Multiproject Resource Leveling

Some resources may be shared among projects. The question is which resources and how much of them. For small projects in a relatively close vicinity, for

Factor that affecting the amounnt of the the resource need:-

- 1-the short and the long term need
- 2-future market expectation
- 3-staff morale
- 4-fatigue
- 5-satisfaction
- 6-relationship between vendor and subcontractor

EXAMPLE6.1

Assume a project engineer earns $30 per hour. Two projects are within *x* miles of each other. The engineer travels at an average speed of 40 miles per hour and costs the company $0.35 per mile to travel between the two projects. Assume the following four statements are true:

1. The engineer is needed a minimum of 3 hours/day in each project,
2. travel between the two projects occurs only once a day (the engineer starts his or her day on job A, travels to job B, and then comes back home near job A),
3. overtime, if needed, is compensated at 1.5 times the regular rate, and
4. a second engineer costs the same amount as the first one.

What is the maximum distance between the two projects that makes sharing the same engineer efficient?

EXAMPLE6.1

Sol: Let's consider two situations.

First—no overtime. No overtime means the engineer may travel between the two jobs (roundtrip) for no more than 2 hours (3 hours at job A + 3 hours at job B + 2 hours' travel = 8 hours per day).

Maximum distance = 2 hours · 40 mph = 80 miles roundtrip or 40 miles one way,

Mileage compensation = 80 · \$0.35/mile = \$28 per day,

Total cost per day = \$30 · 8 + \$28 = \$268,

EXAMPLE6.1

Average cost per hour = \$268/8 = \$33.50.

It is clearly much more economical to use one engineer than to hire two engineers at a combined cost of \$60 per hour.

Second—with overtime. Let us assume the two jobs are 100 miles apart. The first engineer will have 5 hours of driving time (2.5 hours each way), or 11 hours of work per day.

Mileage compensation = 200 * \$0.35/mile = \$70 per day,

Overtime compensation = 3 * \$30 * 1.5 = \$135,

Regular-time compensation = 8 * \$30 = \$240,

and

Total cost per day = 70 + 135 + 240 = \$445.

Assigning Budgets in Computer Scheduling Programs

- Two method for assign the budget for each activity:-
- 1-assigning the lump-sum amount without tellingthe scheduling program how the number is slicedor which resource used.
-
- 2-assingning the no. of unit certain resource to activity

ADVANTAGE OF THE SECOND METHOD:-

- 1-you can level your resourceonly when you assign resource to the activity
-
- 2-you can link your schedul accounting,match,your demand with supply and trace each expense in project
- 3-the scheduling program will reflect the impact of the change at the entire project level
-
- 4-resource driven schedule are possible

EXAMPLE6.1

A subcontractor needs to install flooring in two areas:

1. *Area 1*. This area has old vinyl tile that must be removed and replaced with new vinyl tile.
2. *Area 2*. This area has a concrete slab that needs to be topped with ceramic tile.

This simple project is broken into the activities shown in the following table, along with the logic, the duration, and the required number of laborers for each.

EXAMPLE6.1

ACTIVITY ID	ACTIVITY DESCRIPTION	IPA[a]	DURATION (DAYS)	LABORERS
A	Purchase & Deliver Materials	—	5	2
B	Remove Old Vinyl Tile	—	7	4
C	Install Ceramic Tile	A	3	3
D	Install New Vinyl Tile	A, B	5	3
E	Clean Up & Inspect	C, D	2	2

[a]Immediately preceding activity.

Do the following:

1. Draw the precedence network and perform the CPM calculations.
2. Allocate the required resources, then level them so that the subcontractor does not use more than six laborers at any time.
3. Find ways to improve the labor usage profile.

For the sake of simplicity, assume that any laborer can perform any task.

