

Examples of plant layout and design

Principles of plant layout and design will apply to most industrial situations. The following layout examples encompass a wide variety of facility characteristics, and of process characteristics.

No example is likely to fit your exact needs, because buildings, dimensions, equipment and products vary so much. But flow and layout principles do apply widely. JPR can help with the detail that converts examples into practical solutions, with hands-on attention at your site,

or using remote input, which for early stages is often faster and cheaper but not as accurate as hands-on.

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Plant Layout and Facility Planning, Edition 2, https://www.amazon.com/dp/1491222395/ref=cm_sw_su_dp offers a reliable source of layout and facility planning guidance when you want to keep it in-house and is found at

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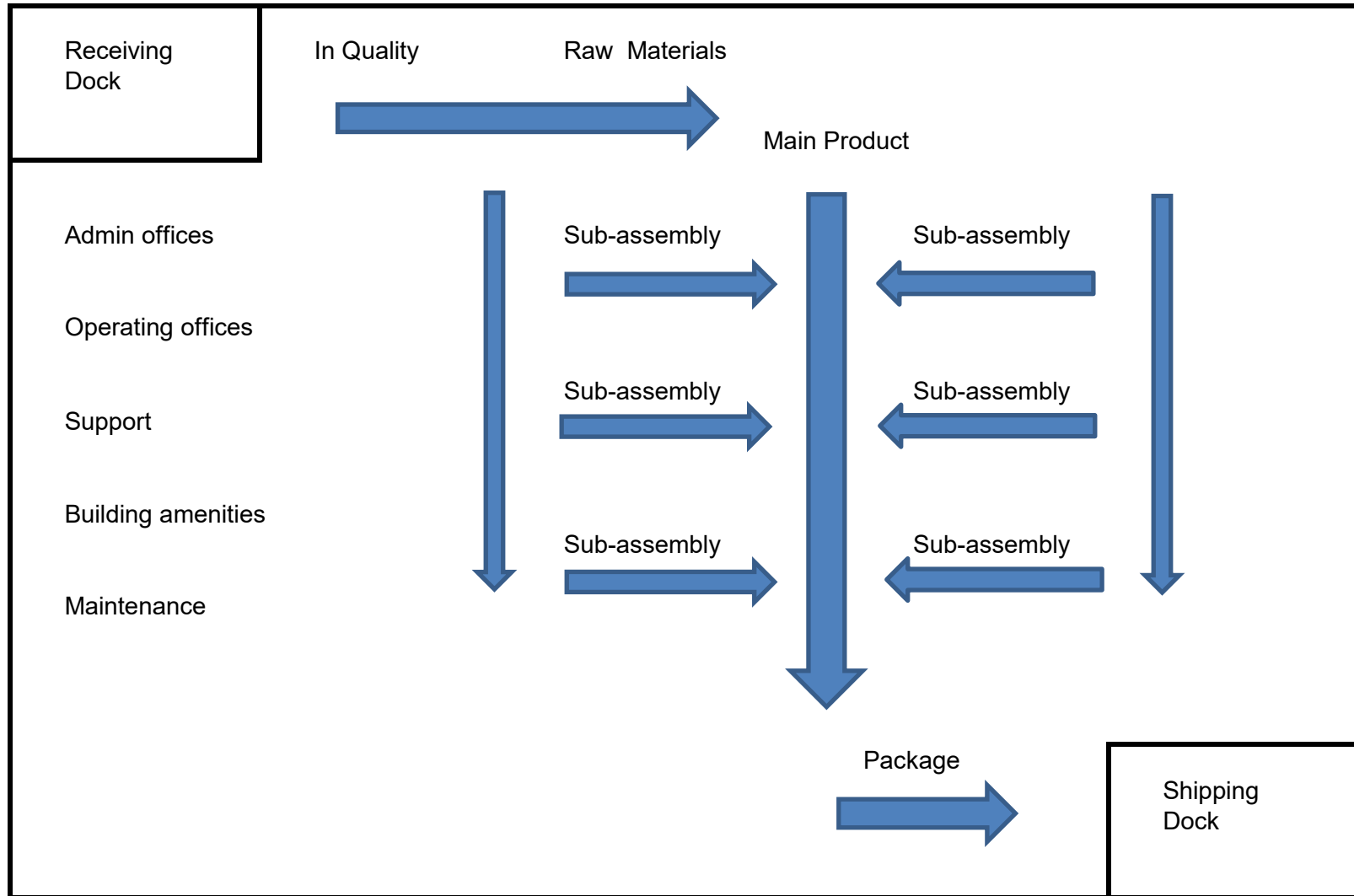
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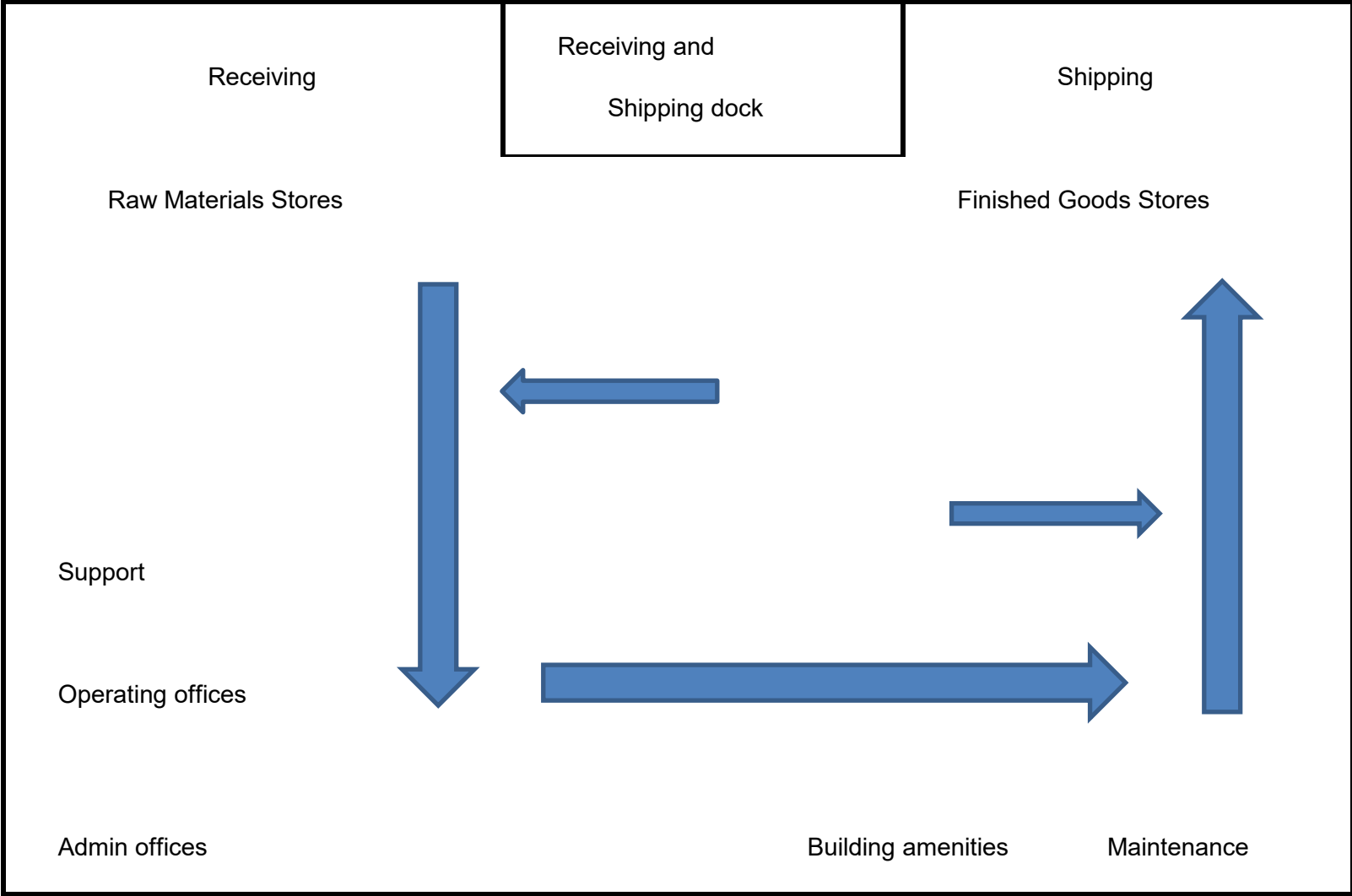
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A 1 Straight Line Flow

Flow is essentially straight line, although it adapts to building design.

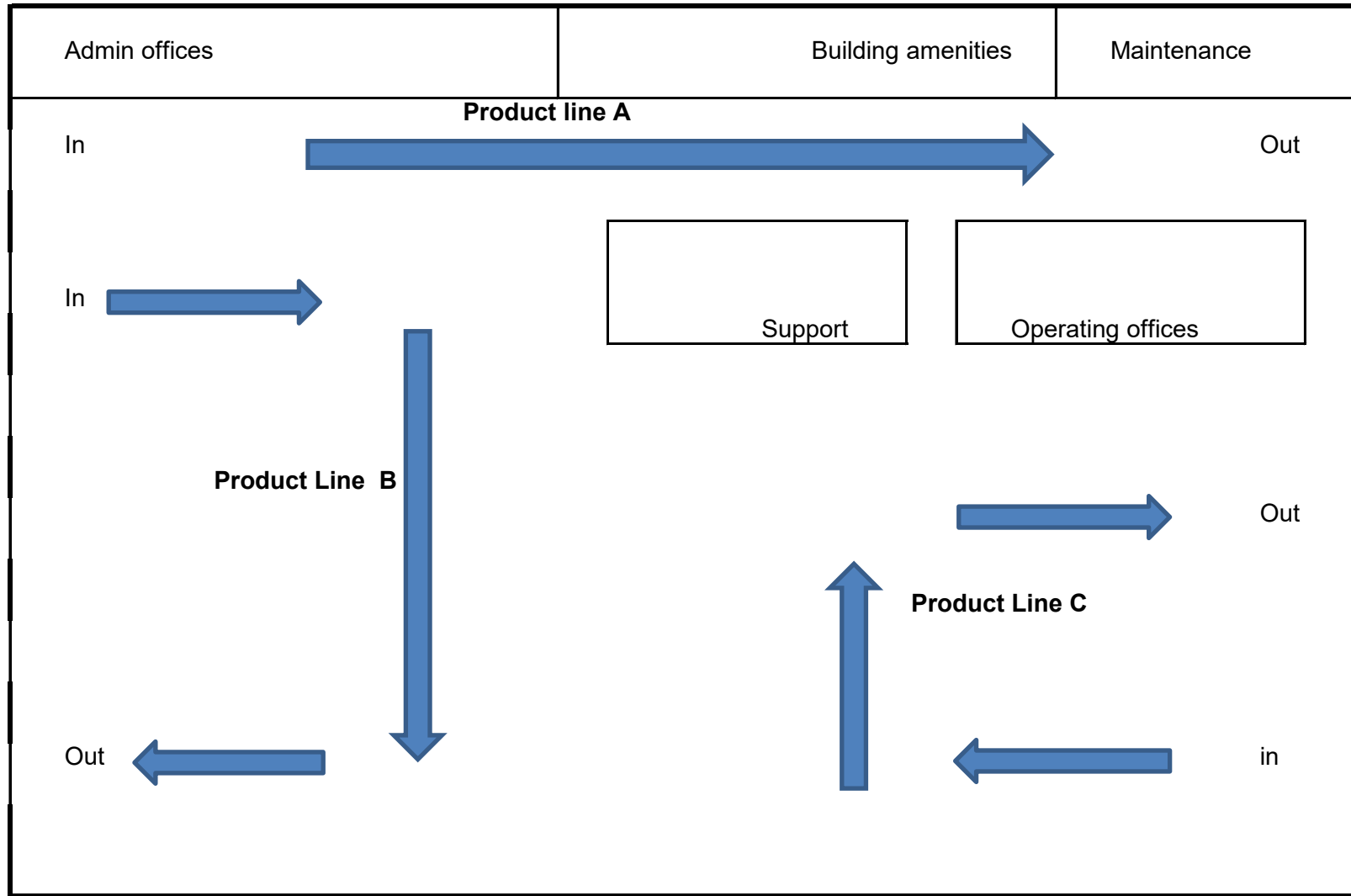


A 2 U Shaped Flow
In and out of the same dock



A 3 In a building designed for distribution, to adapt to another use

Many of these facilities are empty and available. They are characterized by multiple docks and doors. Take advantage of the docks to improve process flow for your operation.



