

PART 4 – QUANTITIES

SCHOOL NAME	ADDRESS	SCHOOL TYPE	CONSTRUCTION TYPE	100 PAIR TRUNK CABLE (FEET)	MDF / IDF QUANTITY
Mildred B Garvin MicroSociety Elementary School	1 Grove Pl East Orange, NJ 07010	ES	New	2800	4

END OF SECTION

SECTION 18759 – TELECOMMUNICATIONS GROUNDING

18759

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes grounding and bonding requirements for the telecommunications infrastructure.
- B. Telecommunications bonding and grounding is additional bonding and grounding installed specifically for telecommunications systems.

1.02 SUBMITTALS

- A. Submit product data for the following:
 - 1. TMGB and TGB grounding busbars.
 - 2. Equipment rack and cabinet busbars
 - 3. Wire conductors.

1.03 REFERENCES

- A. **ANSI/TIA/EIA-607** Commercial Building Grounding and Bonding Requirements for Telecommunications Systems.
- B. All work and materials shall comply with the latest rules, codes and regulations, including but not limited to the following:
 - 1. NFPA 70 – National Electrical Code (NEC)
 - 2. **BICSI** Telecommunications Distribution Methods
 - 3. Occupational Safety and Health Act Standards (OSHA)
 - 4. ANSI/IEEE C-2 National Electrical Safety Code
 - 5. All other applicable Federal, State, and local codes and regulations.

1.04 BONDING & GROUNDING INFRASTRUCTURE

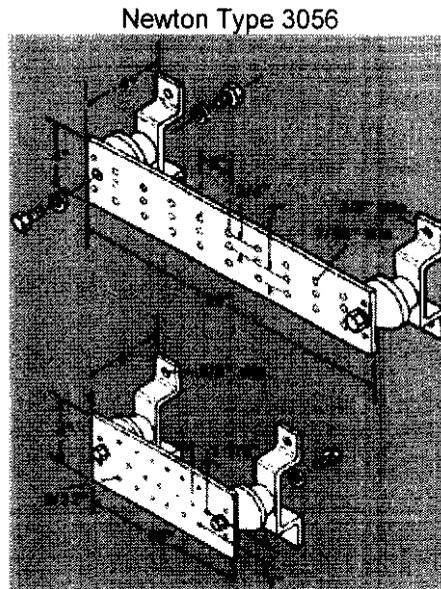
- A. Bonding Conductor for Telecommunications per **TIA/EIA-607**: The copper conductor that bonds the Telecommunications Main Grounding Busbar (TMGB) to the service equipment (electric power) ground.
- B. TMGB (Telecommunications Main Grounding Busbar): A copper ground reference busbar, typically installed in the entrance facility or entrance room, and is bonded to the service equipment (power) ground by the Interconnecting Bonding Conductor.
- C. TGB (Telecommunications Grounding Busbar): A copper ground reference busbar typically installed in telecommunication rooms (TR) and is bonded to the TMGB by the Telecommunications Bonding Backbone. The TGB references metallic entities in the **TR** space to ground.
- D. Telecommunications Bonding Backbone: A network of insulated copper conductors extending from the TMGB to each TGB.
- E. Equipment Bonding Conductor: An insulated copper conductor that bonds metallic items and equipment to the TMGB and TGB.

PART 2 - PRODUCTS

2.01 TELECOMMUNICATION MAIN GROUNDING BUSBAR (TMGB)

- A. Acceptable Manufactures: Newton Instrument Company type 3056. Eritech TMGB - A20L27PT, or Chatsworth 10622-020 1/4 x 4 x 20" insulated copper ground bar or approved equal.

Typical Telecommunications Main Grounding Busbar (TMGB)



Newton Type 3058

Typical Telecommunications Grounding Busbar (TGB)

2.02 TELECOMMUNICATION GROUNDING BUSBAR (TGB)

- A. Acceptable Manufactures: Newton Instrument Company 3058, Alltec Corp. TB-7408-12 or Chatsworth 10622-010 1/4" x 4 x 10 insulated copper ground bar or approved equal.

2.03 EQUIPMENT RACK BUSBARS

- A. Acceptable Manufactures: Newton Instrument Company, Panduit TRGB191 or Chatsworth 10610 1/4" x 1" x 19" rack ground bar detail, for equipment rack and cabinet applications or approved equal.

2.04 OTHER GROUND REFERENCE BUSBARS

- A. Acceptable manufactures: Newton Instrument Company 1/4" x 1" x 12" insulated copper bar, Eritech EGBA14112EE, Thompson Lightning Protection 37208 or approved equal for miscellaneous applications.

2.05 BONDING CONDUCTORS

- A. Single Conductors: 600 volts rated, **98** percent conductivity, stranded, annealed copper, THWN or THHN green colored insulation, sizes as indicated. If due to wire size, green insulation color is not available, identify each conductor every 20 feet when exposed with a green band and identify each end with a green band and a label.
- B. All bonding conductors shall be insulated copper. Exception is use of flat, braided, aluminum ground straps utilized for bonding sections of aluminum cable tray.
- C. Unless otherwise specified, size the conductors as required by NEC
- D. Unless otherwise specified, the Bonding Conductor for Telecommunications per TIA/EIA-607 shall be No. **3/0** AWG.
- E. Unless **otherwise** specified, the Telecommunications Bonding Backbone shall be No. **3/0** AWG.
- F. Unless otherwise specified, the Equipment Bonding Conductor shall be No. **6** AWG

2.06 BONDING CONDUCTOR TERMINATIONS

- A. Acceptable Manufacturers: Thomas and Betts, ILSCO, Alltec or approved equal.
- B. Acceptable materials:
 - 1. Two hole compression lugs: Thomas and Betts, "Two Hole Lugs Long Barrel Type" color code blue (example catalogue No. **54816BE**), ADC "**PowerWorx** CL-02M. or Burndy **YA8C-L** high conductivity wrought copper, electro tin plated, or approved equal.
 - 2. One hole compression lugs: Thomas and Betts, "Long Barrel One Hole Lugs" color code blue (example catalogue No. **54905BE**), Burndy **YA4C-L**, or ADC **PowerWorx** CL-01M high conductivity wrought copper, electro tin plated, or approved equal.

PART 3 - EXECUTION

3.01 PREPARATION

- A Site and materials preparation for testing is the responsibility of Contractor.