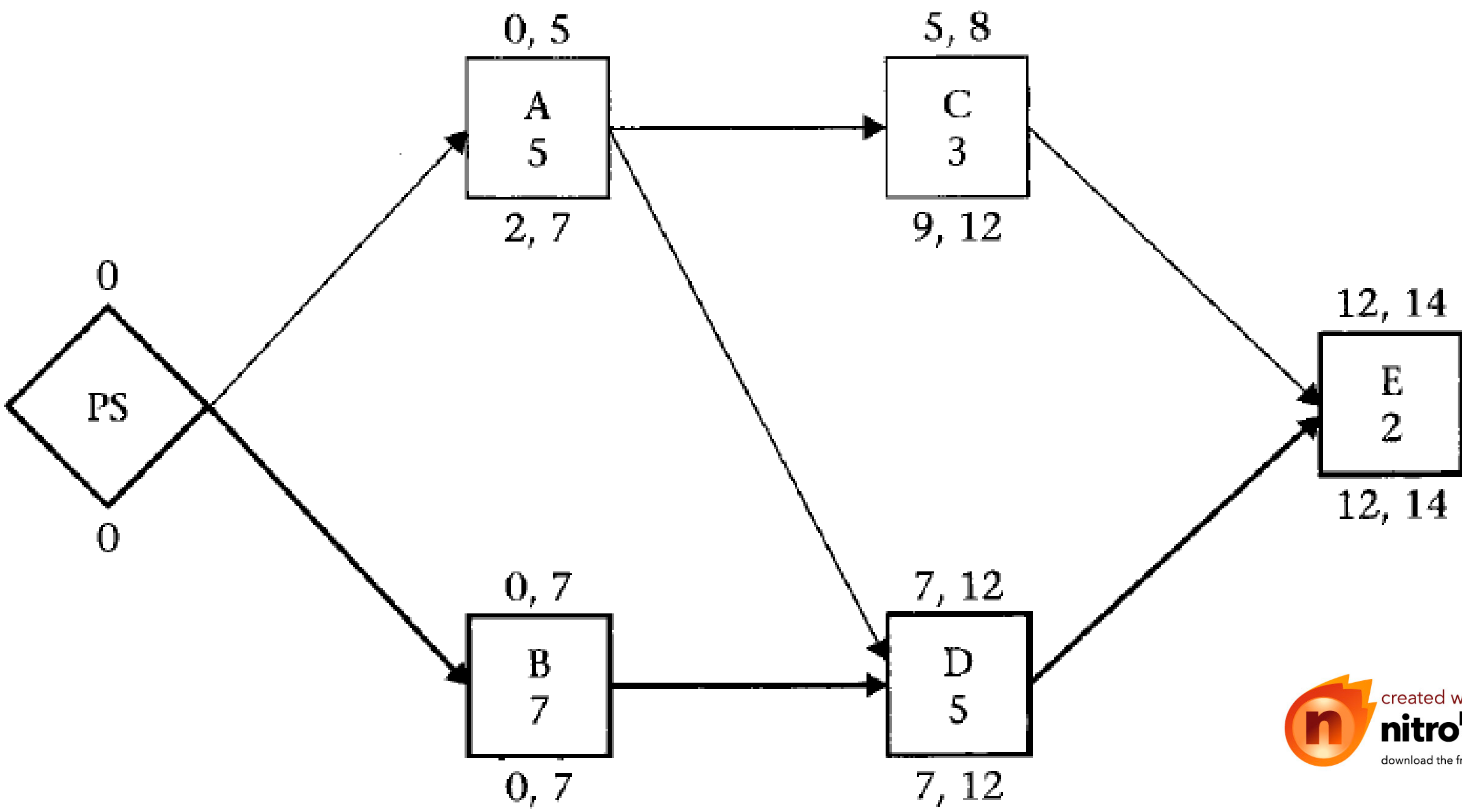
Solution

Figure 6.1 shows the precedence diagram for this example, and Figure 6.2, the bar chart and **resource usage profile,** or laborer, usage profile.

