UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2021
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DIVISION 14 - CONVEYING EQUIPMENT

SECTION 14 92 00

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02/09, CHG 1: 02/15

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USACE / NAVFAC / AFCEC / NASA	**UFGS-14 92 00 (February 2009)** **Change 1 - 02/15**
Preparing Activity: USACE	**Superseding** **UFGS-14 92 00 (April 2006)**

UNIFIED FACILITIES GUIDE SPECIFICATIONS

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SECTION 14 92 00

PNEUMATIC-TUBE SYSTEM
02/09, CHG 1: 02/15

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NOTE: This guide specification covers the requirements for computer controlled pneumatic tube system.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).

****

PART 1 GENERAL

1.1 REFERENCES

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NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a Reference Identifier (RID) outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature

to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

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The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M	(2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1	(2018) Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2020; ERTA 20-1 2020; ERTA 20-2 2020; TIA 20-1; TIA 20-2; TIA 20-3; TIA 20-4) National Electrical Code

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

PL 109-58	Energy Policy Act of 2005 (EPAct05)

1.2 SYSTEM DESCRIPTION

1.2.1 General Requirements

Provide a pneumatic-tube system which is computer controlled and designed with not less than [_____] separate zones interconnected to permit automatic unattended transmission of carriers from any station to any other station. System components shall be designed and located in such a manner that in the event of a defect occurring, components may readily be removed and replaced. Carriers shall be the full access type [, capable of handling 1000 ml I.V. bottles or 1000 ml I.V. bags]. Other system characteristics shall be as follows:

a. Future capacity of not less than [_____] stations without the need for modifications to the central control and existing station control.

b. Each zone capable of serving not less than [_____] stations even though a fewer number may be indicated in a given zone at this time.

c. [Stations within a zone connected to the storage lanes via a single line and diverter unit.] The computer shall control spacing, direction, [storage,] and path of the carriers.

d. Destination selection by means of push buttons or rotary dials on the station control panel.

e. Carriers taking the shortest route to their destinations. A central

exchanger shall not be required. [Carrier processing between zones shall be done through the central storage lanes.]

f. Carriers routed by means of diverters or in-line transfer units.

g. Carrier rejections indicated at the dispatching station for non-existing, signed-off, or malfunctioning station destinations. Reject station shall not be used.

h. Failure of one station shall not interfere with the normal functioning of any other station. Failure of any diverter will shut down that section of the system. Failure of an in-line sensor except zero-level sensor shall not shut down that section of the system.

i. Automatic sequencing of sending and receiving carriers.

j. Each zone [and the central storage lanes] act independently with separate power units as required.

k. Automatic recovery of a carrier will be required only after a transaction has been initiated and a failure occurs that prevents the completion. In such a case the carrier in process will be either returned to its source station or processed to the destination station after the failure has been repaired and cleared.

l. Selection of the shortest, most direct routing of all carriers to their destinations.

m. Complete "route proofing" of transaction paths before acceptance of the carrier to assure all components in the routing are operating.

n. Intra-zone transactions shall take the most direct path within the zone.

o. Self-adjusting priority within the system to load balance according to traffic.

p. Carriers may be positioned in senders simultaneously and destination selected on the station control panel.

q. Carriers in transit at the time a power failure occurs shall be delivered to their selected destinations upon restoration of power.

r. Processing of simultaneous, multiple transactions shall be directed to assure maximum operational efficiency of the system.

s. Carriers in transit at the time of station sign-off shall be delivered to their destination.

t. Carriers addressed to any non-existing or signed off station shall be rejected.

u. Automatic time clock sign off to allow any station to be automatically signed-off.

v. Preventive overload feature at station receiver. Carriers will not be dispatched to a station that is overloaded.

w. Automatic redistribution of empty carriers to return empty carriers to

the locations with the greatest need.

x. Automatic purge by zone or system.

y. Each completed transaction, alarm condition that occurs and sign off schedule automatically printed out on printer.

