Lecture 09
Crossdock: Just In Time Warehouse

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OUTLINE

1. INTRODUCTION TO CROSSDOCK

2. CONGESTIONS IN CROSSDOCK

3. SHAPE OF CROSSDOCK & NUMBER OF DOCK DOOR

4. TRUCK SCHEDULING IN CROSSDOCK

source: General references [BH09, Mul94, Fra02, Kit18]
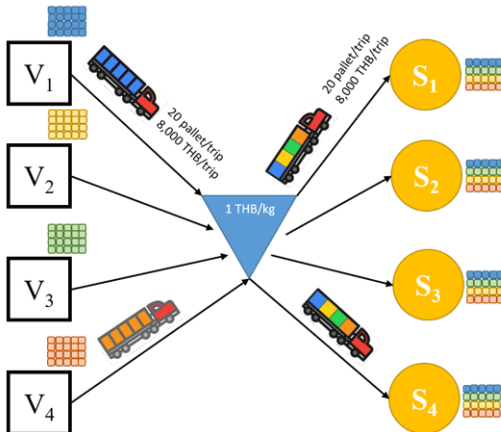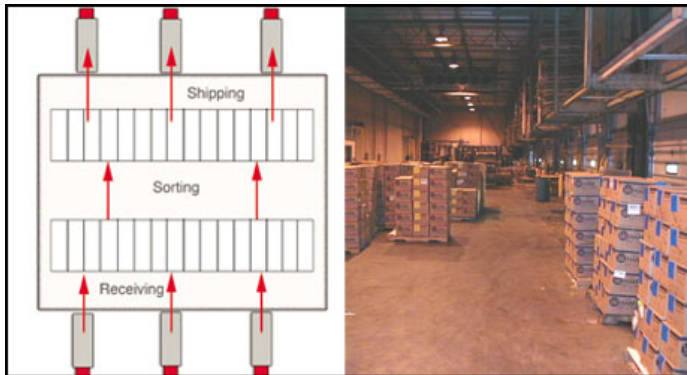
What is a crossdock?

Basics

- **Ideas:** hub with little inventory ($\leq$ 48 hours)
- **Pro:** high shipping frequency & little inventory $\rightarrow$ service level
- **Con:** advance info sharing, commanding, handling cost
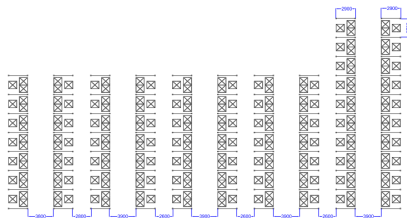
RECAP: BENEFIT OF CROSSDOCKING

source: Kittithreerapronchai, O (2018) [Kit18]
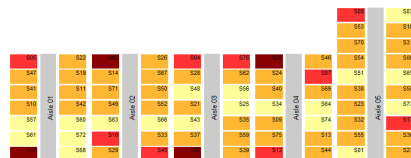
FLOW PROCESS

Manual Crossdocking Flowthrough

current layout

current heatmap

source: Kittithreerapronchai, O (2018) [Kit18]

Managing Crossdock

- **Candidate SKUs:** high & constant demand, perishable, low value
- **Candidate Supplier:** strategic, large qtys for every outlet, good IT
- **Avoid SKUs:** SKU with VAL, initial lunch, promotion
- **Requirement:** good relationship, better decision making, perfect quality, cost saving
- **Implementation:** pilot site, few large supplier, small transaction,

**source:** Ertek, G (2005). "A Tutorial on Crossdocking" [Ert05]

FEATURES COMMON IN CROSSDOCKS

- **Layout:** proximity of receiving & shipping, multiple # of docks
- **Equipment:**
  - **Floor Stack:** pallets or piece → drivers or distributer
  - **Sorter:** carton →
- **Products:** perishable items, no inspection, everyday product, unit load
- **Owner/Business:** 3PL, chain outlet/store, large company
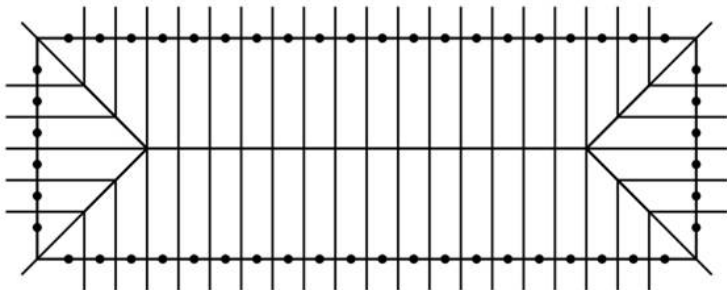
Issues in crossdock
- **Congestion:** floor space, forklift, 'dragline', → dock assignment
- **Layout:** shape of crossdock **VS** # of docks
- **Scheduling:** order of trailers → yard management [GK01]

FLOOR SPACE CONGESTION
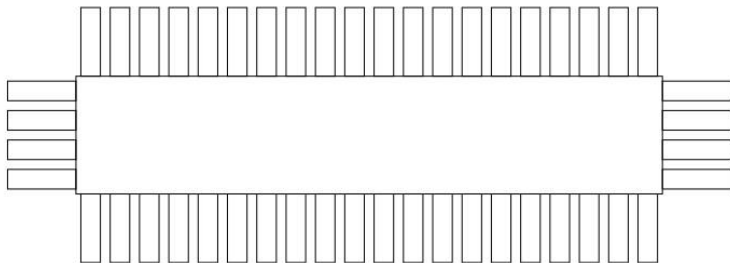
source: Bartholdi, J. & Hackman, S. 2009. [BG00]