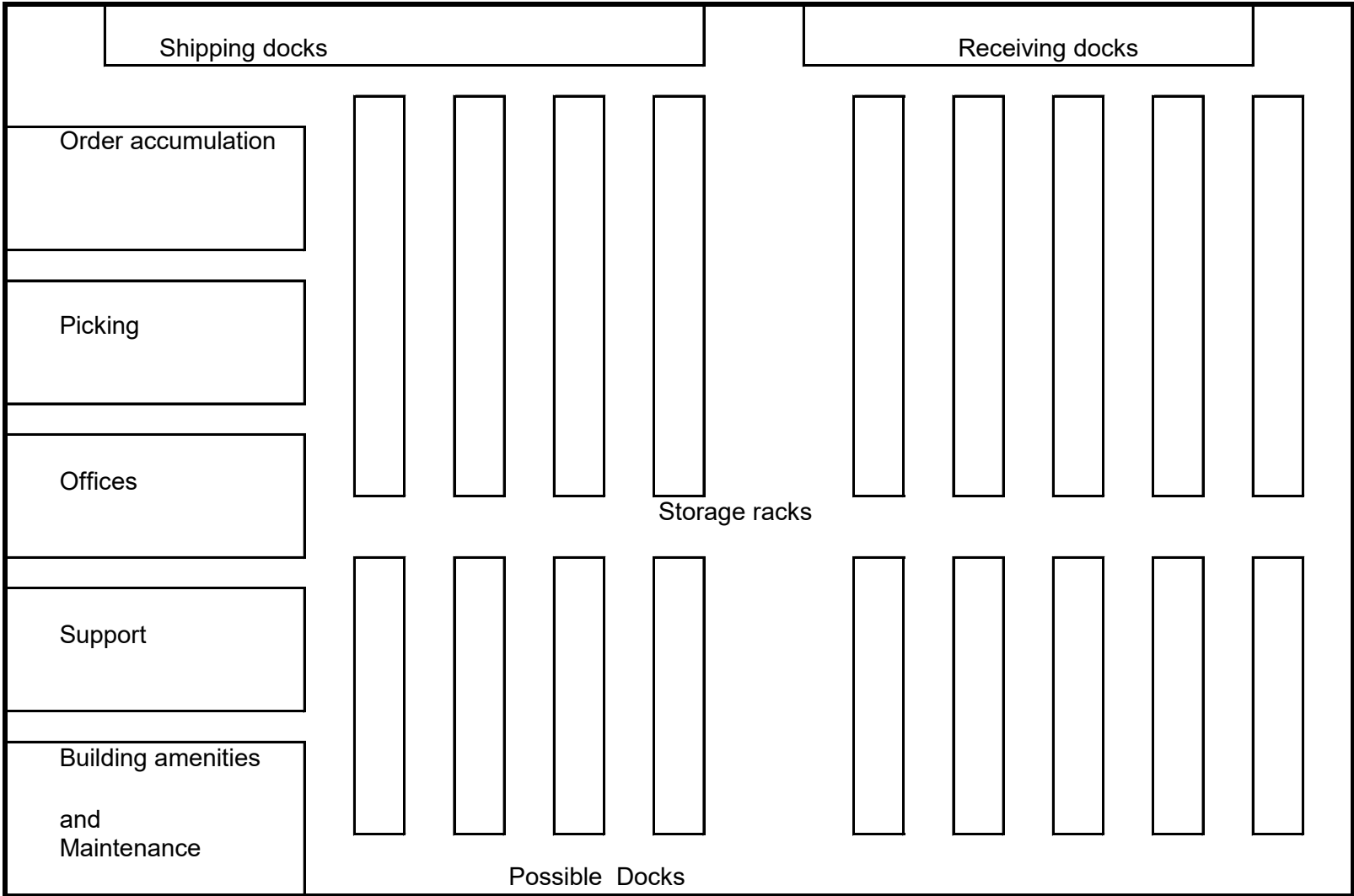
A 4 To place permanent equipment and avoid later interference

Position fixed, hard to relocate, functions and equipment along a wall that will not be used for later expansion. Place equipment outside as well as inside exterior walls.

Hoppers	Liquid waste disposal
Bins	Rest rooms
Tanks	Fire sprinkler risers
Solid waste	In power
Water tower	In gas
Dust collection	Water softening
	Water purification
	Blow-out walls
	Plating, degreasing
	Motor control centers
	Process using mezzanine

A 5 Distribution center

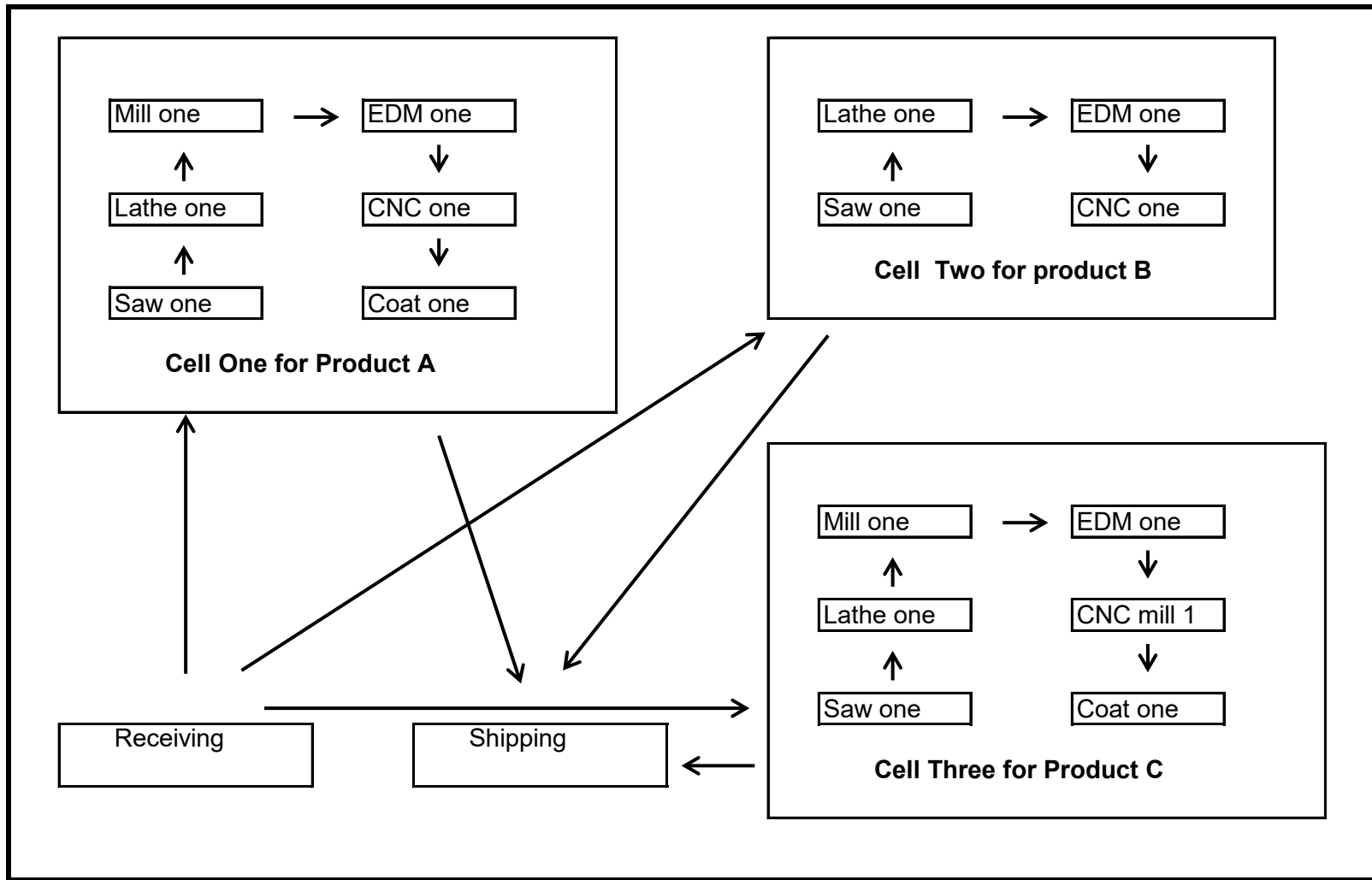
A DC will have many docks, and many storage racks. Straight line or U-shaped flow will depend on dock location. Reduce travel by careful location of materials in racks; warehousing programs will help.



A 6

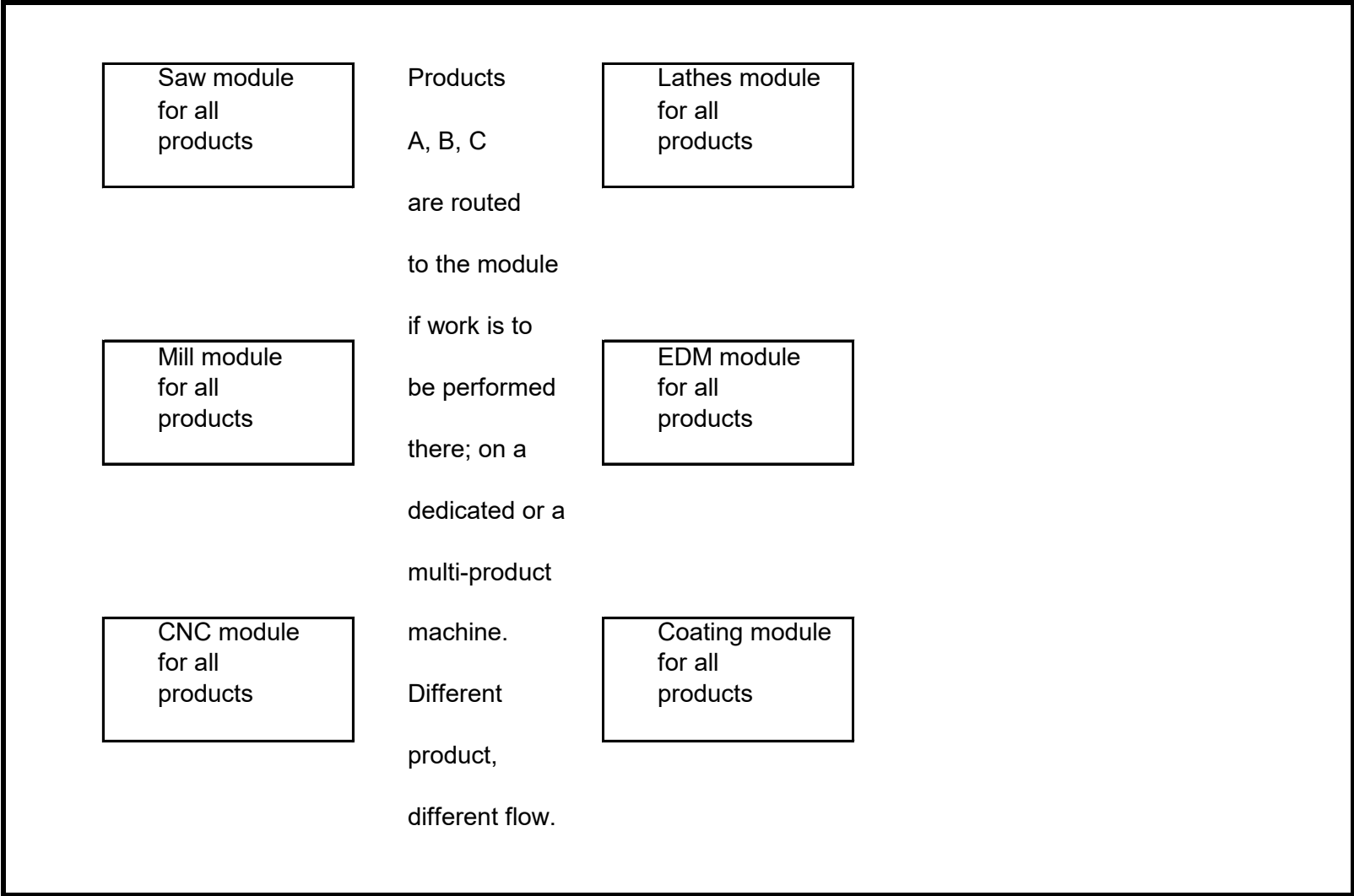
Cellular flow

An approach in which manufacturing work centers (cells) have the total capabilities needed to produce an item or group of similar items. Smooth flow both between and within cells.



