

9 Public Health - Pneumatic Tube System Design (PTS)

This PH-PTS design guideline written for healthcare facilities, is a consolidated document listing out the design requirements for all new construction and major renovation healthcare projects.

The PTS must not jeopardize the continued operation of a healthcare facility and incur any huge capital costs due to equipment replacement.

The requirements outlined in these guidelines are not intended to conflict with Federal Regulations, Local Municipality Laws, Executive Orders, or the needs of the end users.

This document is intended for the Architect/Engineer (A/E) and others engaged in the design and renovation of health facilities. Where direction described in applicable codes are in conflict, the A/E shall comply with the more stringent requirement. The A/E is required to make themselves aware of all applicable codes.

The document should be read in conjunction with other parts of the Health Facility Guidelines (Part A to Part F) & the typical room data sheets and typical room layout sheets.

General

- Pneumatic Tube Systems (PTS) are internal logistics and transport solutions used to transport small items or documents, placed in a container or carrier, from one point to another, through an air pressurized network of tubes.
- In healthcare facilities, Pneumatic Tube Systems (PTS) transport small materials, documents, laboratory samples etc. to and from pharmacies, laboratories, blood banks, surgery centres, emergency departments and nursing stations, as well as other locations throughout healthcare facilities.
- The PTS can be constructed as a single-zone-system or as a multi-zone-system. The major components of such a system include the blower, tubes, stations, diverters, carriers, and the central control unit that forms the command centre of such a system. Figure 9.1 shows a single zone operation with 4 stations (two stations on the Ground Floor, two stations on the First Floor and the blower and diverter in the basement area).
- Each healthcare facility PTS is designed for its respective facility. Figure 9.1 below shows an example of PTS.

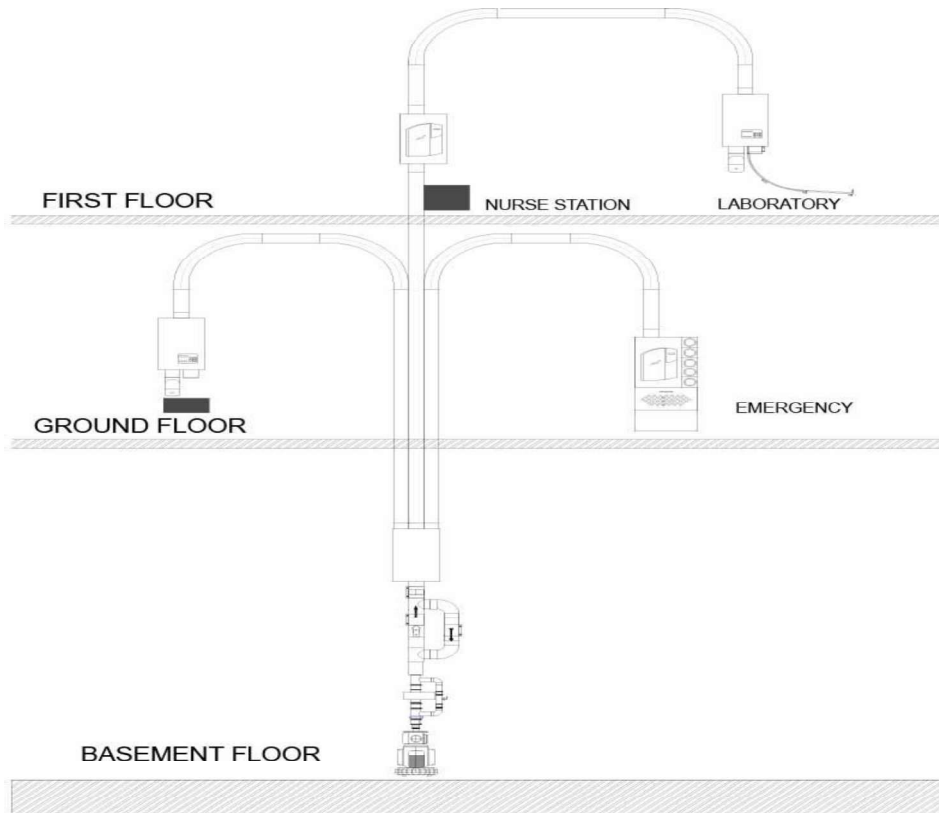


Figure 9.1 – Typical Pneumatic Tube System Layout – Single Zone System

- Multi-zone systems, as seen in Fig. 9.2, are connected together by a transfer system. Each zone has its independent air supply (blower) so transmission can take place at the same time. Dividing a system into multi-zones increases the number of carriers that can be transported as each zone can operate independently. Productivity is improved, efficiency is increased while NPA (non-productive activities) and staffing requirements are decreased.