Floor space congestion

source: Bartholdi, J. & Hackman, S. 2009. [BH09]

minimal stacking areas on both ends of facility
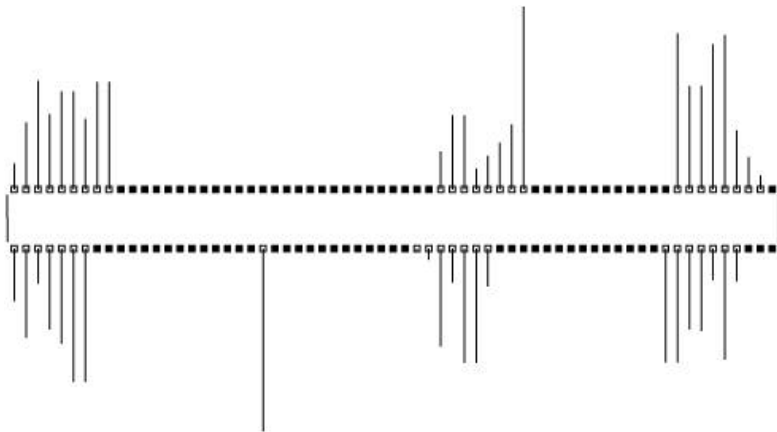
FORKLIFT INTERFERENCE

source: Tours of warehouses, distribution centers, crossdocks. http://www2.isye.gatech.edu/jjb/wh/sites/sites.html
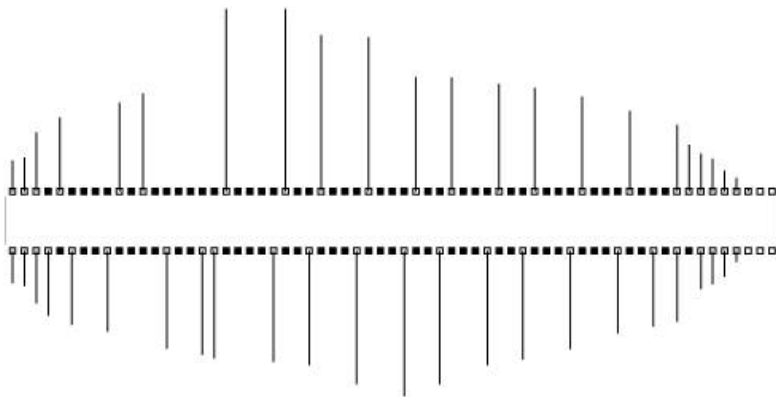
Issues

- **Forklift-Forklift:** lane width, driving **VS** lifting
- **Forklift-Stacking area:** overflow, staging queue, house keeping
- **Forklift-Picker:** sharing lanes, speed difference

ORIGINAL DOCK DOORS ASSIGNMENT

source: Gue, K. http://web.mac.com/krgue/Kevin_Gue/Crossdocking.html

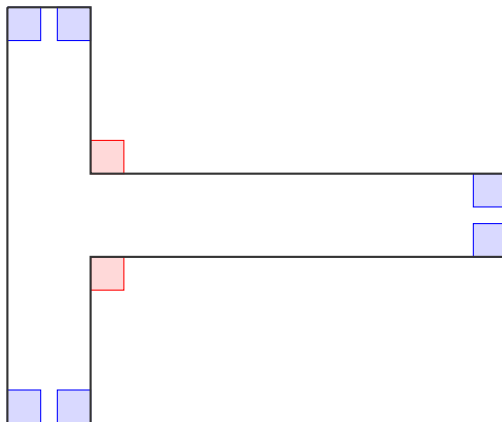# SUGGESTED DOCK DOORS ASSIGNMENT

source: Gue, K. http://web.mac.com/krgue/Kevin_Gue/Crossdocking.html

GEOMETRY OF CROSSDOCK

source: Gue, K. http://web.mac.com/krgue/Kevin_Gue/Crossdocking.html

Internal & External Corners

- **Internal corner:** stacking area,
- **External corner:** parking area

Geometry & Corners

	Number of corners	
Shape	Internal	External
'I'	4	-
'L'	5	1
'T'	6	2
'⊏'	6	2
'+'	8	4
'H'	8	4

- **Dominated:** 'I' ≫ 'L', 'T' ≫ '⊏', '+' ≫ 'H' [BG04]
- **Suggest:** 'I', 'T', '+' depending on # dock doors

MATCHING TRAILERS

source: http://www.lean.org/Common/LexiconTerm.aspx?termid=195&height=550&width=700
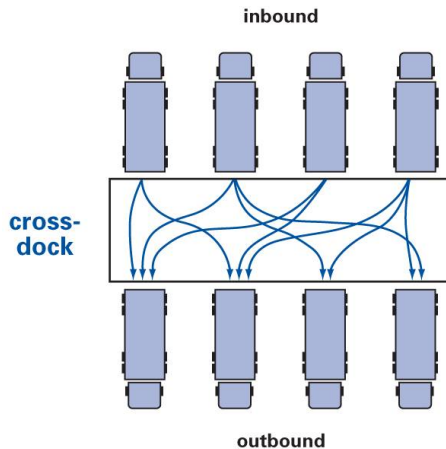
QUESTIONS

1. Explain similarities and differences between a *warehouse* and a *crossdock*?
2. Given the same number of dock doors, explain why a 'T'-shape crossdock is superior than an 'L'-shape crossdock
3. Despite the practical application, some researchers argument that a *promotion product* is a poor candidate for crossdock. Answer the following quesitons:
   - Elaborate rational of this argument
   - Give an exception of this argument

REFERENCE

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