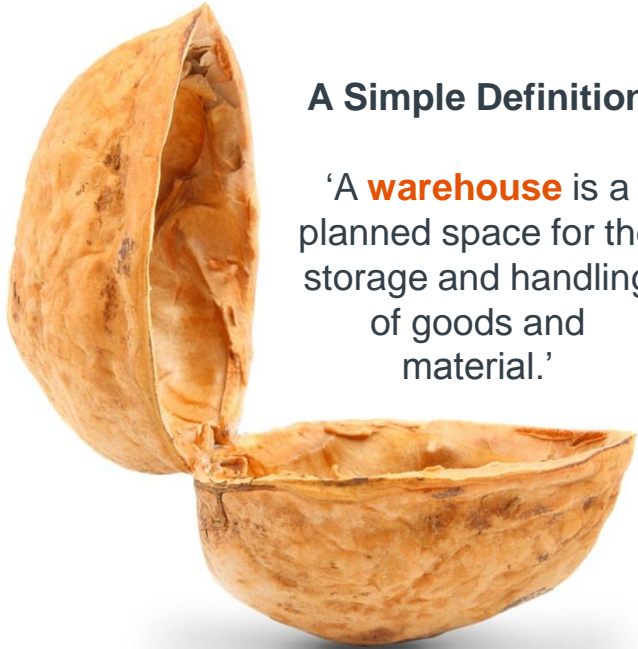




CHOOOLS CONSULTING SERVICES

WAREHOUSE DESIGN & PROCESS FLOW

Warehousing in a Nutshell?



A Simple Definition

‘A **warehouse** is a planned space for the storage and handling of goods and material.’



- Warehouses **act as a buffer** against surges in demand and act as a constraint to releasing stock to market to prevent collapses in demand.
- Enable buyer to gain from the economies of scale in terms of **buying power**.
- Alternatively, **it allows for production of larger batch sizes** which offsets setup costs, price fluctuations, and unreliable demand.
- Allows for the **consolidation of goods** from multiple vendors to multiple consumers.

Warehouse Location

Customer Focus



Start the selection process by realizing that a facility's location performs one main function:

→ **Getting a company close to its customers** ←



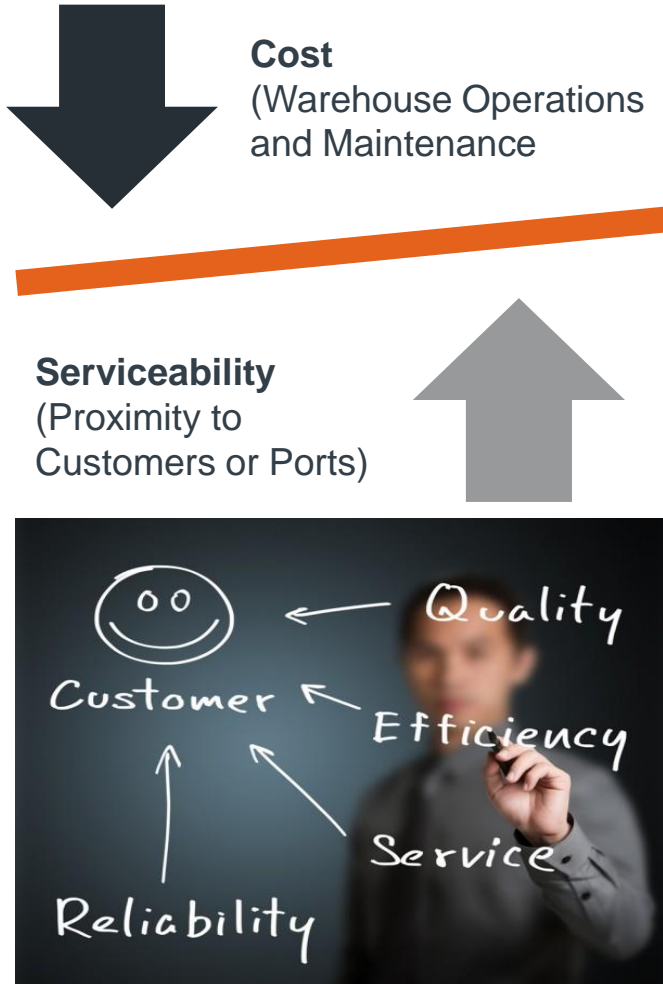
What are the objectives in site selection?