3.02 INSTALLATION

- A In the Telecommunications Rooms, Equipment Rooms, and Entrance Facilities provide all local bonding as indicated on the drawings and in the specifications.
- B. Provide electrical systems and equipment grounding as required by code, utility, local ordinances and requirements herein.
- C. Provide cable connections and joints per **ANSI/TIA/EIA-607**.
- D. Bonding conductors shall be continuous and routed in a direct route to point of termination.
- E All insulated ground bars shall be isolated from the structural support by a 2" minimum separation, using manufacturer's recommended insulating stand-offs and hardware.
- F. Clean ground bars, terminals, and lug prior to terminating conductors.

- G. Label all telecommunications bonding conductors within 6 inches of their termination point.
- H. Bond the TMGB to the service equipment (power) ground, typically located in the main electrical MDP facility, utilizing the most direct route possible to minimize conductor length.
- I. Bond all TGB's to the TMGB using conductor size specified.
- J. Whenever two or more Telecommunications Bonding Backbones are used in a multi-story building, they shall be bonded together on the top floor, and at every third floor, at a minimum, using the bonding conductor size specified.
- K. Bond the following to the TMGB when present:
 - 1. Telecommunication panelboards: Alternating Current Equipment Ground Bus (ACEG). if equipped, or its enclosure.
 - 2. Building structural steel, if exposed.
 - 3. Metallic equipment racks.
 - 4. Telecommunications riser and utility cable shields.
 - 5. All metal raceways and cable trays for telecommunications cabling extending from the same room or space where the TMGB is located.
 - 6. Others as identified on the Plans.
- L. Bond the following to the TGB when present:
 - 1. Telecommunication panelboards: ACEG, if equipped, or it's enclosure.
 - 2. TGBs within the same space.
 - 3. Telecommunications Bonding Backbones terminated on the same floor to other TGBs.
 - 4. Metallic equipment racks.
 - 5. Telecommunications riser and utility cable shields.
 - 6. All metal raceways and cable trays for telecommunications cabling extending from the same room or space where the TGB is located.
 - 7. Others as identified on the Plans.
- M. Bonding Conductor for Telecommunications and Telecommunications Bonding Backbone Conductors shall be terminated with at the TMGB with TWO-HOLE, COMPRESSION LUGS.
- N. Equipment Bonding Conductors shall be terminated with ONE-HOLE COMPRESSION LUGS
- O. Any conduit **and** sleeves for Bonding Conductors for Telecommunications and Telecommunications Bonding Backbone Conductors shall be of non-metallic construction. It shall be permissible to route the conductors in a metallic telecommunications cable tray where designated for the purpose.

3.03 TESTING PROCEDURES AND GUIDELINES

- A. Tests To Be Performed – The following tests shall be performed. Multiple steps are necessary for each test.
 - 1. Grounding Reference System Continuity Test.

NOTE: The continuity of each equipment bonding conductor is NOT part of this procedure.
- B. Test Equipment – **Biddle** Instruments, megger DET2/2 Ground Tester or later approved model. The testing procedure that follows refers to the DET2/2 Tester.

C. Testing Process – The following testing guidelines apply to all test procedures and shall be followed to promote efficient and accurate testing.

1. Be sure all connections are tight. Loose connections will have a major effect on the test results.
2. The test lead shall be No. 14 AWG, stranded, insulated, copper conductor. The test lead shall be long enough to reach all TGBs from the TMGB. One test lead shall be used for all tests.

NOTE: The test lead may be spooled however, the Biddle test meter may produce inaccurate or erratic resistance measurements if the quantity of cable on the spool is too great. If the meter behaves erratically first try performing the test in the "low current" setting. If the behavior persists, the test lead should be unspooled.

3. The Current shall be set to "HIGH".
4. The Filter shall be set to "ON".
5. The Frequency shall be set to "150Hz".
6. Connect Terminals C2 and P2 by a jumper wire (if not connected by the manufacturer).
7. Connect Terminals P1 and C1 by a jumper wire (if not connected by the manufacturer)
8. Once the test lead is attached to the meter it should not be removed as identified in the specific test procedure.

3.04 TESTING

A. Reference Test – The reference test procedure is necessary to calibrate the test setup. The reference test procedure shall be performed prior to performing any test. The reference value shall be recorded and subtracted from all other measurements. If the length of the test lead is changed, new reference data must be taken and recorded. Refer to the test documentation.

The test procedure is as follows:

1. Connect one end of the test lead to Terminal C1 and the other end to Terminal C2.
2. Perform the Biddle Meter Resistance Test.
3. Record test lead resistance on the data sheet.
4. Disconnect the test lead from Terminal C1 ONLY. The test lead should remain connected to Terminal C2 if possible throughout the tests.

B. GROUND REFERENCE SYSTEM CONTINUITY TEST – The ground reference system shall be tested to validate the continuity and integrity of the interconnection of the TMGB, TGB, Telecommunications Bonding Backbone, Bonding Conductor for Telecommunications, and building's grounding electrode.

The test procedure is as follows:

1. Remove all equipment bonding conductors from the TMGB and the TGBs. The Bonding Conductor for Telecommunications SHALL REMAIN ATTACHED TO THE TMGB. Panelboard and building steel bonds shall be removed. The Telecommunications Bonding Backbone conductor (interconnecting the TMGB and TGBs) shall remain attached at all busbars.

2. Move the meter and test lead to the first TGB to be tested. Route the test lead to the TMGB and connect the test lead to the TMGB. The other end of the test lead should still be connected to Terminal C2 from the Reference Test. Connect a short test lead (typically from the manufacturer) from Terminal C1 to the TGB to be tested.
3. Perform the Biddle Meter Resistance Test
4. Record the resistance on the data sheet.
5. Attach the equipment bonding conductor from the panelboard (if the panelboard is located within the room) to the TGB and repeat the test. Record the resistance on the data sheet. The reading may be slightly less than the first reading.
6. Attach the equipment bonding conductor from the building steel (if applicable) and repeat the test. Record the resistance on the data sheet. The reading may be slightly less than the previous reading.
7. This completes the grounding system continuity test for this TGB. Leave the building steel and panelboard ground connected to the TGB. Repeat the test for all other TGBs.
8. Test results should be in the order of a few **10ths** of an ohm (approximately 0.10 to 0.90). The measured value should decrease when the panelboard and building steel grounds are connected.