EXAMPLE6.1

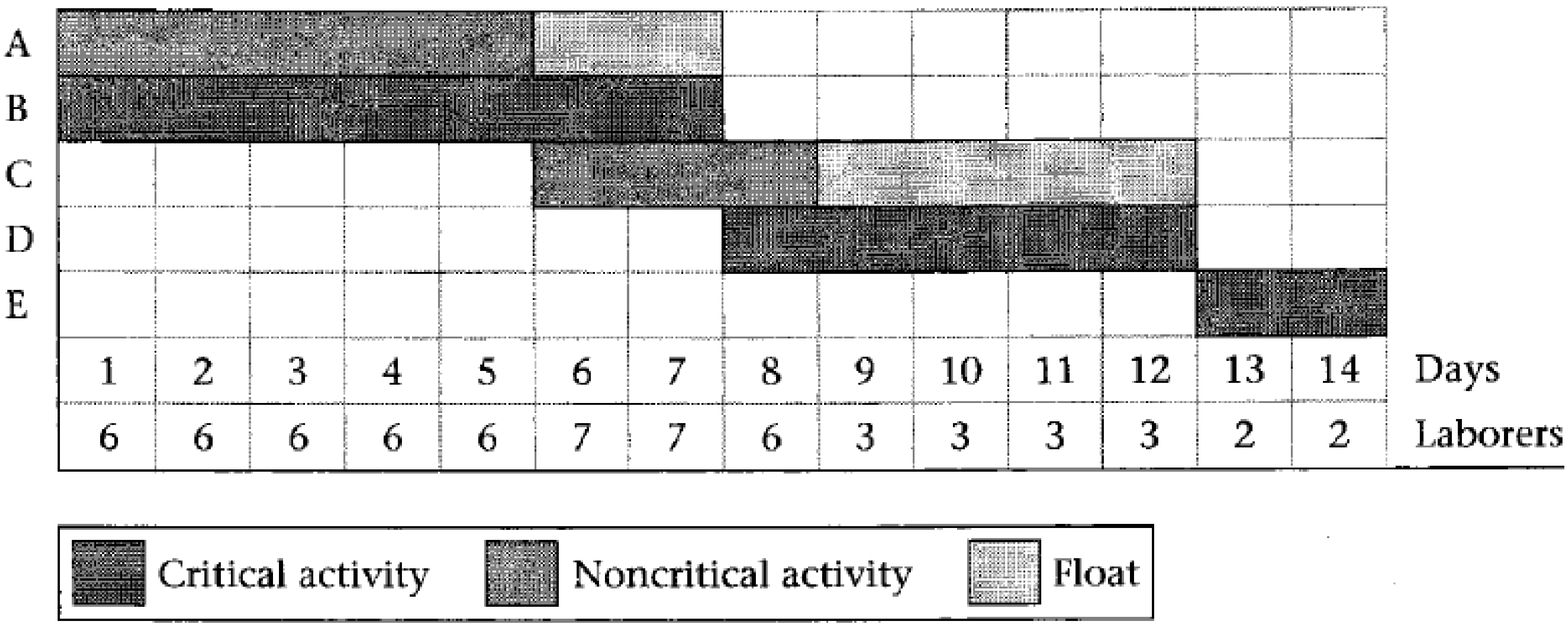
Solution

Figure 6.1 shows the precedence diagram for this example, and Figure 6.2, the bar chart and **resource usage profile,** or laborer, usage profile.



