

**SECTION 14 58 00
PNEUMATIC TUBE SYSTEM**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide and install a 6-inch diameter automatic pneumatic tube system (PTS), complete and ready for operation, including air power units, stations, diverters, carriers, centralized computer controls with requisite software, tubing and fittings, communication wiring, conduit, and all necessary accessories and equipment.
- B. Provide all necessary work to completely integrate the PTS stations installed in the NHCU into this PTS.

1.2 RELATED WORK

- A. Division 1, General Requirements.
- B. Division 16, Section 26 05 11 - REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.3 GENERAL REQUIREMENTS

Verification of Dimensions: The contract drawings show the extent and general arrangement of the PTS. The Contractor shall visit the premises to verify details of the work, working conditions, and dimensions in the field, then shall advise the Contracting Officer of any discrepancy before performing any work. He shall be specifically responsible for the conditions and proper relation of this work to the building structure and to the work of other trades.

1.4 QUALIFICATIONS

- A. Approval by the Contracting Officer is required of products or services of proposed manufacturer, suppliers, and installers and will be based upon submission by contractor of certification that:
 - 1. Manufacturer regularly and presently manufactures pneumatic tube system equipment specified as one of his principal products.
 - 2. Installer has technical qualifications of at least three (3) years experience, trained supervisory and installation personnel and facilities to install specified items. Approval may be granted at the Contracting Officer's option for vendors with less than three (3) years experience upon presentation of satisfactory evidence that all requirements of this specification can be met, and that vendor has the physical and financial resources to support all contractual obligations. Approval will not be given where the experience record on either government, municipal, or commercial projects is one of unsatisfactory performance.
 - 3. Manufacturer's product submitted has been in satisfactory and efficient operation on at least one (1) installation similar to this project for not less than two (2) years. Submit details of installation; include names and addresses of hospitals and hospital administrators thereof.
 - 4. There is a permanent service organization maintained or trained by manufacturer that will render satisfactory service to this installation within four hours of receipt of notification that service is needed. Submit name and address of service organization.
- B. Contracting Officer retains the right to approve an experience record and services facilities less than those specified when the best interest of the Government would be served by such action and objectives of this specification are fulfilled.

1.5 PRODUCTS CRITERIA

- A. Multiple units: When two (2) or more units of the same type or class of materials or equipment are required, these units are products of one manufacturer.
- B. Assembled units: Manufacturers of equipment assemblies that use components made by others shall be completely responsible for the final assembled product.
 - 1. All components of an assembled unit need not be products of the same manufacturer, but component parts that are alike shall be the product of a single manufacturer.
 - 2. Components shall be compatible with each other and with the total assembly for the intended service.
- C. System Requirement:
 - 1. Provide add-on equipment and software changes for the addition of one station to the existing system in main hospital.
 - 2. Operation shall be totally automatic requiring no intermediate manual handling of carriers.
 - a. Dispatched carriers shall not pass through another station.
 - b. Destination selection shall be by membrane keypad on the station control panel. No destination coding shall be on carriers.
 - c. Failure of one station shall not interfere with normal functioning of any other station on system.
 - d. A "carrier acceptance" signal on station control panel shall confirm that carrier can be delivered to selected station before system accepts a carrier.
 - e. After receipt of "carrier acceptance" signal, dispatching sequence shall be controlled by system computer and shall require no additional attention from operator.
 - f. Carriers shall be rejected at the source station if they cannot be delivered to the destination station. The route to the destination station shall be checked twice to insure that all required system components are operating properly and in their correct position before the carrier is dispatched. A "carrier rejection" signal on station control panel shall indicate carrier cannot be delivered to selected station for one of the following reasons:
 - 1) Non-existing station selection.
 - 2) Selected station receive bin filled to capacity.
 - 3) Selected station off-line.
 - 4) System malfunction.
 - g. Use no carrier impact valves in system. Carrier transfer from negative pressure or positive pressure sections of system to atmospheric shall be through electro-mechanical devices not dependent on carrier mass or velocity for proper operation.
 - h. Carriers already in transit at time of a power failure shall be delivered to selected destinations when power is restored.
 - i. Carriers in transit when system is turned off at central control center shall be delivered to their selected destinations. Additional carriers shall not be accepted into system after off button is pressed.
 - j. Carriers in transit when receiving station is turned off shall be returned to sending station.
 - k. Carrier in process shall be returned to the source station if the destination station becomes overloaded while carrier is in transit.
 - l. If carrier has not reached its turn around point, enable carrier to return to its originating station should its destination become inoperative.

