

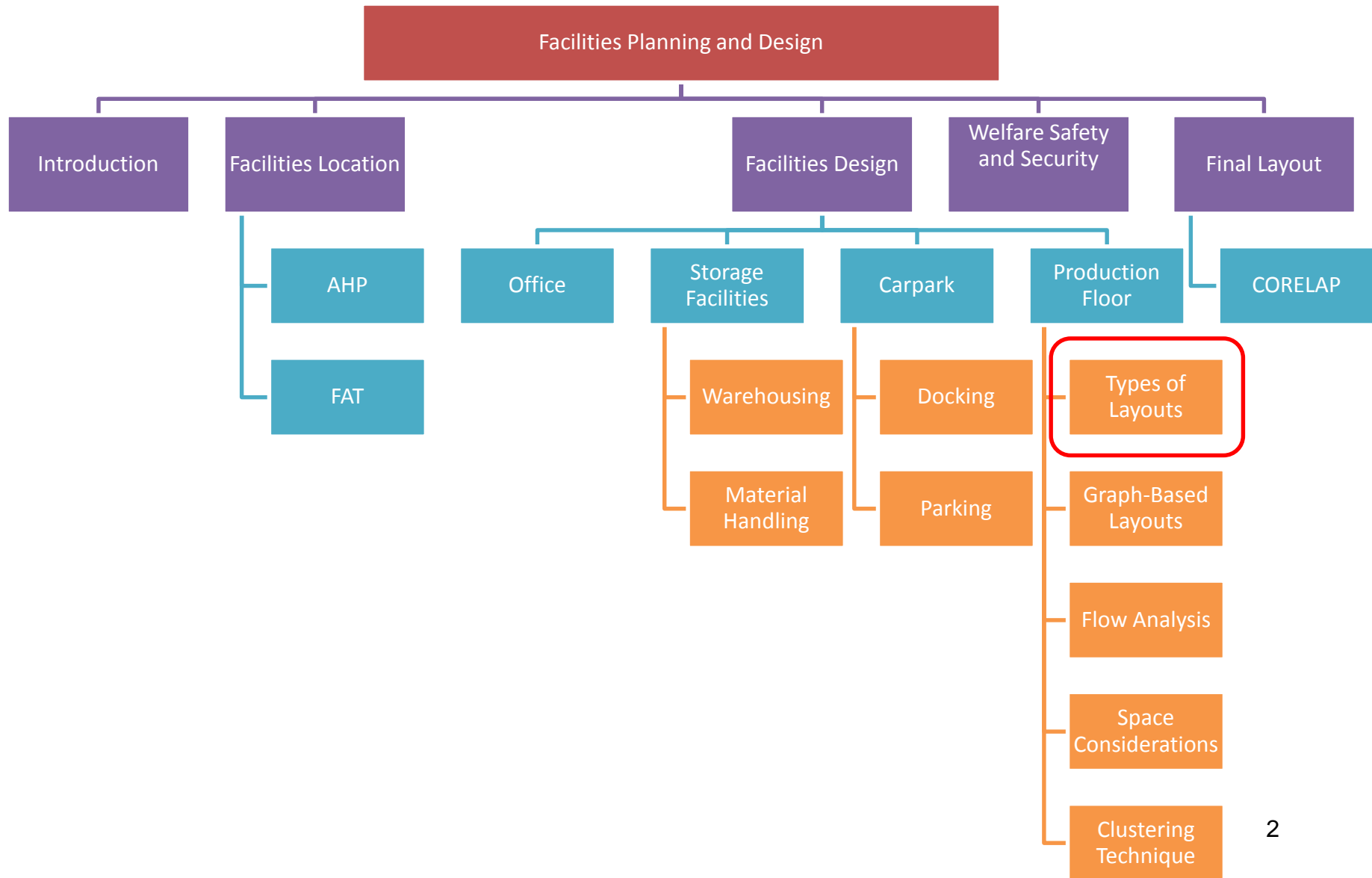


P03 The Basic

E212 – Facilities Planning and Design

SCHOOL OF
ENGINEERING

E212 Facilities Planning & Design - Topic Tree



Learning Objectives



- Describe the need of layout design decisions and identify important factors to consider when making layout design decisions
- Identify different types of basic layout and explain the advantages and disadvantages of each layout
- Illustrate the process flow of a product in a manufacturing line in a Operation Process Chart.
- Select a suitable type of layout based on the characteristics of the product
- Draft out a facility layout using AutoCAD Architecture 2018.

