

Systematic Layout Planning (SLP)

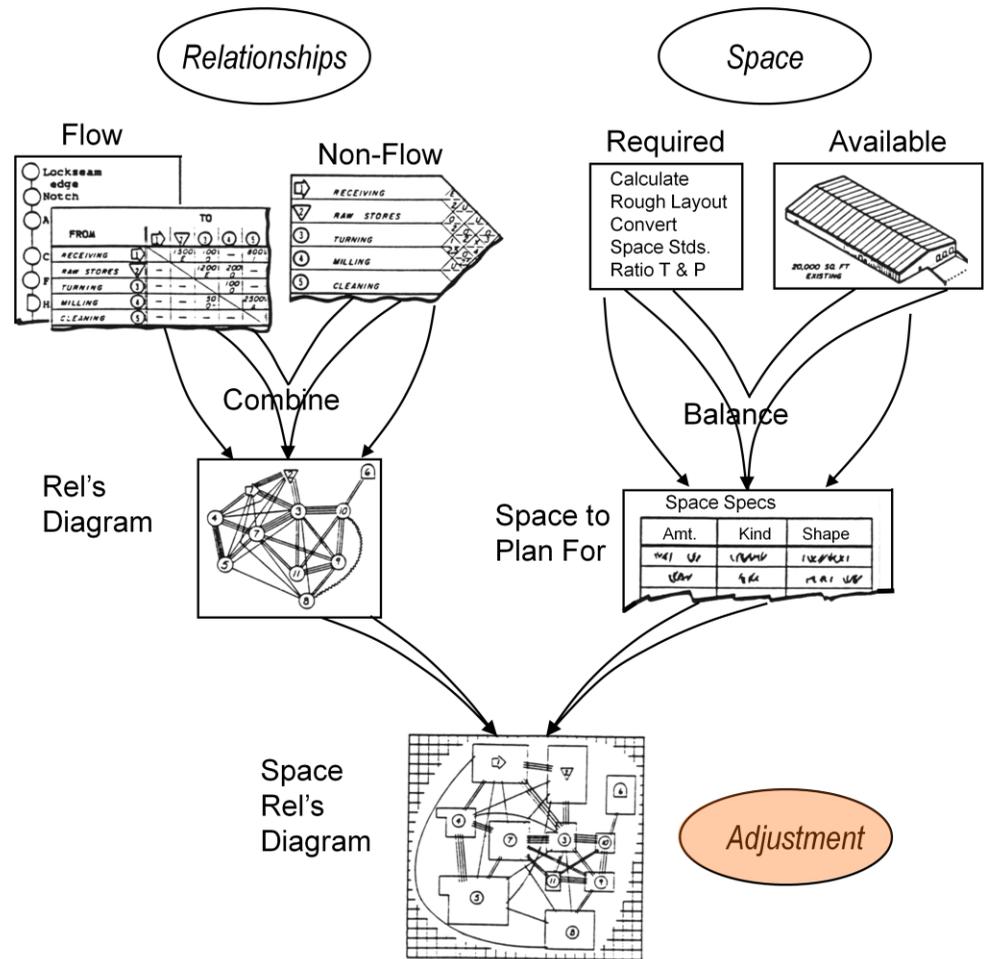


How to Develop Layout Plans

Interact & Establish

Main Points

1. Section 2 of the SLP Pattern of Procedures interacts relationships and space to establish a space relationship diagram.
2. Relationships are developed from flow analysis and/or recording of other-than-flow relationships.
3. Once recorded, relationships are visualized in an activity relationship diagram.
4. Space requirements are determined for each activity area by various methods.
5. The total space required is balanced against the space available (dictated by the location established in Phase I.)
6. Once balanced, space requirements are specified in amount, kind, and shape.
7. The space relationship diagram is a re-draw of the activity relationship diagram, with each area represented to scale and perhaps in any mandatory shape or dimensions.



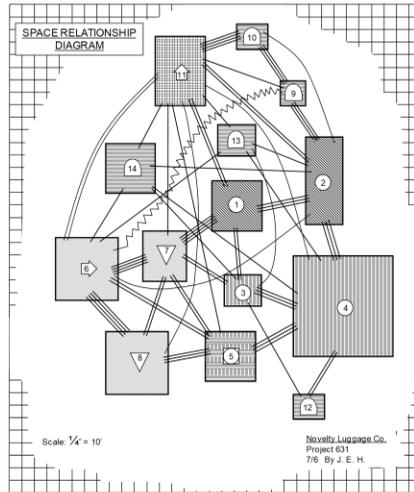
RICHARD MUTHER & ASSOCIATES - P-2018-ppt