3.05 **CABLE DOCUMENTATION**

- A. The Test Results Data Sheet shall be completed and submitted to the Owner prior to substantial completion of the Project.
- B. The Test Results Data Sheet shall be used to record submit all test data. All information shall be typed on the sheet.
- C. Provide the Owner with a Test Results Data Sheet for each TGB. Make copies of the form as necessary.

END OF SECTION

SECTION 18764 - TELEPHONE SYSTEM (PBX)

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes

1. All telecommunications equipment, required to provide telephone system indicated in Contract Documents.

1.02 SYSTEM DESCRIPTION

A. Overall Description: Digital private branch exchange programmable data telecommunications network providing features, functions, and provisions specified in this Section including telephones specified in this Section

1. Includes labor, materials, equipment, services, and all operations required for complete installation of telecommunications equipment and systems and related work as shown on Drawings and specified in this section.
2. Provide new, unused equipment of latest design offered by manufacturer and field-proven; equipment in "alpha" or "beta" testing phases not acceptable.
3. Provide interface to existing and new sound racks for zone paging and all call including all wiring between school sound system and PBX.

B. Requirements and Features - Telephone System A / Telephone System B

1. System

- a. Allows or denies features at 3 levels:
 - (1) System basis.
 - (2) Customer basis for all consoles, sets, and trunks
 - (3) Individually for each console, set and trunk.
- b. Provides for complete system maintenance check using built-in, self-diagnostic routines programmed to run every **24** hours, at time specified by Owner. Same or additional diagnostic routines capable of manual activation from maintenance terminal or designated maintenance all class of service telephone. If faults detected, error messages printed on maintenance terminal and recorded on History File.
- c. Equipped with system monitoring and administration from terminal at remote site.
- d. Accommodates expansion by simple addition of modules
- e. Nodes capable of remote location (max. 8.7 miles on single mode fiber)
- f. Equipped with distinctive ringing allowing party receiving call to distinguish between internal call and outside call.
- g. Universal port/slot configuration for flexibility of using trunk or station cards in each system slot.

- h. Connected to public telephone trunk lines through FCC approved central office interface with public telephone calls received by system and routed to designated attendant console and to designated telephones.
- i. Equipment able to convert to next generation IP telephony by changing only main controller and utilize traditional TDM equipment to protect Owner's original investment.
- j. QSIG Compliance – ISO networking specifications compliance
- k. Capable of simultaneous voice and data transmission from single telephone.

2. Telephone

- a. Provides individual telephones, programmable for following options:
 - (1) Receive incoming phone calls.
 - (2) Receive incoming phone calls directly from outside without intervention from attendant(s).
 - (3) Receive inter-building calls only.
 - (4)** Allow direct outside dialing.
 - (5) Allow multiple levels of restricted outside dialing.
 - (6) Allow inter-building dialing only.
 - (7) Allow emergency paging.
 - (8) Allow zone paging only.
 - (9) **No** paging access.
 - (10) Receive public calls only when transferred by the attendant.
 - (11) **Initiate** priority calls.
 - (12) Unrestricted outside dialing.
- b. Attendant position and administrative telephones installed in locations selected by Owner and available for both public and inter-building communications.

3. PBX (including serving handset functions):

- a. Centralized attendant answering.
- b. Provides ability to:
 - (1) Restrict use of phone system on per phone, per trunk basis.
 - (2) Restrict calls on per station, per trunk, per exchange and/or per area code basis.
 - (3) Alter station's class of service on phone-by-phone basis as directed by Owner
 - (4)** Enable caller away from his desk to override any restrictions on that phone, changing class of service to his own phone's class of service for duration of call.
- c. Includes following features:
 - (1) Ability for user to relocate his own phone to compatible type location without outside intervention from equipment supplier.
 - (2) Capability for phone to appear busy while allowing user to make calls
 - (3) Ability to activate features without use of "hook-switching".
 - (4)** Menu-driven access for calling features and messaging features
 - (5) Select-number redial allowing station user to store last number dialed. Other calls initiated and received without erasing stored number.

- (6) Capability of notifying user that previously busy extension number or trunk called earlier is now available. Call completed using self-identifying access button that, when depressed, redials extension number or trunk.
 - (7) Ability to reroute calls made to busy and/or unanswered extension to predetermined location or locations.
 - (8) Conference calls established by any telephone
 - (9) Automatic route selection of outgoing calls
 - (10) Ability to display internal extension number or external telephone number of calling or called party.
 - (11) Ability to display ANI/DNIS numbers (caller ID) at digital display sets as well as analog single line sets with display or caller ID box.
 - (12) Executive override permitting assigned administrative telephone to "break in" on-going conversations in system and field-programmable without modification or additional equipment.
 - (13) Provision of private lines to individual phones and private lines to be shared by select group of phones.
- d. Includes "Night Answer" providing ability to redirect public telephone lines during "Night Mode" to specific telephone sets, bell ringers or paging speakers with redirected calls answerable by one or more individuals by pressing button or dialing code.
 - e. Includes Call Accounting with ability to charge incoming or outgoing calls to specific account code and record following information about selected calls.
 - (1) For each call, CDR identifies:
 - (a) Calling and called parties.
 - (b) Start time of call.
 - (c) Duration of call.
 - (d) Month and date.
 - (e) Route (trunk group) number
 - (f) Attendant handled.
 - (g) Account code.
 - (h) Authorization code.
 - (i) Cost of call.
 - (2) Record describing complete call output by switch when call is terminated using standard RS-232 type interface.
 - f. Include Station Administration: Utilizing Windows operating system and GUI interface allows for station configuration tasks such as moves, adds and changes. Must be able to install on the Owners LAN.
 - g. Provides for storage of diagnostic results, traffic statistics, software error, and other system messages, printable upon request through local or remote access.
 - h. Includes provisions to connect:
 - (1) PRI/BRI ISDN trunks.
 - (2) T1 carrier lines directly, without requiring channel banks
 - (3) Two-wire DTMF trunks.

