

Adapted from the Course Book: *Manufacturing Facilities Design and Material Handling*, F.E. Meyers and M.P. Stephens, 5<sup>th</sup> Edition, 2013, Purdue University Press (ISBN-10: 1557536503)

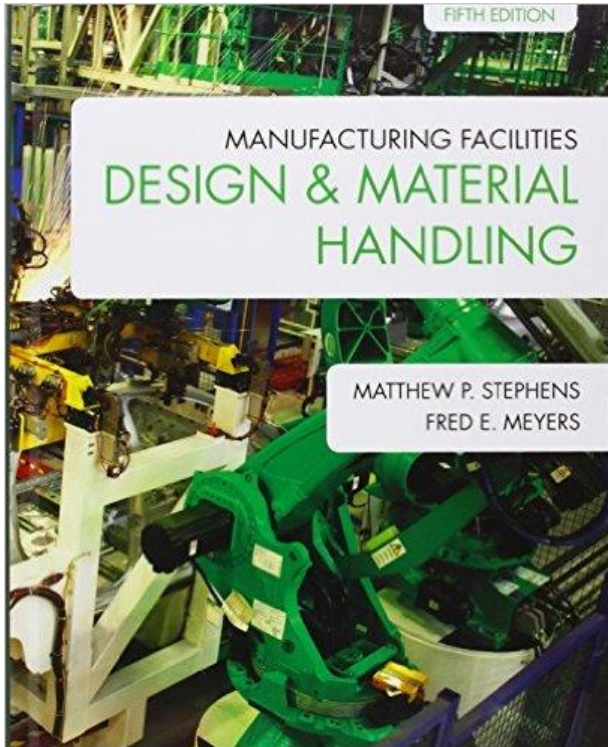
# Introduction to Facility Layout Planning

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# Course Book



*Course Book: Manufacturing Facilities Design and Material Handling, F.E. Meyers and M.P. Stephens, 5<sup>th</sup> Edition, 2013, ISBN-10: 1557536503*

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# Content

- Introduction
- Objective of Plant Layout
- Factors Affecting Plant Layout
- Types of Plant Layout
  - Fixed-Position Layout
  - Product-Oriented Layout
  - Process-Oriented Layout
  - Cellular Manufacturing Layout
- Video: Facility Planning Process and Layout



# Introduction

## *Facility Layout:*

Arrangement of machines, storage areas, and/or work areas usually within the confines of a physical structure, such as a retail store, an office, a warehouse, or a manufacturing facility.





# Objective of Plant Layout



*The main objective* consists of organizing equipment and working areas in the most efficient way, and at the same time satisfactory and safe for the personnel doing the work.



# Factors Affecting Plant Layout

The final solution for a Plant Layout has to take into account a balance among *the characteristics and considerations of all factors* affecting plant layout, in order to get *the maximum* advantages.

The factors affecting plant layout can be grouped into 8 categories:

- *Materials*
- *Machinery*
- *Labor*
- *Material Handling*
- *Waiting Time*
- *Auxiliary Services*
- *The Building*
- *Future Changes*

# Types of Plant Layout

The production process normally determines the type of plant layout to be applied to the facility:

- *Fixed-position plant layout*  
Product stays and resources move to it.
- *Product-oriented plant layout*  
Machinery and Materials are placed following the product path.
- *Process-oriented plant layout*  
Machinery is placed according to what they do and materials go to them.
- *Cellular manufacturing layout*  
Hybrid Layout that tries to take advantage of different layouts types.

# Types of Plant Layout

## *Fixed-Position Layout*

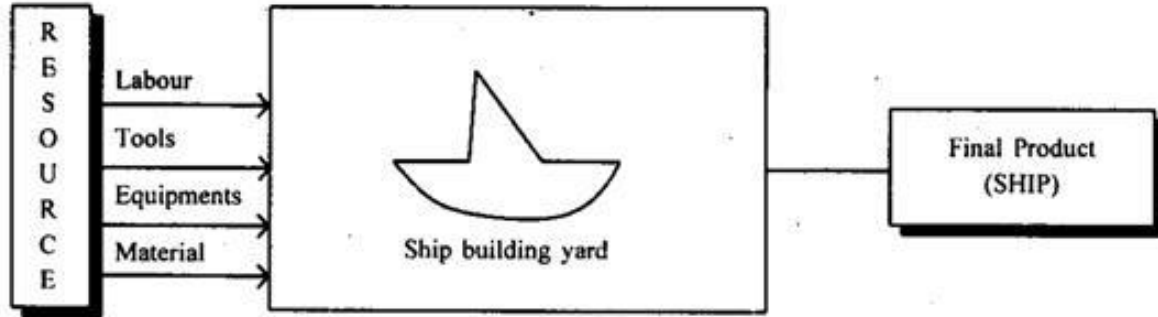
Manufacturing and non-manufacturing operations of bulky or fragile products, *e.g., ships and planes.*

