distress Diary (PDD) is on other contractors. The workbook should be updated weekly under the direction of the site Project Manager or Superintendent. The intent of data acquisition is to capture readily available information on key parameters that are necessary for timely and profitable project success. It is not intended to replace existing project control systems or other forms of documentation such as diaries and correspondence.

ORGANIZATION

The PDD is organized into several parts. Part 1 summarizes the project participants and key project events affecting performance. The remaining parts are organized according to the *Factor Model of Labor Productivity* that is shown on the next page. Part 2 covers the progress of the project and indicates if the work is behind schedule. Part 3 addresses issues related to the resources required to perform the work. Included are schedule progress, labor utilization, installed equipment, and submittal information. In Part 4, several inhibitors are monitored. These include out-of-sequence work and construction changes.

The PDD addresses the principal factors affecting the performance of the work. Its contents must be viewed in its entirety, since no single factor alone will indicate that the project may potentially be headed for trouble.



The Factor Model of Labor Productivity

PART I

PROJECT PARTICIPANTS AND KEY EVENTS

PROJECT PARTICIPANTS

Instructions: Record the name of the firm (and division or location if appropriate) of the key project participants.

Owner:

Designer:

Construction Manager:

General Contractor:

Civil Subcontractor:

Steel Erection Subcontractor:

Drywall Subcontractor:

Mechanical Subcontractor:

Concrete Subcontractor:

Masonry Subcontractor:

Elevator Subcontractor:

Electrical Supplier:

Electrical Supplier:

(Other) Subcontractor:

(Other) Subcontractor:

(Other) Subcontractor:

(Other) Subcontractor:

CONTRACT AMOUNTS

Instructions: Record the initial contract amount for each participating contractor. This information should be available from the construction manager or general contractor. (The exact monetary amount is not necessary.)

Contractor	Contract Amount ($)
General contractor	_____
Civil subcontractor	_____
Steel erection subcontractor	_____
Drywall subcontractor	_____
Mechanical subcontractor	_____
Concrete contractor	_____
Masonry contractor	_____
Elevator contractor	_____
(Other) subcontractor	_____
(Other) subcontractor	_____
(Other) subcontractor	_____

- ❑ Check here if the general or CM does not have this information.
- ❑ Check here if the general or CM refuses to provide this information.
- ❑ Check here if you are not allowed or have not been asked to participate in progress meetings.
- ❑ Check here if there are no meetings or no minutes of progress meetings.

CHRONOLOGY OF SIGNIFICANT EVENTS (DIARY NOTES)

Instructions: Include a brief statement of problems encountered, letters (particularly notice letters), and minutes of progress meetings. Also maintain a separate project file of pertinent correspondence and documents, such as:

- Narrative on claims or issues that could be potential claims
- Important letters, particularly notice letters
- Minutes of weekly progress meetings
- Weekly progress photographs

DATE	SIGNIFICANT EVENTS THAT COULD AFFECT PERFORMANCE

DATE	SIGNIFICANT EVENTS THAT COULD AFFECT PERFORMANCE

GUIDELINES FOR PROJECT PHOTOGRAPHS

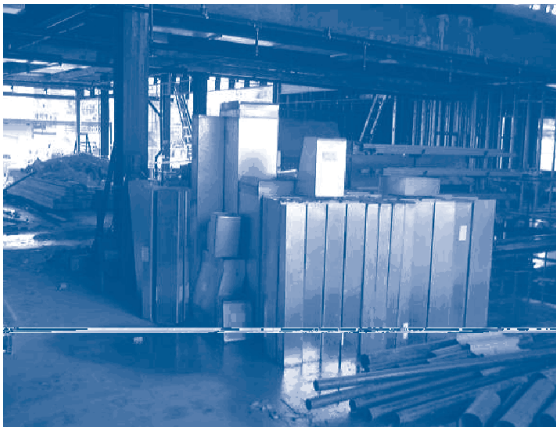
Project photographs are an important source of information that help establish progress and the conditions around which the work was done. However, following a few simple rules can greatly enhance the value of photographs. When taking photographs, keep in mind that a primary focus is on other contractors' work as much as it is on the electrical contractor's work. In many cases, it is other contractors that have the greatest adverse effect on the electrical work.

1. As a general rule, **avoid panoramic "vacation-type" photographs** because these provide limited value in establishing the work conditions and timing of events. Photos like the ones below merely serve to illustrate the nature of the site at a particular point in time. Only a few of these types of photos should be taken each week.

2. In many situations, the essence of early warnings is in the details. The most obvious details are design errors and omissions and out-of-sequence work. **Take photos of the work as it is being done, including craftsmen.**

3. **Take photographs of the conditions in which the work is done, especially poor working conditions and unforeseen conditions.** For example, photos showing congestion, stacking of trades, overcrowding, and out-of-sequence work are invaluable.

4. **Give appropriate attention to the work of other contractors,** as they are often the cause of inefficiencies incurred by the electrical contractor.

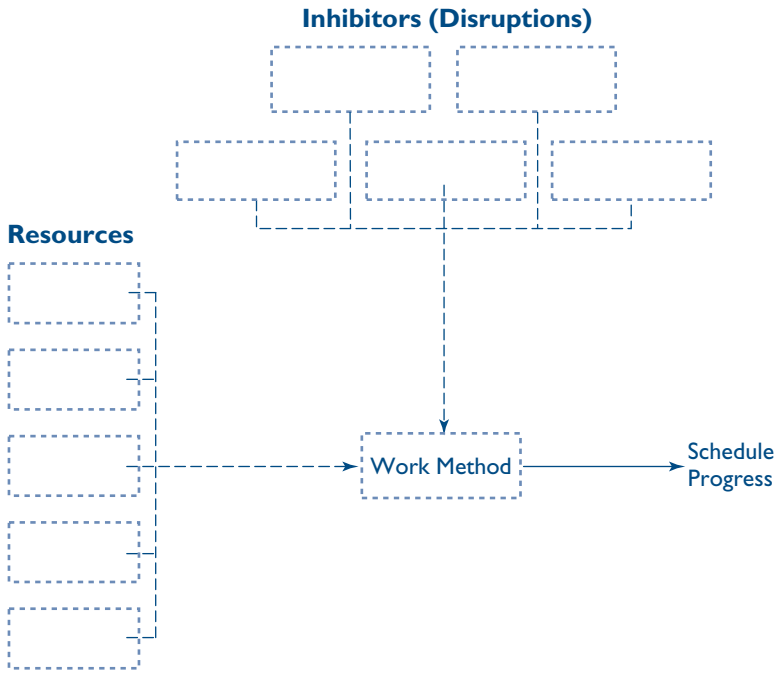


5. Housekeeping practices are a strong indicator of how well the project is managed. **Take photos of inside and outside housekeeping.**

6. **Material storage practices are particularly relevant.**

PART 2

PROGRESS



MILESTONE SCHEDULE

PURPOSE:

The purpose of the milestone schedule is to highlight important activities and events that can be used to determine if the project is progressing according to schedule.

DESCRIPTION:

As shown in this section, the major project milestone activities are listed along the vertical axis. The activities are arranged in sequential order based on the planned starting dates ascending the axis. The horizontal axis is divided into weeks of time.

