

DI04006071: Railway, Harbour & Tunnel Engineering

Lecture 4.33: Essential Features of Transit Sheds, Required Area and Dimension of transit shed, ware house

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Introduction to Transit Sheds I

Transit sheds are essential structures at ports, providing temporary storage for cargo transitioning between ships and land transport. They protect goods from weather, theft, and damage while facilitating customs inspection, sorting, and short-term holding.

Key Points

- Temporary storage facility at port terminals.
- Protects cargo from environmental factors.
- Facilitates customs clearing and cargo sorting.
- Designed for rapid turnaround, not long-term storage.

Essential Features of Transit Sheds I

The design and layout of a transit shed must prioritize operational efficiency, ease of access, and adequate protection. They must integrate smoothly with quay aprons on the waterside and rail/road networks on the landside.

Key Points

- Ample clear floor space with minimal interior columns.
- Sufficient overhead clearance for mechanical handling equipment (e.g., forklifts).
- Wide and high doors on both quay and land sides for uninterrupted traffic flow.
- Adequate natural and artificial lighting and ventilation.
- Strong, durable, and smooth flooring to withstand heavy loads and wear.

Structural Requirements & Components I

Transit sheds require robust construction to handle continuous heavy machinery movement and cargo stacking. They generally utilize steel portal frames or reinforced concrete structures.

Key Points

- Flooring: Must sustain uniform loads typically between 30 to 50 kN/m².
- Roofing: Usually pitched or saw-tooth trusses, covered with corrugated GI or asbestos cement sheets.
- Platforms: Raised platforms on the landside (typically 1 to 1.2 m high) to match truck or wagon bed heights.
- Doors: Roller shutters or sliding doors, typically 4 to 5 meters wide and 5 meters high.

Typical Cargo Storage Requirements I

The following table illustrates typical storage densities and required operational space for various types of cargo handled in transit sheds.

Cargo Type	Typical Stowage Factor (m ³ /tonne)	Max Stacking Height (m)	Aisle Space Allowance (%)
General Cargo (Palletized)	1.5 - 2.5	4.0 - 5.0	35 - 40
Bagged Cargo (Rice/Wheat)	1.3 - 1.6	5.0 - 6.0	25 - 30
Steel Coils/Plates	0.4 - 0.7	2.5 - 3.5	25 - 30
Cotton Bales	2.5 - 3.0	4.5 - 5.5	30 - 35

Key Points

- Stowage factor determines the volume occupied by one tonne of cargo.
- Aisle space allowance varies based on handling equipment size.
- Max stacking height is limited by cargo fragility and shed clearance.

Calculation of Required Area and Dimensions I

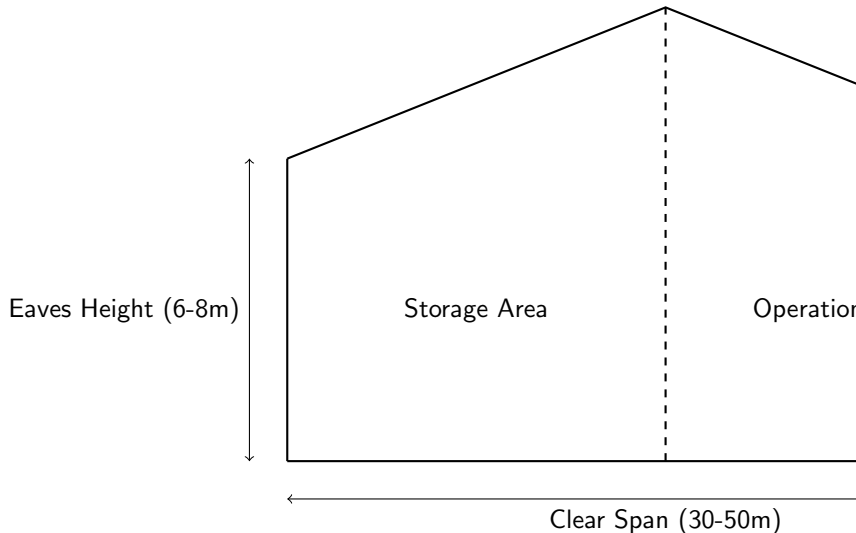
The dimensioning of a transit shed is intrinsically linked to the size of vessels berthed, the cargo throughput, and the allowable storage time. The gross area must account for both net cargo storage and operational maneuverability.