1. Customer service
2. Lower operating costs: the 4 primary areas of cost are:
 - Inbound & Outbound transportation costs
 - Inventory costs
 - Facility costs
 - Labour costs
3. To be superior to that of our competitors.

Warehouse Location

Factors to Consider:

The correct positioning of a facility will greatly impact both cost and customer service levels.



Influencing factors include:



Warehouse Design

Where do we start?



The Database

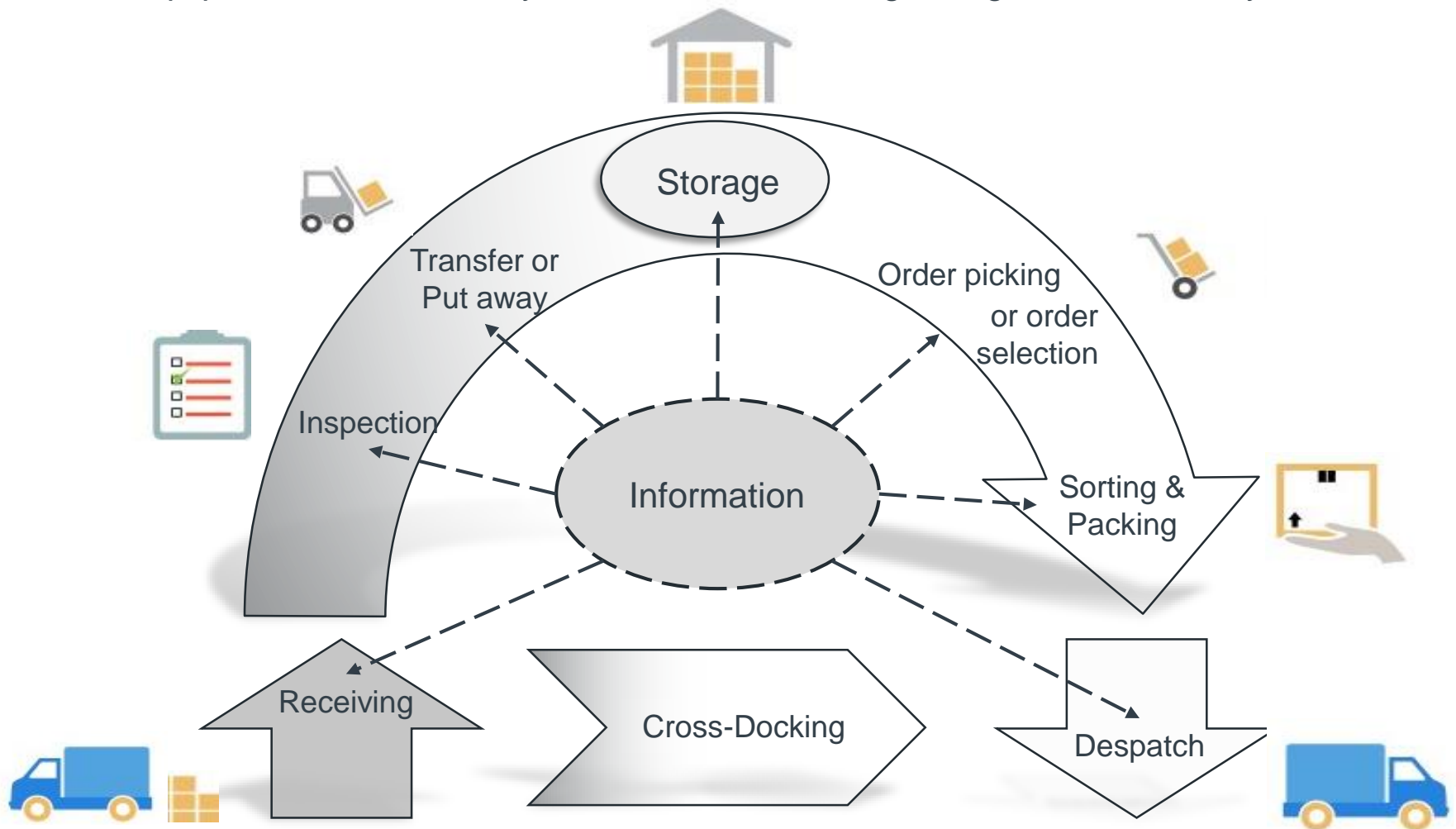
- **Collecting operations data is often the first step** in designing a warehouse.
- From the database, companies can **model actual facility throughput**, based on daily shipments and production/receiving cycles.
- **Projecting inventory levels** is the most difficult task associated with sizing and designing a warehouse to meet future operating requirements.
- In most facilities, **inventory is the primary space driver** - companies must consider **how much inventory** they need to contain, and the **associated pick faces needed** to handle inventory.