Layout Design Decisions



- The need for layout design decisions:
 - Support new product or service introduction
 - Support change in the design of products or services
 - Remove inefficient operations, e.g. high-cost process
 - Remove hazards
- A good layout design is able to:
 - Support changes in volume of output or mix of products
 - Support changes in equipment or work methods
 - Address environmental, legal and other statutory requirements

Layout Design Decisions



- Factors to consider when making layout design decisions:
 - Demand forecast
 - Product variety
 - Material handling
 - Process requirement
 - System objectives
 - Flexibility in term of future changes
- Basic layout types:
 1. Fixed-position
 2. Product
 3. Process
 4. Cellular
 5. Mixed

Basic Layout Types



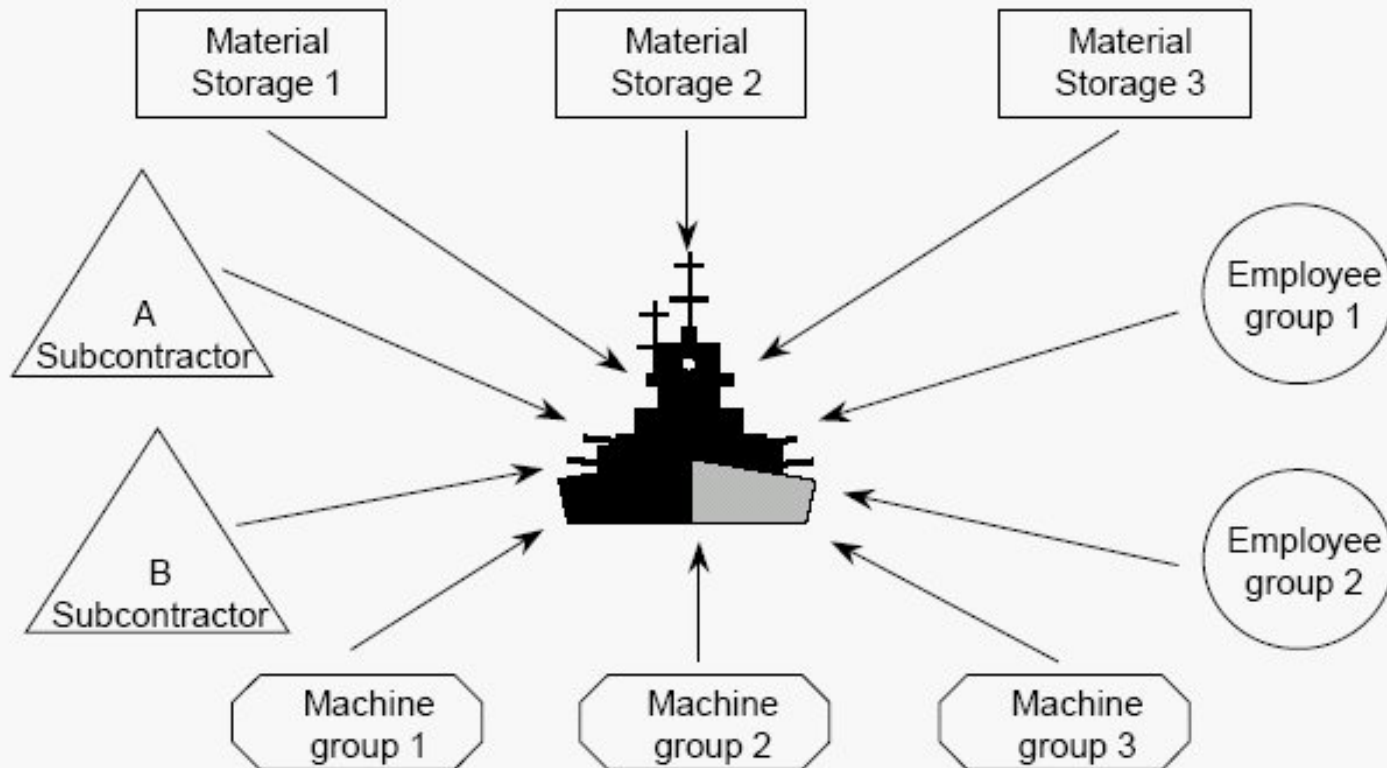
1. Fixed-Position Layout

- Layout in which the product remains stationary and workers, materials and equipment are moved as and when needed
- Equipment and tooling costs are low compared to other layout types
- Not geared for high-production quantities
- Used when the product is bulky, heavy or fragile
- High degree of product customization can be achieved
- Minimizes the amount of product movement
- Examples: Ship building
Aircraft assembly