- (4) Two-wire pulse or DTMF tie trunks.
 - (5) Two-wire ring down.
 - (6) Four-wire digital.
 - (7) OPX circuits.
- i. Includes provisions to interconnect multiple PBX's together.
 - j. Includes main control unit capable of storing information and giving reports on features, restrictions, hunting patterns, service call information. etc. upon request either on site or remotely.
 - k. Includes central switching exchange providing RS-232 port for connection of on-site or off-site diagnostics by distributor or factory personnel allowing determination of circuit and software faults via diagnostics to facilitate remote software repairs to system.
 - (1) System maintains history file containing running tally number of operations of main system functions for use by individual administrating system.
 - (2) Port also useable for programming and saving of all programmed data for each system using on-site or off-site computer.
 - l. Provides compatibility with Emergency 9-1-1 System. Caller dialing either 911 or 9-911 automatically routed over local (analog) trunk to public emergency answer center. Caller from room phone directed to designated internal display telephone that rings continuously until manually cleared. Display contains extension number placing 911 calls.
 - m. Compatible with Enhanced 911
 - n. Transfers to dedicated alternate power source in event of commercial power failure with minimum two-hour battery backup included at each site. (Back up system includes Voice Mail and Call Accounting systems).
 - o. Includes Power Failure Transfer Units at each site providing emergency service for up to 8 designated 500/2500 type sets by connecting directly to Central Office trunks.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's product brochures and other data for each specified telecommunications item demonstrating compliance with specified requirements and provide list of locations where each item is installed.
- B. Shop Drawings: Submit complete drawings showing entire system, components, point-to-point wiring, and field connections.
- C. Samples: Submit telephone system PBX/key system active components including system bill of materials.
- D. Quality Control Submittals
 - 1. Certificates: Submit verification from manufacturer that Contractor is "Certified Installer" of manufacturer's product line.
 - 2. Installer Experience Listing: Submit list of names, locations, and size of 10 recent successful installations in local area of Project.

1.04 QUALITY ASSURANCE

A. Qualifications

1. Supplier: Ensure supplier is accredited by proposed equipment manufacturers and is prepared to offer service contract for system maintenance specified below.
2. Installer: Ensure installation and start-up of all systems accomplished under direct supervision of local company regularly engaged in installation, repair, and maintenance of similar systems with at least 10 recent successful installations in local area of Project.

1.05 PROJECT/SITE CONDITIONS

- ##### A. Existing Conditions: Obtain additional detail drawings of existing conditions from Owner as required for installation.

1.06 SEQUENCING AND SCHEDULING

A. Coordination with Owner

1. Coordinate requirements for access to buildings, equipment, and facilities with Owner sufficiently prior to requirement for access to avoid delay in telephone system installation.
2. Determine Owner's schedule for inspections provided by Owner sufficiently in advance of required inspections to avoid delay in telephone system installation.

- ##### B. Coordinate all work with Local and Long Distance Carrier Representative for all interconnects, disconnects and new leased circuits.

- ##### C. Coordinate all interviews with Owner to determine system wide and individual station features and functions.

- ##### D. Provide schedule of cutover. Keep existing equipment in operation until new equipment is programmed and cutover.

- ##### E. Obtain approval of Architect before proceeding with installation requiring cutting into or through any part of building structure such as girders, beams, concrete or tile floors, or partition ceilings.

1.07 WARRANTY

- ##### A. Manufacturer's Warranty: Provide manufacturer's system warranty against electrical or mechanical defects for minimum of 1-year from date of final acceptance.

1.08 MAINTENANCE

- ##### A. Maintenance Service: On completion of warranty period, provide maintenance agreement with 24 hours per day service, with 24-hour non-emergency service response time, and 1-hour emergency call response time on 365-day-per-year, 24 hours per day basis.

PART 2 - PRODUCTS

2.01 TELEPHONE SYSTEM

A. Manufacturers and System Configuration

1. Specified Manufacturer- For convenience, details and specifications have been based on "Toshiba CTX100 12x24 Phone System" by Toshiba Telecommunications Systems
2. Provide (1) PBX at each location listed on attached spreadsheet.
3. Each PBX to minimally contain the following configuration:
 - a. [1] ea. dual port. digital trunk card for connection of T-1/ PRI circuit.
 - b. [1] ea. analog trunk cards for a total capacity of 8 ea. analog trunk ports for connection of analog trunks.
 - c. [16] port, full feature digital telephone cards to control new digital telephone devices as listed on attached spreadsheet.
 - d. [16] port, full feature analog telephone cards to control new analog telephone devices as listed on attached spreadsheet
 - e. includes minimum 3 open card slots for addition of station/trunk cards.
 - f. Software: "CTX100 StrataNet". (If more recent Software Release is available, it must be provided)
4. Other manufacturers offering products complying with specified requirements include:
 - a. Avaya, Inc.
 - b. Mitel Corporation

B. Voice Mail - Fully Integrated Voice Processing (Automated Attendant, Voice Messaging) capability similar to Toshiba Stragy 24-8.

1. Provide Windows based, integrated voice processing system. See attached spreadsheet for minimum quantities of ports, users and hours of storage. (Note: Ports dynamically allocated for automated attendant and voice mail functions.) Proposed systems have following minimum service parameters:
 - a. Mailbox Message Time 1 to 180 Minutes
 - b. Mailbox Message Retention 1 to 365 Days
 - c. Greeting Length..... 1 to 10 Minutes
2. System supports following features:
 - a. Day and time stamp.
 - b. **Immediate** reply.
 - c. Alpha and numeric directory.
 - d. Off-Premise notification.
 - e. Pager/beeper notification.
 - f. External Volume Control.
 - g. Variable length passwords.
 - h. Variable length security codes.
 - i. **Information** mailboxes.
 - j. Single digit access to at least 4 "trees" with 10 menu levels per tree and 8 options per menu level.
 - k. General Delivery mailbox.