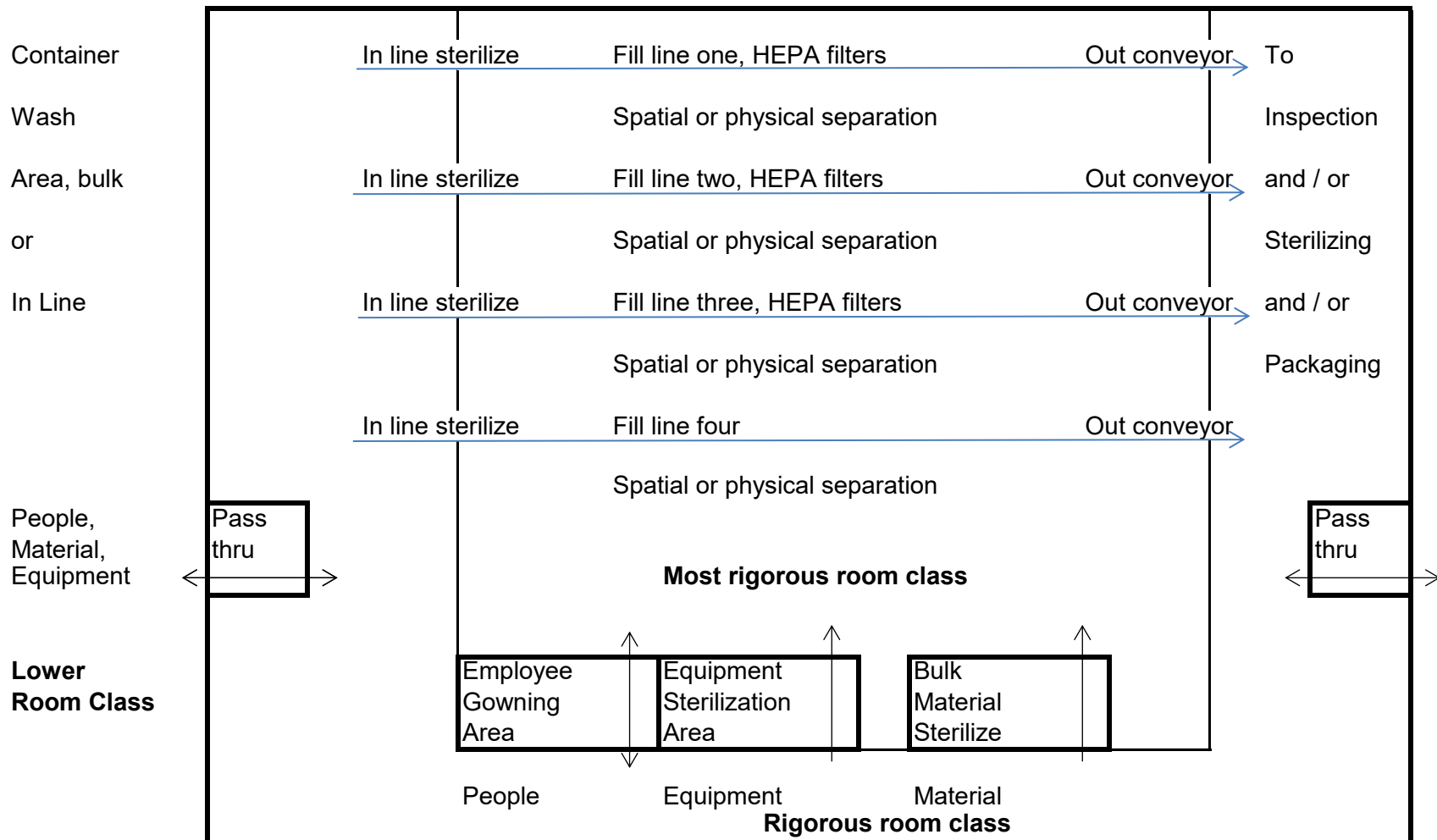
A 7 Modular work flow

Modular work centers consist of similar equipment or capabilities, and products move among multiple work centers before they are completed. With or without conveyor lines.



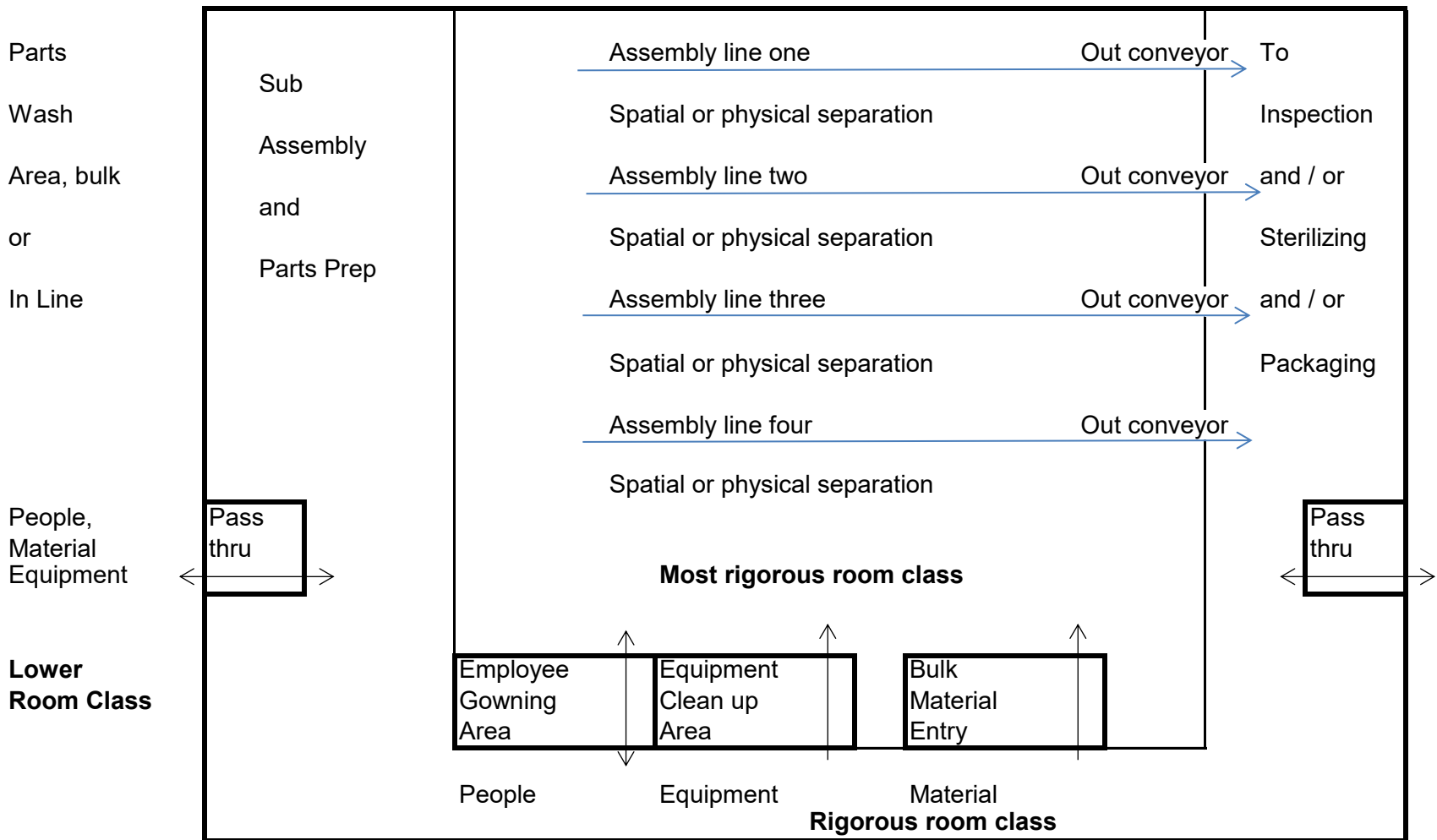
A 8 Clean room for sterile or aseptic liquids

Characterized by material pass thru, employee change rooms, sterilization.
With or without conveyor lines.

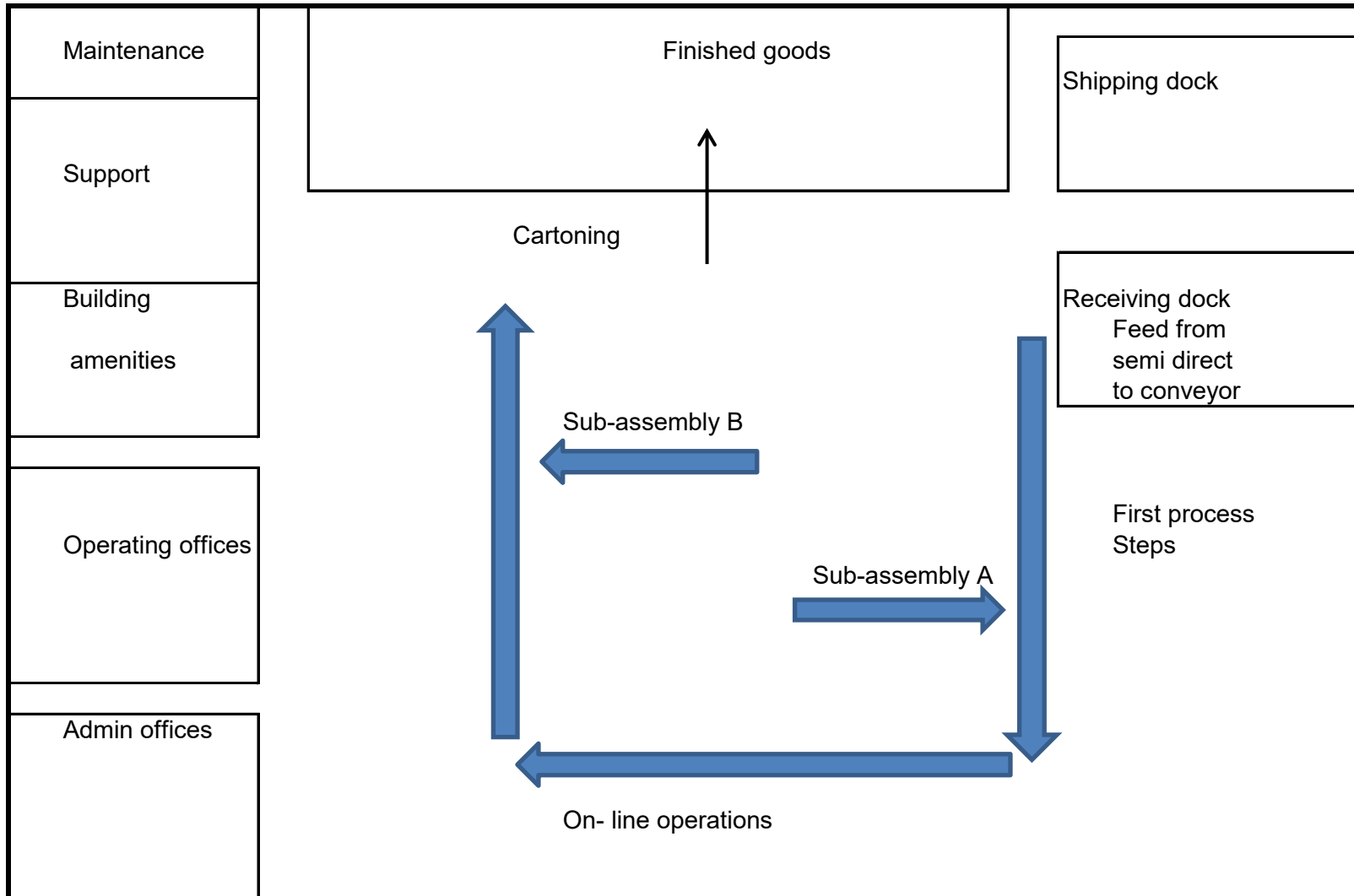


A 9 Clean room for devices, semiconductors

Characterized by material pass thrus, employee change rooms, superior HVAC
 Usually involves conveyors