Basic Layout Types



An example of Fixed-position layout: Ship building



Basic Layout Types



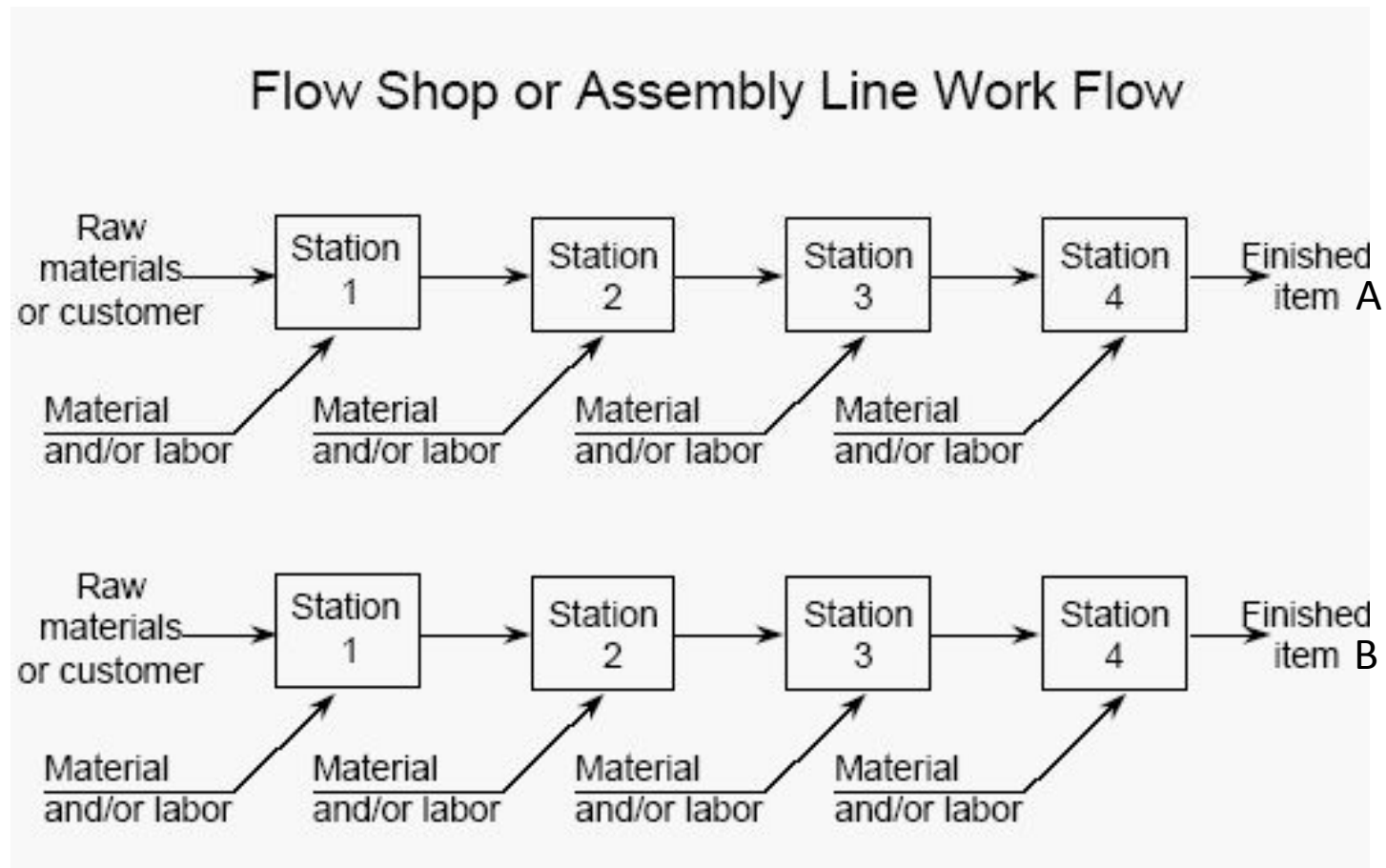
2. Product Layout

- Layout that uses **standardized processing operations** to achieve smooth, rapid, **high-volume flow**
- Equipment and tooling costs are generally higher
- High levels of labor and equipment utilization can be achieved
- Requires balance of time between operations: i.e. line balancing
- Provides opportunities for process automation
- According to **process flow** of each product
- Can achieve low production cost per unit
- Examples: Soft drink manufacturing
Sausage manufacturing