- l. Message waiting indicators.
 - m. Non-blocking of new messages when mailbox is "full".
 - n. On line tutorial, full voice instructional prompts.
 - o. Interruptible prompts.
 - p. Zero-out to variable locations.
 - q. Variable greetings for time of day/holiday greetings
 - r. Auto Attendant blocks calls to specific extensions during fixed time of day
 - s. Distributed messages by group.
3. System includes context-sensitive help available at all times with help prompt structure describing:
- a. Current situation.
 - b. Alternative actions.
 - c. How to initiate other transactions.
 - d. Initial mailbox/greeting set up
4. System Administration:
- a. System supports following System Administration functions through telephone set and GUI (graphical user interface) on PC.
 - (1) Adding or Deleting Mailboxes.
 - (2) Resetting Passwords.
 - (3) Adding or Modifying Group Lists,
 - (4) Setting Time and Date.
 - (5) Printing Alarm Reports.
 - (6) Ability to easily change Auto Attendant greeting locally or remotely.
 - (7) System Administrator can select, by user, time period for already read messages to be automatically deleted. Messages can also be retained indefinitely.
 - b. Management functions are Windows based and include on-line help
 - c. Multiple simultaneous administrative sessions.
 - d. System must be able to connect to Owners LAN/WAN to allow for administrative changes and system monitoring from multiple points via intranet or the Internet.
5. Unified Messaging: Gives users ability to merge voice mail, fax and email messages into single interface.
- a. Allows users to playback voice mail messages through a telephone or speakers on a multimedia computer.
 - b. Voice mail Messages can be stored on a PC or forwarded as a wave file in an email attachment.
 - c. Allows faxes from users workstation (PC). Provide password-protected access to incoming faxes and allow outbound faxes from any Windows application.
6. Speech Activated Messaging: Speech recognition interface for managing messages from any location. This allows users to use speech commands to navigate through their mailbox to play, store, forward, etc. messages in voice mailbox.
7. Provide all necessary hardware (PC, etc) for a complete operating system

- C. Call Detail Recording: PC-based Call Accounting System, designed to interface with proposed PBX Network. System providing collection, storage, analysis and processing of SMDR information on Owners' premises. System gathers calls from all locations and records them on centralized PC connected to PBX through RS-232 communication port. Includes Pentium workstation with minimum of 24MB RAM and at least 1.0 GB Hard Drive running Windows.

1. Provide following standard reports:

- a. Extension Detail.
- b. Extension Analysis by Hour.
- c. Extension Summary by Department.
- d. Organization Summary.
- e. Department Summary.
- f. Account Code Detail.
- g. Account Code Summary.
- h. Missing Account Code.
- i. Alert Call Detail.
- j. Calls Over Specific Cost.
- k. Calls Over Specific Length.
- l. Calls to Specific Numbers.
- m. Full Call Detail by Organization.
- n. Most Frequently Dialed Numbers.
- o. Most Costly and Longest Calls by Extension or by Organization
- p. Directories:
- q. Trunk Utilization by Detail, Summary or Hour.
- r. Call Summary by State
- s. Alert Number Listing.
- t. Full Directory by Name.
- u. Costing Method Assigned to Trunks
- v. Full Directory by Extension.
- w. Full Account Code List.

- D. Personal Call Manager - Utilizing Windows operating system with GUI interface or Web browser interface allows for station configuration tasks such as moves, adds and changes. Maintenance terminal for use by the District System Administrator to implement said tasks.

1. Station Administration; system software to include the following for station administration:

- a. Telephone graphics
- b. Call party name display
- c. Automatic terminal number and directory number assignments
- d. Telephone set configuration and feature changes
- e. Global changes
- f. Telephone templates
- g. Comprehensive station selection/search
- h. Comprehensive reporting features
- i. Export capabilities

2. System Terminal includes following minimum characteristics:

- a. Intel TM Pentium II TM
- b. 64 MB RAM
- c. Minimum 2 GB hard drive with 500 MB free space
- d. 3.5 floppy drive
- e. 12X CD ROM drive
- f. Ethernet NIC
- g. Soundblaster card

- h. 512 Cache memory
 - i. 1 4 color monitor, keyboard, mouse
3. Web Based Station Configuration Management: Allows District System Administrator to change telephone features and key assignments through Web Navigator. End Users, where permitted by system administrator, can view their phone feature assignments and make assignment changes as well as receive help on feature use and activation.
- E. Digital Telephones - Similar to "Toshiba DKT2020-FDSP Telephone" and including following features:
- 1. 12 self-labeled programmable line/feature keys with indicators.
 - 2. 4 context-sensitive programmable feature keys
 - 3. User programmable, variable ring tones.
 - 4. Fixed hold, good-bye and feature keys.
 - 5. LED message-waiting indicator.
 - 6. Independent volume control for handset, ring, and on hook dialing
 - 7. Built in Hands-free.
 - 6. Direct connect headset port
 - 9. 5 line by 24 character display
 - 10. Personal Directory
 - 11. Optional expansion modules
 - 12. 2 accessory ports for application modules
 - 13. Desk or wall mount.
 - 14. All sets available in ash or black.
 - 15. Locations to be determined in field.
- F. Analog Telephones - Similar to "Toshiba DKT3010-SD Telephone".
- 1. Wall mount
 - 2. Touchtone
 - 3. "Tap" button (or Flash button), simulates hook switch flash for ease of feature activation
 - 4. Available in ash or black.
 - 5. Locations to be determined in field

2.02 COMPONENTS AND ACCESSORIES

- A. Wall Mounting Boards: 3/4-inch plywood, painted all sides with fire retardant paint.
- B. Site Event Buffer Box
- 1. Host Location: Similar to Teltronics Site Event Buffer-II
 - a. Basic data collection (CDR records, traffic statistics, PBX diagnostic routines)
 - b. Remote event reporting
 - c. Supports multiple host devices (PBX, voice mail, etc)
 - 2. Remote locations: Similar to "Teltronics Site Event Buffer Jr."
 - a. Data collection
 - b. Data screening
 - c. Remote reporting

C. Uninterruptible Power Systems

1. Remote Locations: Similar to "APC Smart-UPS 1000 XL Model# SU1000XLNET" and appropriate "SU24XLBP" battery packs.
2. Host Location: Similar to "APC Smart-UPS 2200 XL Model# SU2200XLNET" and appropriate "SU48XLBP" battery packs.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions (by Installer): Examine conditions under which telephone system is to be installed and notify Prime Contractor in writing of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to Installer.
1. Notify Owner in writing of any conditions not strictly complying with laws, ordinances, and rules specified in this Section.