Warehouse Design

Typical Warehouse Flow



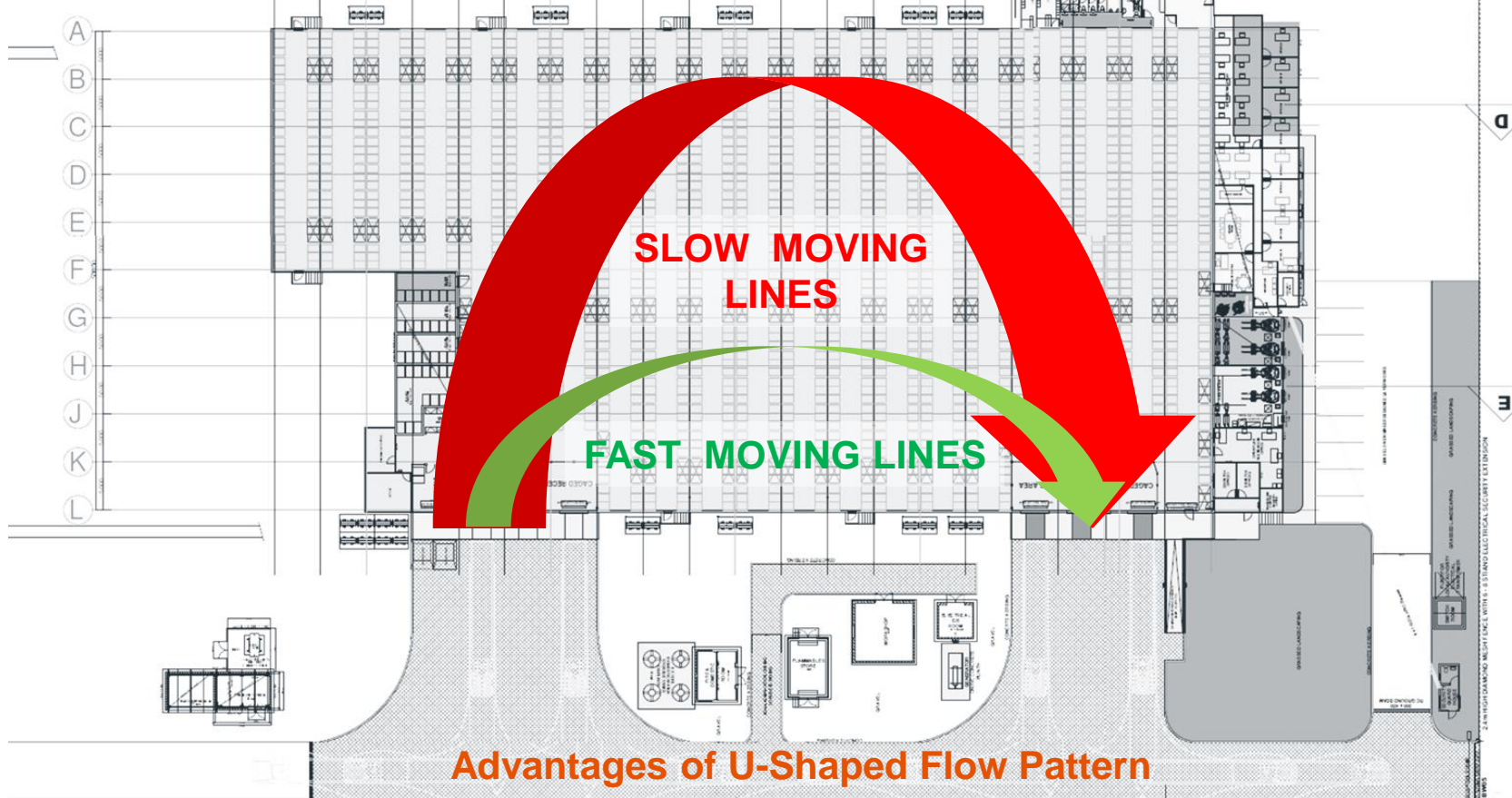
Designs should address material flows, picking and storage modules, materials handling equipment, information systems support, building configurations, and layout.