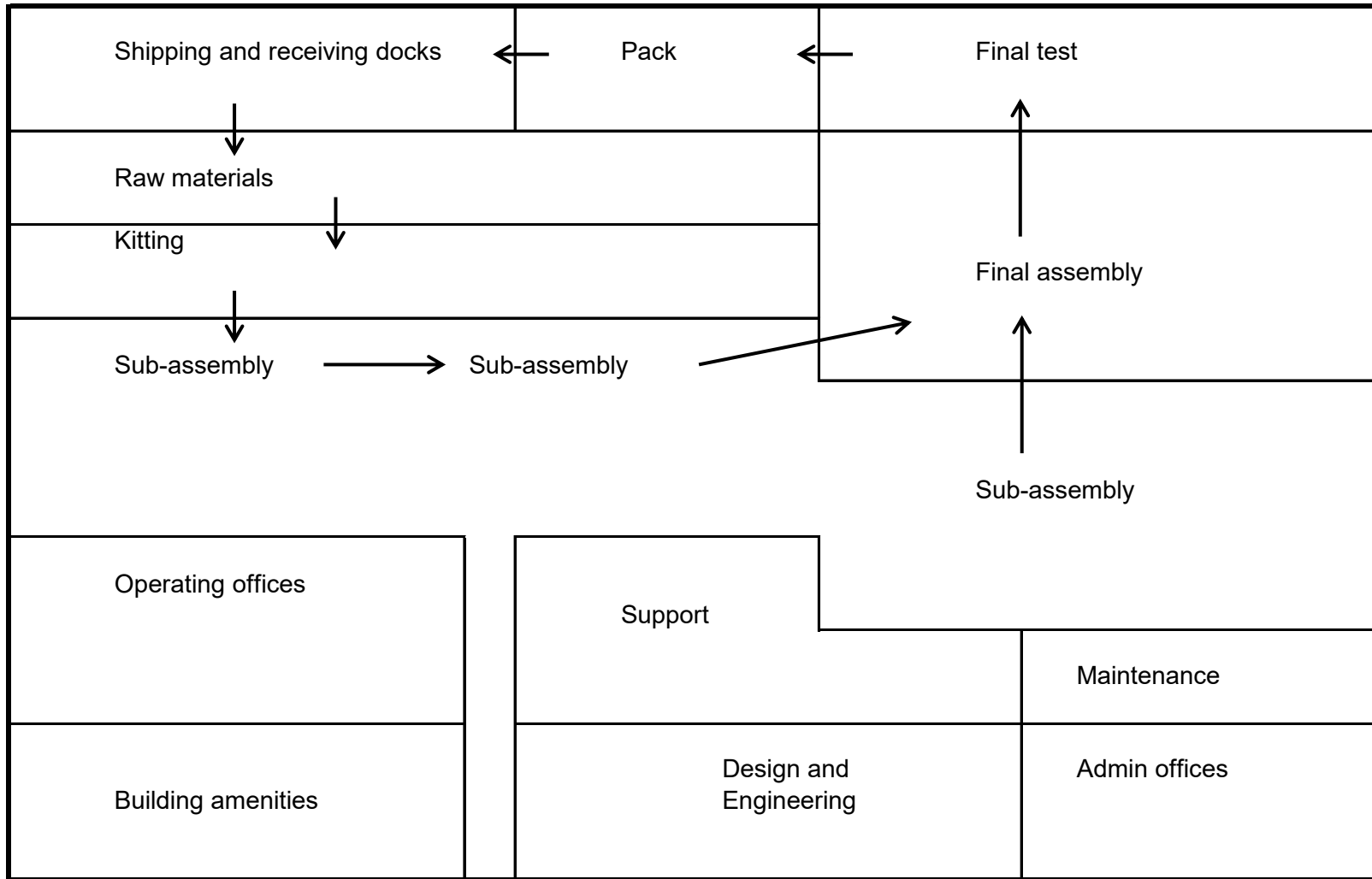


A 10 Primary Conveyor, fed from other conveyors, from above
 Detail is driven by the product components and sequence of steps and assembly.



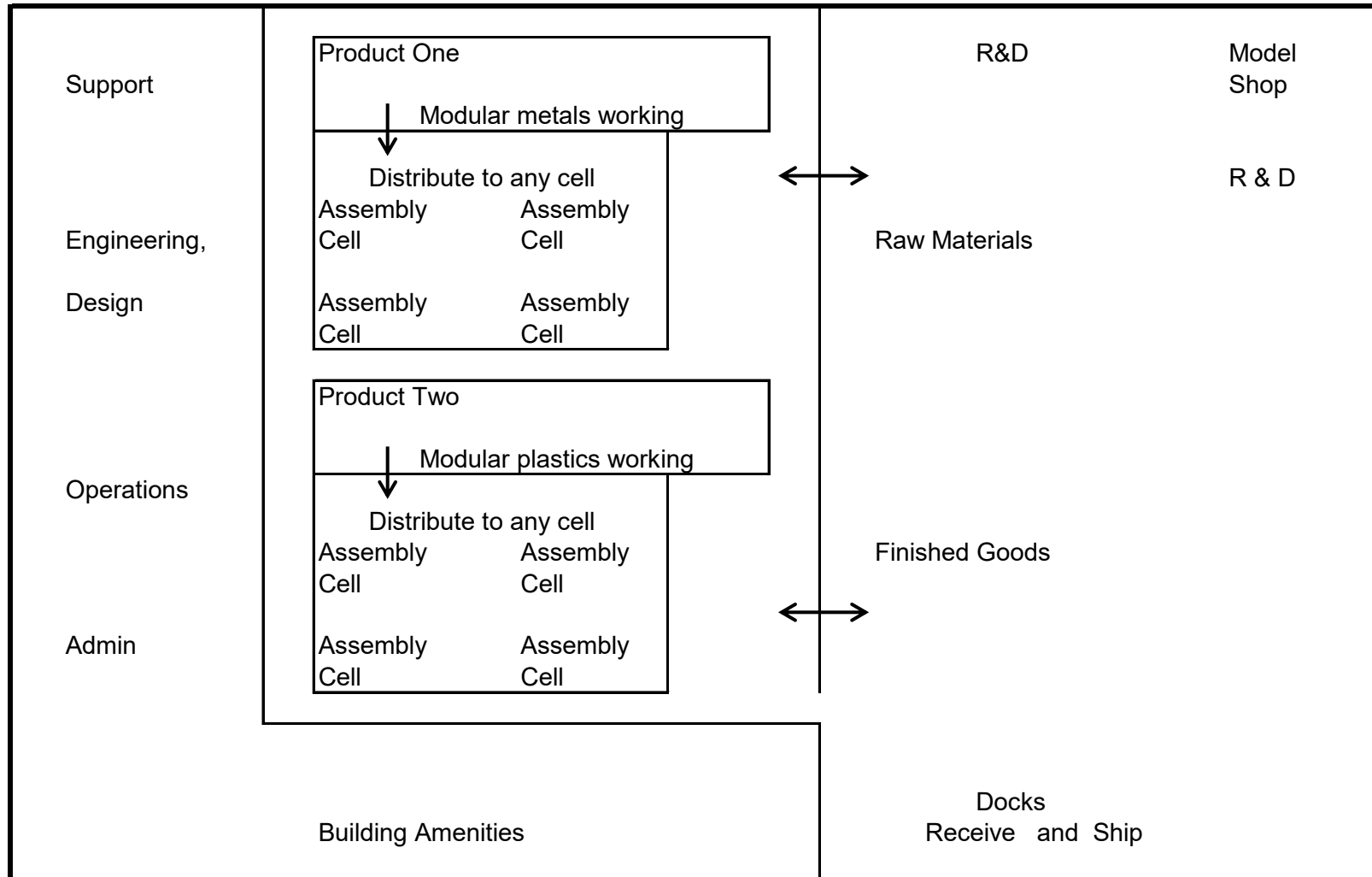
A 11 One product, with several components, not conveyORIZED

This example shows kitting, sub assemblies, final assembly, test, pack, ship in a U shape..



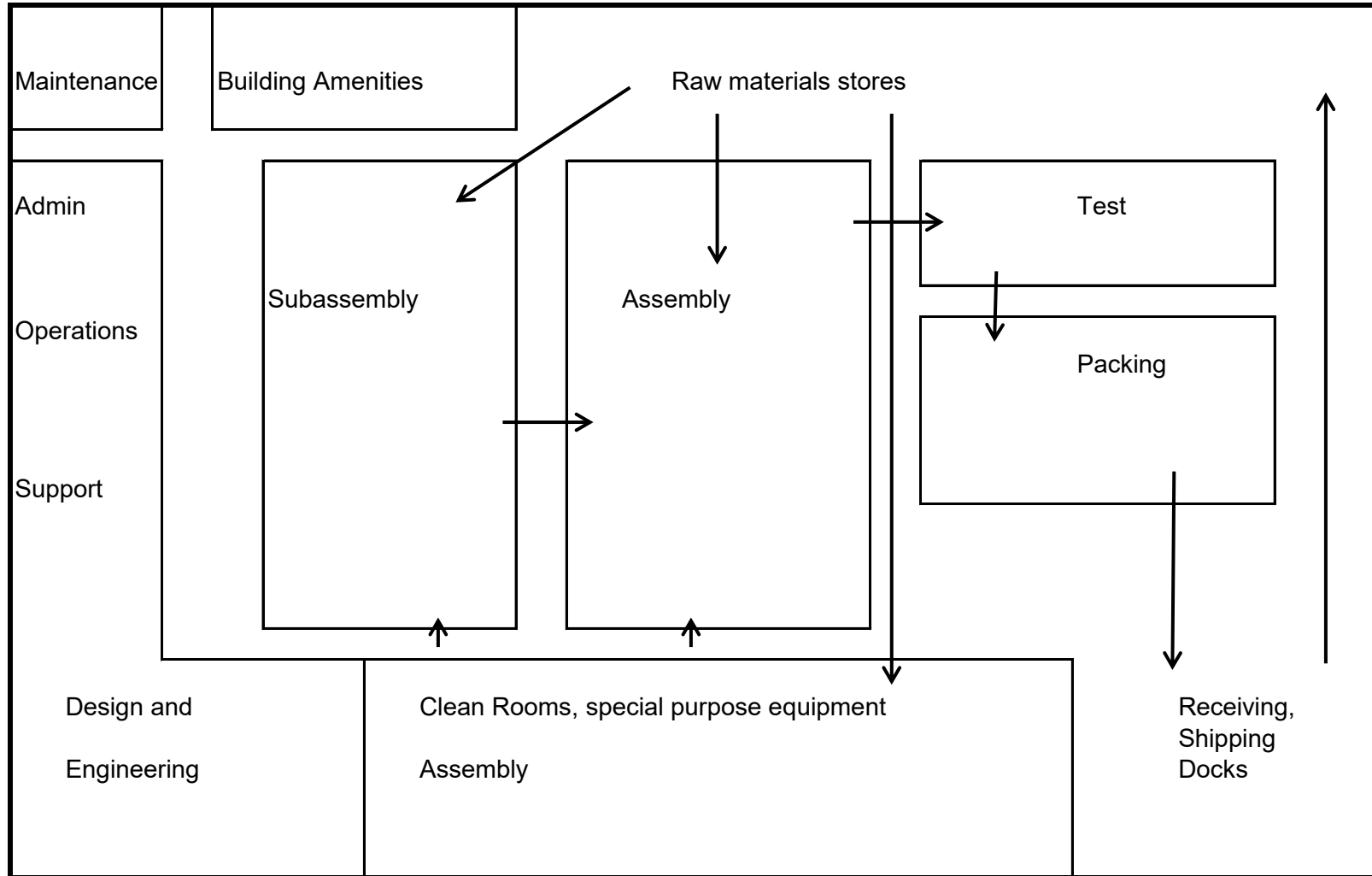
A 12 Cell and modular elements in the same layout