EXAMPLE6.1

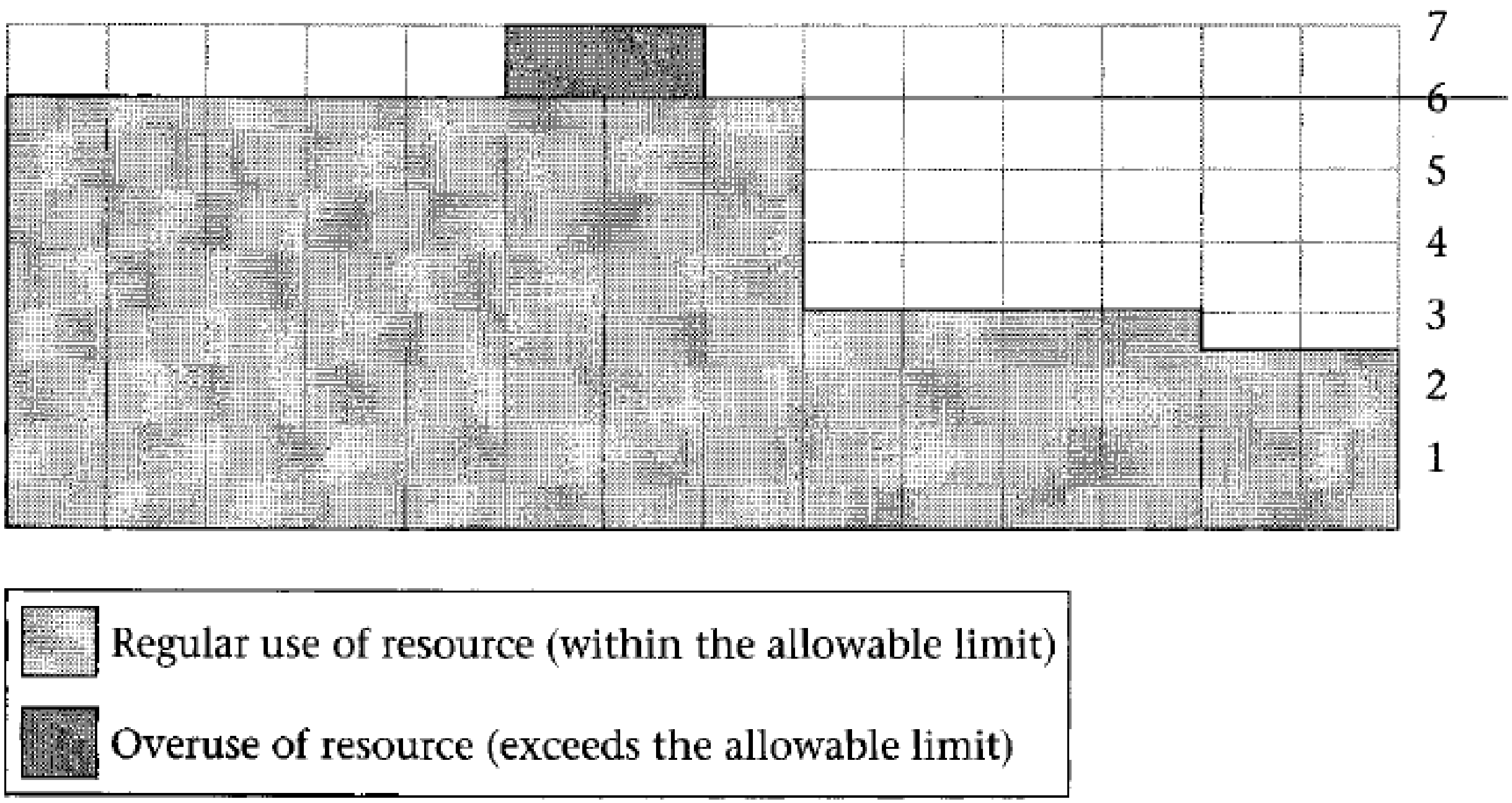
FIGURE 6.1 Precedence diagram for example 6.2 (PS, project start)



(a)

FIGURE 6.2 (a) Bar chart for example 6.2 with an unleveled labor assignment (typically following early dates);