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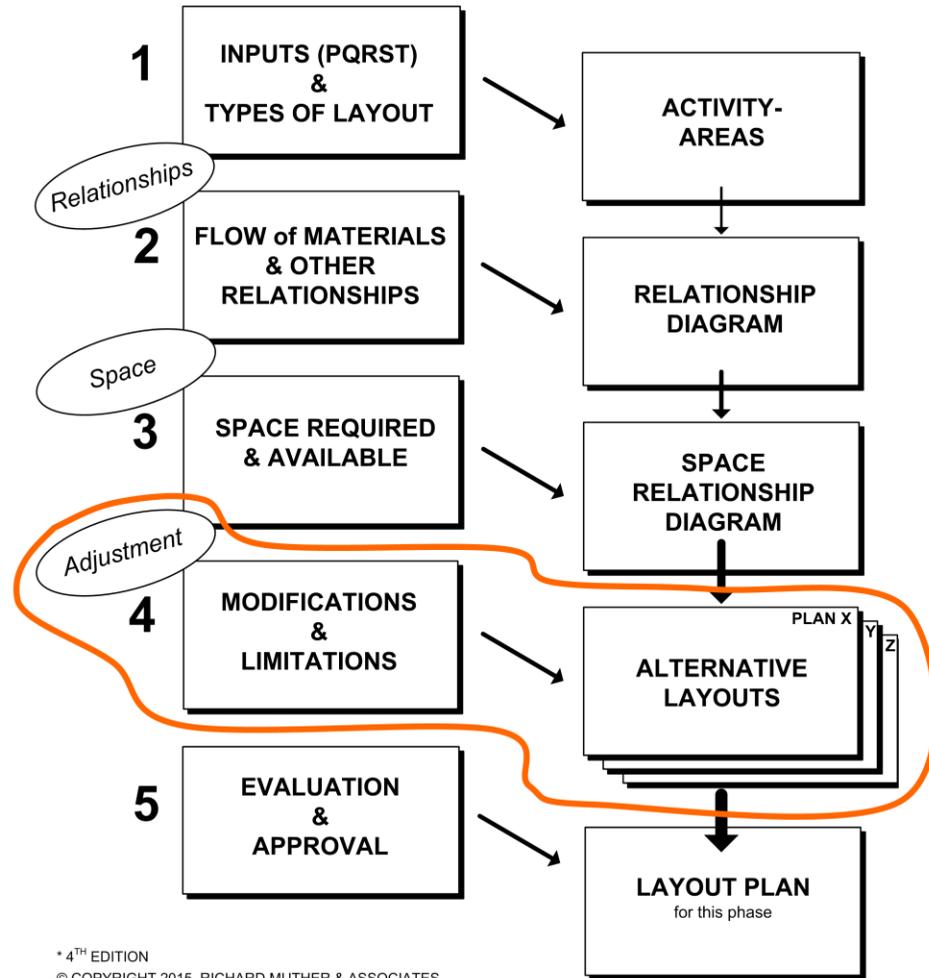
Notes