BEGINNING OF PROJECT MILESTONE DATE:

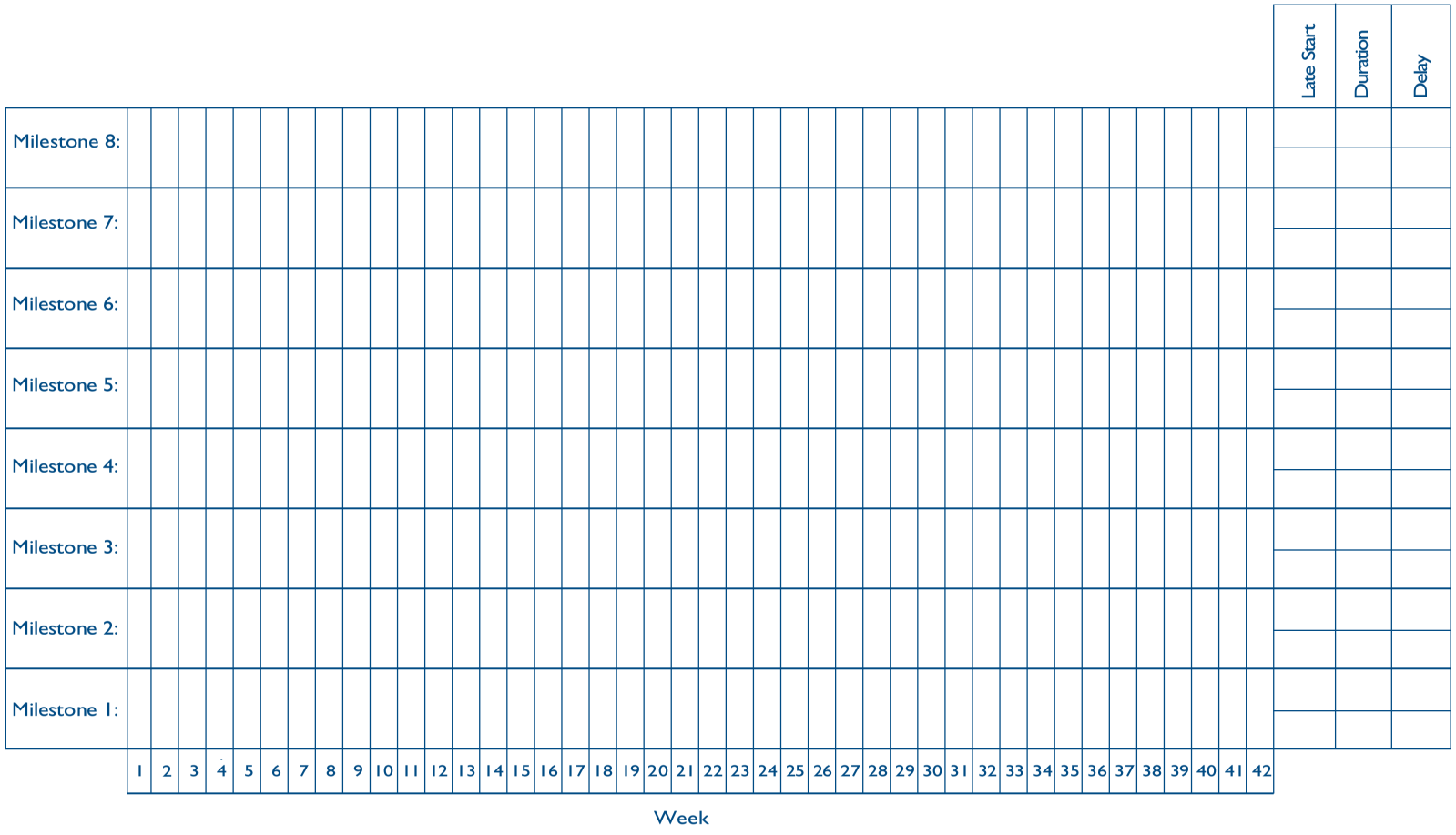
The calendar date corresponding to week 1 is _____. This is the first week of significant progress on the first activity, not necessarily the electrical contractor's work.

INSTRUCTIONS:

1. Identify the major project milestone activities that may affect your work. In selecting activities, focus mainly on the early phases of the project. Listed below are typical activities that may be used, but preference should be given to project-specific activities derived from experience or from the master project schedule. In selecting milestones, choose ones that are important to the progress of the work, particularly your work. For example, delays in steel erection will likely delay you later, whereas delays in grade slabs may have little impact. List the milestones in chronological order (based on the starting time), with the earliest beginning activity listed at the bottom of the milestone schedule template.

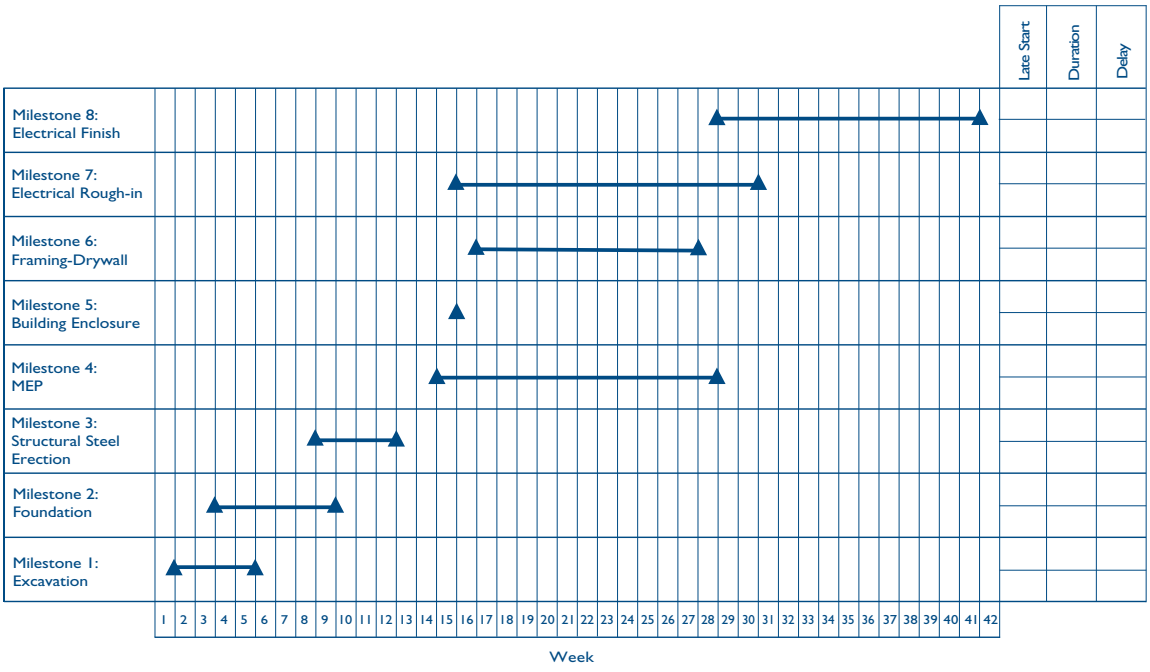
Representative Milestone Activities	Selected Milestones
Excavation	1. _____
Foundation	2. _____
Structural Steel Erection	3. _____
Roof	4. _____
Curtain Wall	5. _____
MEP	6. _____
Building Enclosure	7. _____
Electrical Rough-in	8. _____
Framing—Drywall	9. _____
Electrical Finish	10. _____

Milestone Schedule



2. Based on the master schedule, determine the planned starting and ending dates of these milestone activities. Connect these two as shown in the example below. Two points should be kept in mind. First, even if the beginning of the project is delayed, use week 1 as the week the work was actually started (so the graph always starts at week 1). Second, note that in the illustration below, milestone 5 is building enclosure, which has no duration—that is, it is simply an important event. Upon completion, the graph should resemble the one illustrated below.

