Section 149200 Pneumatic Tube System

Part 1 General

1.01 Description of Work

A. Provide all engineering, labor and materials for the complete installation of the ZipPTS computer controlled pneumatic tube system as manufactured by Zip Pneumatics, Inc.
B. All work shall be performed in a workmanlike manner. All materials and installation shall conform to applicable local, state and national codes.
C. The station types and locations shall be as indicated on the drawings and in strict accordance to these specifications.

1.02 Work Included in this Section

A. Provide all drawings and equipment detail for coordination with other trades.
B. Provide and install all low voltage control wiring for proper operation of the system.
C. Furnish properly sized motor starter(s) for the blower unit(s).

1.03 Work Excluded from this Section

A. All architectural enclosures for the stations as shown on the drawings.
B. Furnish and install all access panels as required.
C. Furnish and set any sleeves and cut sleeve openings as required.
D. Core drilling, cutting, patching, refurbishing or painting of floors, walls and ceilings, including removal or replacement of ceilings as required.
E. Paint any tube or unfinished equipment if required.
F. Provide elevator or hoist service if required.
G. Provide safe, dry storage for all materials on jobsite.
H. Provide dry contact Fire Alarm notification if required.
I. Furnish and install electrical power as follows;
    a) 120 VAC single phase power to each station location, blower location and the computer control center.
    b) 208/230/460 VAC 3-phase power and fused disconnect to each 5.5 hp blower unit.
    c) Any temporary power if required for testing system.
J. Asbestos abatement, fire protection and any sound proofing if required.
K. Obtain all necessary licenses and permits.
L. Provide conduit for communication cable, if required. All cable is plenum rated.
M. Trenching, backfill and final surface for underground tubing or cabling if required.

1.04 Submittals

A. Product Data: Manufacturer's detailed data sheets on each component and description of system.
B. Shop Drawings: Detailed layout of tube routing and components, indicating the following:
   1. Equipment locations and dimensioned layouts of major components.
   2. Penetrations through floors and required clearances.
   3. Location and method of field connection to structure.
   4. Tube riser diagram.
   5. Electrical power requirements and locations needed.
C. Single User Software License form with submittal for signing by the Owner and manufacturer.

1.05 Quality Assurance

A. Wiring shall conform with NEC requirements and shall be in compliance with local codes. Electrical components shall be UL listed.
B. Manufacturer Qualifications: Company specializing in making products specified in this section.
   1. With not less than 10 years of experience.
   2. With no less than 10 working installations of similar products in healthcare facilities used for transporting sensitive materials such as the following:
      a. Blood specimens for chemistry and hematology analysis.
      b. Arterial blood for blood gas analysis.
      c. Blood products for transfusion.
      d. Urine specimens for routine analysis and culture.
      e. Cerebral spinal fluid.
      f. Tissues for biopsy.
   3. Have a fully trained service staff that is able to provide service within 24 hours of receipt of notice that service is required. 24/7 phone support shall be provided with a three hour or less response time.
   4. The manufacturer shall train and instruct the Owner in the operations and maintenance with comprehensive hands-on instruction of Owner's own equipment during the test and tune period of the system. Remote training for maintenance staff will be available at no charge for the first 3 months after system start up.
C. Installer Qualifications: Skilled technicians specializing in performing the work of this section under direct employment of the pneumatic tube system manufacturer.

1.06 Warranty

A. Correct defective work within a 1 year period after signed Date of Substantial Completion.
B. Defective material shall be repaired to a new condition or replaced at no cost to the Owner.
C. Failures resulting from normal wear, improper use, improper maintenance or neglect of defined owner preventative maintenance of the system shall be excluded from the warranty.

Part 2 Products

2.01 Manufacturers

A. Pneumatic Tube System (PTS) shall be the Enterprise Series pneumatic transport system controlled by the ZipPTS enhanced graphic software package as manufactured by Zip Pneumatics, Inc.
B. All Components are to be supplied by the same manufacturer.