Typical Practical Limitations

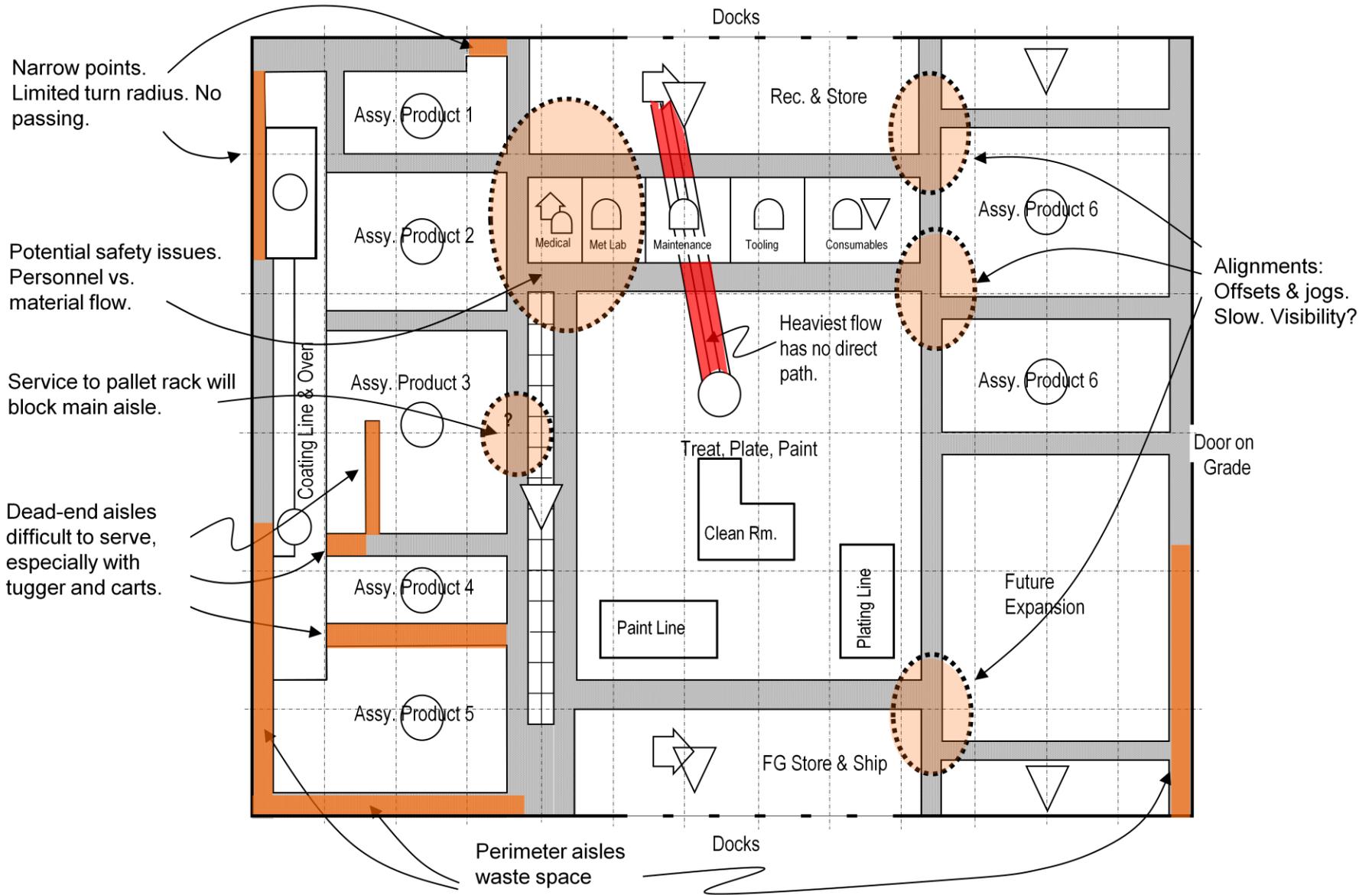
Theoretical Ideal Arrangement



1. Mandatory features and requirements.
2. Use of existing equipment or building features.
3. Budgetary limitations.
4. Time constraints.
5. Codes and regulations.
6. Company policies and procedures.
7. Labor contracts.



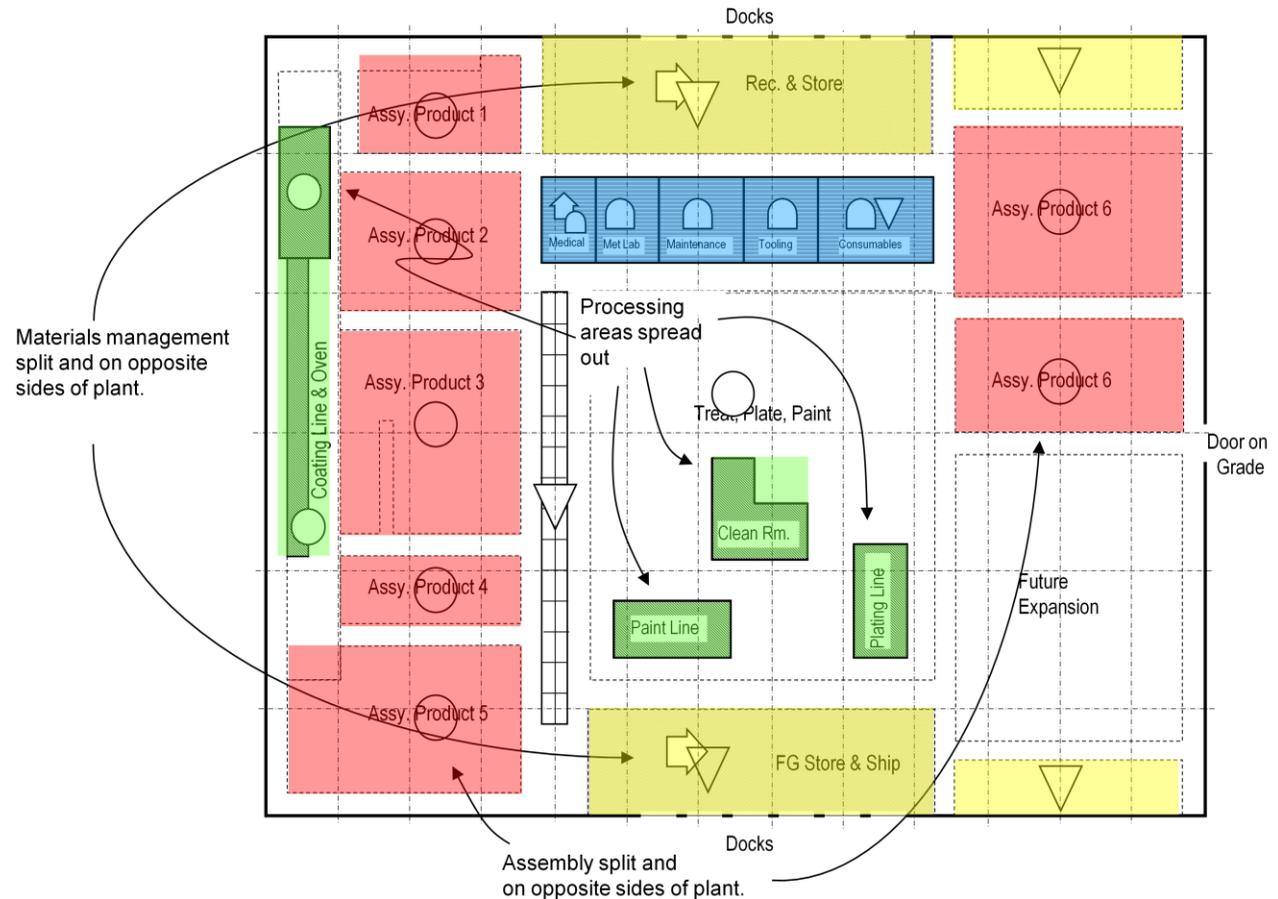
Adjusting for effective aisles & circulation