Milestone Schedule



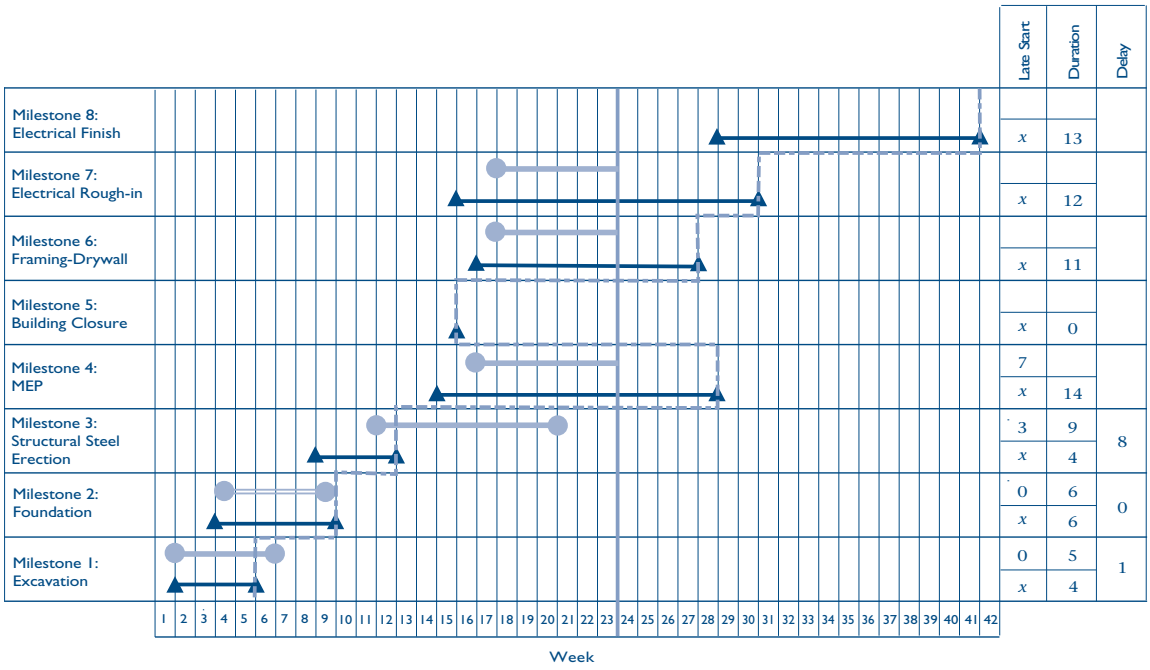
3. As the work progresses, plot the actual start and finish dates on the graph as shown above.

4. In the right-hand columns, enter the number of weeks late the activity started and the actual and planned activity duration as shown in the legend.

Number of Weeks Late the Activity Started	Actual Activity Duration
(Leave Blank)	Planned Duration

5. In the last column, calculate the number of weeks late the activity completion was using the following equation:

No. Weeks Late = Number of weeks late the activity started + Actual Activity Duration – Planned Duration



For the structural steel activity on the hypothetical project, the no. weeks late = 3 + 9 – 4 = 8 weeks late. A quick review of the example shows that the project is being seriously delayed. After 23 weeks of work, the project is 8 weeks behind schedule.

MILESTONE SCHEDULE

INTERPRETATION:

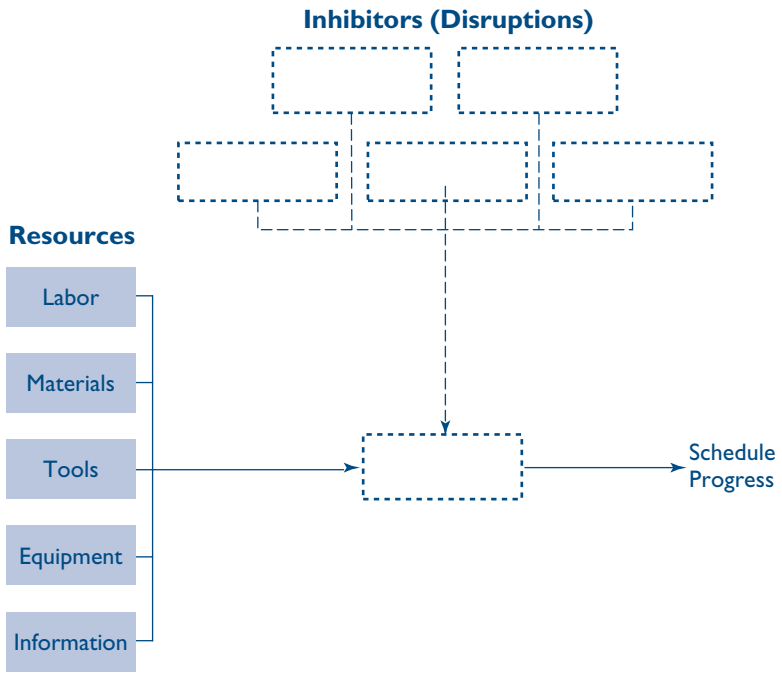
Whenever an activity extends beyond the planned finish date, the activity is late. Examining the milestone schedule uncovers several issues.

The excavation work took about a week longer than planned, but this is not particularly significant since the foundation work started only slightly behind schedule and finished just ahead of schedule. At this point, the project was essentially on schedule. A more ominous sign is that the structural steel erection began about three weeks late. Instead of finishing in four weeks, the work took nine weeks. As seen, the steel erection delay has delayed the start of the MEP work by about seven weeks.

By now, the project superintendent should have done several things. When it was obvious that that the steel erection was going to be delayed, a *notice letter* should have been written to the prime contractor and/or the owner. This letter should have advised them that the steel erection delay was also going to delay the electrical work and that in accordance with the contract, the electrical contractor may be entitled to a time extension and additional compensation. The superintendent should have also advised his or her home office project manager. The causes of the delay should be noted in the significant events section of this manual.

PART 3

RESOURCES



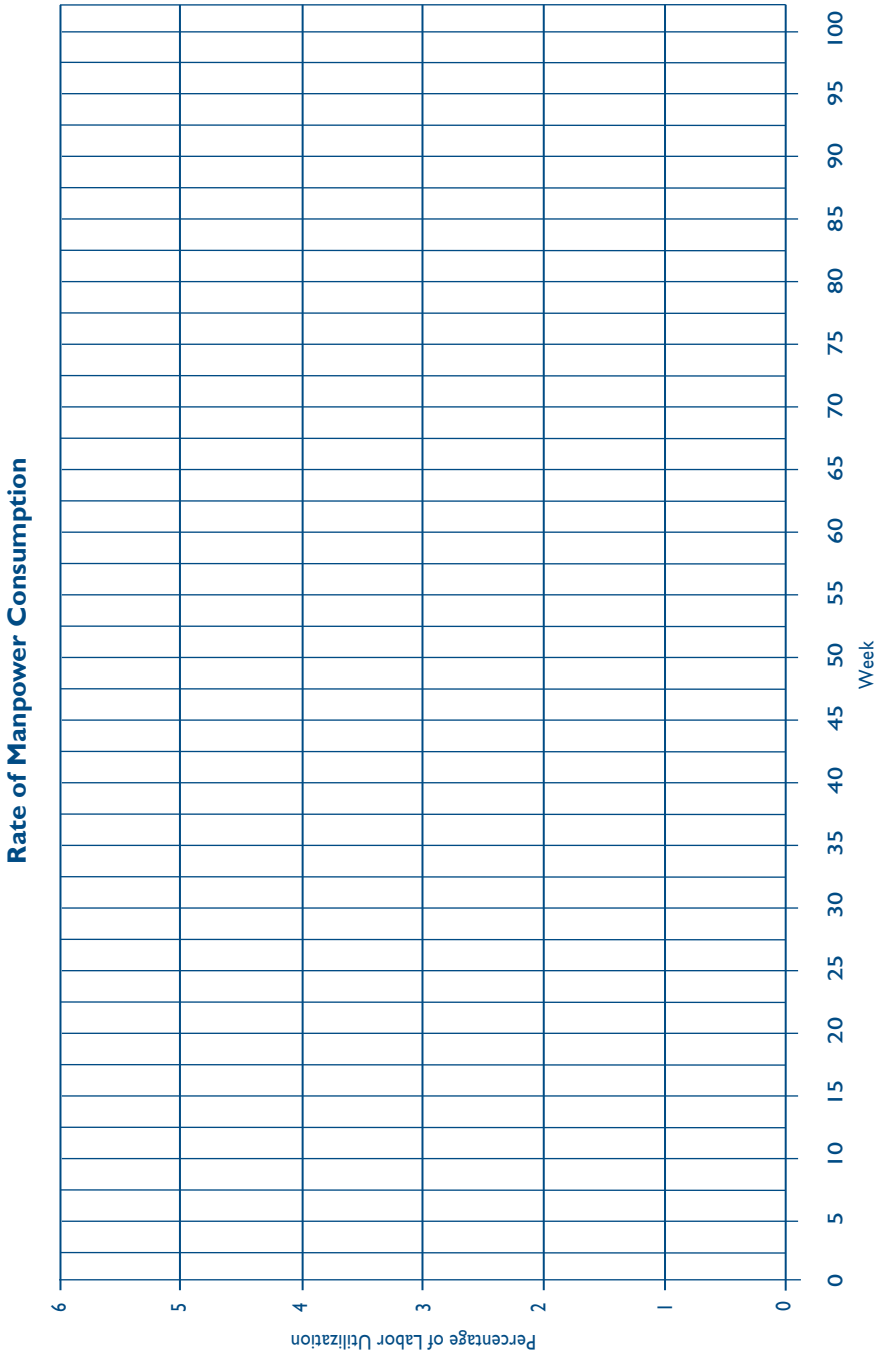
RATE OF MANPOWER CONSUMPTION

PURPOSE:

The planned and actual labor utilization curves show how the labor resource is being used compared to the planned usage. Because the amount of weekly labor charged to a project is based on the amount of work available to perform, a comparison of the two curves quickly highlights when the work is not proceeding according to plan.