Move machines and/or workers to the site; products normally remains in one location for its entire manufacturing period



# Types of Plant Layout

## *Fixed-Position Layout*



# Types of Plant Layout

## *Product-Oriented Plant Layout*

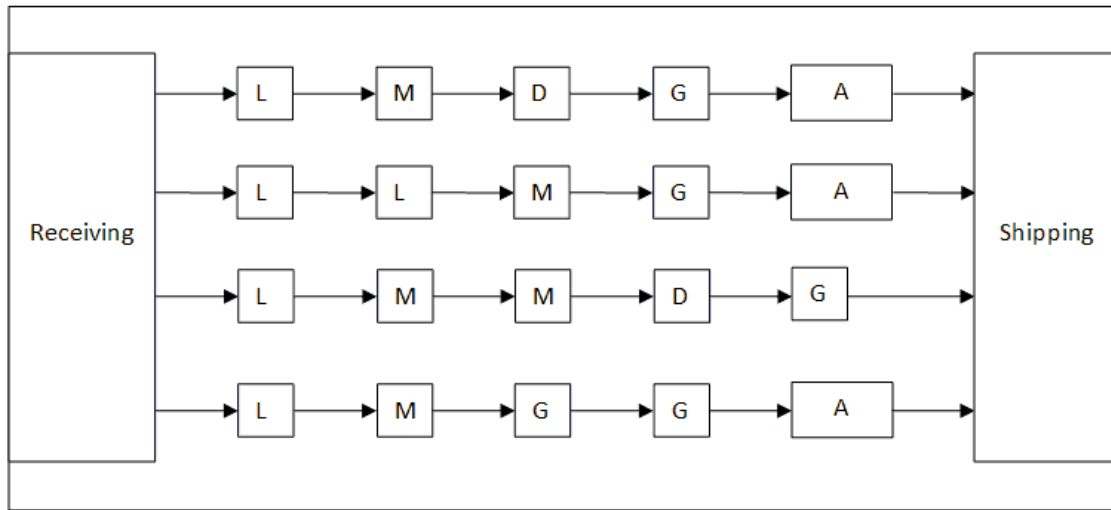
This type of plant layout is useful when the production process is organized in a *continuous* or *repetitive* way.

- Continuous flow: The correct operations flow is reached through the layout design and the equipment and machinery specifications.
- Repetitive flow (assembly line): The correct operations flow will be based in a line balancing exercise, in order to avoid problems generated by bottlenecks.

The plant layout will be based in allocating a machine as close as possible to the next one in line, in the correct sequence to manufacture the product.

# Types of Plant Layout

## *Product-Oriented Plant Layout*





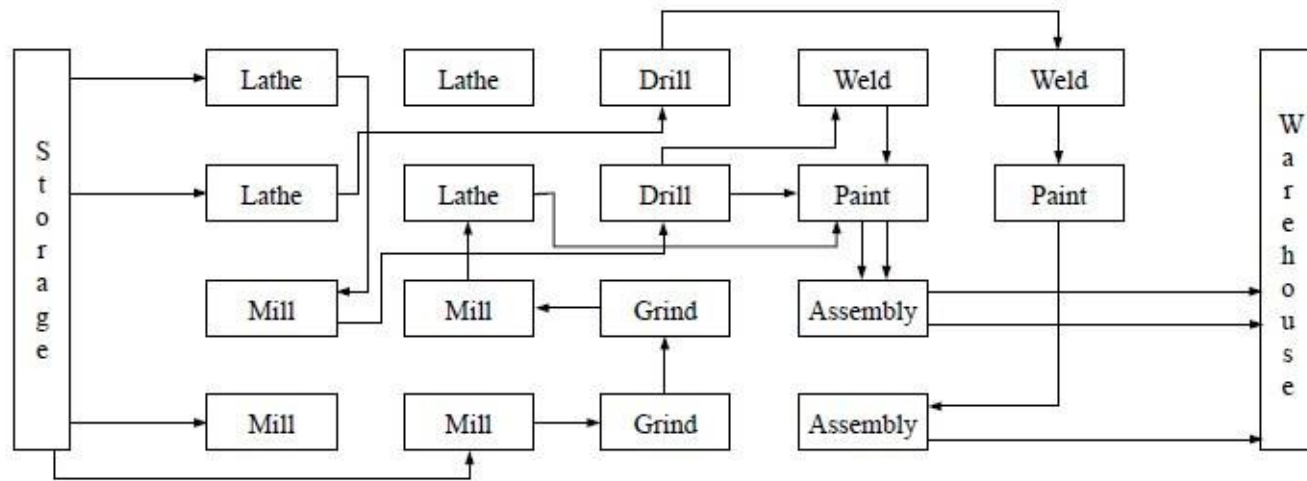
# Types of Plant Layout

## *Process-Oriented Plant Layout*

- This type of plant layout is useful when the production process is organized *in batches*.
- Personnel and equipment to perform the same function are allocated *in the same area*.
- *The different items* have to move from one area to another one, according to the sequence of operations previously established.
- The variety of products to produce will lead to *a diversity of flows* through the facility.
- *The variations in the production volumes* from one period to the next one (short periods of time) may lead to modifications in the manufactured quantities as well as the types of products to be produced.