Warehouse Flows

U-Shaped Layout

U-Shaped Layout - Product comes in one side of the building, moves to the back (pallet storage), moves across the back (to forward pick and other process), and back to the front (Despatch)

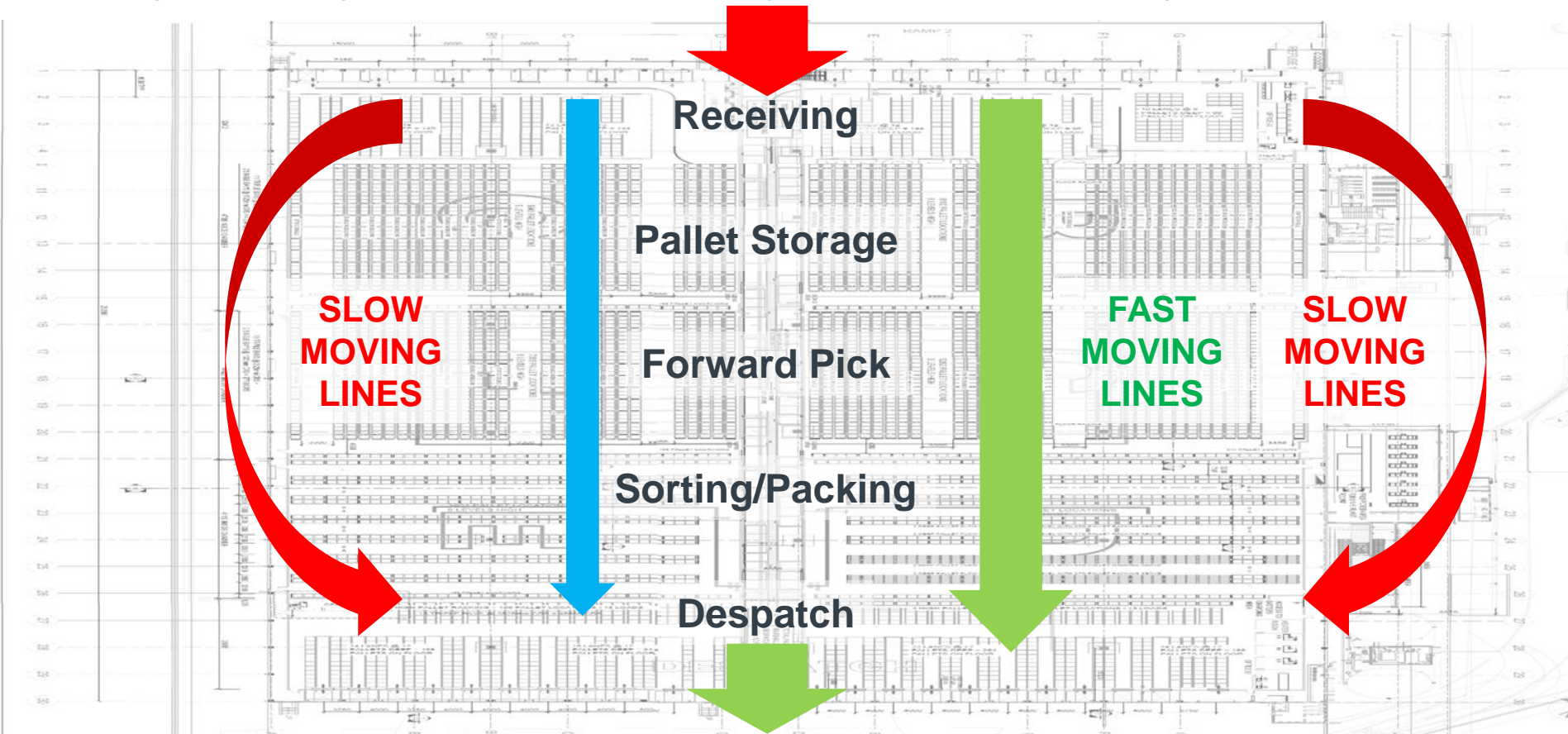


Facilitates cross-docking, best use of dock space (receiving and shipping can share dock doors), allows for expansion.

Warehouse Flows

Flow Through Layout

Flow Through Layout - Product comes in one side of the building (Receiving), flows directly through the building (pallet storage to forward pick, to processing, to the far end of the building (Despatch)).



Advantages of Flow Through Pattern

Best for heavy cross-docking operations and operations with very systematic processes (production plant or manufacturing).