3.02 INSTALLATION

- A. Ensure telecommunications systems and equipment specified in this Section are installed in strict accordance with requirements of rules, local law and ordinances of State of New Jersey National Board of Fire Underwriters, and National Electrical Code and that systems and power supplies are Underwriter Laboratory (UL) approved.
1. Obtain Owner's and Architect's written consent before making changes in Contract Documents.
- B. Install equipment in accordance with manufacturer's specifications for system
1. Conduct tests and inspections after installation has been completed to assure Owner that requirements for installation have been met.
 2. Promptly notify Architect of completion of work on equipment ready for inspection at least 1 week prior to completion.
 3. Promptly correct all defects.
- C. Distribution Frame Installation: Locate telephone system control units as indicated on Drawings and as required for complete system integration.
- D. Power Requirements - Provide:
1. 120 Volt power on dedicated circuit
 2. Separately wired building ground
 3. Single-person contact

3.03 FIELD QUALITY CONTROL

- A. Tests: Perform testing under direct supervision of representatives of accredited agencies for all specified equipment and services.
1. Notify Architect in writing 3 days prior to testing, to allow Architect to observe or participate in testing.

2. Demonstrate minimum acceptable signals, levels, audible and visual qualities as required by Owner's representative and Architect.
3. Submit written test report from authorized representative of equipment manufacturer indicating system has been tested and is in working order prior to final inspection by Architect.

3.04 ADJUSTING / CLEANING

- A. Repair all damage to building resulting from installation of telecommunications systems and equipment, and exercise reasonable care to avoid any damage to existing construction. Report to Owner any damage to existing construction. Provide full clean up of all installation areas and removal of all debris. Refer to Division 1 for additional requirements.

3.05 DEMONSTRATION

- A. On-Site Training
 1. Provide all training by manufacturer's authorized representative who is professional system programmer and user trainer familiar with Owner's customized telephone system. Train users on Owner's customized telephone system.
 - a. Coordinate with Owner to schedule employees attending training sessions.
 2. Station User Training: Prior to telephone system cutover, provide on-site classroom-style training sessions at each location for each telephone type for all Owner staff.
 - a. Classroom sessions limited to **15** people per session and approximately 1 hour each session.
 - b. Provide live demonstration telephones of each type for attendees' use during training sessions.
 - c. Instruct users in telephone feature use and activation, including Voice Mail use and feature activation.
 3. Attendant Training: Prior to telephone system cutover, provide on-site classroom sessions for all telephone systems attendants with maximum 3 people per session for approximately 2 hours per session.
 - a. Provide live demonstration telephones and attendant set for attendee's use during training session.
 - b. Instruct users in console feature use and activation, including Voice Mail use and feature activation.
 4. System Administration Training - PBX, Voice Processing, CDR: Within 3 weeks before system cutover, provide on-site training for at least 3 employees designated by Owner for at least 3 full days (6-hours) including:
 - a. PBX System Administration: Including (but not limited to) moves, adds, and changes of stations; station features, restriction levels, and account codes; and printing and reading of station details, traffic reports and directories.
 - b. Voice Processor: Including (but not limited to) adding and deleting mailboxes, changing name assignments, and changes to auto attendant greetings.
 - c. Call Detail Recording: Including (but not limited to) retrieving and printing reports, inputting pricing information, and trunk analysis.
 - d. Review of Owner Specific Manual.

5. Additional Training: Schedule as directed by Owner additional training day (8 hours) approximately 30 days after cutover to review any user issues.
 6. "Hot Line": Provide "Hot Line" extension for users to call to receive assistance on phone use, voice mail use etc., answered by trained technician with voice mail box assigned for back up. Provide "Hot Line" for minimum of (10) business days after cutover (coordinate disconnect time with Owner). During "hotline" period, minor feature changes such as call pick up group assignments, extension number appearances, etc. provided at no extra charge to Owner.
- B. Off-Site Training: Provide Owner with schedule of off-site manufacturer's training sessions for additional more detailed system training. Include course descriptions and fees.
- C. Documentation
1. User Guides: Provide user guides for all telephone sets in quantity equal to quantity of sets plus 15 percent for each set type. Distribute guides as directed by Owner.
 2. Directories: Provide Owner with typed directory, listing all extension numbers, voice mail box numbers and their name assignments, two weeks prior to cutover.
 3. System Manuals: Provide full set of system documentation on-site at all locations at all times.
 4. Owner Specific Manual - At System Administration training, provide Owner with manual containing following information:
 - a. Customer ID numbers for all necessary equipment.
 - b. Telephone numbers for service representatives and outline for service procedures
 - c. Telco information: Identification of RJ-21X, listing uses for all circuit numbers.
 - d. Power failure transfer information, including trunk assignments and locations
 - e. Trunk configuration, including line assignment, type, route member number, access codes.
 - f. Night answer detail including description of how "Night Answer" mode operates and locations of night answer extensions/ringers.
 - g. Typewritten spreadsheet providing following station information
 - (1) Extension number
 - (2) Location
 - (3) Set type
 - (4) Restriction level
 - (5) Call Pick up groups
 - (6) Feature Assignments
 - (7) Custom equipment (long coil/line cords, external ringers, etc)
 - (8) Account codes
 - h. Restriction Level Definition, providing list defining parameters of each restriction level.
 - i. Voice mail directory (Name vs. Mailbox number)
 - j. Quantity of spare set and trunk ports
 - k. Quantity of unplaced sets.

PART 4—QUANTITIES

SCHOOL NAME	ADDRESS	SCHOOL TYPE	CONSTRUCTION TYPE	SQUARE FEET	CLASSROOMS	ANALOG PHONES (QUANTITY)	DIGITAL PHONES (QUANTITY)	PHONE SYSTEM SWITCH (TYPE)	VOICE MAIL (PORTS)	VOICE MAIL (HOURS)	VOICE MAIL (USERS)
Mildred B Garvin MicroSociety Elementary School	1 Grove Pl East Orange NJ 07017	ES	New	61,250	18	18	18	Toshiba	8	100	38

END OF SECTION

3.03 FIELD QUALITY CONTROL

- A. Telecommunications Wiring System Testing: Provided by Contractor
1. Perform all testing under direct supervision of manufacturer's representative or accredited agencies for all specified equipment and services. Notify Architect and Owner in writing at least 3 working days prior to time testing is to begin. Architect and/or Owner reserves right to have representatives present and participating in testing. Provide re-testing at Contractor's expense if proper written notification required above is not given.
 2. Test entire telecommunications wiring system in presence of Owner's representative and issue report to Architect stating that cabling system is in proper operating condition and meets all manufacturer's minimum listed specifications for signal levels and data speeds.
 3. Twisted-Pair Cable Testing:
 - a. Perform with cable testing system similar to **Microtest/Fluke "OMNI scanner"** using factor, -prescribed test procedure for certification of Category 6 (CAT 6) cable systems
 - b. Report test results in format provided as standard for OMNI scanner with additional formatting provided by Architect that can be directly loaded into OMNI scanner per directions provided by Microtest. Software provided in this manner to ensure reporting in uniform and easily read format for convenience of Contractor responsible for testing. Obtain Architect's approval of any proposed deviation from specified testing process as part of Submittals described in Part 1 above.
 4. Report: Submit written test report from authorized representative of equipment manufacturer indicating that system has been tested and is in working order prior to final inspection.