Main Points

1. This plan does a good job of keeping the walled service areas as a block. However, primary processing areas (green) are spread out.
2. If these need special electrification, piping, drainage, spill retention, special ventilation, roof stacks and the like, costs may be reduced and maintenance made easier by adjusting into closer proximity and alignment.
3. Note that both assembly and materials management areas are on opposite sides of the layout.
4. This prevents sharing of docks and fork trucks, and makes it harder to supervise and share personnel in both functions.
5. Presumably any relationships pulling these areas together were captured in the relationship chart and diagram. But if they were overlooked, or the layout has been based on flow of materials alone, any important other-than-flow relationships must be considered now.

Adjusting for types of space



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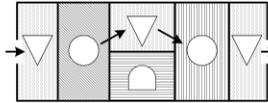
Notes

Plant-Level Flow Patterns and Their Benefits

Main Points

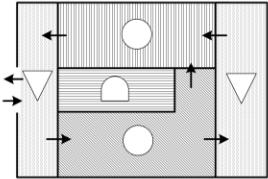
1. Plant and warehouse layouts exhibit the basic flow patterns shown here.
2. Straight-Thru and U-Shape are most common.
3. Most facilities use a combination of flow patterns.
4. Each has its benefits and appropriate uses, and each may influence the choice of material handling methods.

Straight Thru



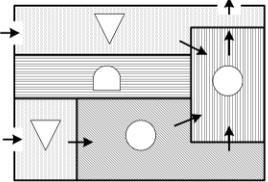
1. Easy to expand with minimum of rearrangement.
2. Accommodates different items and handling equipment at Receiving and Shipping.
3. Takes advantage of gravity in vertical buildings.

U-Shape or Circular



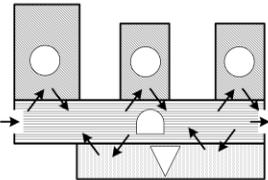
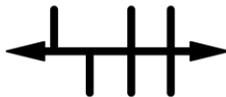
1. Receiving and Shipping together with savings in energy, docks, doors, pavement...
2. Raw and finished storage adjacent, with better use of storage space and workforce.
3. Back tracking and travel empty reduced with better use of mobile equipment.

L-Shape



1. Well-suited to assembly operations with high proportion of purchased parts stored inside "L."
2. Fits with external constraints of railroad, trucks, barge, and/or neighboring buildings.
3. Easier expansion of critical, high-fixed-asset space if located in the elbow.

Comb or Spine



1. Lends itself to two-way flow and to easy access at multiple points.
2. Fingers/teeth can be segregated by function or special requirements.
3. Vertically, this is the pattern of an elevator serving several floors.

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FROM THE BOOK: PLANNING MANUFACTURING CELLS, BY HALES & ANDERSEN

Notes

Cell- & Area-Level Flow Patterns and Their Benefits

Main Points

1. The same four flow patterns used at the plant level are also applied to equipment layout within manufacturing cells and departmental work areas.
2. The flow pattern within a cell or area is often influenced or even dictated by the overall or block layout of the facility.
3. Straight-Thru and U-Shape are most common, with U-Shape being advocated by the Toyota Production System (also called Lean Manufacturing).
4. Each flow pattern has its benefits and appropriate uses, and each may influence the choice of material handling methods at the detailed or area level.

Straight Thru



1. Easy to understand, follow, schedule, and control.
2. Allows straight, inexpensive handling methods.
3. Easy access on two sides.
4. Avoids congestion at point of delivery and take away.

U-Shape or Circular



1. Automatically returns product, holding fixtures, and mobile handling equipment to cell entrance.
2. Delivery and take away point are the same; allows convenient handling to and from the cell.
3. Workers in center can assist one another more readily.
4. Easier to assign multiple operations to an operator. Allows easier line balancing.

L-Shape



1. Allows fitting lengthy series of operations into limited space.
2. Lets feeding cells start on an aisle and end at point of use.
3. May allow isolation of dangerous or costly-to-move equipment in the elbow, with savings in implementation cost and/or two directions for expansion.
4. Easy to segregate in-flow and out-flow of physically different materials, products, supplies, and special services.