- m. If both sending and receiving stations should be turned off after carrier is in transit, carrier shall be sent to receiving station. Power at receiving station shall not shut off until carriers in route to receiving station have been received.
 - n. Carriers in process or pending when any part of the system is signed off shall deliver to their destinations. Any new requests to send shall be rejected.
4. The dispatching routing, spacing and storage of carriers shall be directed by the control center to provide automatic, unattended transmission of carriers between all stations.
 5. Provide shortest route vacuum-pressure travel. Transactions between stations on the same zone shall process to the closet turnaround point to the destination.
 6. To dispatch a carrier from a station the operator will place a latched carrier in the dispatcher, select the destination address and press the "send" pushbutton at the station.
 7. Allow multiple carriers in transit within the system. Allow the station dispatchers to be simultaneously loaded and destinations selected. Automatically process all carriers until the system is clear.
 8. The modular construction of the system components shall permit changes and the additions of stations and/or zones as Owner requirements change.
 9. Provide automatic empty carrier redistribution. Allow any station with excess carriers to select automatic return, which will direct empty carriers anywhere in the system on a most-needed basis. The need will be determined by the ratio of assigned carriers to present carriers.
 10. Allow individual station or zone shutdown without affecting remainder of system.
 11. When a power failure occurs at the control center, the system shall continue to process carriers for approximately one minute without interruption. If the power failure lasts more than one minute, as many in process transactions as possible shall be completed before the system is shut off. Any remaining in process transactions are stored in memory and delivered to their destinations when power is restored.
 12. Station send and receive priorities shall insure that carriers are processed to their destinations in the shortest time.
 13. A 115V AC duplex receptacle and on/off switch shall be provided at each station, diverter, and air power unit.
 14. The destination selection capability of any station can be controlled from the Control Center.
 15. An option can be selected to allow scheduled off stations to dispatch but not receive carriers.
 16. Stations can be automatically assigned up to five (5) on/off periods per day.
- D. Stations can be automatically assigned up to ten (10) dispatch and receive priority levels with different time intervals.
 - E. Employee Instructions: Provide a qualified representative possessing complete knowledge of system and equipment to train employees in operation and maintenance of system. Training period shall be as follows:
 1. Twelve (12) hours instructing maintenance personnel on operation and maintenance of system.
 2. Sixteen (16) hours instructing operating personnel in use of system.
 - F. Inspection and Maintenance Service: Furnish inspection and maintenance service on equipment for a period of two (2) year after system begins daily operation. This service shall consist of eight (8) hours each

month for examination, repair and adjustment by competent and qualified mechanics; cleaning, oiling greasing adjustments and replacement of any parts required to place equipment in proper working order (except parts made necessary by improper use, accident, or negligence).

1.6 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- B. Manufacturer's Data and Shop Drawings of Equipment: Submit the following as one package:
 - 1. Stations.
 - 2. Carriers.
 - 3. Diverters.
 - 4. Tubing.
 - 5. Hangers.
 - 6. Air Power Units.
- C. Provide shop-drawing layouts showing pneumatic tubes and adjacent ducts and pipes for possible interference. Provide complete dimensioned drawings that indicate tube routing, rights-of-way and maintenance clearance requirements, methods of supporting and anchoring tubing and equipment, station details, equipment locations, and detailed dimensions of all major components.
- D. Include separate riser diagrams for PTS routing and electrical control wiring.
- E. Operating and Instruction Manual: Provide six (6) manuals. Each manual shall be bound and indexed containing complete operation, maintenance and repair instructions including following:
 - 1. Description of system and components.
 - 2. Starting and stopping procedures.
 - 3. Special operating instructions.
 - 4. Routine maintenance procedures.
 - 5. Cataloged list of spare parts.