Not an uncommon arrangement, especially when equipment has accumulated over time.
With or without conveyor lines.



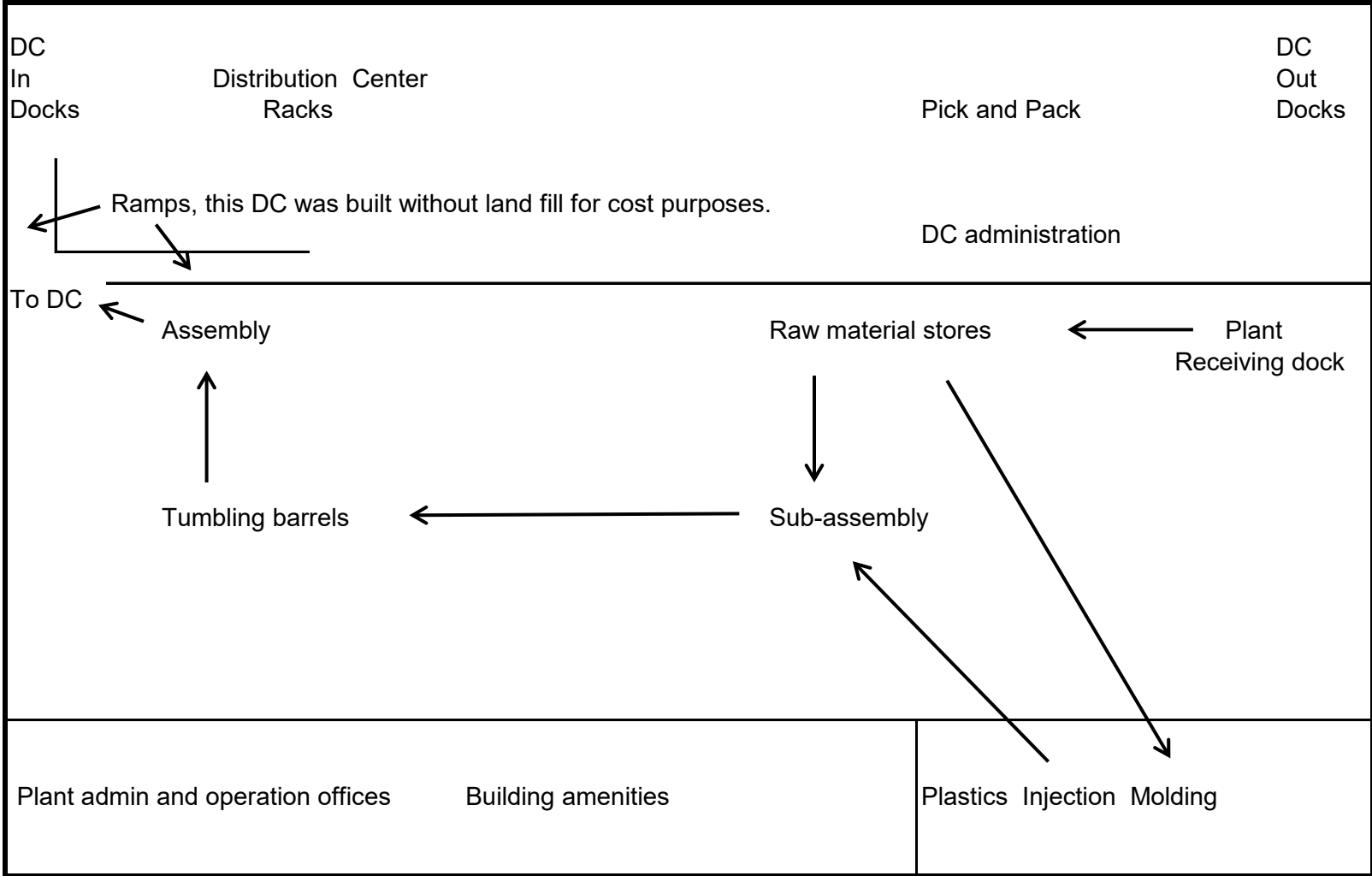
A 13 Electronics fab and test

Integrated manufacture; subassembly, fab, assembly, and test in clean rooms.
Because parts are small, materials handling moves many parts at one time.



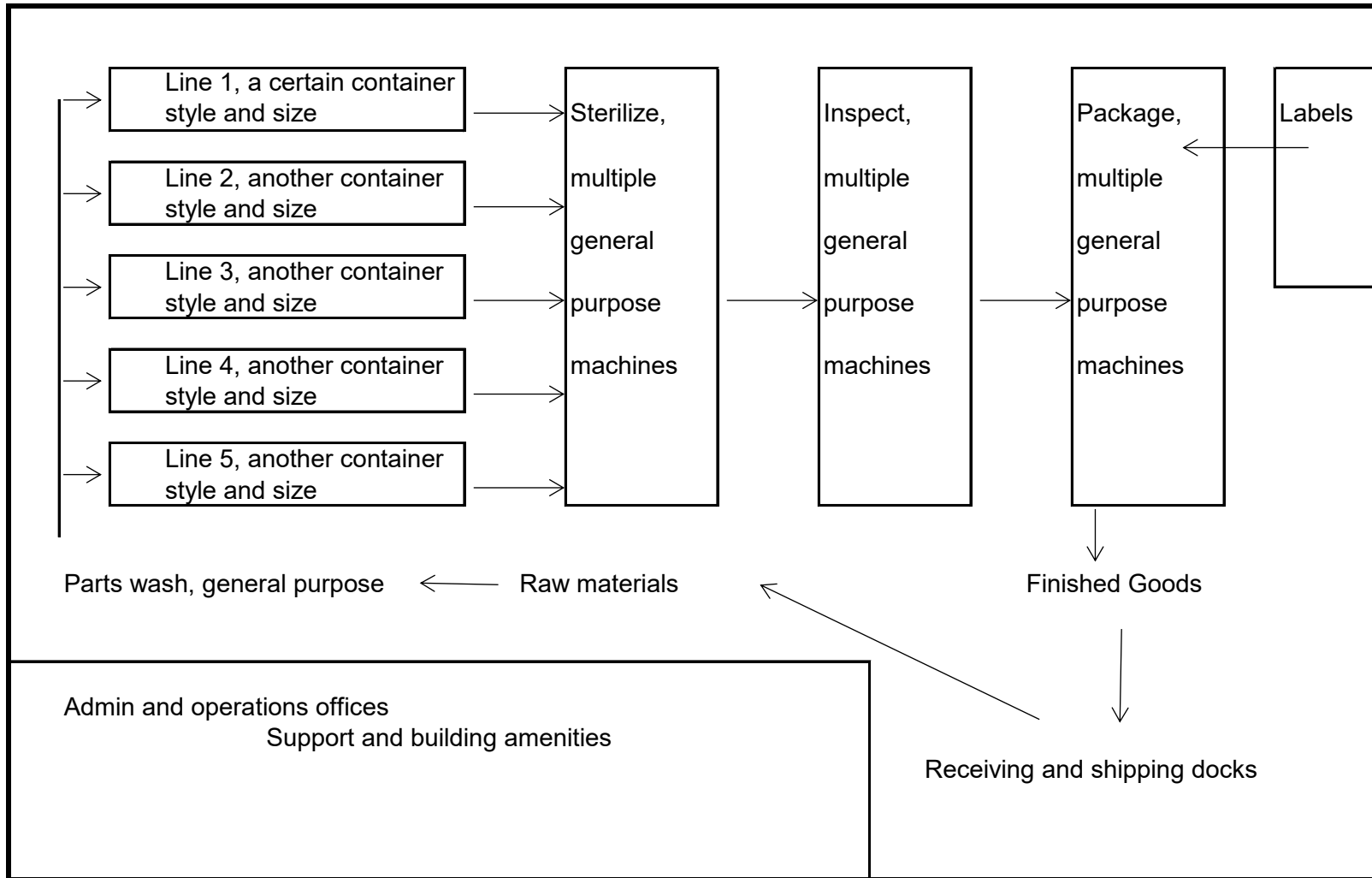
A 14 Integrated plastics product

Molding, sub-assembly, tumbling barrels for smoothing, assembly, through distribution



A 15 From dedicated cells into modular packaging lines

A typical layout; in this example specialized product filling flows into general purpose inspection and packing.



A 16 Model and prototype shops, pilot plant

These operations will have both specialized and general purpose machines. They will be called on to produce any product, with as little subcontracted as possible. If associated with production operations, these shops should be able to match or simulate all production equipment.