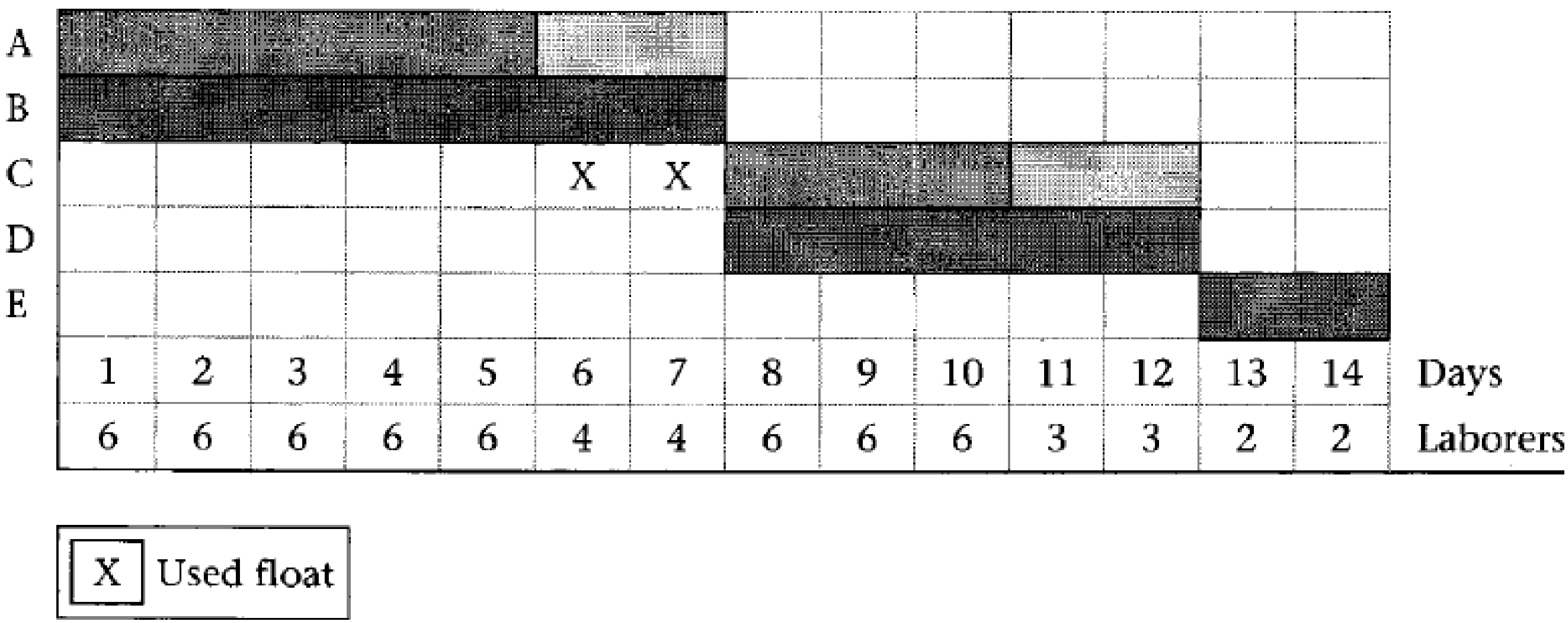
EXAMPLE6.1



(b)

FIGURE 6.2 *(continued)* (b) resource, or labor, usage profile for example 6.2. showing overallocation

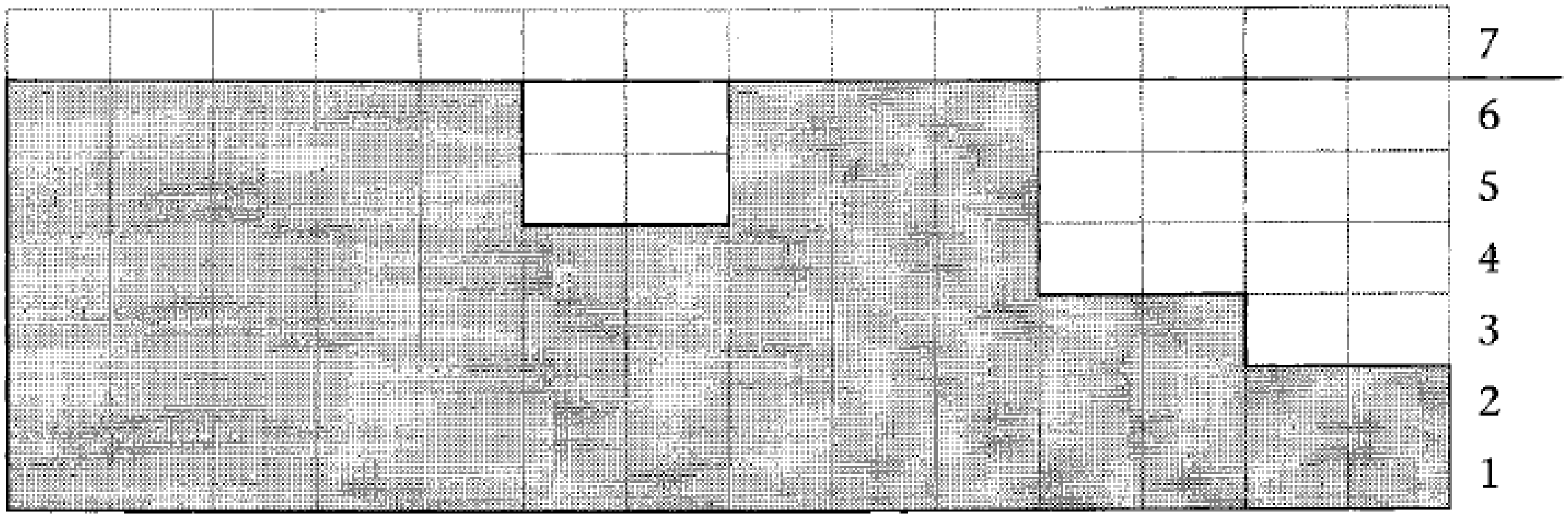
EXAMPLE6.1



(a)