DESCRIPTION:

A contractor staffs a project based on the amount of work available to perform. Where there is considerable work available or there is a need to accelerate, an overtime schedule may be applied or more craftsmen may be assigned to the project. Less work available means a shorter workweek or fewer people, resulting in fewer work hours. The two curves show when a project is not proceeding as planned. Deviations from normally anticipated labor utilization can be caused by poor weather, design changes, delays, other contractors, or schedule acceleration.

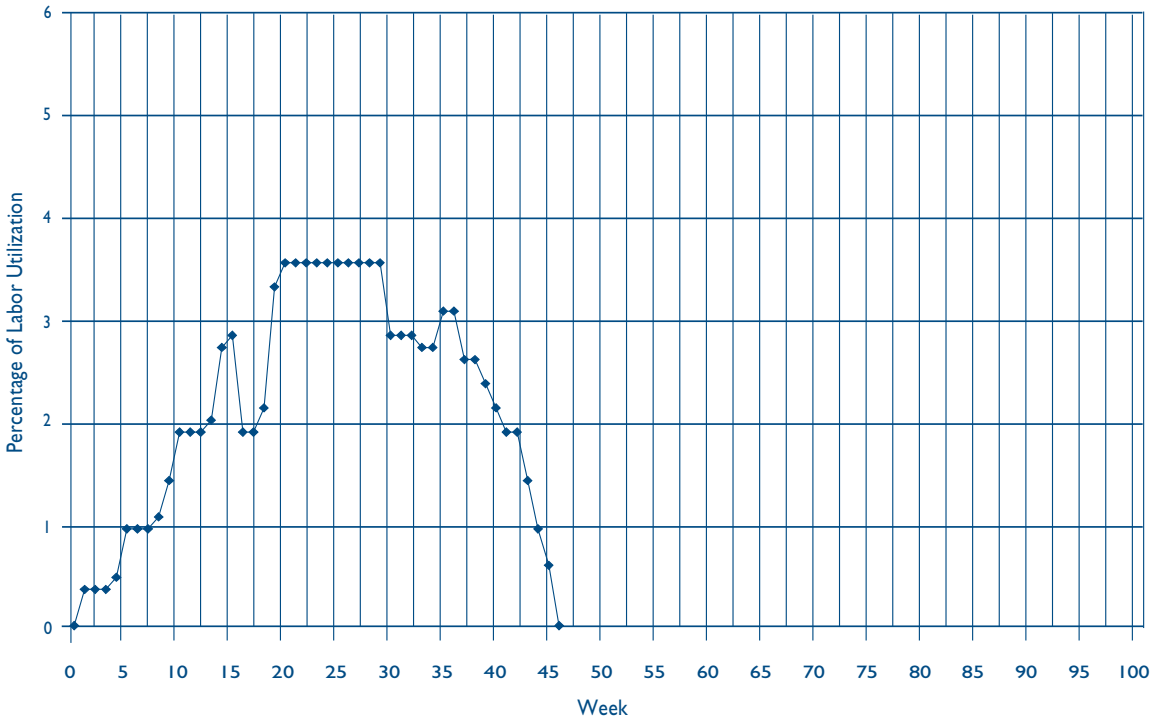


INSTRUCTIONS:

1. **Record Project Specific Parameters**
   a. The total estimated or budgeted work hours for the electrical contractor (craft labor including foreman) at the beginning of the project = _____.
   b. The total planned duration **of the electrical work** in weeks = _____.
   c. The maximum planned number of craft electricians (including foremen) = _____.

2. **Plot the Planned Labor Utilization using the as-planned schedule (if there is no as-planned schedule, proceed to step 3)**
   a. From the initial as-planned schedule, determine the planned work hours (craft labor including foreman) each week.
   b. Calculate the weekly labor percentage {(2a. (1a.) × 100}. The sum of the weekly percentages should equal 100%.
   c. Plot the weekly labor utilization percentage for each week as shown below.
   d. Add the weekly percentages, making sure that the sum equals 100%.
   e. Proceed to step 4.

   For a hypothetical project with a planned duration of 45 weeks using the as-planned schedule, the planned labor utilization percentages are as follows:



3. **When weekly labor work hours are not available, plot the planned labor utilization percentages using the standard utilization curves from NECA Publication 5075.**

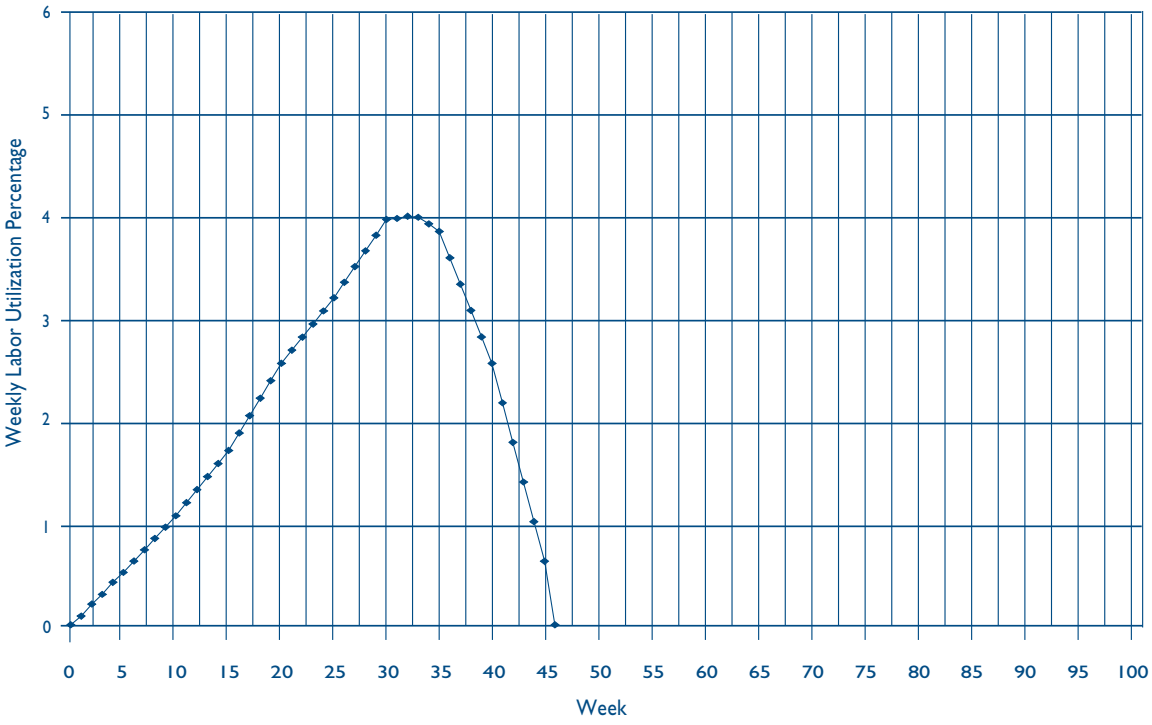
   a. Select the appropriate curve from NECA Publication 5075.

   b. Convert the time percentages along the x-axis from Pub. 5075 to weeks based on the planned number of weeks from 1b. above.

   c. Add the weekly percentages, making sure that the total equals 100%.