Specialty shops will depend on the charter of the organization, and may contain one or more of the following:

Metal working, classic	Wood working	Plumbing
Metal working, Cad Cam	Plastics working, layup	Hydraulics
Electrical	Composites working, layup	Instrumentation
Electronic	Welding	Fill
Sheet metal, cut and form	Plating	Package
Sandblast	Paint	Label
Chemistry	Multi-layer printing	Exact measurement
Assembly	Signs, printing	Optics

Design and engineering offices, Cad Cam equipment

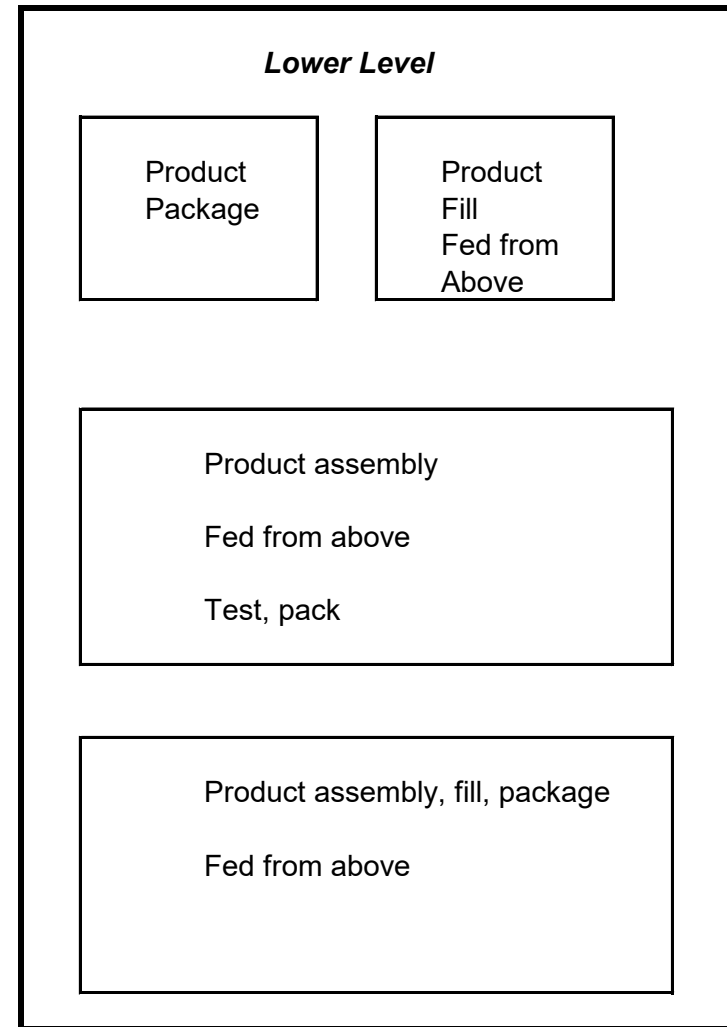
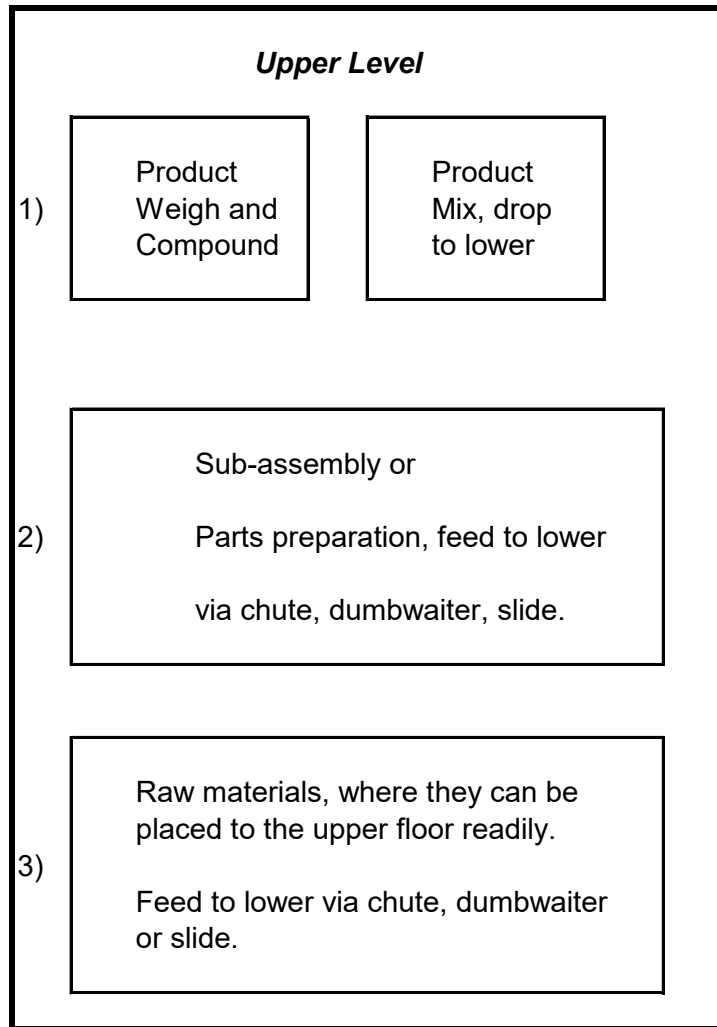
Model and prototype shops are not the place for Just in Time material delivery, no matter what the black belts say. The predictability of work, the horizon, is not long enough to allow lead times.. Don't discard but keep on hand a wide variety of materials. The shop will be called on to produce and modify on short notice and the next model or prototype may well be able to use materials or subassembly from the retained inventory. Reliable local sources if any can allow a smaller inventory.

Layout of machines should concentrate on fitting them into the space with regard to safety and material handling, because the flow of materials will likely be unpredictable and irregular . If possible leave ample access space for material, and for new equipment and technology.

B 1 Multi-story building, utilize vertical flow

Where possible, utilize vertical flow to move product.

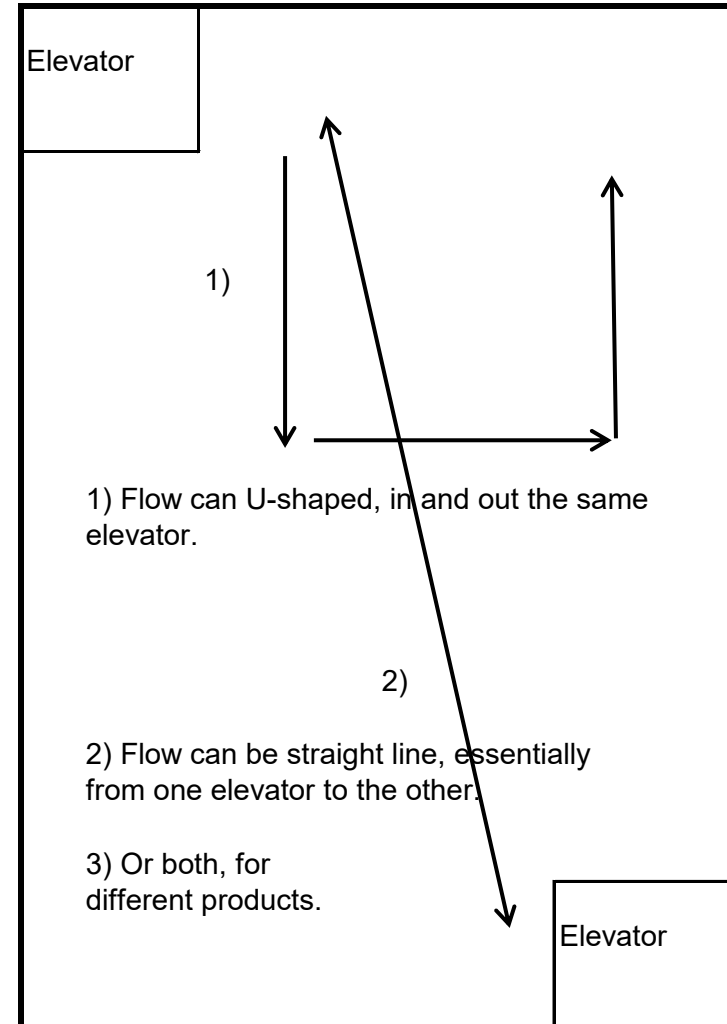
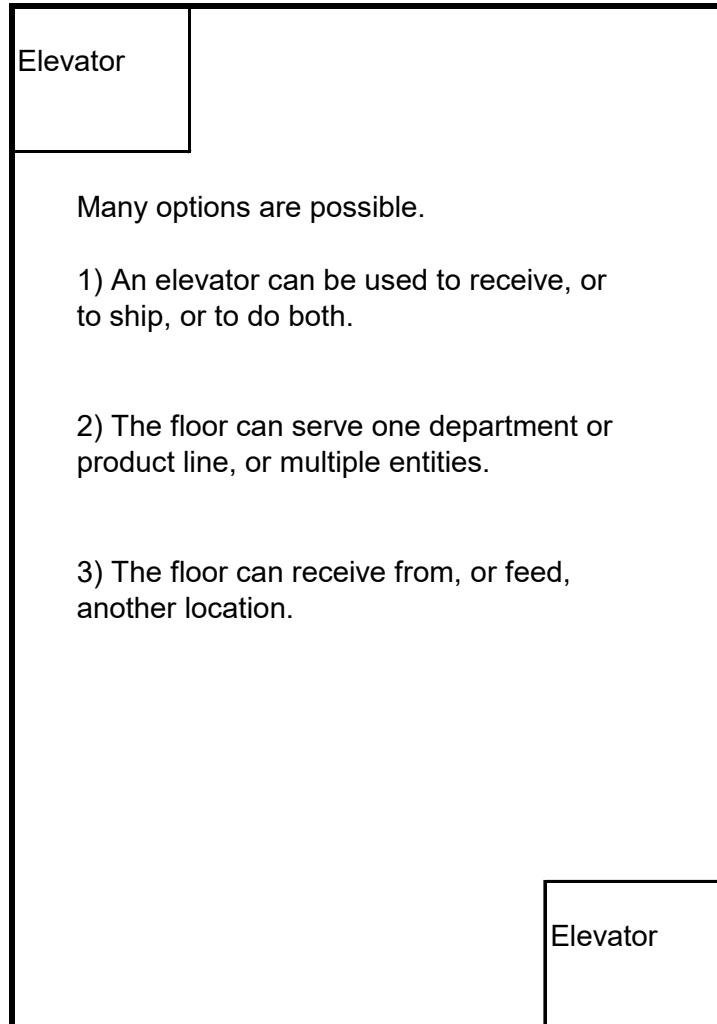
A practical handling system is necessary to place material on the upper floor to start.



B 2 Multi-story building, two elevators

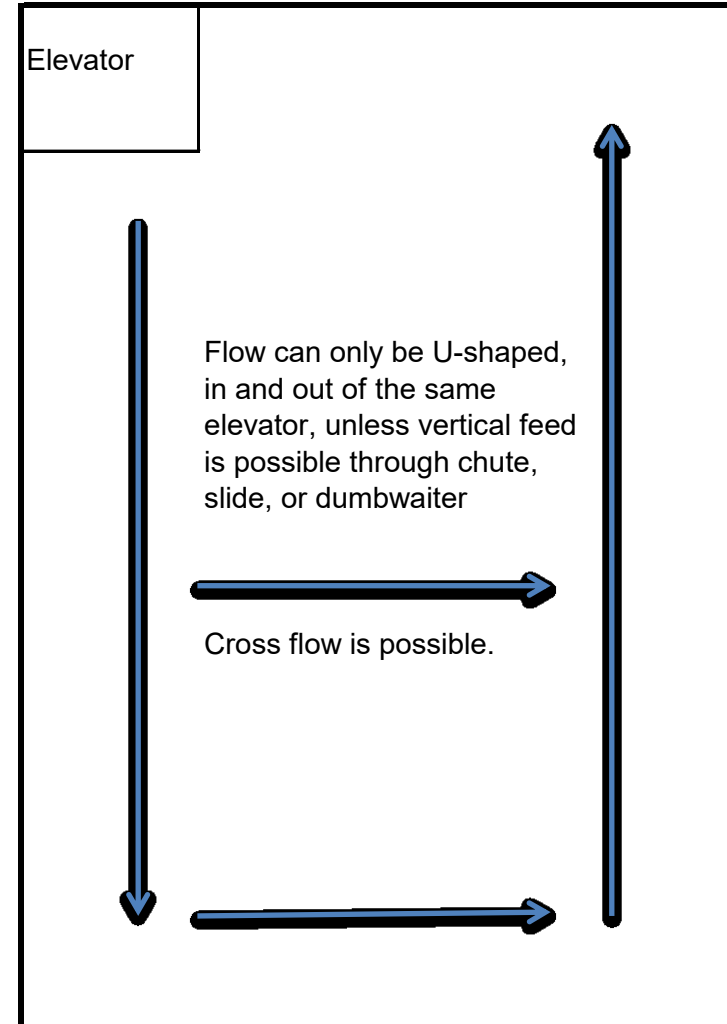
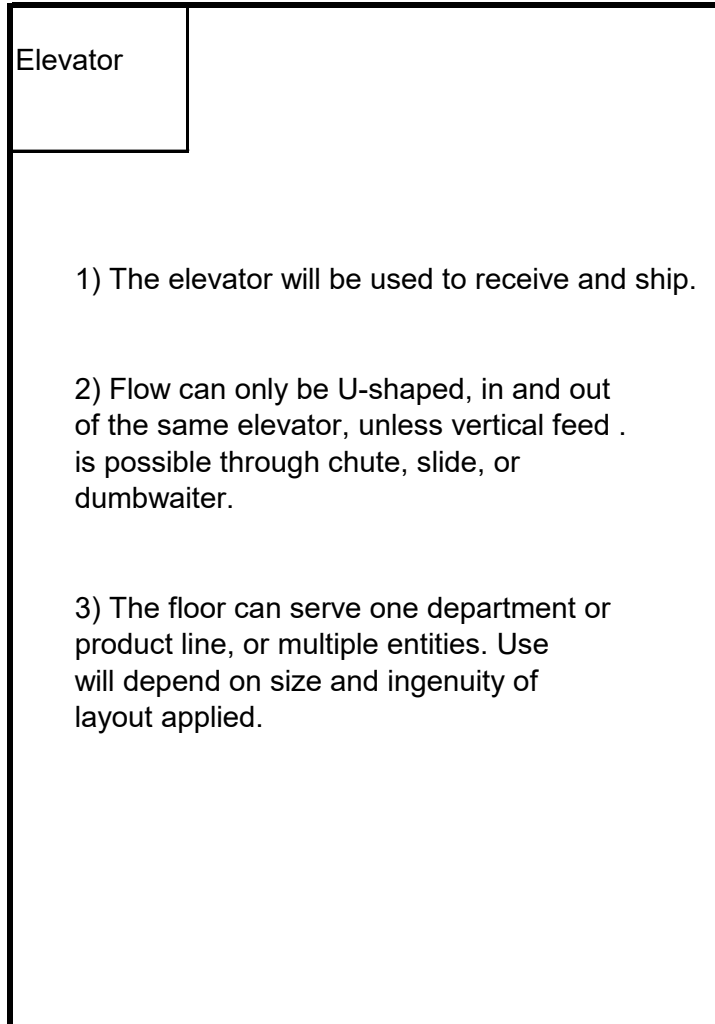
Except for the fact that material must use an elevator, flow can be productive.