Comb or Spine



1. Lends itself to two-way flow.
2. Well suited to cells with highly variable routings.
3. Allows "fingers/teeth" to be segregated for special requirements.
4. Well-suited to functional cells.

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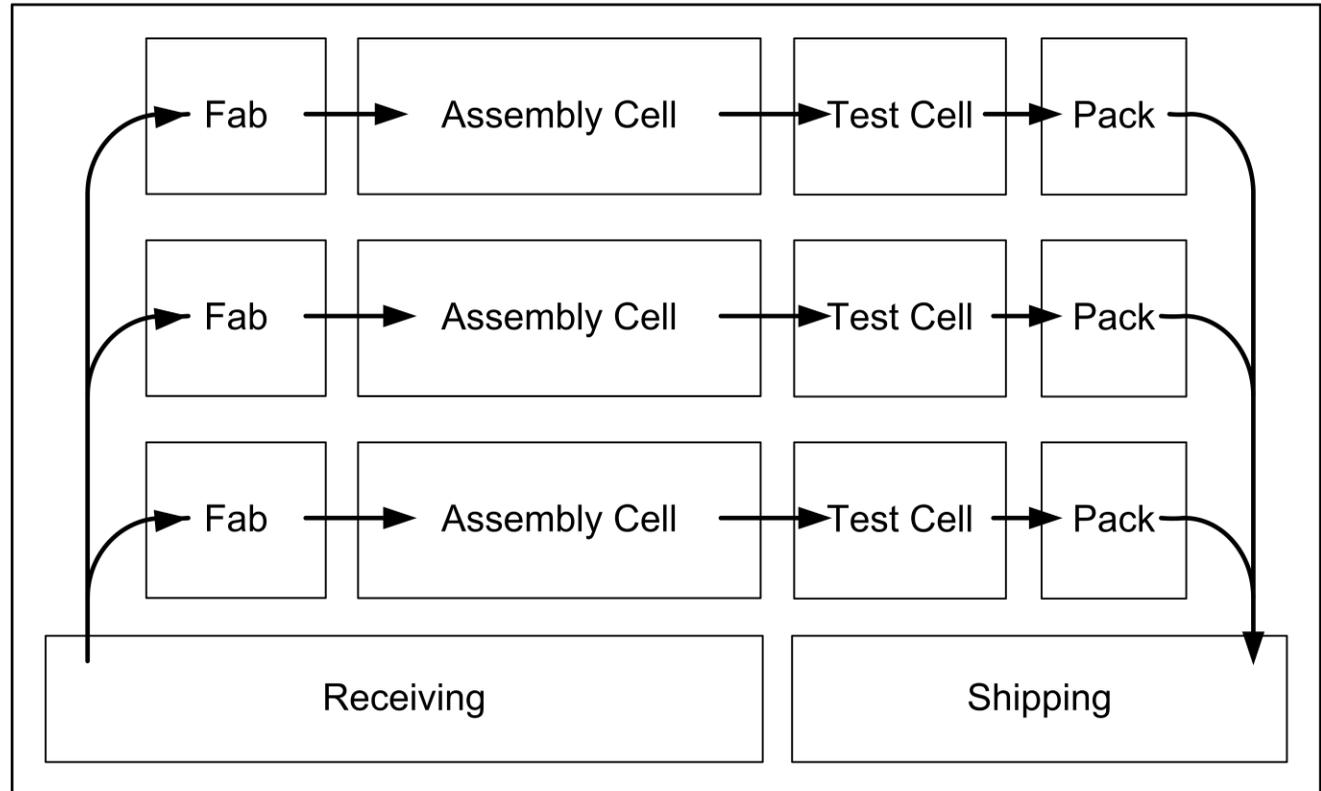
FROM THE BOOK: PLANNING MANUFACTURING CELLS, BY HALES & ANDERSEN

Notes

Straight-thru cell flow to achieve U-shaped plant flow

Main Points

1. Straight-thru “line” cells can be used to achieve U-shaped plant flow in multi-cell plants where the process changes from beginning to end in terms of:
 - a. Special utilities required under floor or overhead, or ventilation required;
 - b. Special enclosure, clean room or isolation required;
 - c. Material handling methods –carts at one end, conveyors at the other;
 - d. Mezzanine required at one end to feed material, parts, or packaging;
 - e. Operator skill – e.g. high-tech at the front; manual packaging labor at the end.
2. This arrangement economizes on the cost of special facilities and it moves material the length of the plant without extra effort, especially if finished goods can be conveyed to shipping.
3. If cells can be lined up in parallel, with the same skills used side-by-side across two or more cells, this form of layout can help to achieve the goal of “one operator; multiple operations.”