Warehouse Layout

Yard Design



Vehicle Interface to Warehouse



Truck types affect building options



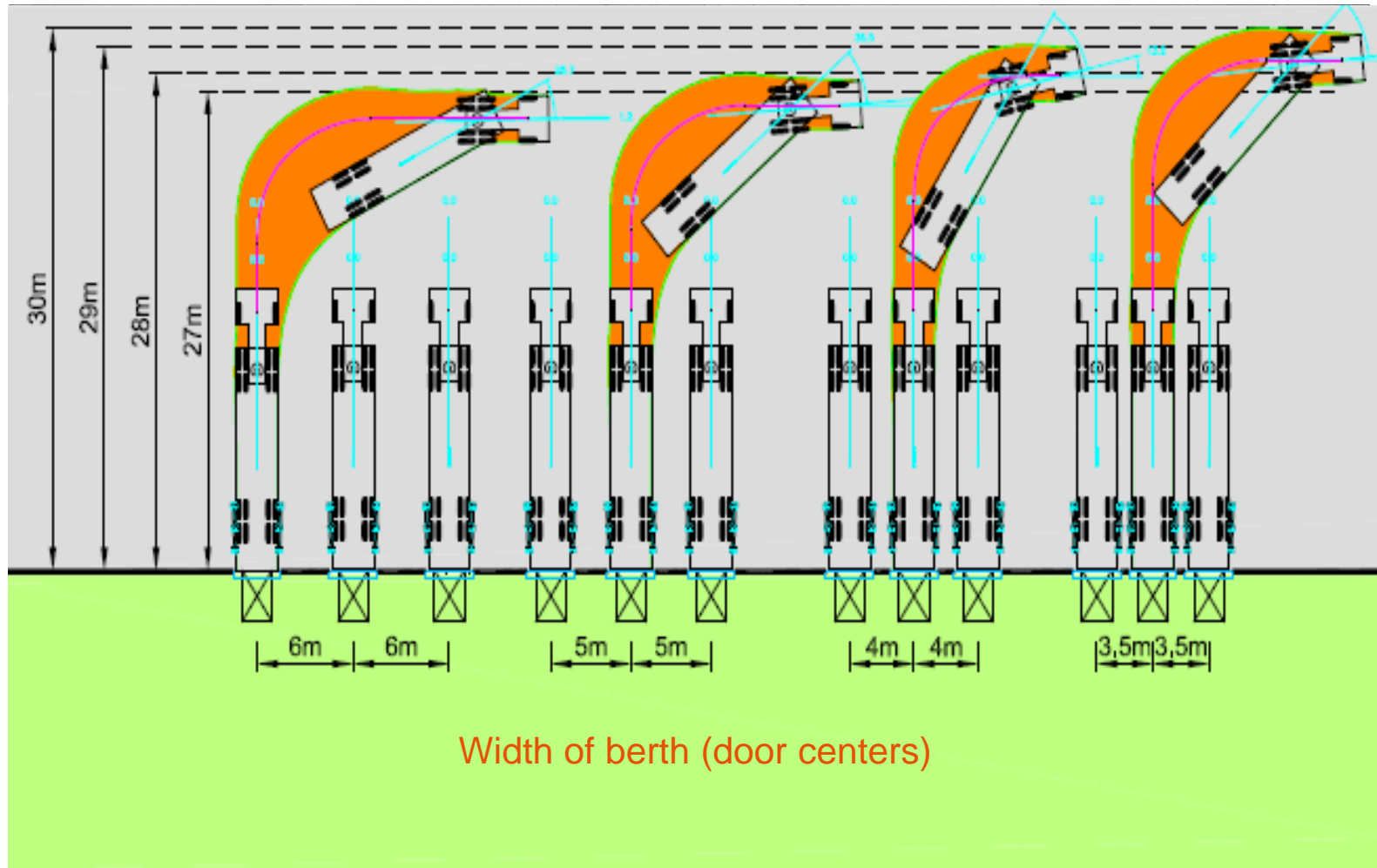
In Planning the Number of Docks:

- Number of Receipts & Shipments.
- Type of Loading & Unloading.
- Type and **sizes of vehicles**.
- Number & timing of carriers.