Many options are possible.



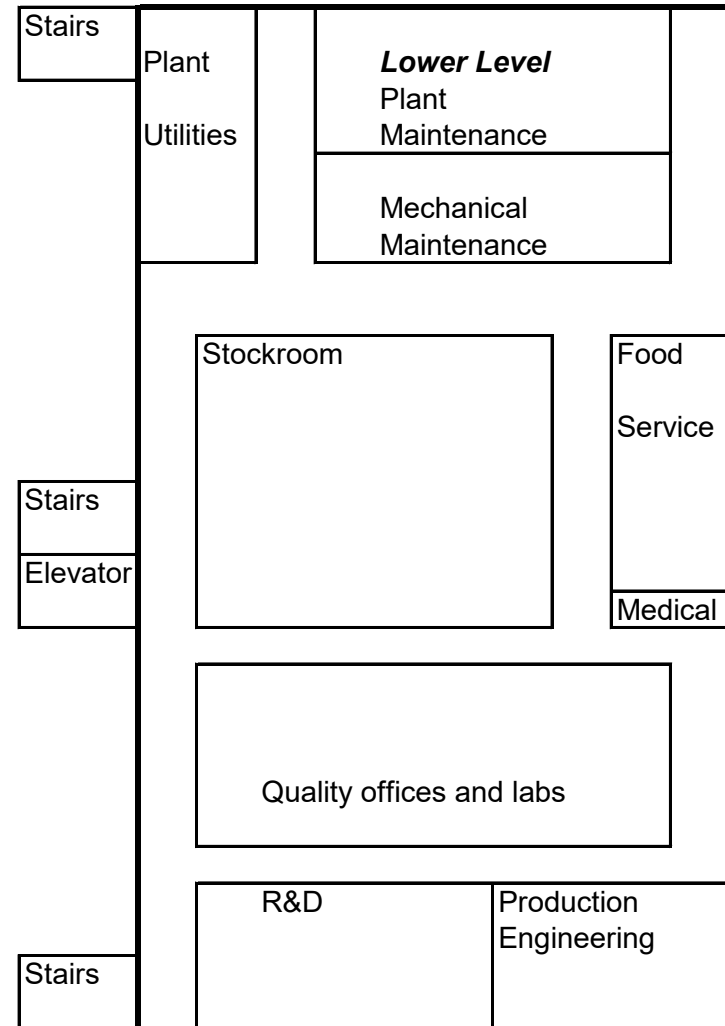
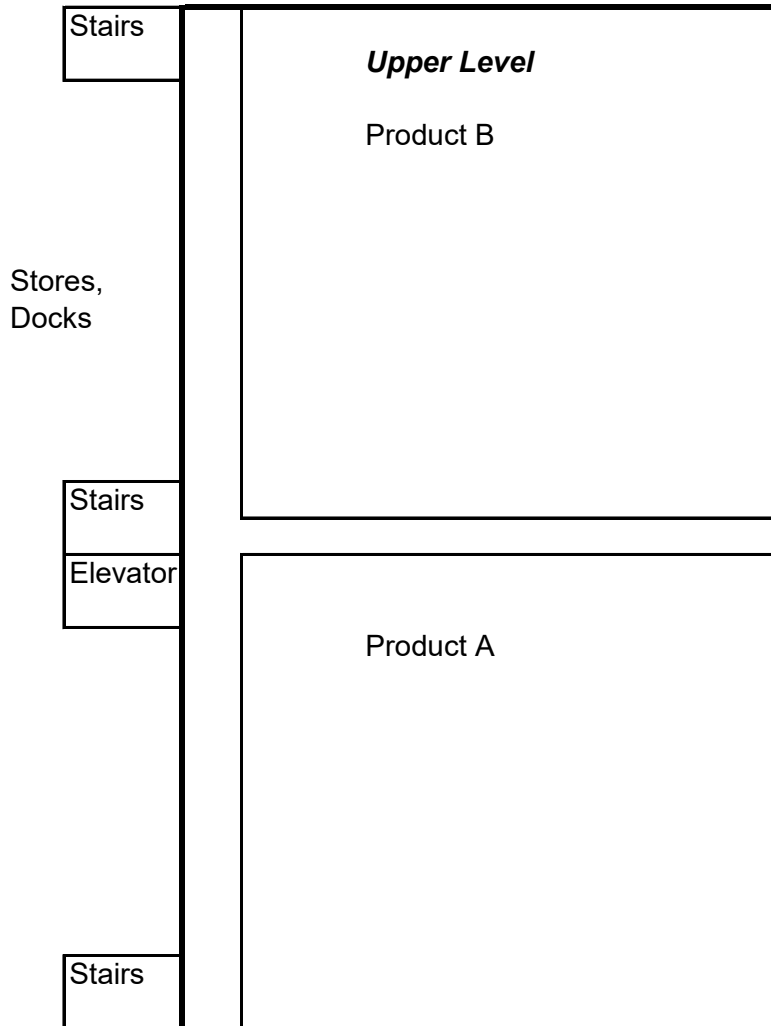
B 3 Multi-story building, one elevator

The area near the elevator will be busy, and should be kept open.
Careful layout will be useful to maintain productivity.



B 4 Multi-story building, services on another floor

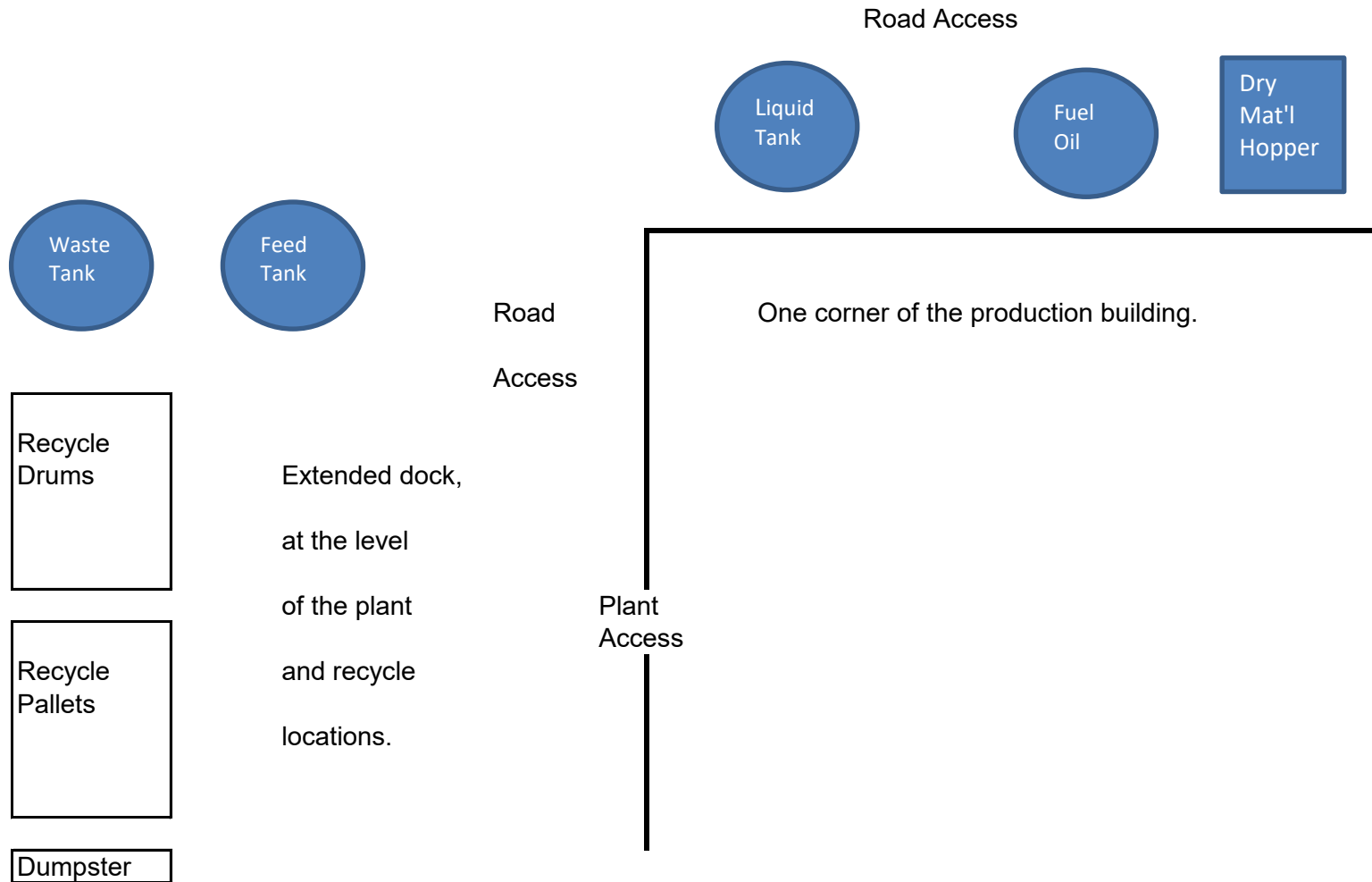
The operations floor can be effectively laid out because services and amenities are on another floor
In this example, services are located on only a partial floor, under manufacturing..