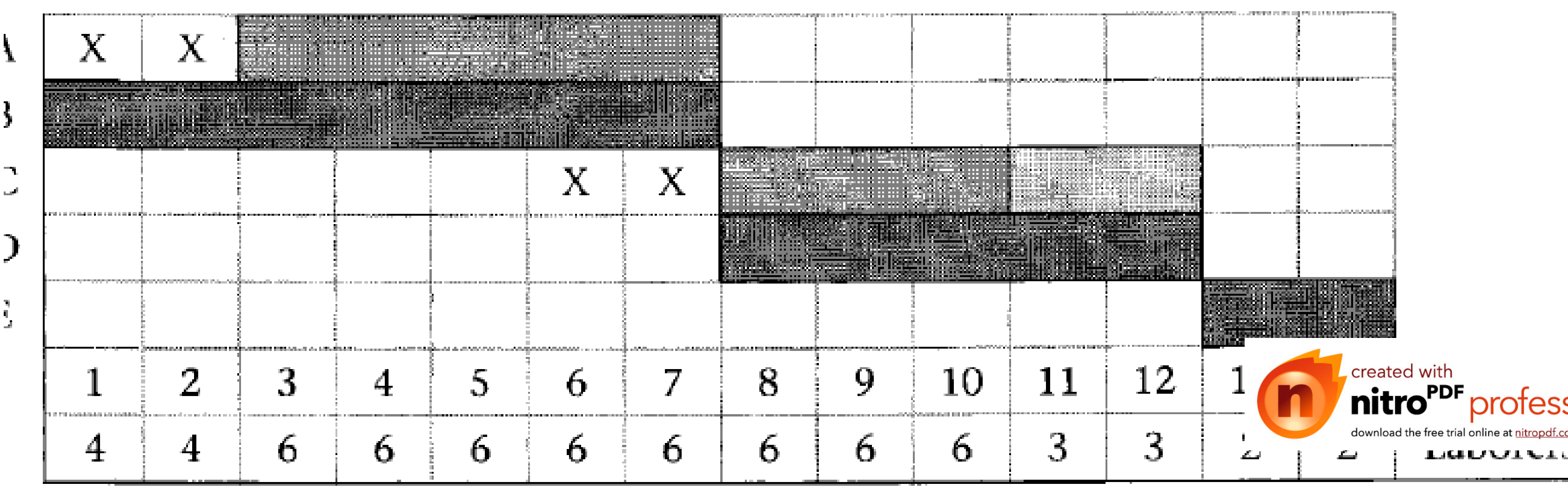
FIGURE 6.3 (a) Bar chart for example 6.2 with a leveled labor assignment (within the allowable limit);