1.7 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. Federal Specifications (Fed. Spec.):
 - WW-H-171E.....Hangers, And Supports, Pipe
 - WW-T-799E.....Tube, Copper, Seamless, Water And Refrigeration
(For Use With Solder-Flared Or Compression-Type Fittings)

1.8 GUARANTEE

- A. Submit all labor and materials furnished in connection with pneumatic tube system and installation to terms of "Guarantee" articles of Section 01001, GENERAL CONDITIONS. Guarantee shall commence upon final inspection and completion of performance test and upon full acceptance of the installation and shall concur with the length of the maintenance contract.
- B. If it becomes evident during guarantee period that any device is not functioning properly or in accordance with specification requirements, or if in the opinion of the Contracting Officer, excessive maintenance and attention must be employed to keep device operational, device shall be removed and a new device meeting all requirements shall be installed as part of work until satisfactory operation for installation is obtained. Period of guarantee shall start anew for such parts from date of completion of each new installation performed, in accordance with foregoing requirements.

PART 2 - PRODUCTS

2.1 STATIONS

- A. Recessed wall type. Provide self-supporting "rough-in" frame to which various operating and decorative components are added. Provide switch with signal lights or written legends to indicate station "ON" or "OFF."
- B. Sheet metal surfaces shall be factory painted with a polyurethane base or scuff resistant low gloss black, or be covered with molded decorative plastic. Finish frame for final mating to wall surface shall be stainless steel or same material as terminal surface.
- C. Station receive bin shall be capable of receiving and holding not less than four (4) carriers before engaging overload alarm.
- D. Provide means to assure quiet arrival of carriers.
- E. Carrier storage compartment shall be capable of storing four empty carriers and be integral with station.
- F. Station directory operating instructions shall be an integral part of station panel
- G. Station Control Panel shall contain the following:
 1. Membrane keypad - for destination and special function selection.
 2. Display with 48 characters - for message display.
 3. Send/Enter key - to activate dispatch after destination selection or to enter data for special functions.
 4. Cancel/Clear Key - to allow for transaction cancellation or clearing of display during special function activation.
 5. Special Function Key - to request special features.
 6. Directory - listing station addresses.
 7. Instruction Compartment - for operating and special function instructions.
 8. Discreet rejection messages shall be provided for:
 - a. Station receive bin full.
 - b. Station turned off.
 - c. Station not in service.
 - d. Receiving station full.
 - e. Receiving station does not exist.
 - f. Receiving station turned off.
 - g. Receiving station not in service.
 - h. Selection not permitted.
 - i. Transaction aborted.
- H. Message will be displayed for the following conditions:
 1. Incoming carriers at the receiving station.
 2. To return surplus carriers when the receiving station has a specified surplus over its assigned number of carriers.
 3. To empty a station receiver when it is full.
 4. Receiving station not receiving - traffic forwarded to another station.
- I. The following special functions shall be selectable from each station.
 1. Transaction Tracking.
 2. Secure Transaction.
 3. Emergency Shutdown.
 4. Stat Transaction.
 5. Traffic Forwarding.
 6. Incoming Carrier Query.
 7. Station On/Off.
 8. Carriers Present.
 9. Station Diagnostics.
 10. Audible Full Station.
 11. Audible Carrier Arrival.

2.2 CARRIERS

Side opening transparent shatterproof plastic. Carriers shall be bi-directional and have replaceable wear bands and latches. Open carriers shall not be accepted in system. Carrier shall have an interior diameter of approximately 5" and a minimum length of 11" for transporting 1000 ML IV bottle. Furnish four (4) for each station.