RICHARD MUTHER & ASSOCIATES - PMC FIG. 5-5-ppt

FROM THE BOOK: PLANNING MANUFACTURING CELLS, BY HALES AND ANDERSEN

Notes

Main Points

1. Layout plans are always influenced by the layout's location and surroundings, including the configuration and condition of available buildings.
2. On large plant layout projects, it is good practice in Phase I – Location – to mark up a plan or aerial view of the site, highlighting existing conditions and features that should be considered in the plan.
3. In this illustration, a large plant comprises numerous structures with configurations. These have been color coded on a satellite photo. Each will lend itself to particular uses.
4. The eventual *adjustment* of the ideal arrangement into practical alternatives will try to take advantage of these configurations and conditions.
5. Smaller projects under-roof are similarly influenced by their locations and surroundings.

Location & Building Considerations



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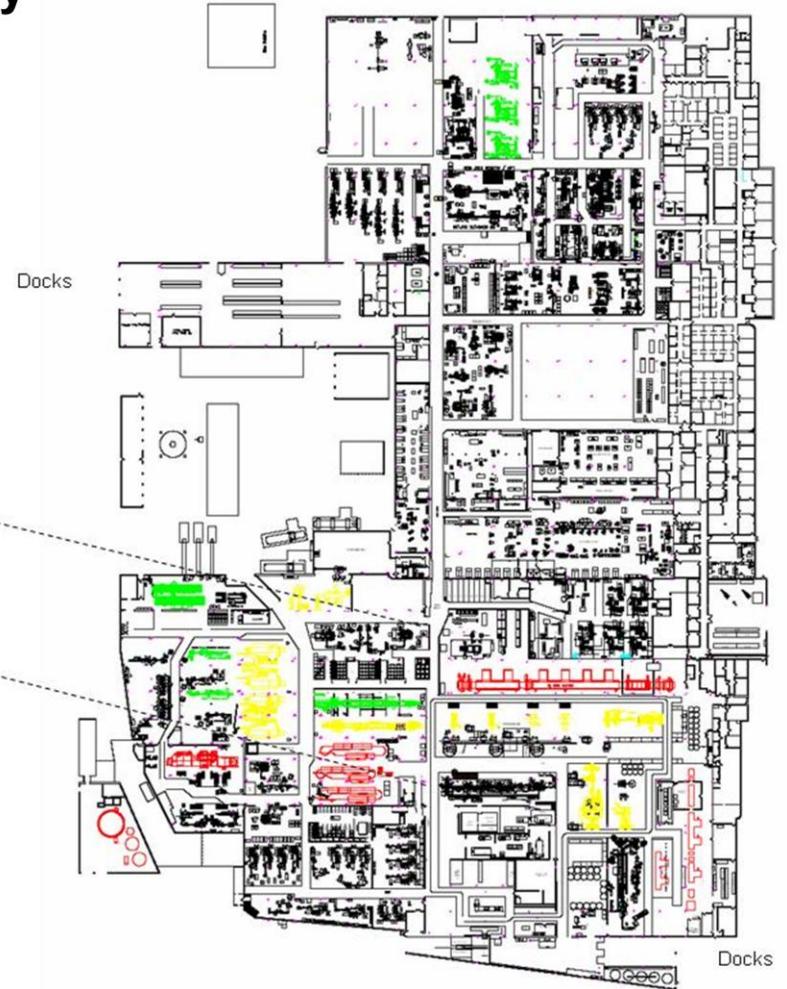
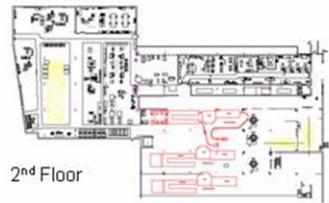
Notes

Current Layout – “Fixity”

Main Points

1. Many layouts and planning situations contain “monuments” -- things that are highly fixed and cannot or will not be moved.
2. It is good practice in Phase I – Location – to identify those pieces of equipment or areas that *must* remain in their current locations, or *should* remain and the reasons therefore.
3. Color-coding “red” for cannot be moved and “yellow” for “rather not move” is a good way to get everyone’s awareness and agreement before planning any rearrangement.
4. It is also helpful to identify areas that must move or are already planned to be moved, or removed from the layout. Coloring these “green” will help planners and approvers to be aware of these decisions already made.

- Cannot be moved
- Very expensive to move
- Will be moved, installed or rearranged