- Different areas in which materials will be utilised, stored, prepared for shipment.

Warehouse Layout

Dock Apron and Door Centers

Apron space required



Width of berth (door centers)

Warehouse Layout

Materials Handling Equipment Selection

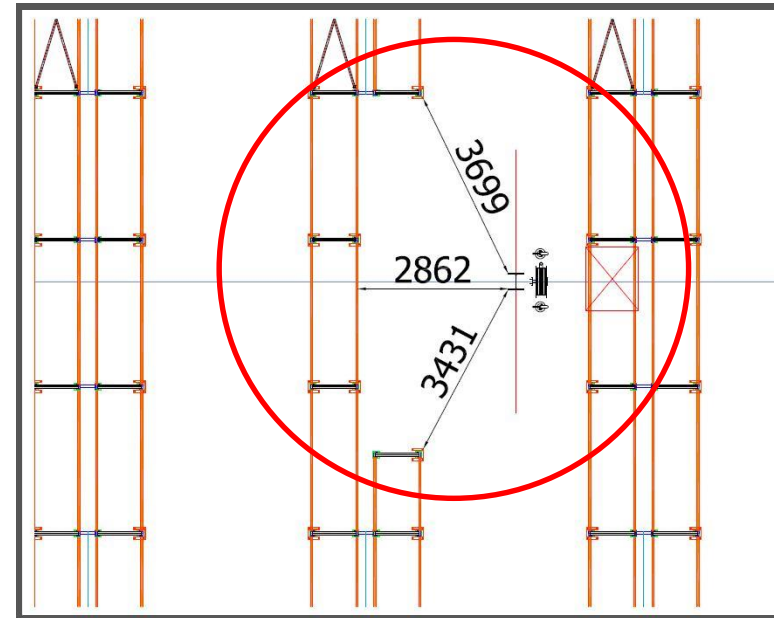


What happens when you don't design with the operation in mind?