2.3 TUBING

- A. Tubing and bends shall be 16-gauge cold rolled, electric welded steel with flash removed and zinc-coated after fabrication. Joints shall be bell-end tubing or sleeve couplings forming airtight connections.
- B. Form bends to minimum 48" radius.
- C. Provide expansion joints where tubing passes through a construction expansion joint.

2.4 SOUND DAMPENING

Provide 1-1/2 inch thick insulation, one-pound density flexible fiberglass with 0.0025-inch foil facing with joints taped.

2.5 HANGERS

- A. Fed. Spec. WW-H-171.
- B. Horizontal Tubing: Types 1, 4, 5, 6 and 11. Provide lock nuts on Type 1 hangers.
- C. Vertical Tubing: Riser Clamp Type 8.
- D. Trapeze Hangers: Preformed channel shapes. May be used for groups of pipes close together and parallel.

2.6 DIVERTERS

Diverters shall be silent operating, valve less, electro/mechanical devices. Unit shall be housed in sheet metal enclosure with removable access panels fastened with quick release type fasteners or keyhole type with captive machine screw. Motor shall be fused or otherwise protected from seizing due to obstructions. Diverter designation label shall be provided and clearly visible when accessed.

2.7 AIR POWER UNITS

- A. Provide air power units to enable an average carrier velocity of 20 feet per second and to operate vacuum pressure over a minimum air circuit of 1000 feet. Speed of blower motor shall not exceed 3500 rpm.
- B. Air power assembly shall consist of a regenerative blower containing a 40 degrees C ambient temperature, squirrel cage type ball or roller bearing motor having normal starting torque, and low starting current characteristics. Size motor to operate blower without being overloaded and mount on the same frame with the blower. Motor shall be in accordance with NEMA Standard.
- C. Provide disconnect switch at the blower motor. Arrange controls so system can be started only at same point where it was originally stopped.
- D. Provide each blower with exhaust mufflers. Exhaust mufflers shall have characteristics to effect a noise reduction down to a range from 60 to 65 decibels when measured five feet from outlet and 45 degrees of center.

2.8 REMOTE CARRIER ARRIVAL INDICATOR

- A. Provide wall mounted assembly that emits visual and audible signal that a carrier has arrived at its designated station. Unit can only be

activated when a carrier intended for that work space has arrived at the station.

- B. Indicator shall have the following characteristics:
 - 1. Sheet metal enclosure with removable lid, free of rough edges and painted with a polyurethane base or scuff resistant low gloss paint.
 - 2. Flashing yellow light and audio chime that can be reset at the indicator or the station. Intensity and chime may be independently adjusted without opening the enclosure.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All installation work shall be fully coordinated by the contractor and accomplished in a "first class" manner.
- B. All system components shall be installed in easily accessible locations.
- C. Install vertical and horizontal tubing routes within designated spaces.
- D. Tubing shall be cut squarely, chamfer filed and mandrelled to ensure perfect transition between joints. Chamfer file the straight end of tubing for a belled connection. All transmission lines shall be installed with flash on top.
- E. Slots and openings in structural floors are in place and no new holes are allowed.
- F. Vertical tubing passing through occupied floors other than designated locations is not permitted.
- G. Hangers shall be spaced not more than 10 feet on centers. Support bends at each tangent point. Provide floor clamps for each tube at each floor on vertical runs. Install diverters with split sleeves to facilitate replacement. Hangers shall be attached to building structure and not from piping above. Straight tubing, bends, and diverters shall be diagonally braced to prevent sway.
- H. Installed tubing, bends, diverters, hangers, and bracing shall not touch building systems or building structural members.
- I. Apply insulation only to tubing not located in pipe shafts, equipment rooms, and pipe basements.
- J. Close pipe openings with caps or plugs during installation. Tightly cover and protect fixtures and equipment against dirt, water and chemical or mechanical injury. At completion of all work thoroughly clean fixtures, exposed materials and equipment.
- K. Station trim frame shall be installed flush to wall and only after room finishes are completed.