Basic Layout Types



An example of Product layout: Product Assembly Line



Basic Layout Types



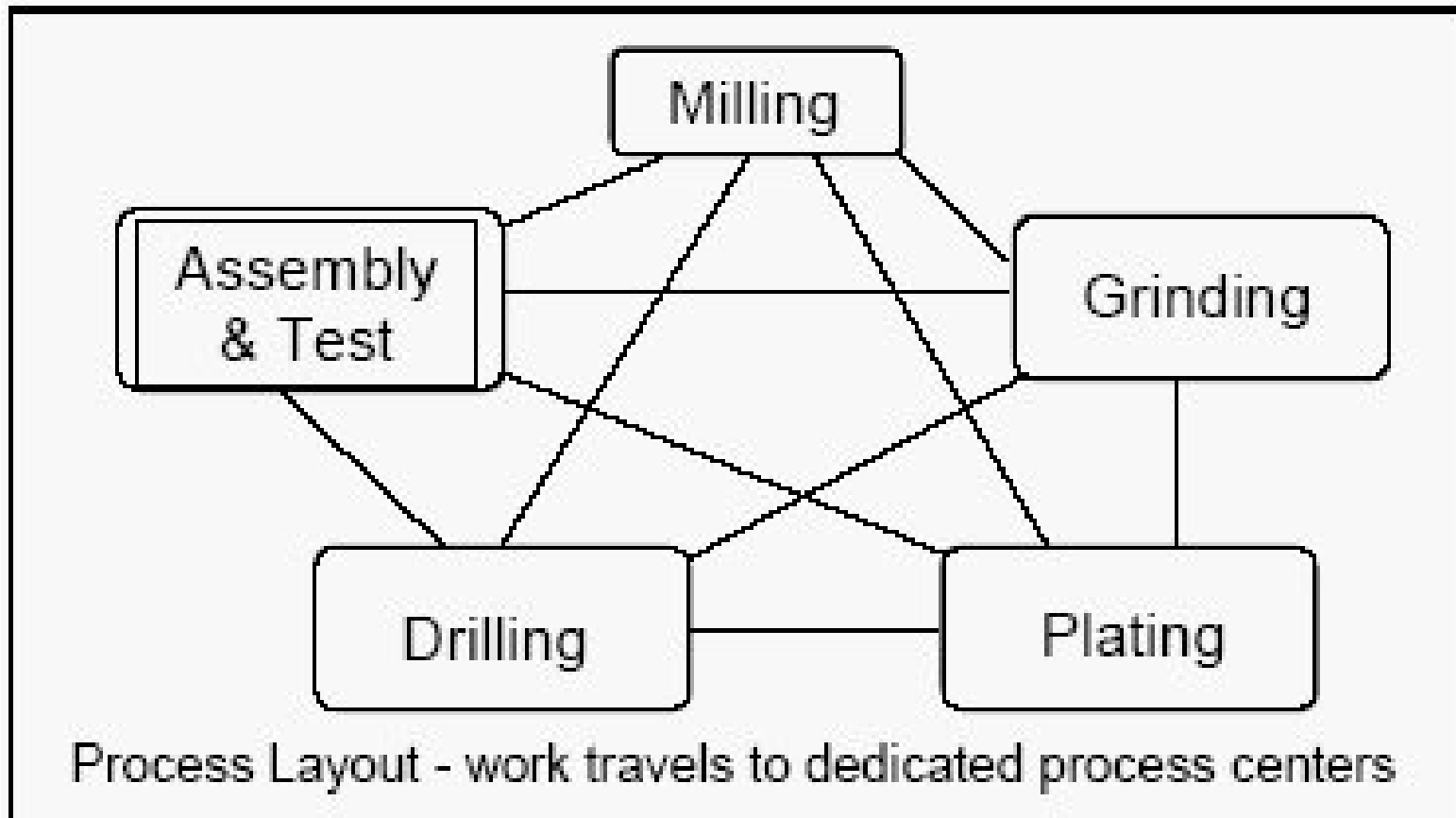
3. Process Layout

- For producing a **fairly large number** of similar products (in batches)
- Consists of several well-defined operations
- Equipment and tools are less costly than those in product-layouts
- **High degree of labor specialization by process**
- **According to the unique process**
- Equipment breakdown can be easily managed due to multiple machines
- Frequent set-up of machines to handle product (batch) changes
- Examples: Fast food operation
Car manufacturing

Basic Layout Types