EXAMPLE6.1

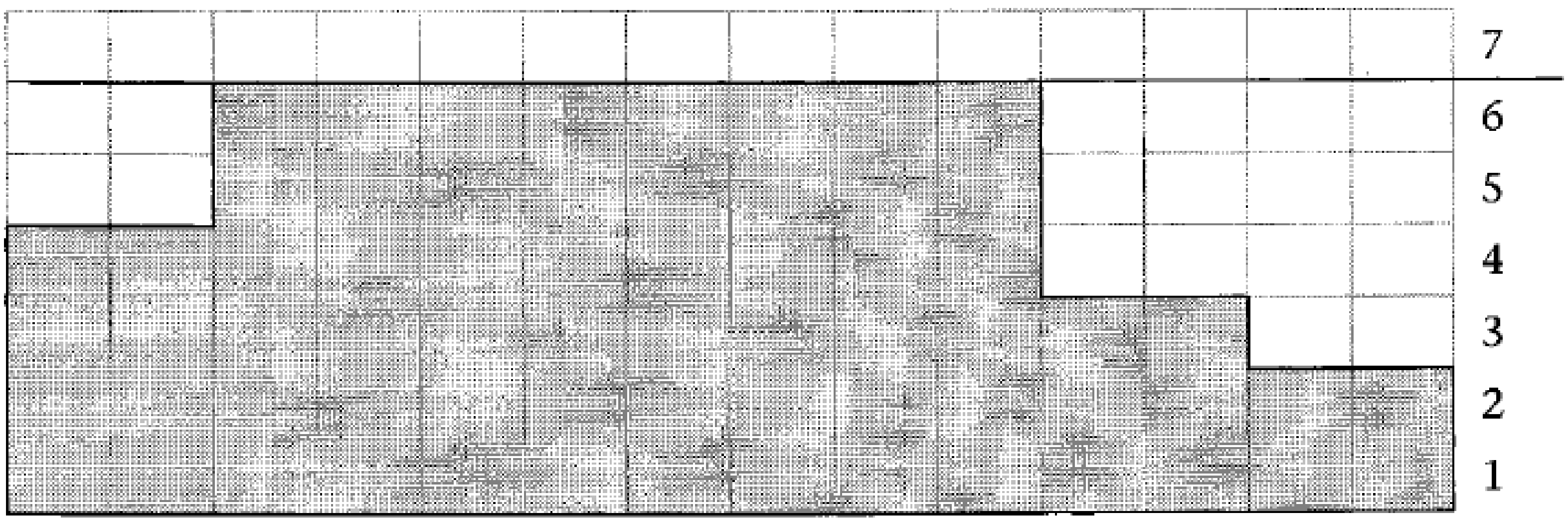


(b)

FIGURE 6.3 *(continued)* (b) resource, or labor, usage profile for example 6.2, with a labor assignment within the allowable limit



EXAMPLE6.2



(b)

FIGURE 6.4 (a) Bar chart for example 6.2 with the labor assignment leveled and more efficiently distributed; (b) resource, or labor, usage profile for example 6.2 with the labor assignment efficiently distributed within the allowable limit

RESOURCE LEVELING FROM THE GENERAL CONTRACTOR'S PERSPECTIVE

The general contractor in stead must manage overall work of his or her subcontractor. However he or she may still be concerned with the following four issues:-

1-keping up with the subcontractor's schedule and the number of workers each subcontractor has, each day, is one concern

2. If the owner's purchased equipment and materials are to be used, the general contractor must be in full coordination with the relevant subcontractor with regard to the time and method of delivery.
3. When the general contractor is providing equipment such as a crane to the subcontractors, he or she must coordinate the use equipment and prioritize the subcontractors' needs.

MATERIAL MANAGMENT

Materials management is defined as the planning and controlling of all necessary efforts to ensure that the correct quality and quantity of materials and equipment are appropriately specified in a timely manner, are obtained at a reasonable cost, and are available when needed (Construction Industry 1986b, 1988b). Four important objectives of materials management are as follows (Construction Industry Institute 1988b):

1. Ensure that materials meet the specifications and are on hand when and where required.
2. Obtain the best value for purchased materials.
3. Provide efficient, low-cost transport, security, and storage of materials at construction sites.
4. Reduce any surplus to the lowest level possible.

Some authors (Ahuja, Dozzi, and Abourizk 1994; Hendrickson and Au 1989) have identified four materials cost categories, as follows:

1. *Purchase costs.*
2. *Order costs.*
3. *Holding costs.*
4. *Shortage (unavailability) costs.*

Theoretically, there are two extreme materials management theories:

1. The **just-in-time theory,** which calls for delivering materials at the time of installation only. Thus, materials are not stored at the site.
2. The **inventory buffer theory,** which calls for all materials to be purchased, delivered, and stored on-site prior to installatior

cont.

The advantages of the first theory are less handling, no storage, no frozen capital, and less vulnerability to theft, vandalism, obsolescence, shrinkage, and deterioration—in other words, fewer handling costs. The disadvantages are higher order costs (more orders) and higher shortage costs (higher probability of not having materials on time). Conversely, the advantages of the second theory are lower purchase, order, and shortage costs. The disadvantage is higher holding costs.