2.02 System Description

A. The PTS shall be a computer controlled pneumatic tube materials transport system consisting of tubing, stations, diverters, blower packages, carriers and a control center.
B. The PTS shall be configured of groups of stations (zones) connected together by inter-zone storage tubes. Each station shall be connected to the system by a single tube to a diverter.
C. Each zone shall include a blower and function independently.
D. The dispatching, routing, and storage of carriers shall be directed by the ZipPTS control center to provide automatic unattended handling of carriers between any two stations.
E. The PTS shall provide shortest travel route. Transactions within a zone shall turn around at the nearest diverter common to the sending and destination stations.
F. To dispatch a carrier from a station, the operator shall place the latched carrier in the send magazine, touch the destination button and touch the "OK" confirmation touch switch.
G. Systems with more than one zone shall allow multiple carriers to be in transit simultaneously. The PTS shall allow all station dispatchers to be loaded simultaneously, destinations to be selected and all transactions processed automatically until the system is clear.
H. The PTS shall consist of ## stations arranged on # zones.
I. The PTS shall provide a minimum capacity of 996 units on 32 zones without the need to modify or replace existing equipment. Additions shall require no modifications to existing equipment.
J. The modular design of the PTS components shall permit changes in the number of stations and/or zones as Owner requirements change.
K. The PTS shall provide automatic empty carrier redistribution. The system shall enable operators to dispatch excess empty carriers

to carrier-deficient stations which shall be automatically determined by the PTS, based on number of carriers assigned to stations versus number actually present.

L. Individual stations or zones shall be able to shut down without affecting the remainder of the PTS.

M. Destinations which are unavailable (off-line, overloaded, out-of-service) shall be rejected at the origination station. A transaction to a station that becomes unavailable after dispatch shall be returned to the origin station.

N. Transactions in process or pending when any part of the PTS is signed off shall deliver to their destinations. Any new requests to send shall be rejected.

O. If a power failure occurs, the PTS will continue to process carriers under UPS. All in-transit carriers will be processed to their destinations and all pending transactions will be cancelled.
   1. If power fails at a blower, diverter or station, the controls will identify that device as unavailable voiding all transactions which involved the affected device.

P. Each station shall be able to be individually assigned a schedule of events per day including: on/off times, send and receive priorities, carrier forwarding on/off and quantity of assigned carriers.

Q. Station sending and receiving and PTS priorities shall ensure that carriers are processed to their destinations in the shortest time.

R. The PTS shall verify that a command to a PTS component is properly executed before the next segment of the transaction is initiated.

S. A 115 VAC duplex receptacle and device on/off switch shall be provided at each station, exchanger, and blower package.

T. The destinations available at each station shall be individually configurable at the ZipPTS control center and/or, when the card reader option is installed, the destinations available shall be configurable at each station based on the security id of the individual initiating the transaction.

U. Stations shall be able to be individually scheduled to be able to dispatch but not receive carriers.

V. Each station, diverter, exchanger and blower shall include diagnostic capability at the unit.

W. Carrier on demand storage system (Empty Call):
   1. The PTS shall provide for the storage of empty carriers in storage tubes to be called out on demand by users.
   2. Dedicated storage tubes shall be installed for the purpose of storing empty carriers.

a. Each zone desiring to call an empty must be equipped with a storage tube. If not equipped carriers will not be delivered from storage tubes.
b. Each tube may store 1 (one) carrier.

3. Users shall be able to call an empty carrier to their station by pressing the "Empty Call" touch switch on the touch screen.
4. When empty carriers are redistributed using the "Empty Send" feature, the PTS will automatically refill the storage tubes as needed.

X. Card Reader Access [*optional*]:

1. Stations shall be equipped with a security access card reader to secure operation of the station until a valid badge is presented.
   a. The PTS shall maintain a log of all access attempts.
   b. When a transaction is sent immediately after unlocking a station, the name of the sender is recorded in the transaction record.

2.03 Equipment

A. Line material:
1. Tubing shall be 4 inch (101.6 mm) outside diameter, 16 gauge, cold rolled, electric welded steel, flash removed, degreased and hot dip galvanized. (ASTM A787 light comm.)
2. Bends shall be formed of same material on a center line radius of not less than 36 inches. The cross-section shall be free from wrinkles and distortions. No expanded bends shall be allowed in the System.
3. All cut ends shall be square, deburred and mandreled round.
4. Tube and bends to be joined by solid slip or clamp sleeves or expanded end slip joints, sealed to prevent leaks.
5. Tubing shall be supported with suitable hangers and supports as follows:
   a. Minimum every 10 feet (3.048 m) of straight tubing.
   b. At every floor of vertical runs
   c. At each end of bends.
   d. At equipment connections.
6. Hangers shall be all-thread, zinc plated rod attached to the building structure. Tear-drop hangers fastened to the rod shall support the tubing.