An example of Process layout: Components machining



Basic Layout Types



4. Cellular Layout

- Layout in which machines are grouped into a cell that can handle items with similar processing requirements
- Grouping into part families of items with similar design or manufacturing characteristics is called group technology
- Group technology helps in achieving process standardization when processing large quantities of different components
- Examples: Domestic appliance manufacture
Machine component manufacture

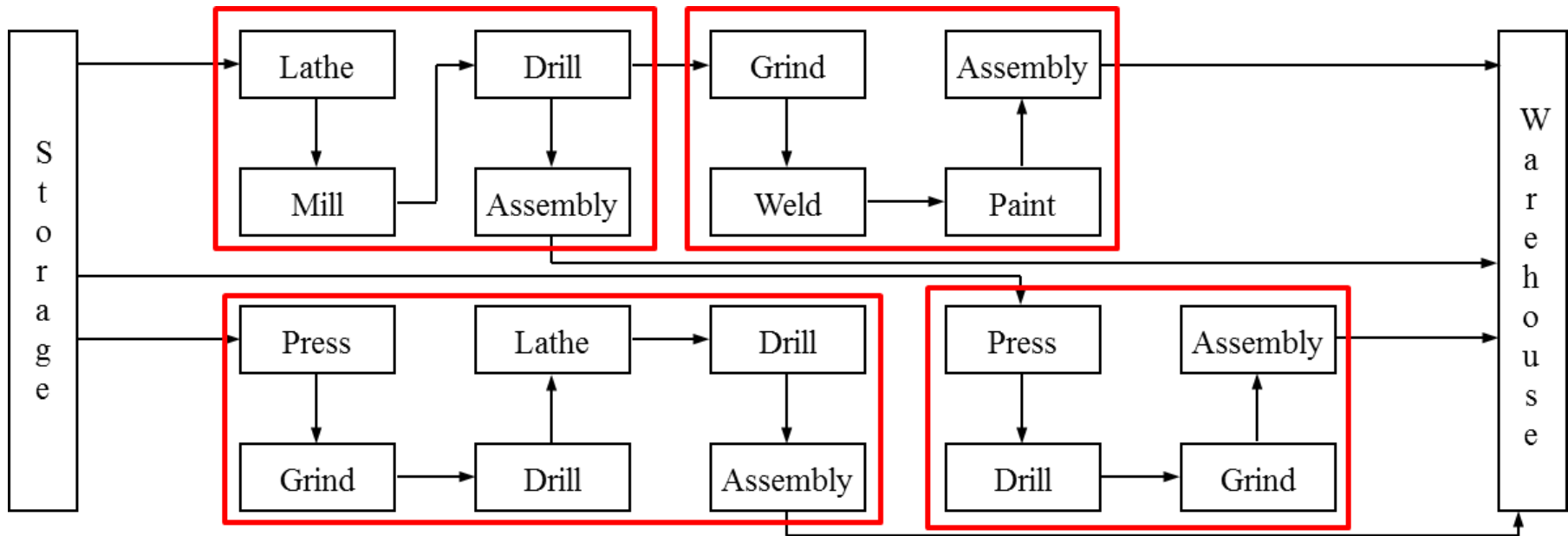
5. Mixed Layout

- A combination of product, process and/or cellular layouts across the entire product manufacturing flow₁₂