C 1 Outside storage, liquid and dry bulk materials

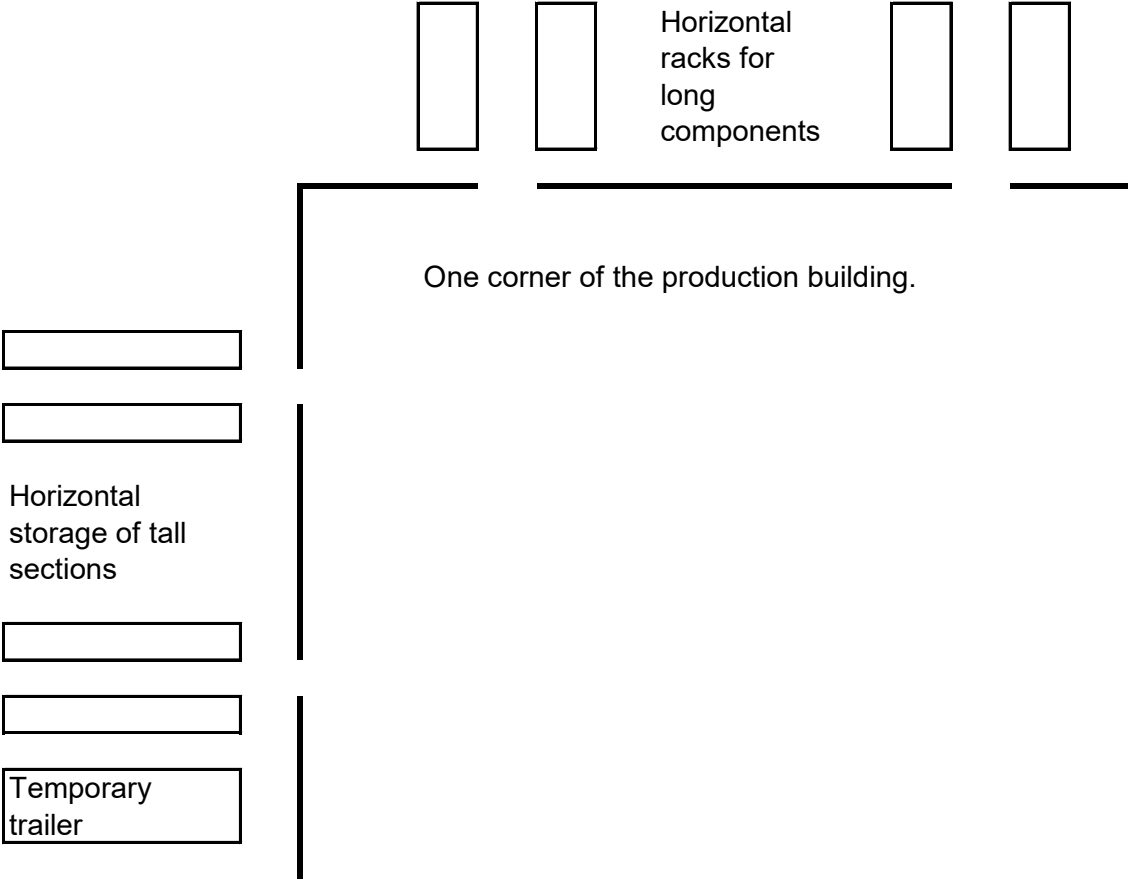
Outside storage is often practical. Outside containers do not take up plant space, and they can be filled by truck easily.

Be sure that permanent containers do not block future plant expansion



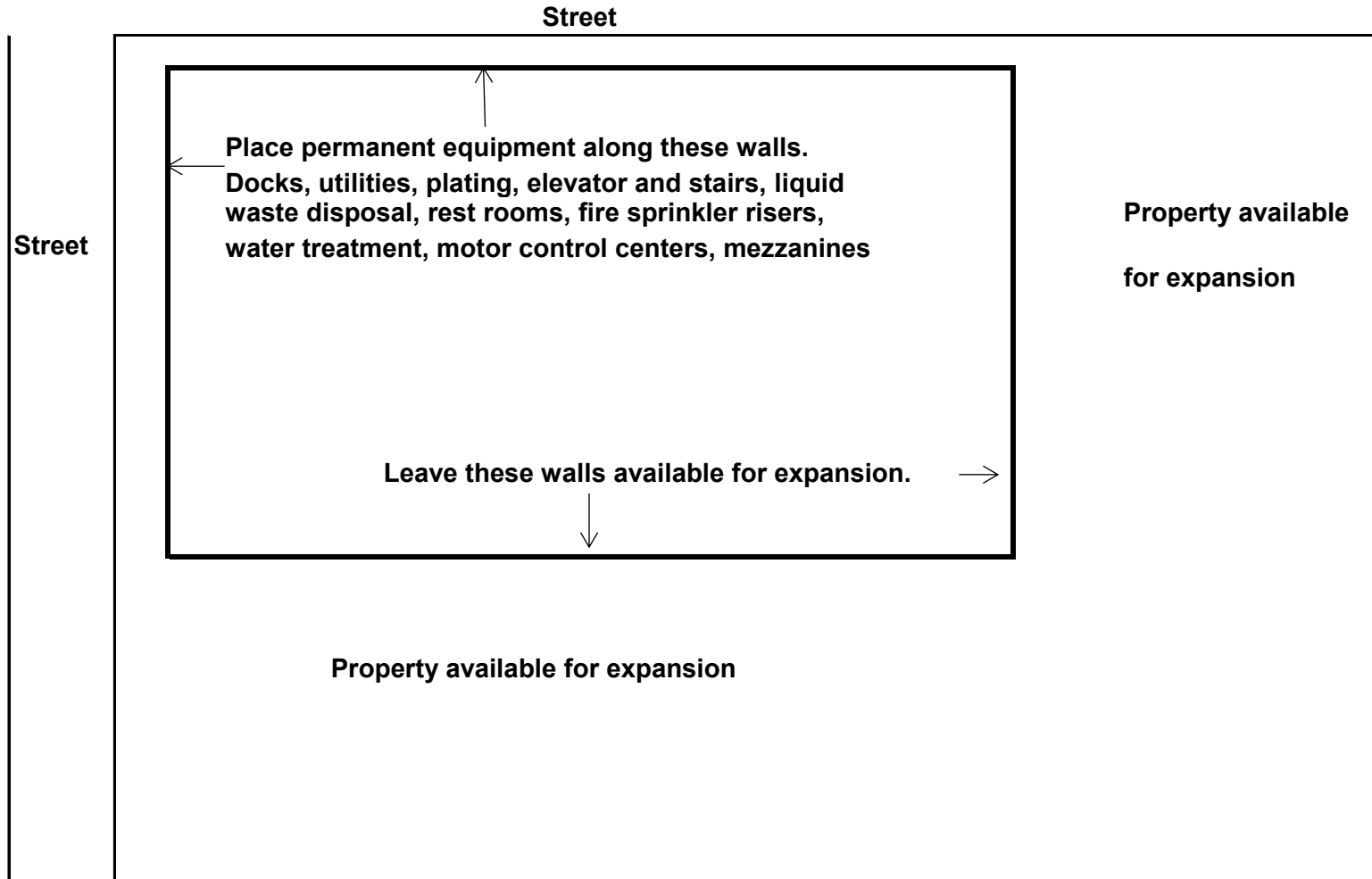
C 2 Outside storage, large components and product handling

Large weather-proof components sometimes can be kept outside.
Be sure that permanent containers do not block future plant expansion



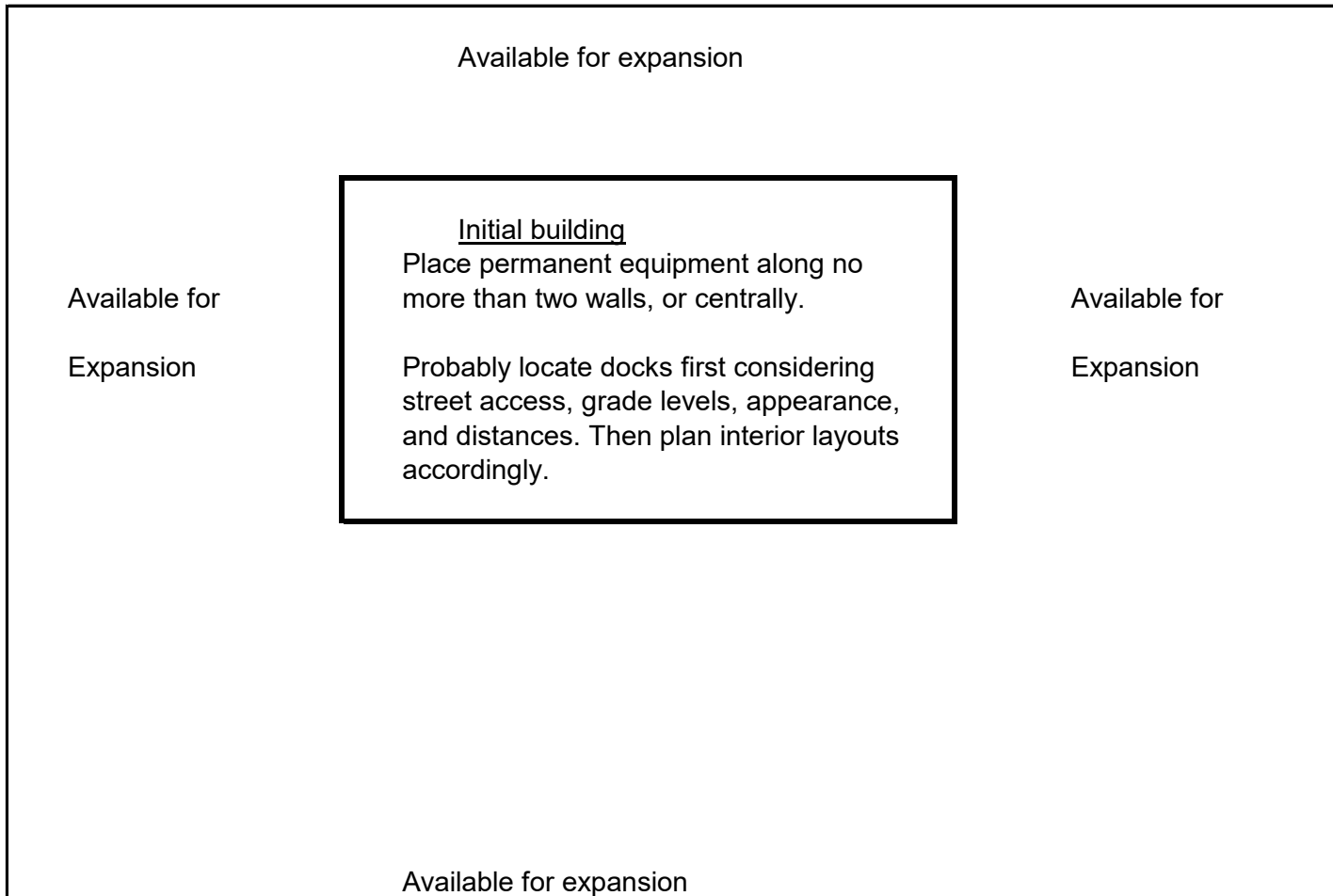
C 3 Constrained by adjoining property

Placement of permanent equipment is key when building expansion is blocked in some directions. Locate permanent equipment along the sides that are already blocked.



C 4 Unconstrained by adjoining property

Placement of permanent equipment is key when building expansion is blocked in some directions. Locate permanent equipment along the sides that are already blocked.



C 5 Details of dock characteristics

Plan general location of access roads and docks considering street access, grade levels, appearance, and distances. Then consider

Paved area characteristics

Access from roads; route, distance and elevation change

Turning radius of semis; in, out, to park

Back into docks, think like a trucker; they want to back clockwise

Don't block future property use and plant expansion.

Non-dock parking for semis

Employee parking

Dock characteristics

Security plan

Internal flow to plant and stores

Number of docks

Dock height, door size

Space between docks

Man doors, stairs

Enclosed? Weather protected?

Trucker check in desk

Formal trucker lobby, restroom

Ramps for access of lift trucks

**Battery charge and / or
propane tank stores**