1.2.2 Electrical Work

Provide electrical motor-driven equipment specified herein complete with motors, motor starters and controls complying with NEMA MG 1. Electrical equipment and wiring shall be in accordance with Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Electrical characteristics shall be as indicated. Extension to equipment from junction box and all control wiring shall be under this section and shall comply with NFPA 70. Provide motor starters under this section complete with properly sized thermal-overload protection in each phase and other appurtenances necessary for the motor control specified. Each motor shall be sized to drive the equipment at the specified capacity without exceeding the nameplate rating of the motor when operating at proper electrical system voltage. Provide control and protective or signal devices required for the operation specified and wiring required for controls and devices but not shown on the electrical plans.

1.3 SUBMITTALS

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NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a “G” to an item, if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force

and NASA projects, or choose the second bracketed item for Army projects.
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Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Pneumatic-Tube System

SD-03 Product Data

Pneumatic-Tube System

Materials and Equipment

Spare Parts

Pneumatic-Tube System

Tests

SD-06 Test Reports

Tests

SD-07 Certificates

Energy Efficiency

SD-10 Operation and Maintenance Data

Operating and Maintenance Instructions; G[, [_____]]

1.4 DELIVERY, STORAGE, AND HANDLING

Protect all equipment delivered and placed in storage from the weather, humidity and temperature variation, dirt and dust, or other contaminants.

1.5 EXTRA MATTERIALS

Submit spare parts data for each different item of materials and equipment specified, after approval of the detail drawings and not later than [_____] months prior to the date of beneficial occupancy. The data shall include a complete list of parts and supplies, with current unit prices and source of supply.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Provide Materials and Equipment which are the standard products of a manufacturer regularly engaged in the manufacture of the products and that

essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site. Submit a complete list of equipment and material, including manufacturer's descriptive data and technical literature, performance charts and curves, catalog cuts, and installation instructions.

2.2 ENERGY EFFICIENCY

****

NOTE: Selected equipment must conform to efficiency requirements as defined in Public Law (PL) 109-58 - "Energy Policy Act of 2005 (EPAct05)" for energy efficiency procurement and as specified by FEMP and ENERGY STAR. Equipment selected will have as a minimum the efficiency rating determined in under "Energy-Efficient Products" at http://www1.eere.energy.gov/femp/procurement
Equipment having a lower efficiency may be specified if the designer determines the equipment to be more life-cycle cost effective.
Indicate the equipment operating characteristics, including rated energy efficiency, on the drawings.

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Provide products that meet or exceed the specified energy efficiency requirements of FEMP designated or Energy Star qualified products. Submit documentation certifying that product conforms to PL 109-58 by meeting or exceeding Energy Star or FEMP efficiency requirements as defined at "Energy-Efficient Products" at http://www.energystar.gov.. Indicate Energy Efficiency Rating. Indicate Energy Efficiency Rating.

2.3 CARRIER TUBING

2.3.1 Tubing

Tubing for carrier transmission lines shall be [152.4] [101.6] [1.613] mm OD [[6] [4] in] [16 U.S. gauge] OD galvanized electric welded steel with flash removed, conforming to ASTM A123/A123M. Air lines shall be sized as required for proper system operation.

2.3.2 Bends

Bends shall be of the same material as straight tubing, formed on the centerline to a radius of not less than 1200 mm 4 feet, free from wrinkles or distortion. Joints between sections shall be made with sleeve couplings, bolted couplings or bell end tubing. When bends are cut for offsets and small angle turns, the ends shall be squarely cut, filed and straightened by mandreling. Expanded bends shall not be used.

2.3.3 Fittings

Fittings shall be cast iron, cast aluminum or fabricated steel with the inside fitting snugly on the tubing. Box connectors, close elbows, tees, coupling sleeves and other fittings required for proper installation of the system shall be provided.

2.4 POWER UNITS

Provide power units for each zone and for lanes when required. The power units shall be capable of operating all lines simultaneously and producing an average carrier speed of 7.6 m/s 25 fps. Power units shall be designed for floor or ceiling mounting. A timer or similar device shall shut the unit off after a predetermined time without carrier movement. Power units shall be complete with vibration isolators, intake and exhaust mufflers, intake and exhaust piping, screen box, air valves if required, and shall be designed for easy access.

2.5 AUTOMATIC CENTRAL-CONTROL CENTER

2.5.1 Operation of the System

A solid state memory computer shall control the system. The computer shall perform logic, control, supervisory and alarm functions and provide permanent storage for system operating program. Program memory protection shall be provided during power loss. Interface controls shall transmit operating data to and from stations. Keyboard shall request information and shall simulate operation of components throughout entire system. Printer shall print transactions and failures.