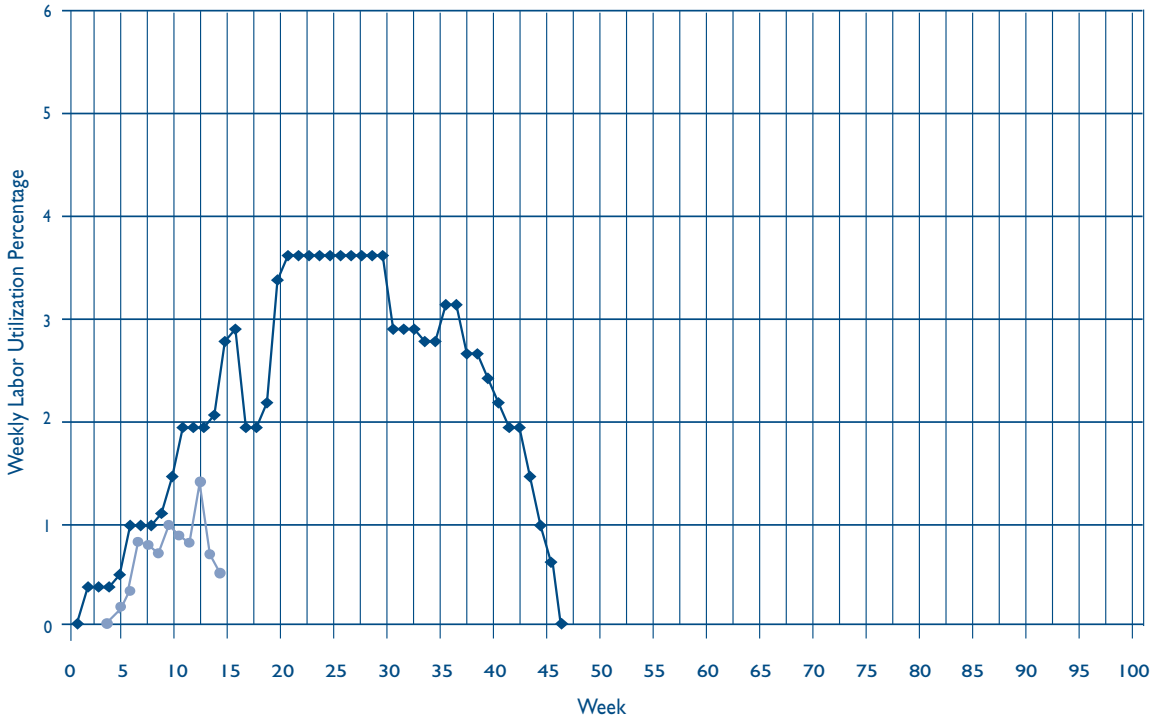
   d. Plot the weekly planned labor utilization percentage.

   For the hypothetical project with a planned duration of 45 weeks using NECA Publication 5075, the planned weekly labor utilization percentages are shown below.



4. Plot **the actual weekly labor utilization percentage.** Use the same date for the first week as was used on the milestone schedule.
   a. Start the plot at week 1, which is the first week of productive work determined earlier. For each week, determine the actual labor work hours (craft work hours including the foreman) charged to the project.
   b. Calculate the actual weekly labor percentage {(4a. (1a) × 100}
   c. Plot the weekly labor utilization percentage.

   For the hypothetical project with a planned duration of 45 weeks using the as-planned schedule, the planned and actual percentages are plotted below. The weeks are plotted continuously until the work is complete. Note that the sum of the actual weekly percentages is unlikely to equal 100%.



INTERPRETATION:

The pattern of deviation of actual from planned is of concern. Two characteristic patterns are of particular interest. These are sharp deviations in utilization and longer-term trends. The example shows a trend of slower than planned utilization. The actual utilization curve shows that the electrical work began four weeks late. For the next five weeks (through week 9), progress was slow, but by week nine, the utilization seemed to have returned to near normal. It is around week 10 that the labor hours should be increasing consistent with work areas being made available. However, the work has not progressed according to schedule. The trend for the next five weeks shows that the project is falling seriously behind schedule. This schedule slowdown will undoubtedly affect the efficiency of the electrical contractor at some later stage of the work.

Just because the actual labor utilization curve reaches the planned utilization curve, it does not necessarily mean that the project has returned to normal. In the hypothetical project, the overall progress is falling farther behind schedule. Down the road, one should be more sensitive to out-of-sequence work and other delays. The milestone schedule and work sequence chart should be reviewed carefully.

EQUIPMENT PROCUREMENT

PURPOSE:

The purpose of the equipment procurement form is to summarize information about major equipment that will be installed.

DESCRIPTION:

There are four forms to be completed. The forms contain information about important, owner-procured equipment, electrical contractor-procured equipment, and equipment procured by other contractors. Only equipment critical to the execution of the electrical work is listed. Each table records planned and actual dates for approval, order, and delivery of each piece of equipment. The timeliness of each piece of equipment is noted.

GUIDELINES FOR USE:

1. List the critical item of equipment on the appropriate form. The list should be limited to major pieces that are important to the electrical contractor's progress. Equipment may be added during the course of the project.
2. Record the scheduled approval, order, and delivery dates for each piece of equipment.
3. As the project progresses, track each piece of equipment and record the actual dates as they occur.

INTERPRETATION:

The following scenarios may occur:

1. If approval, order, or manufacture occurs after the planned date, the equipment may need to be expedited.
2. Late delivery of the equipment means the contractor may need to develop a strategy for completing the work in less time than originally planned. Options include increasing the manpower, working overtime, working multiple shifts, or revising the sequence of activities.
3. Early delivery of the equipment is a plus; however, delivery that is too early may affect the work by getting in the way or by increasing the cost of warehousing, re-handling, or protection.

Owner-Procured Equipment
(Major, Schedule-Sensitive Equipment Only)

Item	Approve		Order		Deliver	
	Plan	Actual	Plan	Actual	Plan	Actual

Electrical Contractor-Procured Equipment (Major, Schedule-Sensitive Equipment Only)

Item	Approve		Order		Deliver	
	Plan	Actual	Plan	Actual	Plan	Actual

Equipment Procured by Other Contractors (Major, Schedule-Sensitive Equipment Only)

Item	Approve		Order		Deliver	
	Plan	Actual	Plan	Actual	Plan	Actual

SUBMITTALS

PURPOSE:

The purpose of this form is to highlight the progress of submittals that are critical to timely project completion.

DESCRIPTION:

Listed are *selected* submittals that are critical to the successful completion of the project. Included are key submittals of other contractors. The scheduled and actual dates of submittal and approval are recorded for each item or grouping of items. The date of re-submittal is reported if the initial submission is rejected.

GUIDELINES:

1. At the beginning of the project
   a) **Identify the mission-critical submittals. Groupings of submissions are acceptable. The submittals are generally ones required by other contractors.** The status of these submissions should be a routine topic of discussion at weekly progress meetings.
   b) List in sequential order on the submittal form.
   c) Enter the scheduled date of submission.
2. When an item(s) is submitted
   a) Enter the actual date of submission.
   b) Enter the scheduled date of approval based on the contract documents or the timeframe agreed to at the pre-construction meeting. If this date is unknown, leave the column blank.
3. If the reviewed submittal was approved,
   a) Enter the date the review was received.
4. If the reviewed submittal requires re-submission,
   a) Enter the date that it is re-submitted in the re-submission column. Multiple dates are permissible in this column denoting multiple re-submissions.
   b) Repeat steps 3 and 4 as necessary.