3.04 ADJUSTING /CLEANING

- A. Clean up debris from installation on daily basis.

3. Determine allowable cable placement proximity to other electrical power sources of 480 volts or less using EIA-569 Cabling Pathways Standard for UTP cable separation guidelines from EMI sources as follows:

a. Minimum Separation Distance from Power Source at 480v or less

CONDITION	<2kVA	2-5KVA	>5KVA
(1) Unshielded power lines or electrical equipment in proximity to open or non-metal pathways	6 in.	12 in.	24 in.
(2) Unshielded power lines or electrical equipment in proximity to grounded metal conduit pathway	3 in.	6 in.	12 in.
(3) Power lines enclosed in a grounded metal conduit (or equiv. shielding) in proximity to grounded metal conduit pathway	3 in.	6 in.	12 in.
(4) Transformers & electric motors	40 in.	40 in.	40 in.
(5) Fluorescent lighting	12 in.	12 in.	12 in.

4. Install all exposed cables in surface raceway manufactured by Wiremold, Hubbell, Panduit, or Ortronics and as detailed on Drawings. Install cables in surface raceway in accordance with all manufacturers' requirements concerning cable slack and bending radius.

5. Install all cable in accordance with all National, State and Local Codes and both TIA/EIA and BICSI standards and practices.

- a. Follow manufacturer's guidelines and requirements for all cable termination.
- b. Install and connect #6AWG or larger ground wires to bond all equipment racks and cabinets to building ground per EIA/TIA 607.
- c. Unless otherwise noted on Drawings, locate all equipment racks to allow minimum of 30 inches aisle clearance both in front and rear of equipment rack for access to equipment.

6. Properly terminate all cables at each outlet location and at each Distribution Rack or terminal. Permanently identify all cables in all pull boxes, in wiring gutters and at each termination point with pre-marked self-adhesive wrap around markers similar to Brady "B-500+ Plastic Cloth Markers", GVSI "TC-WM-X", or Electromark "C113-A1".

7. Permanently identify all system components using following identification format:

- a. Cable Labels: Refer to specification section 18751 for requirements for all labels, installation, and associated work
- b. Faceplate Labels: Match cable label and permanently affix to faceplate; handwritten or "Dymo" type labels not acceptable.
- c. Obtain Owner's and Architect's approval of any deviation from proposed identification scheme prior to installation. Refer to "Cable Identification Nomenclature Legend" on Drawings. Confirm and submit complete cabling schedules to Owner for final approval prior to installation.
- d. Provide typed or printed Cable ID-to-Room reference chart mounted in clear plastic pouch on each data cabinet with additional copy provided to Architect.

3.02 INSTALLATION

- A. Install telecommunications systems and equipment specified in this Section in strict accordance with requirements of local law and ordinances, rules of State of New Jersey, National Board of Fire Underwriters and National Electrical Code and that systems and power supplies are Underwriter Laboratory (UL.) approved.
 - 1. Do not change or deviate from Contract Documents without obtaining prior written approval from Architect and Owner.
 - 2. Obtain approval of Architect before proceeding with any installation requiring cutting into, or through, any part of building structure such as girders, beams, concrete or tile floors, or partition ceilings. Refer to DIVISION 1 for additional requirements
- B. Install equipment in accordance with manufacturer's specifications for system.
 - 1. Conduct tests and inspections after installation has been completed to assure Owner that installation requirements have been met.
 - 2. At least 1 week prior to completion of equipment installation, notify Architect of date equipment will be ready for inspection.
 - 3. Promptly correct all defects.
- C. Wiring, Raceway and Distribution Frames
 - 1. Telephone Cable Termination: Terminate all cables on 110 style termination blocks at MDF and IDF's in each building. Label with riser pair numbers and location numbers.
 - 2. Secure all horizontal cables within ceiling cavities to building structure.
 - a. Loosely bundle all cables and support from structure at 5 ft. intervals with spring steel fasteners and cable clip rated for use with high performance cables (similar to Caddy Series 'CableCat') or approved alternate mounting methods (including placement in cable tray) as indicated on Drawings.
 - b. Properly install all cables in cable tray in locations indicated on Drawings.
 - c. Do not support cables from ceiling grid T-bars or grid support wires or bridle rings.
 - d. Do not allow cables to rest on ceiling grid.
 - e. Install cables in conduit in all unfinished, exposed areas, including, but not limited to storage rooms, mechanical areas, crawlspaces and pipe tunnels.
 - f. Do not secure cables with tightened cable-ties or any other device that deforms cable jacket.
 - g. Provide 6 inches slack at station termination and 24 inches slack at patch panels or terminal blocks.
 - h. Place wire in conformance with EIA/TIA Standard 568A and BICSI standards
 - i. Re-terminate and re-test any cables or pairs of cables failing end-to-end testing. Replace any faulty cables/pairs. Remove all defective cables from pathways.