2.5.2 Control Program

The control program shall become the property of the user. The control program shall be constructed to allow the user to add, delete, and/or relocate components of the system, onsite, without the need for a new program or programming assistance.

2.5.3 Computer Circuits and Keyboard

The interface circuits, monitor and keyboard shall be modular and shall use solid state components throughout. For ease of maintenance, each circuit module shall be readily removable.

2.5.3.1 Cathode Ray Tube

Video Display Monitor to display in English language data for the following functions:

a. Failure Location - Zone, [central storage lane,] station, power unit or transfer unit.

b. Failure Type - Mechanical, electrical or component position.

c. Present transactions - Station carrier is leaving from and station carrier is going to, backlog per station or zone [and carrier in storage lanes].

d. Carrier Distribution - Number of carriers assigned to each station, number of carriers presently at each station.

e. Station sign-off schedule.

f. Failure Action - Locate where carrier is and corrective action to be taken.

g. System History Display - Show all system traffic for the past 24-hour

period with totals for stations, zones, and the entire system. This display shall be automatically printed.

2.5.3.2 Keyboard

The keyboard shall be interactive with the video monitor to perform the following functions:

a. Request video monitor displays listed above.

b. Simulate components for trouble shooting. Simulation of all components shall be made to determine the malfunctioning unit.

2.5.3.3 Printer

****

NOTE: Selected printers are required to meet performance requirements specified by Energy Star. Information on the requirements can be found at http://www.energystar.gov/ia/partners/product_specs/program_reqs/Imaging_Equ As of September 6, 2012, the specific performance requirements were as follows:

Printer	**Standard**	**High Performance IJ, DT, DS, EP, SI, TT**	**TEC**
		IJ, Impact	**OM**
	Large or Small	**DT, DS, EP, Impact, IJ, SI, TT**	**OM**

These are referenced in Energy Star Program Requirements for Residential Air Source Heat Pump (ASHPs) and Central Air Conditioner Equipment, Volume 4.1. These specifications conform to the efficiency requirements as defined in Public Law (PL) 109-58 - "Energy Policy Act of 2005 (EPAct05)" for energy efficiency procurement and as specified by ENERGY STAR. Equipment selected will have as a minimum the efficiency rating determined in under "Energy-Efficient Products" at http://www1.eere.energy.gov/femp/procurement.

Equipment having a lower efficiency may be specified if the designer determines the equipment to be more life-cycle cost effective. Indicate the equipment operating characteristics, including rated energy efficiency, on the drawings. A list of compliant products can be found at http://downloads.energystar.gov/bi/qplist/image_equip_prod_list.xls?be70-acf

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Provide [Energy Star compliant]laser jet printer with at least 128 MB of

random access memory, 1200 dots per inch resolution, and support normal and postscript fonts and drivers. Type face supported shall be True Type fonts. Printer must support HP PCL 6, HP PCL 5e and Post Script emulation. Equip printer with 10/100 Base Ethernet card, a serial and parallel port. Provide all Ethernet connectivity cables, power cables and printer drivers with the printer. Equip printer with at least two paper drawers. Each drawer must have a capacity of at least 600 sheets of standard paper.

2.5.3.4 Alarm Module

Provide an alarm module for remote audio-visual signaling of system alarms. The alarm module shall have a "Press to Silence" button. The alarm shall automatically activate should a system alarm condition occur.

2.6 STORAGE AREAS

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NOTE: Storage areas will be deleted if a single zone system is specified.

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Storage Areas shall be designed to initially serve [_____] zones. Storage shall be expandable to a maximum of [_____] storage lanes without the need to replace the initial unit. Storage area shall consist of storage lanes connected directly to every other zone in the system.

2.7 AUTOMATIC SWITCHING EQUIPMENT

Diverters shall be automatically oriented to route carriers to or from intermediate stations. Units shall be air or electro-mechanically operated and designed to accommodate two or more stations or sublevels and enclosed in sheet metal housing with access panels. Diverter shall be designed so that when a carrier does not clear the diverter completely, no other carrier can be routed to that diverter.