INTERPRETATION:

1. If submittals are late, the problem must be identified and remedied.
2. If submittals are being rejected, the contractor must determine the reason and take action to make submittals approvable on the first submission if possible.
3. If forthcoming approvals are late, the contractor must notify the designers that their inability to process submittals in a timely manner is jeopardizing the potential of completing the project on time.
4. If the problems persist, it may be necessary to notify the construction manager or owner.

Submittal Form
(Mission-Critical Submittals for All Contractors)

Submittal ID	Original Submission		Re-submission	Final Approval	
	Scheduled	Actual		Scheduled	Actual

The time allowed for review of submittals is _____ days based on the contract documents or as agreed to in the pre-construction meeting.

BILLINGS AND RECEIPTS

PURPOSE:

The focus of tracking billings and receipts is on the electrical subcontractor only. The purpose is to organize financial information and plot it in a format that readily reveals problems with late payments and adverse cash flow.

DESCRIPTION:

This section consists of two items: a billings and receipts table and a graph. The table is divided into three categories—expenses, billings, and payments. The table is completed for each monthly payment cycle. The cumulative expenses and payments are plotted on the graph.

GUIDELINES FOR USE:

1. When a pay request is submitted
   a) Enter the invoice date.
   b) Record the expenses incurred since the last pay request.
   c) Calculate the cumulative expenses to date.
   d) Enter the amount of the invoice.
   e) Calculate the cumulative billings to date.
2. When payment is received
   a) Enter the date when payment is received.
   b) Enter the amount of the payment.
   c) Calculate the cumulative payments made to date.
3. Plot the data on the graph
   a) Plot the cumulative expenses (1.c) and cumulative payment received (2.c) according to the dates submitted and received.

PROGRESS PAYMENTS

Invoice		Expenses		Billings (Expenses Less Retainage)				Payments	
No.	Date	Period	Cumulative	Date Invoice Submitted	Invoice Amount (Monthly)	Cumulative Billings	Date Payment Received	Date Received	Cumulative Payments Received
1									
2									
3									
4									
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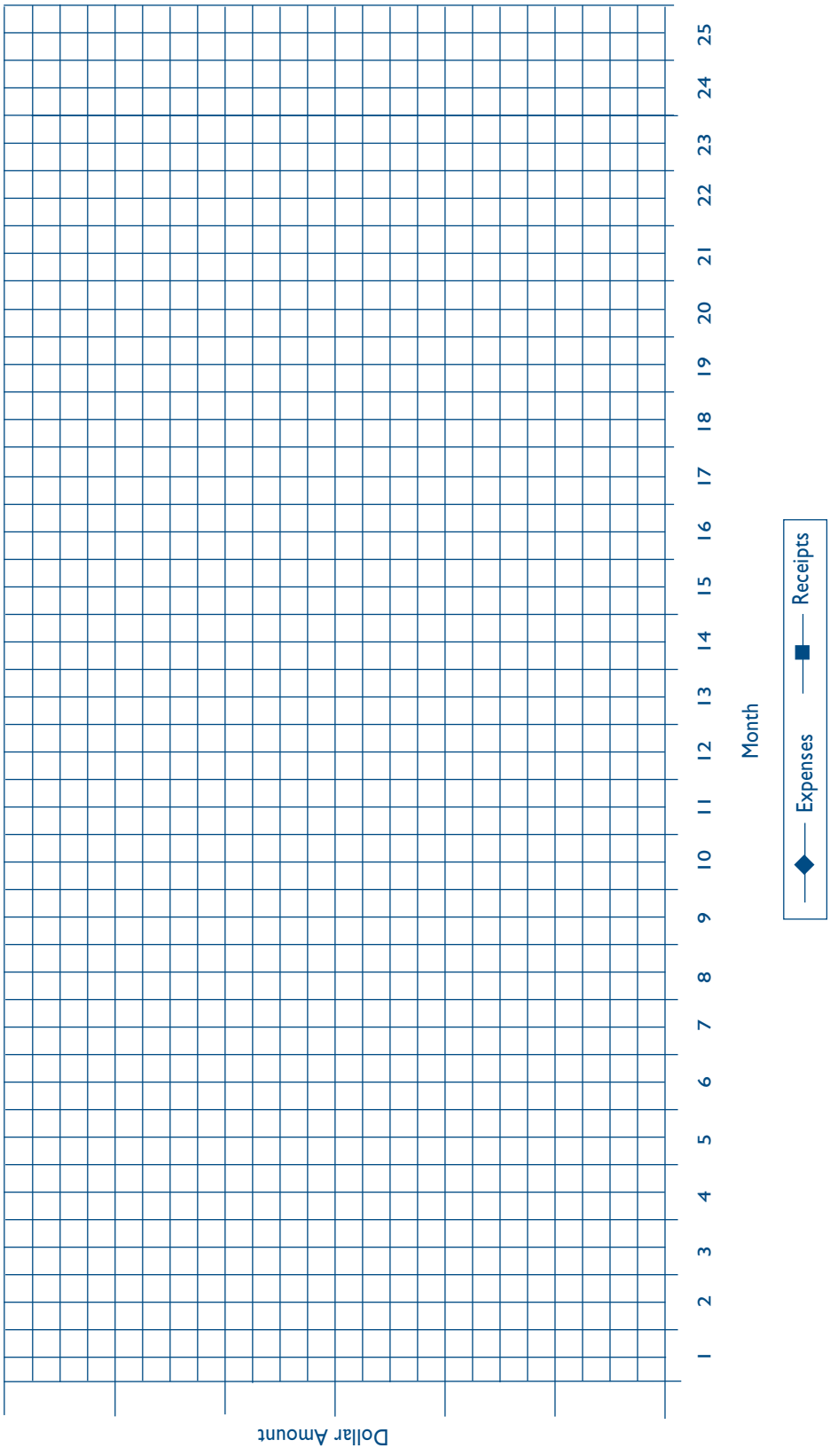
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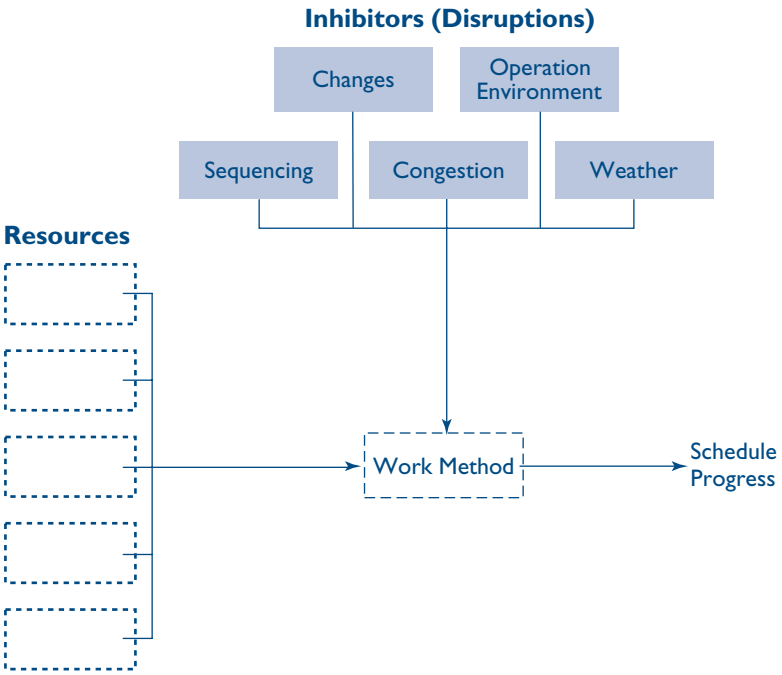
Month
Expenses
Receipts
Dollar Amount

PART 4

INHIBITORS (DISRUPTIONS)



MEP WORK SEQUENCE SCHEDULE

PURPOSE:

The work sequence schedule highlights the sequence in which the MEP and other important trades execute and complete the work. The schedule makes it clear when important trades are working out of sequence.