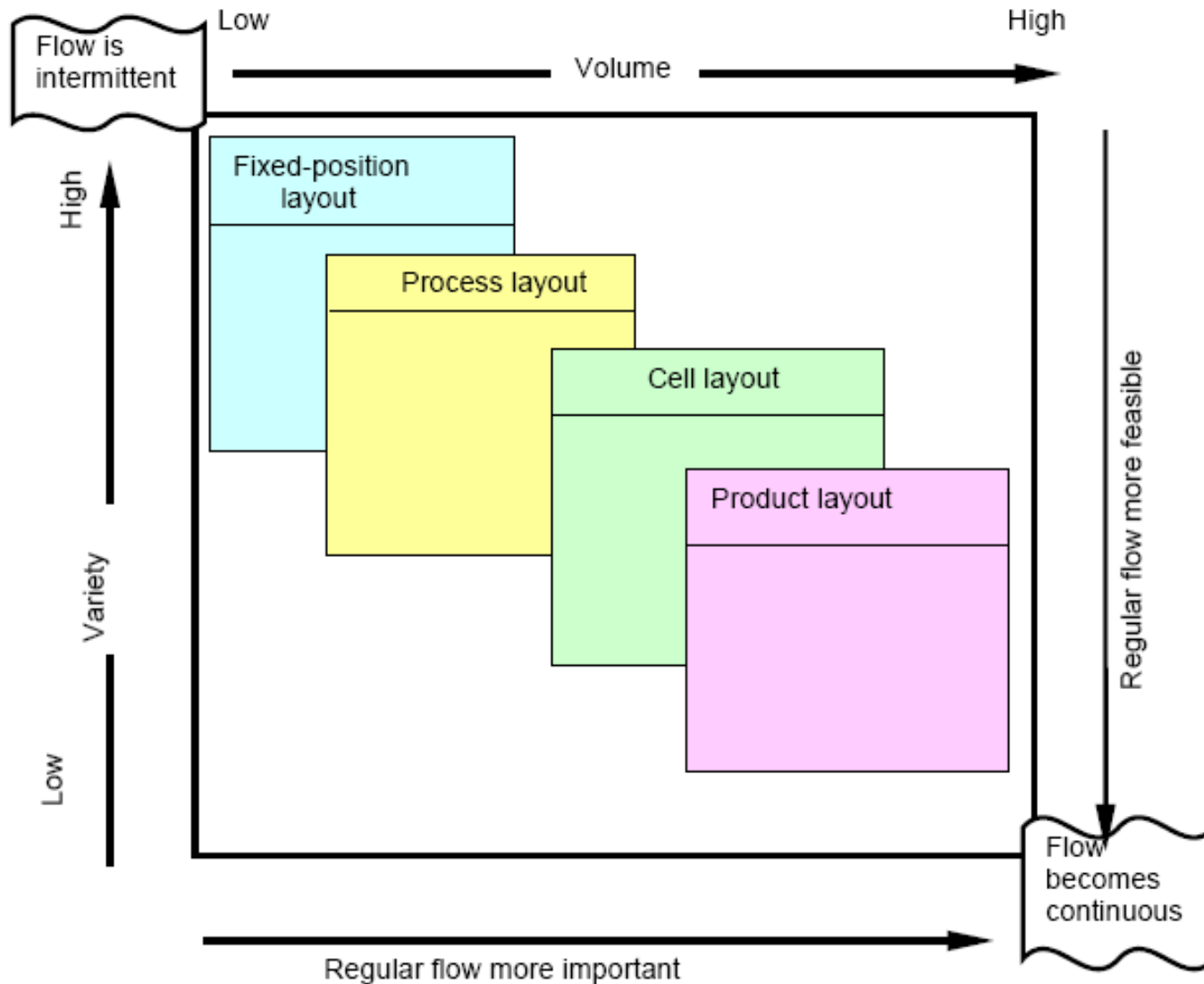
Basic Layout Types



An example of Cellular layout: Machine components manufacture



Layout Types



Problem 03

Suggested Solution



Suggested Solution



- Some essential questions that your team need to ask Goodle Corporation (to decide on a suitable layout):
 - How many product types Goodle Corporation plan to produce in this factory? Any customization allowed? (high or low **variety**)
 - What is the forecasted demand (high or low **volume**) for each product?
 - Any plan for new products in the future?