# Types of Plant Layout

## *Process-Oriented Plant Layout*



# Types of Plant Layout

## *Cellular Manufacturing Layout*

Group of equipment and workers that perform a sequence of operations over multiple units of an item or family of items.

Looks for the advantages of product and process layouts:

Product-oriented layout: *Efficiency*

Process-oriented layout: *Flexibility*

## Group Technology

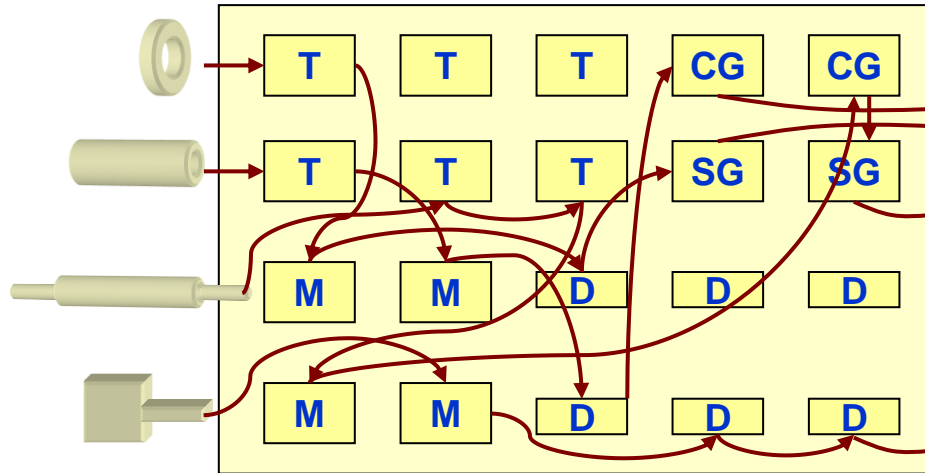
Grouping outputs with the same characteristics to families, and assigning groups of machines and workers for the production of each family.



# Types of Plant Layout

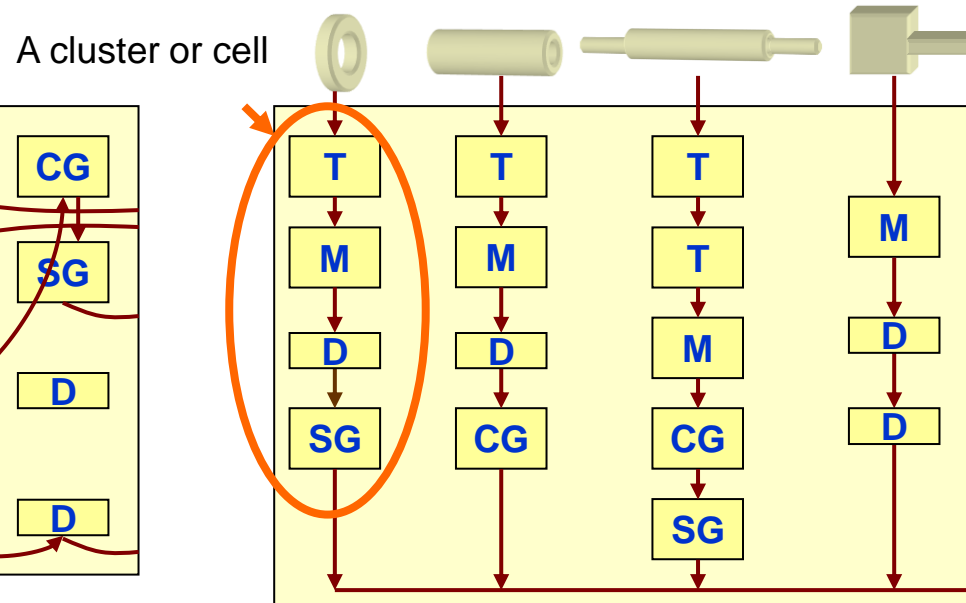
## *Cellular Manufacturing Layout vs. Process-Oriented Plant Layout*

Process-Oriented Plant Layout



Similar resources placed together

Group (Cellular) Layout



Resources to produce similar products placed together

# Video: Facility Planning Process and Layout



Thanks for Listening ...