



CE 479 - Construction Planning, Scheduling and Control

Lecture # 14

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Today...

- ❖ **Resource Allocation and Resource Leveling**
- ❖ **The Three Categories of Resources**

Introduction

- The term **resource** is used in many fields and contexts.
- Most companies have human resources departments, which match the need for employees with the appropriate supply by hiring and laying off workers.
- The term financial resources is commonly used to indicate available monetary sources.
- In project management, we use the term resources to indicate three main categories: **labor (human), equipment, and materials**.
- Ultimately, everything is translated into a monetary quantity that may be— for the accounting department—a part of the financial resources.

The Three Categories of Resources

All expenses, in any construction project, can be classified under one of the three categories just mentioned: **labor, equipment, and materials**.

Labor

1. **Salaried staff**: These individuals include the project manager, superintendent, project engineer, secretary, and any other person who is tied to the corporate office or a project but is not tied to one particular activity or work package in a project. Salaried persons usually get paid a fixed salary for the duration of the project or their assignment. Their salaries usually count as part of the company's indirect expenses (overhead), not as labor.
2. **Hourly workers**: These individuals are hired to perform a specific task or activity. Examples include carpenters, masons, ironworkers, electricians, foremen, and so forth. They are usually paid for actual hours worked.

The Three Categories of Resources

Equipment, and Materials

1. **Construction equipment and materials:** This type of equipment and materials is used for the construction process but is not permanently installed in the project. Examples of construction equipment are bulldozers, backhoes, scrapers, cranes, power generators (if not permanently installed), forklifts, mechanical trowels, heaters, and blowers. Inexpensive personal tools are usually treated differently (either as a lump sum for all tools or as the laborer's personal property). Examples of construction materials are formwork materials and scaffolding.
2. **Installed equipment and materials:** This type of equipment and materials stays permanently in the project after completion. Examples of installed equipment

The Three Categories of Resources

Equipment, and Materials

2. **Installed equipment and materials:** This type of equipment and materials stays permanently in the project after completion.

Examples of installed equipment are heat pumps, emergency power generators (usually installed in hospitals, industrial projects, and some other projects), kitchen equipment, and other specialized equipment in industrial projects. Examples of installed materials are concrete, rebar, concrete masonry units (CMUs), brick, mortar, insulation, framing wood, paint, roof shingles, floor tile and carpet, bathroom accessories, plumbing pipes and fittings, and electrical wires. Elevators and escalators may be classified as either installed equipment or installed materials, but in most cases, they are installed by the same vendor and in the estimate are considered a subcontractor cost.

For estimators, the equipment category includes mostly construction equipment. Installed equipment falls in the materials category.

What is Resource Allocation?

- Resource allocation is the assignment of the required resources to each activity, in the required amount and timing.
- Resource allocation is also called resource loading.

What is Resource Leveling?

- Resource leveling is **minimizing the fluctuations** in day-to-day resource use throughout the project.
- It is usually done by shifting noncritical activities within their available float.
- It attempts to make the daily use of a certain resource as uniform as possible.



Do All Resources Have to Be Levelled?

- **Not all resources need to be levelled.** The main idea of resource leveling is to *improve work efficiency and minimize the cost of the project.*
- This concept applies to resources that are hired or rented—namely, labor and (major) construction equipment. This is because these resources cost the contractor money just for their being on site—working or idle.
- The need for such resources may vary significantly as some activities start (they pull new resources) and other activities finish (they release their resources). Likewise, the resource requirement of some activities changes during their duration.
- In general, materials do not need to be levelled. For instance, it is not an uncommon practice to place 100 CY (cubic yards) of concrete in one day, place no concrete for one week, place more concrete the week after, and so on.

Multi-project Resource Leveling

- Some resources may be shared among projects. The question is which resources and how much should be shared.
- For small projects in a relatively close vicinity, for example, some staff (project manager, safety manager, quality manager, secretary, etc.) and equipment can be shared.
- A project manager must make decisions when the situation looks like a borderline case: for instance, whether it would be more efficient to have someone travel between two jobs versus hiring another person, even though that person would not be fully occupied of the time.



Multi-project Resource Leveling

- The same argument holds true for **equipment**. In general, **convenience and simple economics** are mostly the driving criteria in making such decisions.
- However, other issues may be considered, such as the short- and long-term need; future market expectations; staff morale, fatigue, and satisfaction; relationships with stakeholders; the possibility of a need suddenly occurring, and so forth.
- Keep in mind that transferring resources from one project to another permanently is frequently and normally done, and it is not considered sharing.



Sharing resources among projects is simply a matter of feasibility and economy.