Suggested Solution



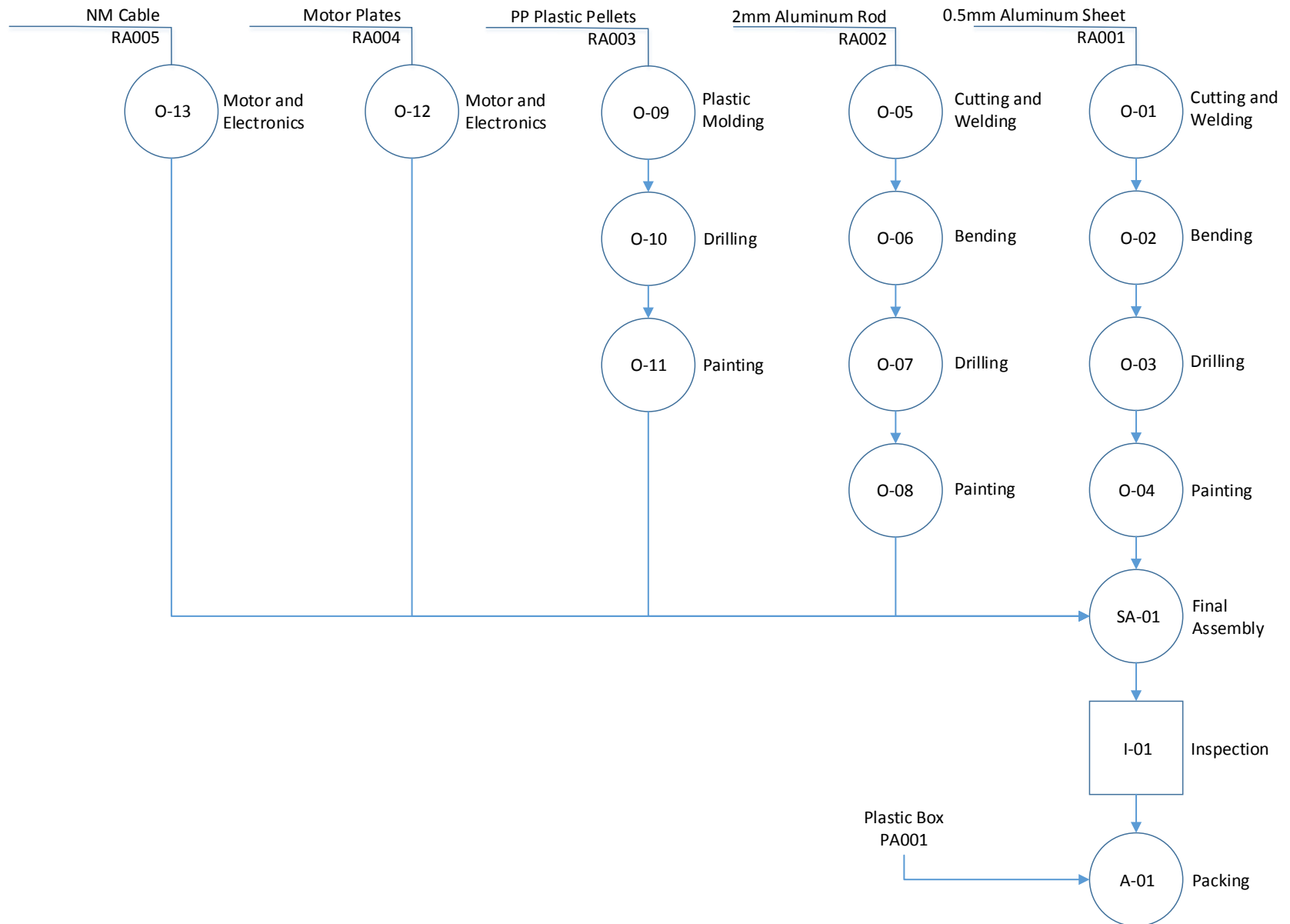
- From Goodle Corporation, we know that:
 - Currently, they plan to produce three models of the Smart Portable Fan Fan.
 - To give more options to the customer, there is a high probability that they will produce more models of fan next year in addition to current plan.
 - To stay relevant with the market trend, Goodle Corporation will update its product line every 2 years (i.e. the factory will produce different models every 2 years).
 - A moderate, stable and sustainable production volume is forecasted.