B. Diverters:
1. Diverters connect one tube to multiple tubes, providing the tubing network for routing to each station.
2. Diverters shall be installed with clamp sleeves and sway braced against motion.
3. Diverters shall be located to allow for complete and clear access to service components.
4. Diverters shall be pneumatically operated and position in 1 second.
5. Diverters shall not rely on sensors for alignment but have a physical position stop.

6. All diverter position sensing and carrier sensing shall be by non-contact sensors.
7. Diverters shall be provided as required with 1 inlet port and multiple outlet ports; 2, 3, 4 or 6.

C. Blower units:
1. Blower units shall be regenerative type, complete with vibration isolators, cleanout screen boxes and air shifter as required.
2. Blowers shall be located to allow complete and clear access to service components.
3. Zone blower packages:
   a. One blower unit shall be provided per zone.
   b. Zone blower packages shall be designed to be mounted up off floors for easy access to service blower and shifter components.
   c. Zone blowers shall provide vacuum and pressure to the system to maintain nominal carrier speed of approximately 20 fps.
   d. For energy conservation, blowers shall automatically shut down during low use periods.
   e. Air tubing shall be 4 inch (101.6 mm) outside diameter of the same material as transmission tubing. Air tubing shall be of the same material as transmission tubing. Tubing shall be complete with all necessary tees, elbows and fittings.

D. Stations:
2. Stations shall consist of a self supporting enclosure which includes a send chamber, receive bin, and carrier storage rack.
3. Stations shall be up send and down receive for air cushioned delivery at receive slidegate.
4. All components shall be front accessible and removable easy for repair or replacement.
5. All control units shall be plug-in type for fast replacement and shall be interchangeable with units in other stations.
6. All component position sensing and carrier sensing shall be by non-contact sensors.
7. All visible metal surfaces shall be factory painted powder coat epoxy.
8. The dispatcher shall hold one carrier at a time.
9. The receiver shall be independent of the dispatcher.
10. The dispatcher shall enable a carrier to be staged for dispatch while a carrier is incoming to a station.
11. When station’s receiver becomes full, that station’s receive and dispatch functions shall be disabled. A message on the station display and at the system control center shall indicate the full condition. The condition shall automatically reset upon carrier removal from receiver.
12. Stations shall be capable of dispatching a five pound payload.
13. Each station shall be equipped with one color touch screen operator control panel per dispatcher. All interaction with

the station by the user will be through the touch screen interface.

a. Touch screen shall be not less than 10 inches in size measured diagonally.
b. Resolution shall be not less than 1024x600 pixels (SXGA)
c. The touch screen interface shall contain the following:
   1) Common screen areas including the following information:
      (a) A message box for displaying system messages
      (b) An area to display the current date and time
      (c) A "More Info" button to display the last 40 transactions sent and the last 40 transactions received.
      (d) A "Special Functions Menu" button to provide access to the station's special functions.
   2) The "Destinations" screen. This screen appears automatically when a carrier is placed in the send magazine.
      (a) This screen includes a button for each station in the system, listed in numerical/alphabetical order or user defined order, up to 40 buttons/screen.
   3) The "Options" screen.
      a. Once the destination is chosen, this screen appears.
         i. A message box containing the name of the destination station.
         ii. The "Stat" button which, if enabled, will allow the user to place the transaction at the top of the queue.
         iii. The "Secured" button which, if enabled, will allow the user to send the carrier secured, requiring a code at the destination to access the carrier.
         iv. An "OK" button to send the carrier normally.
         v. A "Cancel" button to select a different destination.
   4) The "Special Functions Menu" screen.
      a. A "Station Setup" button (password protected) used to program station settings and features.
      b. An "Emergency Shutdown" button to stop the system in case of an emergency, such as a fire or spill in the system.
      c. A "Station Diagnostics" button (password protected) which enters the station diagnostics menu.
      d. A "Play Training Video" button which plays the operator training video on the station screen.
      e. A "Forwarding" button (password protected) to enable transactions to be forwarded to another station.
      f. A "Request Carrier" button to enable an empty carrier to be called from storage (system must be equipped with empty storage tubes.)
      g. A "Set Station Offline" button (password protected) to inhibit transactions to the station.

h. An "Arrival Indicator" selection menu (password protected) to choose unique arrival signals from specified stations.
i. An audible voice announcement on arrival stating the transaction status and sending station.
j. A "Screen Background" theme selection (password protected).