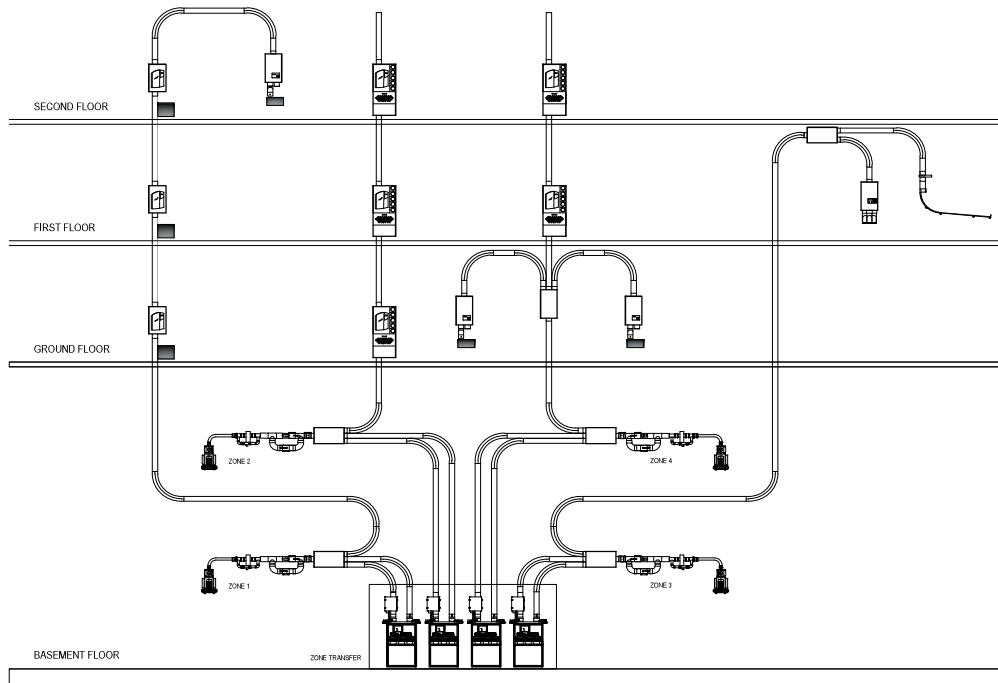


Figure 9.2 – Typical Pneumatic Tube System Layout – Multi-Zone System

Design Criteria

- The PTS shall be provided in accordance with the requirements of NFPA 99 (Health Care Facilities Code), the manufacturer's recommendations, and the healthcare facility's planning brief as defined in Part B of these guidelines .
- The contents of the items within the PTS delivery casing transports material between different sending and receiving modules called PTS Stations.
- The locations of these stations are determined by the health planner and briefing requirements as mentioned in Part B of these guidelines.
- The briefing will also state the details of the station operation i.e. the station is sending or receiving or both or a multiple sending and receiving station.
- The PTS carrier, carries the following critical specimens through the system between departments:
 - Blood Specimens for Chemistry and Hematology
 - Arterial Blood for Blood Gas Analysis
 - Urine Specimens for routine analysis and culture
 - Cerebral Spinal Fluid
 - Tissues for Biopsy and other Body Fluids
- By simply placing the carrier in the station, the user can send it to a predetermined destination. Some key features are:
 - A carrier can be stored at a station of a single-zone-system, independent of the stage of operation.
 - After a carrier is inserted into the station, it will be transported directly to its destination.
 - After one sending process, the system can automatically start the next.
- Speed simulation study with expert/manufacturer software to be made part of the construction plan to assess the delivery time to respective stations.

Pneumatic Tube System Components

- The system consists of many components that make the system as well as allow the system to be designed and operated correctly. The system components are the following:
 - Blower & Air Reverse Valve –The Blower (PTS compressor system) generates the air that moves the PTS carriers throughout the healthcare facility via pressure or vacuum suction. The location of the blower will be in the healthcare facility plant room as per coordination with the healthcare operator and health planning briefing. As soon as all pending processes are finished, the blower disconnects automatically
 - Recommendation: Blowers should come fitted as standard with energy efficient IE2/NEMA motors (acc. to destination country) conformant to the IEC 60034-30 standard. Blowers to be installed in the plant room along with the system control unit and inter zone/linear coupler if applicable.
- Blower Group – This a group of PTS blowers that are interconnected that include sending and receiving drivers allowing any single blower to handle the carrier delivery from sending and receiving as well as vice versa. These are usually installed in large healthcare facilities such as a tier 4-6 delineation healthcare level.
- Carrier – A PTS Reusable plastic container that hold and protect contents (lab specimens, pharmaceuticals, blood products, etc.) sent through a pneumatic tube system. The carriers come in different sizes to cater for the function or requirement of the facility. The carriers used in healthcare facilities include:
 - Standard carriers: for medications or solid particles and small instruments
 - Leak-proof carriers: for the transport of liquids or sensitive samples used in the PTS
 - Special carriers: these designed and developed for very specific uses such as carriers lined with lead or cooling carriers

- All carriers are equipped with an RFID sensor for easy distribution of carriers to departments by programming 'Home' station and 'Destination', which will automatically be guided by the scanner mode or dialled destination. The carrier's movement can be tracked.
- Control Centre – The PTS software that controls the communication between the stations, devices, and user requirements. This also locates the current location of the carrier via a user interface.
- Database – A repository of information for each of the PTS carrier movements including a date and time as well as station operability.
- Interzone Connection – A section of tubing that connects one zone to another zone.
- Station – The user interface unit that may include an interactive touch screen system, a mechanical dialling system and or an RFID scanner, for the sending or receiving of the carrier.
- Diverter – A PTS route switching device used at branching points within a tube network to allow a carrier to move from one path to another. In many healthcare facilities, this is usually located within riser shafts or above the ceilings.
- Tubing – Tubing or system piping is generally provided for 110mm or 160mm. The tubes are available in PVC (Grey), PVC (Transparent), GI and Stainless Steel, depending on the environmental conditions of the site. Healthcare operators may request a pipe greater than 160mm to be provided for bulk pharmacy items or multiple samples or documents being carried from one location to another.
- Zone – A collection of stations with direct tubing connections. Zones are interconnected with inter zone connections. A traditional zone includes approximately 10 stations, while a Blower Group Zone can support up to approximately 60 stations.
- Slow Speed Device – This device used especially in hospitals where certain sensitive goods such as laboratory tests and blood samples require transport with a reduced speed.

Pneumatic Tube System Pipe Material

- Typically for Existing and New building piping material used for PTS is as under;
 - PVC (160mm Diameter Piping)