2.8 SUBSTATION EQUIPMENT

Substation equipment shall be enclosed in a self-supporting "rough-in" recessed type enclosure. The operating components shall be installed after the adjacent walls have been finished. Exposed sheet metal surfaces shall be factory painted. Bright metal parts shall be stainless steel, brushed aluminum or chrome plated.

2.8.1 Receiving Units

Units shall be down receive, air cushion, soft delivery type. Carrier receiver tray shall be designed to receive and store carriers to the front of the received tray. Full carrier capacity shall cause audible alarm to sound or the reject light to illuminate.

2.8.2 Sending Units

Units shall be up-send in conjunction with the receiving unit.

2.8.3 Carrier Storage Receptacle

Storage receptacle shall store not less than four carriers and shall be integral with the terminal front.

2.8.4 Station Control Panel

2.8.4.1 Operating Controls and Indicators

Panel shall include the following operating controls and indicators:

a. Carrier destination selectors, "Carrier Accepted" signal, "Send" buttons.

b. "Carrier Rejected" signal when a carrier cannot be dispatched because of destination sign off, an alarm condition, a nonexisting selection or an overloaded station.

c. "Carrier in Receiver" to indicate a carrier is in the receiving unit when the carrier is not visible.

d. "Cancellation Button."

2.8.4.2 Non-operating Requirements

Non-operating requirements of control panel shall include the following:

a. "Operating Instructions" display.

b. Independent carrier dispatch and receive functions.

c. The memory within the programmable microprocessor available to all stations.

d. Request to dispatch handled immediately on a local or central control basis.

2.8.5 Directory

Each station shall have a framed directory or photo plate on which is neatly and clearly shown the location, name, and number of each station in the system. The framed directory shall be provided with a glass or plastic cover.

2.9 CARRIERS

Furnish four carriers for each station in the system. Carriers shall be not less than [82.6 x 381.0] [114.3 x 381.0] mm [3-1/4 x 15] [4-1/2 x 15] inch inside dimensions and shall be capable of transporting 1000 ml I.V. bottles.

2.9.1 Access

Carriers shall be side opening of full access type, bi-directional.

2.9.2 Carrier Inserts

Foam lining for transporting fragile items shall be furnished for [_____] of the total system carriers [and [_____] of the total system carriers shall be furnished with foam lining for transporting 1000 ml I.V. bottles].

2.10 SYSTEM TESTER

System Tester shall have the ability to test any station, transfer unit, or blower with onsite verification of malfunctions. A portable test device which supplements the control center may be used.

PART 3 EXECUTION

3.1 EXAMINATION

After becoming familiar with all details of the work, verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing the work.

3.2 INSTALLATION

Install the pneumatic-tube system as indicated and as recommended by the manufacturer. Submit diagrams, instructions, and other sheets proposed for posting.

a. Submit detail drawings containing complete wiring and schematic diagrams and any other details required to demonstrate that the system has been coordinated and will properly function as a unit. Drawings shall show proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including clearance for maintenance and operation.

b. Submit [six] [_____] copies of design manual consisting of manufacturer's standard literature. The design manual shall identify the operational requirements for the system and explain the theory of operation, design philosophy, and specific functions. A description of hardware and software functions, interfaces, and requirements shall be included for all system operating modes. The manual shall describe all equipment provided, including general description and specifications.

3.2.1 Sound Insulation

Horizontal tubing and bends run over patient rooms or offices shall be sound deadened by applying a 38.1 mm 1-1/2 inch thick layer of 24 kg/cubic meter 1-1/2 pcf density fiberglass insulation with a dust cover and taped joints over the tubing. Sound insulation material shall extend not less than 1.5 meters 5 feet outside the patient rooms or offices. Insulation shall conform to EPA requirements in conformance with Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING.

3.2.2 Hangers and Supports

Hangers and supports shall be spaced on 3 meters 10 foot centers for horizontal runs of tubing. Vertical runs shall be supported at every floor. Each horizontal bend and in-line component shall be supported. Hangers for one or two lines of tubing shall be 10 mm 3/8 inch plated and threaded rods attached to row clamps. Hangers for three or more lines shall be formed with row clamps or 38.1 mm 1-1/2 inch channels laid flat against the bottom of the tubing and supported by not less than two rods spaced not more than 900 mm 3 feet apart. Row clamps shall maintain centerlines of horizontal runs of multiple tubes straight and level and spaced apart in a consistent configuration.