Suggested Solution



- A suitable factory layout for producing the Smart Portable Fan will be process layout, because:
 - The product will have some level of variety.
 - Flexibility is required to accommodate new product every year.
 - Moderate production volume.

Operation Process Chart (OPC)

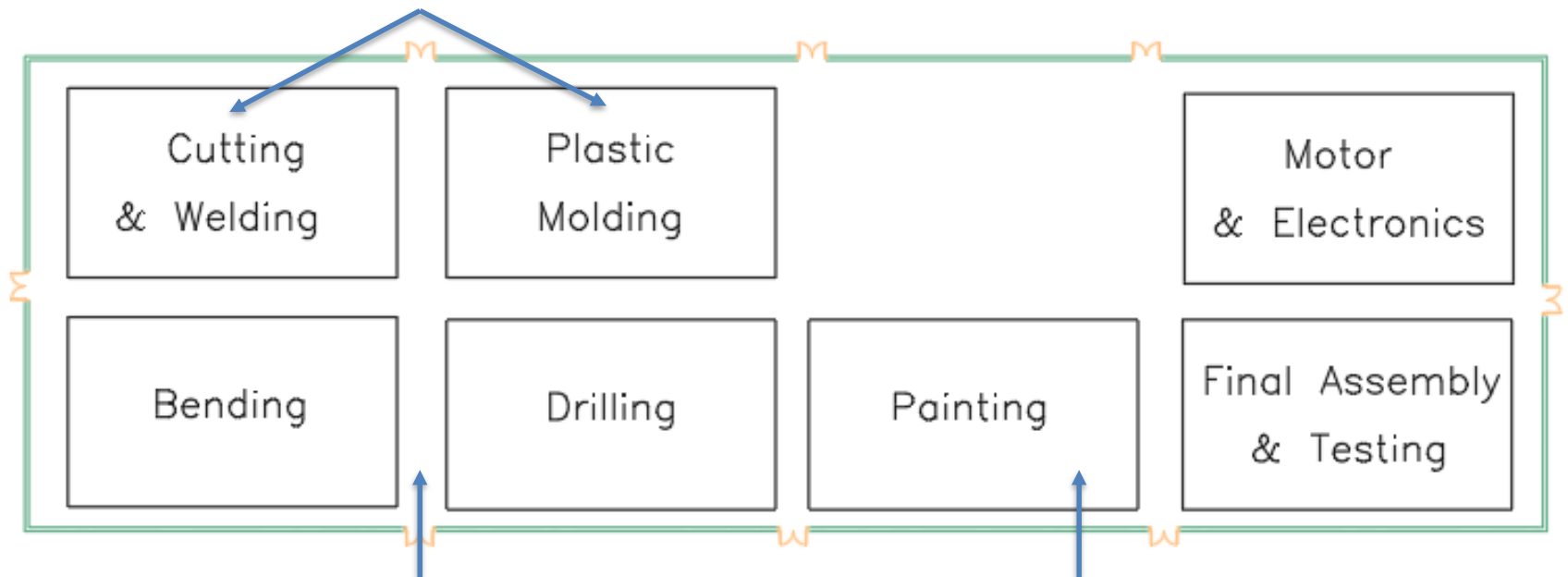


Suggested Solution



Suggested Layout of Production Floor

Where to position each department
(consider material flow and relation
between department)



Aisle space

How big each department area
should be (how many machine
will be on each department area)

Developing the layout





- In process layout, it is important to reduce the flow of materials in the facility
 - 2 departments with high flow between them should be situated close together

It is therefore necessary to know the material flow and activity relationship between departments

- The space required for each department have to be ascertained based on:
 - Equipment (Number of equipment required has to be worked out)
 - Aisle space
 - Maintenance / servicing space for equipment
- A space relationship diagram can then be developed and detailed layout of equipment done upon considering practical limitations and other modifying considerations
 - Various alternative layouts can be generated before the best one is chosen

AutoCAD Architecture 2018



- Selecting object (Blue and Green Selector)
 - Orthomode (F8) 
 - Object snap (F3) 
 - Move
 - Copy
 - Rotate
 - Array
 - Mirror
 - Object properties (ie: adjust wall thickness)
 - Using furniture catalogue
- Using *base point*

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Overview of E212 Facilities Planning and Design