2. Riser Cables: Terminate on pair block assembly similar to Siemon "S110AA2-300FT 300-Pair Block Assembly" or Siemon "S110AA2-100FT 100-Pair Block Assembly with S110C-5 5-Pair Connecting Blocks for 25-Pair (or multiples of 25-pair) Riser Cable Termination", Panduit "P110KB1004 100 Pair Block 110 Kit with Legs Cat5e XP6 Field Term 5 Pair Clips", or Ortronics "30200116 100 Pair Block 110 with Legs Cat5e XP6 Field Term 5 Pair Clips"
- E Consolidation Point Enclosure (CPE): Similar to Siemon "CPEV", Hubbell "CPEI", or Holocom "PGW-CM-CP1" designed to house telecommunication hardware being utilized as a Consolidation Point (IDF) and including following features:
1. Accepts up to six 100-pair S110 blocks
 2. Smoked plexiglass viewing window.
 3. Hinges on left or right side.
- F Termination Boards: 3/4-inch thick fire-retardant treated plywood painted with 2 coats of grey paint on both sides including edges of plywood panel.
1. At Contractor's option, provide non-fire-retardant treated plywood with 2 coats of gray fire-retardant paint on all sides including edges of plywood panel.
- G Lightning Protection: Provide UL listed and approved gas tube and solid state lightning protection with Sneak Current Protection on both ends of all aerial cables and both ends of all underground cables where cable length exceeds 42 meters (140 feet).
1. Protection devices not required on underground cables connecting buildings that are inside properly grounded metallic conduit or have properly grounded integral metallic shielding AND are less than 42 meters (140 feet) in length.
 2. Comply with Article 800-30 of National Electric Code governing specific requirements of protective devices and their installation.
 3. Provide devices similar to products by Porta Systems Corp., ITW Linx, or Midsouth.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine conditions under which telecommunications wiring systems are to be installed in coordination with Installer of materials and components specified in this Section and notify affected Prime Contractors and Architect in writing of any conditions detrimental to proper and timely installation. Do not proceed with installation until **unsatisfactory** conditions have been corrected in a manner acceptable to Installer.
1. When Installer confirms conditions as acceptable to ensure proper and timely installation and to ensure requirements for applicable warranty or guarantee can be satisfied, submit to Architect written confirmation from applicable Installer. Failure to submit written confirmation and subsequent installation will be assumed to indicate conditions are acceptable to Installer.
 2. Survey buildings and issue report to Architect prior to starting installation that indicates any circumstance that may hinder system installation.

1.05 PROJECT/SITE CONDITIONS

- A. Information and Services Provided by Owner
1. Access for Contractor personnel to premises and facilities. Contractor remains responsible for coordinating access requirements with Owner prior to requirement for access.
 2. Additional detail drawings of existing conditions required for installation.
 3. Required inspections. Contractor remains responsible for coordinating with Owner, sufficiently prior to requirement for inspection, to allow scheduling of inspection.

1.06 SEQUENCING AND SCHEDULING

- A. Provide installation schedule demonstrating that existing equipment will be maintained in operation until new equipment is programmed and ready for use.

1.07 WARRANTY

- A. Special Warranty: Provide manufacturer's system warranty against electrical or mechanical defects for 1 year from date of final acceptance.

PART 2 - PRODUCTS

2.01 COMPONENTS

- A. Trunk Cables: Category 3 grade plenum premises cable; **24AWG** solid bare copper conductors, multi-pair telephone cable bundled in 25 pair groups. Similar to "CMP-10024SPP-1 (100 pair) General Cable 2131377, Nordx/CDT 24571250, or Superior Essex 18-799-86.
- B. Grounding Cable: Minimum 1 dedicated copper ground conductor, #6 AWG or larger, directly connected to main building ground system and routed with all backbone riser cables. Ground cable bonded to all protector blocks and provides ground connection to special ground terminals provided on telephone equipment.
- C. T-1 Extension Cable: If Telephone Company demarcation needs to be extended to PBX location, provide multi-pair voice grade cable of 25 or more pairs, similar to Lucent "CMP-002524SAS-3, Berk-Tek 10032052, or Belden 1590A and dual screened 4-pair T-1 circuit rated cable, similar to Lucent "CMP-00822-T1-3, Krone DSP-25225SDWT02, or Berk-Tek 10032052,
1. Place cable from point of demarcation to cross connect terminal blocks serving CO connections to PBX.
 2. Refer to Drawings for specific requirements
 3. Inter-building Outside Plant Cables in Underground Duct: Exchange cable code PE-39 or PC-89, **24AWG** copper conductors, polyethylene sheath, filled core, coated aluminum shield, specified pair count; similar to Anixter "E-020024AFC" or "E-020024AFO", Superior Essex 85-108-AR, or Berk-Tek "E-020024AFO for 200 pair size.
- D. Termination Blocks
1. Station Cables: Terminate on pair block assembly similar to Siemon "S110AB2-300FT 300 Pair Block Assembly" or Siemon "S110AB2-100FT 100 Pair Block Assembly with S110C-4 4-Pair Connecting Blocks for 4-pair Station Cables", Avaya "107058919 100 Pair Block 110 Kit with Legs Cat5e XP6 Field Term 4 Pair Clips", or Leviton "41AB2-1FT 100 Pair Block 110 Kit with Legs Cat5e 4 Pair Clips, Labels & Holders"

SECTION 18753 – TELEPHONE BACKBONE WIRING SYSTEM

PART 1 -GENERAL

1.01 SUMMARY

- A. Section Includes
 - 1. Telecommunications equipment and systems wiring, providing structured cabling infrastructure for telephone system.

1.02 SYSTEM DESCRIPTION

- A. Design Requirements
 - 1. Provide labor, materials, equipment, and services and perform all operations required for complete installation of telecommunications equipment and systems and related components shown on Drawings and specified in this Section.
 - a. Associated wiring system to each telephone as indicated on riser diagrams and on floor plans is specified elsewhere.
 - b. Include all wiring between building sound system and PBX.
 - c. Refer to specification section 18751 for requirements for all Category 6 telephone station wiring, installation, and testing.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's product brochures and other data for each specified telecommunications item demonstrating compliance with specified requirements and provide list of locations where each item is installed.
- B. Shop Drawings: Submit complete drawings showing entire system, components, point-to-point wiring, and field connections.
- C. Samples: Submit samples of all copper cables, terminal blocks, protector blocks, terminations, jacks, cover plates and cable hangers, unless manufacture and part number are same as specified in Part 2 - Products below.
- D. Quality Control Submittals
 - 1. Certificates
 - 2. Submit certification from telephone network cabling system manufacturer indicating that Installer is a "Certified Installer" for product line proposed for use in this Project.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Qualified to cable, terminate and test telephone network cabling system described in this Section. Provide listing of at 5 telephone network cabling system projects of similar size with complete client references.
 - 2. "Certified Installer" in product line submitted for use in this Project