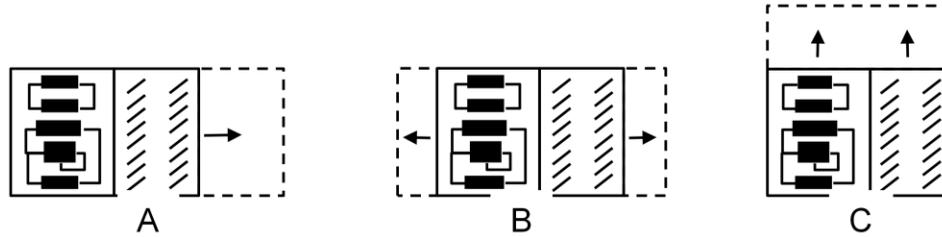
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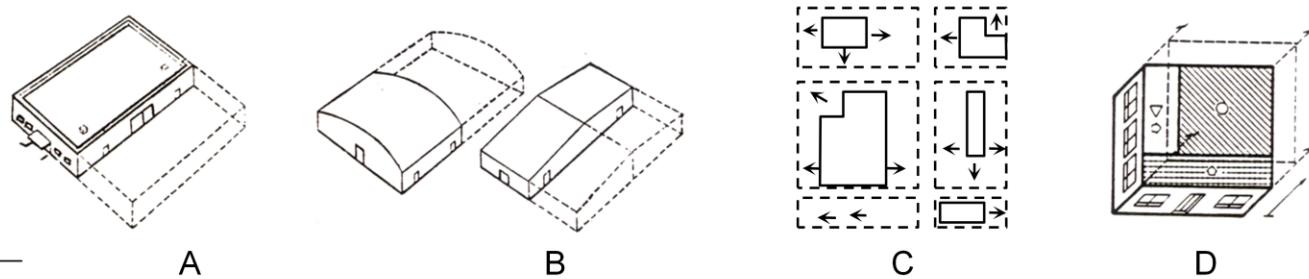
Easiest Expansion