E. Standard Recessed Single Stations:
1. Stations shall include one dispatch chamber and a receive bin.
2. Stations shall be designed to be wall recessed. A finish trim frame shall be provided to conceal the joint between the wall and the station housing.
3. Stations can be equipped with locking access doors.

F. Carriers and liners:
1. Sealed carriers:
a. Provide 4 carriers per station as follows:
1) Full access side opening or end opening.
2) Bi-directional.
3) Replaceable wear bands.
4) Easy open positive closure latches.
5) Capable of carrying: specimens, medications, x-ray film, 1,000 ml IV bags with up to 100 ml's additives.
6) Clear inside dimensions: 3 ¼ inches (82.5 mm) diameter by 15 ¼ inches (387.35 mm) length.
2. Provide half of the carriers with thin carrier liners for cushioning large items.
3. Provide half of the carriers with full carrier liners for cushioning small items.

G. PTS control center:
1. The control center shall consist of a computer, two (2) monitors, keyboard, uninterruptible power supply, printer and software located at the engineering shop.
2. The control center shall direct all operations of the PTS and provide monitor displays and hard copy feedback of the various PTS activities and data. Additions or changes to the PTS design such as station or diverter shall be accommodated without modifications to the system control center hardware.
3. Computer:
a. The minimum configuration shall be:
1) 3 GHz, Dual-core Intel compatible CPU.
2) 2 GB of RAM.
3) 80 GB hard drive.
4) Read/write CD drive.
5) One serial port, two PCI slots.
6) Mouse.
7) 104 key keyboard.
8) Uninterruptible power supply.
4. Monitors: Minimum configuration shall be two (2) 27.5 inch (698.5) widescreen LCD flat panel monitors.
5. Printer:
a. The System printer shall be a color ink jet type, minimum 600 dots per inch color.

b. The printer shall print any report or list on command from the keyboard.

6. Software:
   a. The computer hard drive shall be loaded with:
      1) Microsoft© Windows XP Professional (with latest service pack) or Windows 7 Home Premium (32 bit).
      2) ZipPTS Control Software.
      3) Adobe© Acrobat Reader.
   b. The Windows Operating System software shall allow for:
      1) Multi-tasking among the ZipPTS software and file documentation.
      2) Local Area Network (LAN) compatibility with any LAN that supports Microsoft Windows, providing the capability to access and log in to the PTS Control center from another computer on the LAN.
   c. The ZipPTS program shall be supplied on the CD-Rom. System configuration shall be able to be downloaded from the PTS control center.
   d. The ZipPTS software shall utilize a mouse driven user interface. Access to the mouse and keyboard shall be password protected. The monitor shall display:
      1) A title bar including a control box, a maximize block and a minimize block.
      2) Tiled window panes:
         a) 'Pending Events For Zone X': Shows all transactions pending for each zone.
         b) 'Zone Status': Shows the current transaction status.
         c) 'Event History': Shows the event history for the system.
      3) A menu bar with pull-down menus.
         (a) Counters: Shows all station and system transaction counters.
         (b) Diverters: Shows diverter status for all diverters.
         (c) Stations: Shows station status for all stations and components.
         (d) Maintenance: Allows the user to perform all maintenance functions for the system:
            (1) View zone status.
            (2) View station status.
            (3) View diverter status.
            (4) 'Enter maintenance' – separately for each zone.
            (5) 'Pressure Purge'.
            (6) 'Vacuum purge'.
            (7) 'Zone purge'.
            (8) 'Exchanger purge'.
            (9) 'Reset Station'.
            (10) 'Station Offline'.
            (11) 'Station Online'.
            (12) 'Align Diverters' to each station.
            (13) Change diverter position.
            (14) Change exchanger position.
         (e) Graphic View:

(1) Zone 'X' Graphics:
a. Shall provide a graphical representation of the desired zone, including real time animation of system status, stations, diverters and blowers.
b. Each zone graphics display shall provide for accessing all zone maintenance functions directly from the graphics display window using the mouse.