Warehouse Layout

Getting It Wrong!



Warehouse Specifications

If its not written...it was never said!



Typical Building Specifications to name a few:

- Clear heights – canopies, eaves, lighting & other services.
- Lighting LUX levels.
- Operational offices.
- Client specific electrical requirements.
- Future expansion.
- Contractual agreements.
- Offsetting the environmental cost of the building by applying greener practices:
 - Rain & Grey water harvesting
 - Solar energy
 - Natural lighting & ventilation



Warehouse Specifications

Floor Specifications

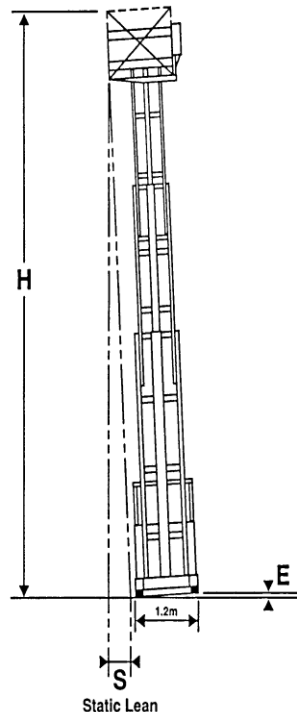


A Warehouse Floor

Integral part of the warehouse system. It is the **Table Top** on which that system will operate.



STATIC LEAN TABLE



The table below shows the static lean 'S' of a fork lift truck assuming the mast is rigid. Due to the engineering tolerances in the mast and the dynamic force when the truck is moving this could increase the static lean by up to three times the figure shown.

The centre to centre distance between the load wheels of the fork lift truck is 1.2 metres.

		Difference in elevation between left and right hand fork truck load wheels										
		E (mm)										
		3	4	5	6	7	8	9	10	11	12	
Height of racking	6	15	20	25	30	35	40	45	50	55	60	
	6.5	16	22	27	33	38	43	49	54	60	65	
	7	18	23	29	35	41	47	53	58	64	70	
	7.5	19	25	31	38	44	50	56	63	69	75	
	8	20	27	33	40	47	53	60	67	73	80	
H (metres)	8.5	21	28	35	43	50	57	64	71	78	85	
	9	23	30	38	45	53	60	68	75	83	90	
	9.5	24	32	40	48	55	63	71	79	87	95	
	10	25	33	42	50	58	67	75	83	92	100	
	10.5	26	35	44	53	61	70	79	88	96	105	
	11	28	37	46	55	64	73	83	92	101	110	
	11.5	29	38	48	58	67	77	86	96	105	115	
	12	30	40	50	60	70	80	90	100	110	120	
	12.5	31	42	52	63	73	83	94	104	115	125	
	13	33	43	54	65	76	87	98	108	119	130	

Floor Specifications must consider:

- Flatness Specification
- Joint layout and joint design
- Construction methodologies

Warehouse Specifications

Fire Specifications



Fire Specifications:

- SANS (ex.SABS) legal compliance.
- ASIB & FM Global are guideline standards and not legislated but can be a client's insurance requirement.
- Rational Fire design requires a Fire Engineer executing for life preservation.
- Local Fire and Council authority variances.



Fire Specifications must consider:

- Goods and product fire risk categorization.
- Rack design and layout.
- Fire escape route planning in conjunction with operation.