3.2 PRE-TESTS AND TEST

- A. Pre-test as per specifications in the presence of the Resident Engineer, for proper operation before requesting final inspection. Final inspection shall be conducted at other than normal working hours, if required by the Resident Engineer's Representative. The pneumatic tube system shall be tested as specified in the presence of, and under the direction of the Resident Engineer's Representative.
- B. General: Test shall be conducted by Contractor's competent factory-trained engineer, who possesses complete knowledge of system and equipment.
- C. Test Procedure: Phase I - To determine that system meets functional, operational installation and hardware requirements of specifications:
 - 1. Inspect components to determine compliance with hardware and installation specifications.
 - 2. At new station, demonstrate the following:

- a. Make random destination selection. Depress dispatch button. Remove carrier from station dispatcher. Acceptable result: System shall ignore dispatch request.
 - b. Place carrier into station dispatcher. Make random inter-zone destination selection. Depress dispatch button. Acceptable result: Carrier accepted light shall turn on, carrier shall be delivered to selected destination.
 - c. Place carrier into station dispatcher. Make intra-zone destination selection. Depress dispatch button. Acceptable result: Carrier accepted light shall turn on, carrier shall be delivered to selected destination.
3. At new station, attempt to dispatch a carrier under following listed conditions. Acceptable result in each case: Carrier rejected signal shall light and carrier shall not be accepted into system. Following each test, press cancel button, which shall cancel the reject light.
- a. Destined station filled to capacity.
 - b. Destined station turned off.
 - c. Power off at destined station.
 - d. Simulate a system malfunction on a different zone and try to dispatch a carrier into that zone.
 - e. Simulate a system malfunction on the same zone and try to dispatch carrier to a random station.
 - f. Simulate malfunction of inter-zone transfer and attempt to dispatch carrier to random station in the system.
 - g. At random station, dispatch carrier to another random station. Immediately after start of dispatch, remove power from the destined station. Acceptable result: Carrier will return to dispatching station.
4. One (1) station per zone will be randomly selected to dispatch carrier into a different zone. Ten seconds after start of sending, remove power from main system control center. Restore power and depress system "on" switch. Acceptable result: Carrier shall be delivered to destined station.
5. Simulate any malfunction of the system. Acceptable result: computer shall generate specified printout, master audio-visual alarm shall activate. Operate reset switch or buttons. Acceptable result: All alarm indicators shall reset.
6. Phase II - To test operation of maintenance program.
- a. Turn random zone off through zone control switch on Control Center.
 - b. Through the keyboard input, components in turned-off zone shall be selectively set and reset.
 - c. Through keyboard input, devices in zone shall be cycled.
- D. Carriers: Carriers used for final tests shall be new and specifically intended for these tests. They are not to be considered part of the specification requirement.
1. Inspect carriers used for tests for scratches on carrier body and rubbing bands. Presences of deep scratches indicate rough spots in tubing and/or joints. Rough spots shall be corrected before commencement of Reliability Test.
 2. Carriers scratched, marred, or damaged as a result of test shall be repaired or replaced for re-test.
- E. Reliability Test
1. Reliability testing shall begin only when the functional testing has been completed to the satisfaction of Resident Engineer.
 2. Reliability testing shall proceed as follows:
 - a. Complete PTS shall be operated by VA personnel for a period of fifteen (15) consecutive days during which time each station shall

realize a minimum of 100 transactions without mechanical or electrical malfunction in excess of the following:

- (1) One-twentieth of one percent (.0005) of total transactions.
- (2) Downtime of one percent (.01) of total system operating hours.
Downtime is defined as the total number of hours that station(s) are unable to operate at 100% capability divided by the total number of hours that stations should be in full operation.

- b. Contractor shall be present during reliability testing and provide a written log of all malfunctions, including date and time of alarm, cause, location, corrective measures, and time system restored to full operation.

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