(f) Help: shows zone riser diagrams, component location charts and the PTS manuals.

(g) Scheduling: Allows for scheduling individual stations offline and online up to 10 times daily, including separate weekend scheduling.

(h) Launch LogReport: Shows the log report program which provides built in reports as well as user definable reports.

e. Carrier tracking functionality
1) ZipPTS software shall provide for the following carrier tracking functionality (if equipped with carrier tracking hardware):
(a) Verified delivery. Confirms the carrier serial number sent is the one that was received.
(b) Automatic carrier inventory adjustment.
(c) Station home carrier assignment.

7. Fire alarm interface [*optional*]:
a. The PTS or portions thereof shall be able to be turned off by a signal from the building fire alarm system. Sets of contacts provided under "Work Excluded from this Section" above shall automatically shut down any or all blowers in the system.
b. Activation of the fire alarm contacts shall be reported at the ZipPTS control center.

8. Alert Messaging – System Alarm Text Messaging [*optional*]:
a. Will provide for descriptive alpha-numeric messaging of system malfunctions to one of the following devices:
1) Alpha-numeric pager.
2) Cell phone.
3) Wireless device capable of receiving an e-mail.
4) Other device pre-qualified and approved.

H. Interzone storage:
1. Provide tube connections between zones using an exchanger which provides zone storage chambers, for temporary storage until transfer of carriers to destination zone.
2. Exchanger unit is to be located for easy access to service components.
3. Exchanger units can connect up to 9 zones.

Part 3 Execution

3.01 Installation

A. The pneumatic tube system and components shall be assembled and installed in strict accordance with contract documents,

applicable codes and regulations, approved shop drawings, and Manufacturer's recommendations.

B. The System and components shall be anchored and fastened to building construction as required for a stable, secure installation. All exposed parts of the system and finish components shall be closely fit and joined to provide a neat uniform appearance.

3.02 System Testing and Acceptance

A. Prior to a formal System performance test, the manufacturer shall perform preliminary tests, verifying all components are in fully operational condition for carrier dispatch and receive between all possible station combinations.

B. Provide written notification to the General Contractor thirty (30) days in advance of the scheduled System performance test. The manufacturer shall provide all personnel, equipment and instruments required for such an examination.

C. Perform all operational tests, inspect PTS components and verify of equipment installation and operating is in proper condition, in accordance with the construction documents in the presence of the General Contractor and Owner rep.

3.03 Owner Training

A. Operator training
   1. Providing on-site training to the Owner's staff in the use and operation of the System. Training shall be provided for one person per station with a minimum of ten persons.
   2. The training shall include:
      a. A commercially prepared video describing the use and operation of the ZipPTS.
      b. Guide in developing the protocol policies for the Owner's use of the system.
      c. Proper packaging of items in carriers for transport.
      d. Review of common System alarms and their correction.
      e. A decontamination/infection control procedure and a cleanout kit with procedures for cleaning liquid spills in the tube system.

B. Maintenance training
   1. Maintenance personnel as assigned by the Owner shall be trained on the job site in the proper maintenance and trouble shooting of the ZipPTS.
   2. Maintenance personnel shall be instructed on all equipment of the ZipPTS.
   3. An optional training course shall be made available at the manufacturer's facility for one person in the repair and maintenance of the tube system. Cost of transportation, room and board shall be provided by the Owner.

C. Provide operating and maintenance information in the following formats.
   1. One read-only CD ROM.
   2. One paper copy manual.
   3. Included in the CD and manual shall be;
      a. System components and part descriptions,
      b. Starting and stopping procedures,
      c. General operating instructions,

d. Specific maintenance and troubleshooting instructions,
e. Recommended preventive maintenance schedules for adjustment, lubrication and inspection.
f. Recommended spare parts inventory.

D. Provide as-built shop drawings on AutoCAD release 2009 for instruction and future reference by the Owner.