Which is easiest to expand? _____



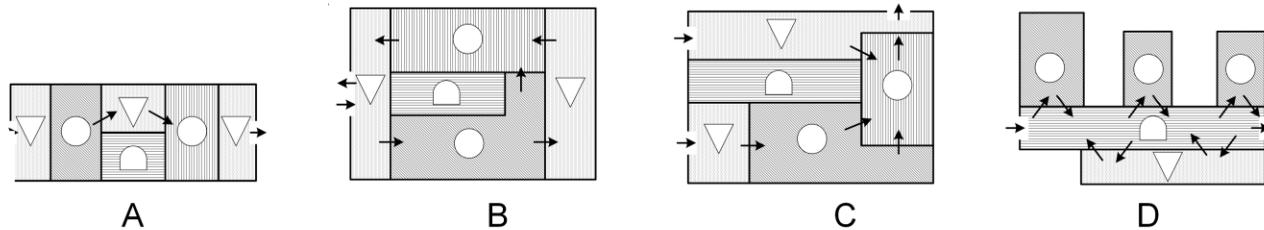
Why? _____

Which is easiest to expand? _____



Why? _____

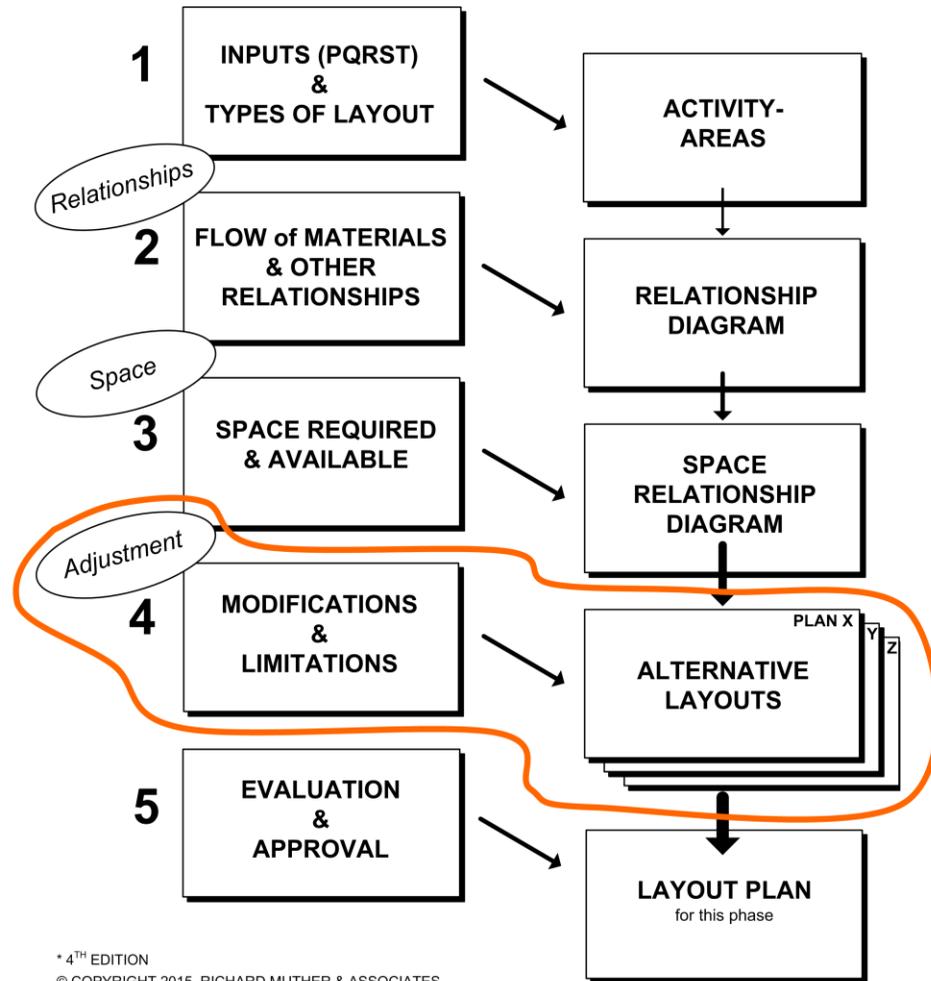
Which is easiest to expand? _____



Why? _____

How to assure two or more alternatives

1. Vary *flow patterns* and *flow directions* through the layout: Straight-through, U-flow, L-flow, some variation or combination.
2. Vary *dock locations*, or input and output points.
3. Vary layout and pattern of main aisles: number of, locations and orientations.
4. Moving a highly-fixed area or not.
5. Vary “anchor locations” for highly-fixed, critical or “highly-connected” activity-areas.
6. Vary the placements of key areas: to different bay, wings, floor levels or buildings, including off-site.
7. Vary the space available – its configuration or location, incl. building or area shape and use of mezzanines.
8. Centralize or decentralize support areas.
9. Combine or split key activity-areas.
10. Mirror or rotate an alternative within the space available.



Team Assignments and Templates

Actions to be explored & team assigned

Action	Team 1	Team 2	Team 3
Move office upstairs	If needed	No	Yes
Consolidate Military model including Subs	Yes	If it happens	Yes
Use kitting to save space	Yes	No	If needed
Move test stands	No	Only if needed	If needed
Move purchased parts storage	If needed	If needed	If needed
Large overhead door can move	If needed	If needed	If needed
Move Dept. 6 off site	If needed	No	If needed

- Agree on options to be explored and deliberately varied among alternative plans.
- Assign specific explorations to teams. Don't allow exploration of options to be at random or by chance.



- Give sets of scaled templates to teams.
- Make sure teams do not develop minor variations of the same basic plan.



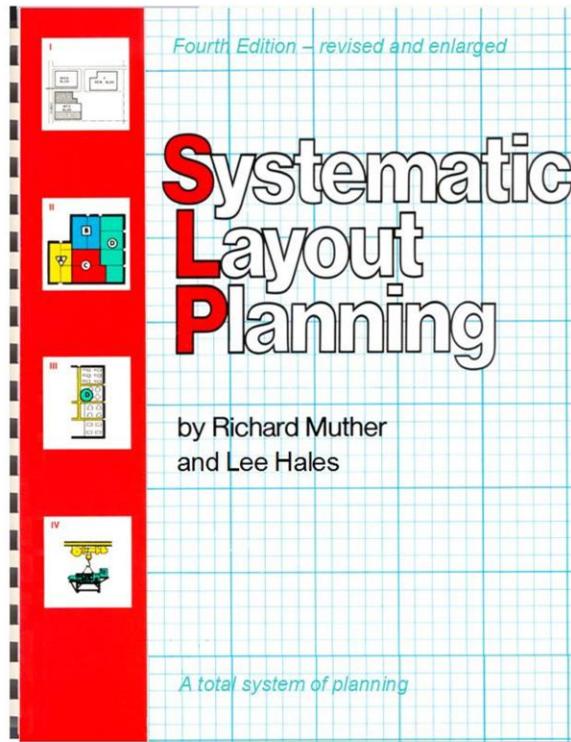
Here's What I Know

Question	Which Answer Is (Most) Correct	Got It
<p>1. When adjusting the Space Relationship Diagram, which of these modifying considerations may prevent us from realizing the ideal arrangement?</p>	<p>A. Material handling methods, especially equipment. B. Site conditions or surroundings. C. Building features. D. Utilities and auxiliaries. E. Any of the above.</p>	
<p>2. When adjusting the Space Relationship Diagram, which of these practical limitations may prevent us from realizing the ideal arrangement?</p>	<p>A. Budgetary and time limitations. B. Codes and regulations. C. Company policies and procedures. D. Any of the above.</p>	
<p>3. Which of these may require adjustments to main aisles and circulatory patterns?</p>	<p>A. Personnel safety. B. Dead-ends. C. Tight corners and narrow widths. D. Location and alignments of intersections. E. Any of the above.</p>	
<p>4. Systematic Layout Planning (SLP) requires that we develop two or more good layouts that differ in some significant way.</p>	<p>A. True. B. False.</p>	
<p>5. Varying flow patterns (Straight-thru,U-shape, L-shape) is one way to generate alternatives.</p>	<p>A. True B. False</p>	

Here's What I Know

Question	Which Answer Is (Most) Correct	Got It
6. The best way to get good alternative layouts is to turn several teams loose and wait to see what they develop.	A. True. B. False.	
7. The best way to avoid overlooking a good alternative is to agree in advance on what alternatives need to be explored.	A. True. B. False.	
8. Scaled templates made of paper or card stock are helpful when teams prepare layouts.	A. True. B. False.	
9. Two or more teams working in parallel can develop multiple alternatives in the same time that one person or team would develop only one.	A. True. B. False.	

Supplemental Reading



For more depth
on this topic,
see Chapter 9

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