3.2.3 Installation of Tubing

Joints shall be made airtight by methods recommended by the manufacturer. Lines shall be installed where indicated and securely held in place and braced against any motion caused by the passage of carriers. Tubing passing through openings in floors shall be installed in suitable sleeves or slots which shall be stuffed with 25 mm 1 inch fiberglass blanket and sealed on both ends with a continuous bead of nonhardening mastic at least 6.4 mm 1/4 inch deep.

3.2.4 Firewall Penetrations

Where holes are required in fire and smoke walls for the passage of tubing and other accessories, the annular space between pipe and hole shall be filled with a UL approved fireproof material. Sealing of penetrations through fire rated walls shall be as specified in Section 07 84 00 FIRESTOPPING.

3.3 PAINTING AND FINISHING

Field-applied paint shall be as specified in Section 09 90 00 PAINTS AND COATINGS.

3.4 ACCESS PANELS

Access Panels shall be as specified in Section 08 31 00 ACCESS DOORS AND PANELS.

3.5 ACOUSTIC COUPLER

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NOTE: Delete acoustic coupler if manufacturer has a service organization conveniently located to the site.

****

An acoustic coupler that will permit the facility to have direct communications with the manufacturer shall be provided for one year. The coupler shall provide a communication tie-in to a cathode ray tube (CRT) at the manufacturer's facility through the handset of an ordinary telephone and the acoustic coupler at the facility. The coupler will be used to examine or modify computer memory and may command any system component and determine its status.

3.6 FRAMED INSTRUCTIONS

Framed instructions under glass or in laminated plastic, including wiring and control diagrams showing the complete layout of the entire system, shall be posted where directed. Condensed operating instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation, and procedures for safely starting and stopping the system shall be prepared in typed form, framed as specified above and posted beside the diagrams. The framed instructions shall be posted before acceptance testing of the systems.

3.7 MANUFACTURER'S FIELD SERVICES

Provide the services of a manufacturer's representative who is experienced in the installation, adjustment, and operation of the equipment

specified. The representative shall supervise the installation, adjustment, and testing of the equipment.

3.8 FIELD TRAINING

Provide a field training course for designated operating and maintenance staff members. Training shall be provided for a total period of [_____] hours of normal working time and shall start after the system is functionally complete but prior to final acceptance tests. Field training shall cover all of the items contained in the Operating and Maintenance Instructions. Submit [six] [_____] complete copies of operation manual outlining the step-by-step procedures required for system startup, operation, and shutdown. The manuals shall include the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and their basic operating features. Submit [six] [_____] complete copies of maintenance manual listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guide. The manuals shall include piping layout, equipment layout, simplified wiring and control diagrams of the system as installed. Operation and maintenance manuals shall be approved prior to the training course.

3.9 TESTS

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NOTE: If a single zone system is specified, delete subparagraphs "c," "e," and "f" below.
****

Submit test plan and procedures, not later than [_____] days prior to the start of testing. The test plan and test procedures shall explain in detail, step-by-step, actions and expected results to demonstrate compliance with the requirements of this specification, and the methods for simulating the necessary conditions of operation to demonstrate performance of the system. Tests shall be conducted in accordance with the approved test procedures to determine that the system is functional, operational and installed in accordance with the specifications. Notify the Contracting Officer in writing [_____] days prior to conducting tests. The following test shall be conducted:

a. Computer simulation and interrogation.

b. Consecutive dispatching to random stations within the zone.

c. Consecutive dispatching to random stations outside the zone.

d. Multi-station dispatching within the zone where all dispatchers are loaded with carriers, random stations selected and dispatching begins.

e. Multi-station dispatching outside the zone where all dispatchers are loaded with carriers, random stations selected and dispatching begins.

f. Two stations in each zone will be randomly selected to dispatch carriers into other zones.

Submit test reports in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria, upon completion of installation and testing of the installed system. Each test report shall indicate the final position of controls.

-- End of Section --