DESCRIPTION:

This section describes the MEP Work Sequence Schedule. The horizontal axis represents weeks of time. The vertical axis is divided into major work areas. An area could be a floor of a multistory building or an area or zone in a single-story school building. The vertical axis shows the important trade activities that directly affect the electrical contractor's work. Track only those trades with whom the electrical contractor interacts directly, because trying to track more than several trades would be too time consuming. The solid bar ▬▬▬ indicates the times when activities in an area are planned. The dashed bar – – – – – – indicates when the work actually took place. In developing the work sequence schedule, limit the number of trades, and show that work was done in an area only when an honest work effort was applied.

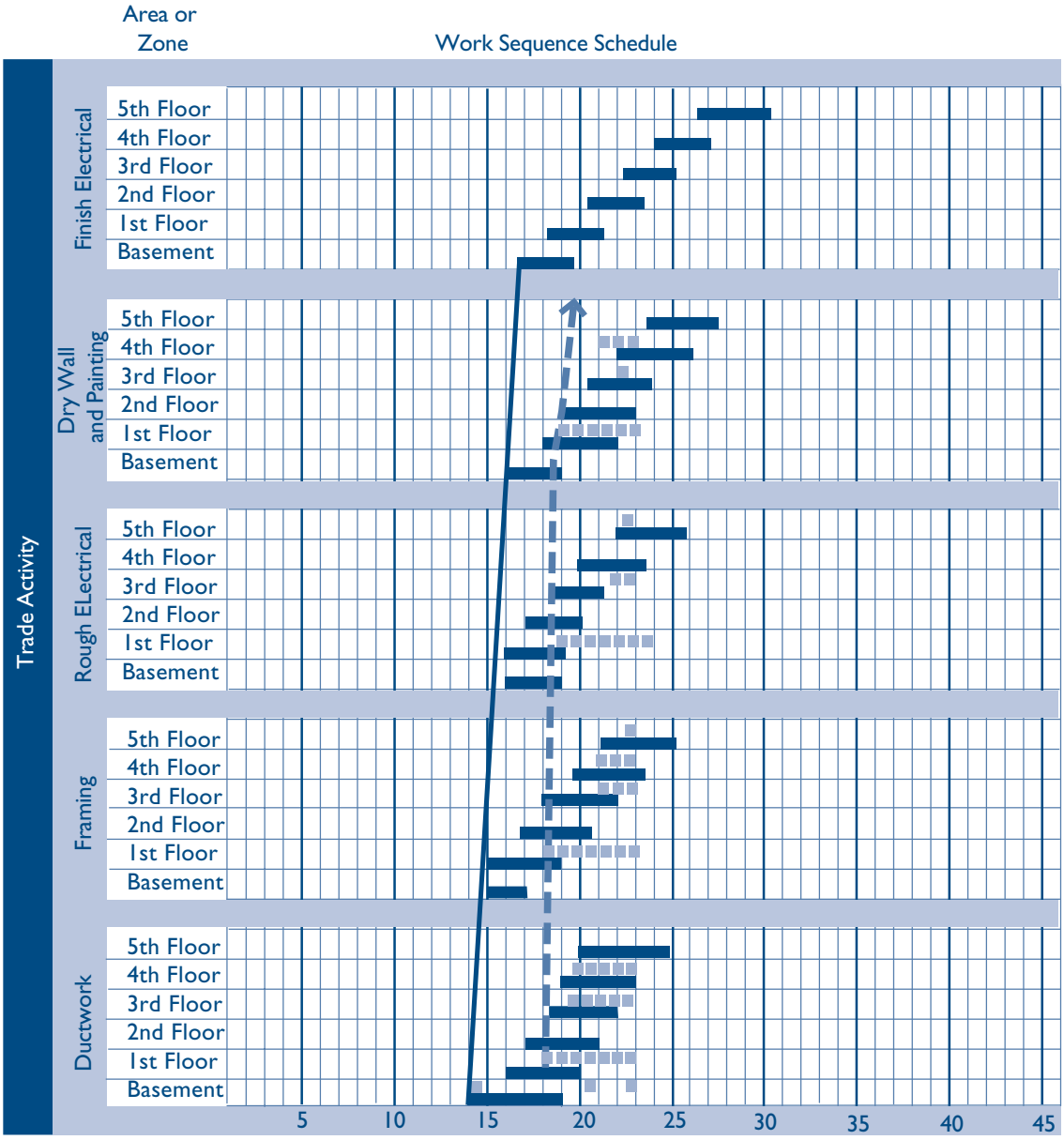
INSTRUCTIONS:

1. Identify the major trade activities that can affect your work. In selecting trade activities, focus on the ones with which you interact most. Listed below are example trade activities for commercial work that may be used; however, preference should be given to project-specific ones derived from experience or from the master project schedule. In selecting activities, choose ones that are important to the progress of your work. Do not try to track more than five or six activities.

Representative Trade Activities	Selected Trade Activities
Ductwork	_____
Framing	_____
Electrical Rough-in	_____
Drywall	_____
Electrical Finish	_____

2. Record these activities on the schedule in the order in which they are planned to start with the earliest activity at the bottom of the chart. Draw a horizontal bar ▬▬▬ indicating the time frame when each activity is scheduled to be performed. Identify these times from the master schedule. Week 1 is the same week as was used in the milestone schedule.

3. Each week, update the schedule drawing a dashed bar – – – – – – indicating when work is done aggressively in each particular area. As a general rule, the work is considered aggressive when work takes place on three or more days during the week and two or more craftsmen are assigned each day.


Area or Zone
Work Sequence Schedule
Trade Activity
Finish Electrical
Dry Wall and Painting
Rough ELectrical
Framing
Ductwork
5th Floor
4th Floor
3rd Floor
2nd Floor
1st Floor
Basement
5
10
15
20
25
30
35
40
45

4. The example MEP work sequence schedule shown is for a simple five-story office building with one basement level. The important trade activities on the vertical axis are ductwork, framing, rough electrical, drywall, and finish electrical. The five floors plus the basement define the geographical regions or zones. The solid black bars show when each activity is planned to take place. As seen, an orderly progression is planned from the basement to first floor and on to the fifth floor. The dashed bars indicate when the work actually occurred. The update is performed at the end of week 23.

INTERPRETATION:

In the example MEP work schedule, the ductwork began in the basement on schedule, but the schedule could not be maintained. The basement work was sporadic. The ductwork did not begin in earnest until week 18 or three weeks later than scheduled. It began on the first floor, not the basement. The original plan called for the framing work to take place on two floors at a time. However, that work was done out of sequence. As of week 23 when the last update was done, framing work was being done on four floors, not two. The schedule shows that the drywall lags behind the framing by about a week. Since the electrical rough-in is sandwiched between these two activities, the electrical contractor is forced to follow the framing crew wherever it goes. Therefore, the orderly sequence of work, which was part of the original plan, is not being followed, and because rough-in is also being done on four floors, more electricians are needed. None of the finish electrical work has begun, partly because none of the floors have been completed. It seems that the framing and drywall activities are taking place in many locations, and the work is not being completed in a timely manner.

In general, there are two sequencing aspects that should be observed. The first is a trade starting out-of-sequence with other trades. In the example schedule, it can be seen that by comparing the solid line with the dashed line, the trades began work in the order prescribed in the original schedule, even though the work is about two weeks behind schedule. A second aspect is whether all trades started in the right place. The work was supposed to begin in the basement and progress to the fifth floor (B-1-2-3-4-5). Only the ductwork followed this sequence. Most of the work followed the progression of 1-4-3-5.

PERCENTAGE OF CHANGE ORDER WORK HOURS

PURPOSE:

The purpose of tracking change order work hours is to highlight design changes and other revisions to the contract documents that can have an adverse effect on the day-to-day planning of the electrical contractor.

DESCRIPTION:

Track only the change order work hours associated with the electrical contract. Significant changes to the work of other crafts should be noted in the Chronology of Significant Events (Diary Notes). Research has suggested that when the number of change order hours exceeds about 10% of the total hours expended, there is likelihood that labor productivity is affected. The results are summarized in numerical and graphical form. The data for the graph is recorded on the Electrical Work Hour Summary Form.