Key Points

- Formula: Required Area (A) = (Maximum Cargo Tonnage x Stowage Factor) / (Average Stacking Height x Space Utilization Factor).
- Length: Usually matches the length of the berth or ship (e.g., 150m to 200m).
- Width: Ranges from 30m to 50m. Wider sheds require clear-span roof trusses to avoid central columns.
- Height: Minimum clear height at eaves is typically 6m to 8m to accommodate forklifts and mobile cranes.

Cross-Section of a Transit Shed I

Cross-Section of a Transit Shed II



Cross-Section of a Transit Shed III

Key Points

- Clear span structural design avoids internal columns, maximizing usable floor space.
- Adequate eaves height ensures safe operation of handling equipment.
- Loading platforms on the landside facilitate direct transfer to trucks or rail wagons.

Introduction to Warehouses I

While transit sheds are for short-term transit, warehouses at ports provide medium to long-term storage facilities. They are situated further inland from the quay to keep the expensive waterfront space clear for active vessel loading/unloading operations.

Key Points

- Located behind transit sheds or outside the immediate dock area.
- Used for bulk storage, consolidation, distribution, and value-added services (e.g., packaging).
- Reduces congestion at the quay by clearing out transit sheds rapidly.
- Can be specialized (e.g., cold storage, hazardous materials, bonded warehouses).

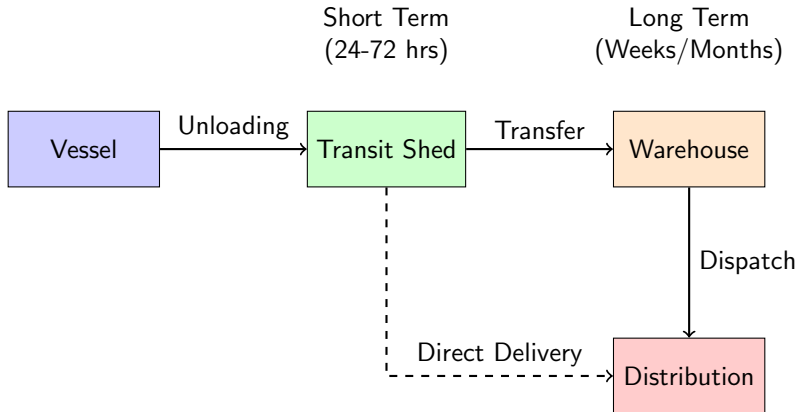
Essential Features of Warehouses I

Warehouses demand distinct design features focused on maximized storage volume, specialized environmental controls, and sophisticated inventory management systems rather than just rapid throughput.

Key Points

- High stacking capability (often up to 10-15m) using advanced racking systems.
- Specialized flooring to tolerate extremely high point loads from rack uprights.
- Advanced fire protection and sprinkler systems due to higher fuel loads and dense storage.
- Environmental controls (temperature, humidity) for perishable or sensitive goods.
- Multi-story configurations possible where land value is exceptionally high.

Flow Diagram: Transit Shed vs Warehouse I



Flow Diagram: Transit Shed vs Warehouse II

Key Points

- Cargo moves from the vessel directly into the transit shed for immediate sorting.
- Goods requiring long-term storage are transferred to the warehouse.
- Direct delivery allows cargo to bypass the warehouse and move straight to distribution from the transit shed.

Design Criteria for Warehouses I

Warehouse design requires meticulous planning regarding space utilization, equipment selection, and safety regulations. The structural footprint and internal layout heavily influence operational efficiency and long-term viability.

Key Points

- Aisle width must match the turning radii of reach trucks and Very Narrow Aisle (VNA) equipment.
- Structural grid spacing must align with the intended pallet racking layout.
- Dock leveling equipment must be integrated into receiving and dispatch bays.
- Integration of Warehouse Management Systems (WMS) for automated tracking.

Summary I

Transit sheds and warehouses are critical nodes in port infrastructure. Transit sheds facilitate rapid cargo transfer at the quay, requiring clear spans and high throughput design. Warehouses provide extended storage, focusing on high-density stacking and specialized inventory management. Proper dimensioning of both relies on cargo volume, stowage factors, and handling equipment.

Key Points

- Transit sheds: Short-term, rapid turnaround, located at the waterfront.
- Warehouses: Long-term storage, high-density, located landward.
- Area calculation depends on cargo tonnage, stowage factor, and stacking height.
- Efficient layout and structural design minimize operational bottlenecks.