GUIDELINES FOR USE:

1. Record the total electrical work hours expended to date and the estimated work hours to date expended on changes work. Do not include work hours for changes that are yet to be performed.

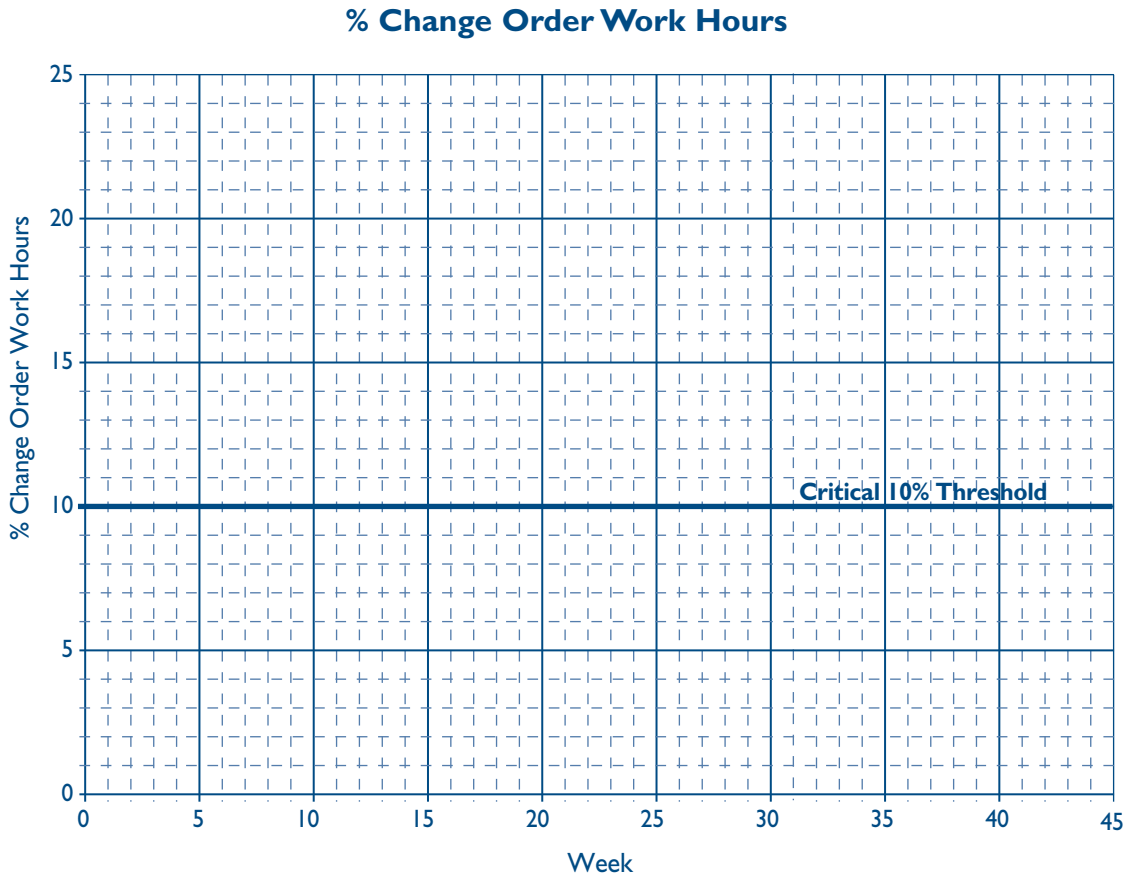
2. Indicate if a significant portion of the change order work hours charged during each week involved rework or demolition.
   Record the information in the table below.

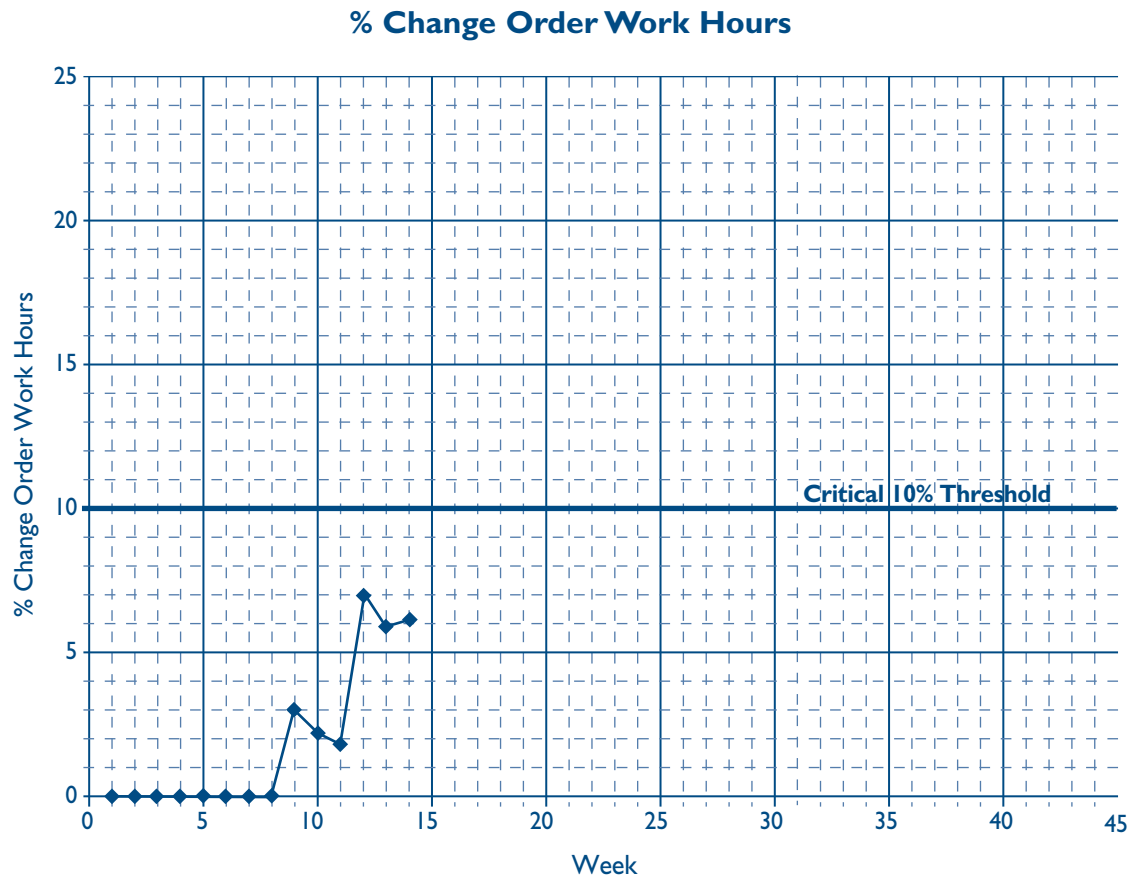
3. Calculate the percentage of change order work hours as:

$$\text{Percent. CO wh} = \frac{\text{Cum. Change Order wh}}{\text{Cum Total wh}} \times 100$$

Wk	Weekly Elect. wh	Cum. Total wh	Weekly Change Order wh	Cum. Change Order wh	Perc. of Change Order wh	Rework Demo. (yes or no)	Wk	Weekly Elec. wh	Cum. Total wh	Weekly Change Order wh	Cum. Change Order wh	Perc. of Change Order wh	Rework Demo. (yes or no)
1							24						
2							25						
3							26						
4							27						
5							28						
6							29						
7							30						
8							31						
9							32						
10							33						
11							34						
12							35						
13							36						
14							37						
15							38						
16							39						
17							40						
18							41						
19							42						
20							43						
21							44						
22							45						
23							46						

4. Plot the percentage of change order work hours on the graph.





INTERPRETATION:

1. Examine the graph to determine if the percentage of change order hours exceeds the critical threshold of 10%. Beyond this point, the contractor needs to include impact hours in the pricing of changes. The owner or general contractor should be put on notice that the change orders have reached the point where they are affecting productivity on the job.

2. An examination of the example graph indicates that changes work was done during weeks 9 and 12. The cumulative percentage has not reached an alarming proportion.