

## SECTION 26 00 00

## ELECTRICAL

## PART 1 GENERAL

## 1.1 SCOPE

A. The work covered by this section includes the furnishing of labor and materials, equipment, and incidentals and the performing of operations in connection with "electrical work" as indicated on the drawings and/or specified herein and including incidental items to provide a finished, complete and operable system as indicated. The electrical work shall include but not be limited to:

1. Provide panel feeder from the existing 600A service switch in the existing electrical room to a new 600A panel. Provide a service conduit and conductors as indicated on the plans.
2. Perform all electrical work in accordance with requirements of 2011 NEC.
3. Provide new wiring for luminaires and receptacles as indicated. All new wiring shall be minimum 12 ga. copper.
4. Provide new wiring for HVAC equipment and controls as required. Including Alternate 3&4.
5. Provide GFCI protection for receptacles in all bathrooms, exterior and kitchens in accordance with 2011 NEC.
6. Alternate #3 – See Drawing EBIDALT. Disconnects are provided with equipment. Install a GFI receptacle on a dedicated 20 ampere branch circuit at each unit.
7. Alternate #4 - Replace existing fire alarm panel with complete Addressable fire alarm system including radio masterbox per City of Portland Standards. Provide qty (6) addressable modules to connect existing zones to new panel. Provide addressable modules for (2) tamper and (2) flow switches on sprinkler systems. Contact City Of Portland Fire Marshall Ben Wallace for inspections.
8. Provide complete smoke detector coverage per NFPA 72 and City of Portland ordinances. Provide audio/visual alarms per NFPA 72 and City of Portland ordinances. Provide tamper and flow switched on sprinkler systems and pulls stations per NFPA 72.
9. Provide luminaires as indicated on the plans.
10. Provide CATV and Tel cable and jacks in all units as indicated on the plans.
11. Provide Door Operators as indicated on the plans.

Work shall be subject to the conditions of the contract and shall be in strict accordance with the plans and specifications.

- B. Before submitting his bid, the Electrical Contractor is required to visit the site and survey the conditions likely to be encountered in the performance of the electrical work. Failure to familiarize himself with said conditions shall not relieve the Contractor of responsibility for full completion of the work in accordance with the provisions of the Contract.
- C. The term "Contractor used hereinafter shall designate the Electrical Contractor.
- D. Any questions regarding this specification or the Electrical Drawings must be addressed in writing to the Architect before bids close; after close of bids, the Architect's interpretation of the meaning and intent of the specifications and drawings shall be made according to the provisions of the General Conditions.

## 1.2 RELATED DOCUMENTS

- A. The General Conditions, Supplemental General Conditions and Instructions to Bidders shall apply to this work.
- B. Drawings and general provisions of Contract including General and Supplementary Conditions and all Division 1 specification sections.
- C. Provision of waste management: Section 01 74 19, Construction Waste Management and Disposal.

## 1.3 CODES AND STANDARDS

- A. Where referred to, published standard specifications of technical societies, trade associations and governmental agencies codes and regulations of Underwriters and protective organizations, Federal, State and Municipal regulations and codes and publications of a similar nature shall be the edition current as of the date of this Specification.
- B. The applicable requirements of the publications of the following organizations shall apply to the work under this section as if fully written herein:
  - 1. American National Standards Institute, Inc. (ANSI)
  - 2. National Electrical Manufacturers Associations (NEMA)
  - 3. National Fire Codes (NFPA)
  - 4. Underwriters Laboratories, Inc. (UL)
  - 5. Federal, State and Municipal Building Codes, and all other Authorities having jurisdiction.
  - 6. National Electrical Code (NEC)
  - 7. Americans with Disabilities Act (ADA)
  - 8. Occupational Safety and Health Administration (OSHA)

## 1.4 MATERIALS AND EQUIPMENT

- A. Materials shall be of the best quality. Workmanship shall be of highest grade and construction shall be done according to best practices of the trade.
- B. Provide, when required, labeled samples of material or equipment specified herein or proposed to be used in this work.
- C. Where words "furnish", "provide", or "install" are mentioned, either singly or in combination, these words are hereby interpreted to mean "furnish and install" or "provide and install", including materials complete with connections, supplemental devices, accessories and appurtenances, unless specifically noted otherwise. These words are likewise hereby interpreted as being prefixed to materials, equipment, and apparatus hereinafter mentioned, either in abbreviated or scheduled information or in the technical sections of the specifications.

## 1.5 SHOP DRAWINGS

- A. Submit to the Architect for approval not less than eight (8) sets of Shop Drawings of the materials, fixtures and equipment to be incorporated in the work. Information shall contain specific reference to catalog numbers and shall be qualified in writing as required. No considerations will be given to brochure or catalog information not specifically designated or referenced to the specification by an identifying number.

- B. Shop drawings that are facsimiled, (FAX) produced, or photocopies of FAX documents will not be considered or reviewed. Only originals and or photocopied originals, complying with paragraph A above will be considered.
- C. Before consideration, electrical submittal packages shall include cover pages for each of the electrical equipment groups, i.e. load centers, lighting, fire alarm, devices, emergency call system, apartment intercom/security system.
- D. Shop drawings must bear the Architect's review stamp. In the event that the Architect rejects shop drawings, the shop drawing must be revised and resubmitted for review.
- D. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- E. Product Data: Submit data on product characteristics, performance criteria and limitations.
- F. Manufacturer's Installation Instructions: Submit procedure for preparation and installation.
- G. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

#### 1.6 SUBSTITUTIONS

- A. Reference in the specifications or on the drawings to any product, material, fixture, form or type of construction, by proprietary name, manufacturer, make or catalog number, establishes a standard of quality or design and is not meant to limit competition. Use any equivalent substitute provided favorable written review by the Architect is first obtained.

#### 1.7 CODES, PERMITS, INSPECTIONS

- A. The installation shall comply with laws and regulations applying to the electrical installation in effect at the site with regulations of any other governmental body of agency having jurisdiction, and with regulations of the National Electrical Code (NEC).
- B. Obtain and pay for permits required by the ordinances at the site. After completion of the work, furnish the Owner a certificate of final inspection and approval from the Inspection Bureau having jurisdiction.
- C. Inspections and tests shall be made in accordance with the requirements of Division One. Rejected materials shall be removed from the site and new materials furnished, retested and installed to the satisfaction of the Architect without additional cost to the Owner.
- D. Arrange for periodic inspections by the local Electrical Inspector during construction.

#### 1.8 TEMPORARY LIGHT AND POWER

- A. Temporary light and power shall be installed and maintained by the Electrical Contractor for use by all trades for the duration of construction complete with all wiring, switches, protective devices and similar equipment as may be required. Arrangement for the temporary service with the Power Company is the responsibility of the Electrical Contractor. Power bills will be paid by the General Contractor.

#### 1.9 ACCEPTANCE

- A. Before acceptance of the work under this section, damaged or imperfect materials shall be refinished or replaced, debris, scaffolding and tools shall be removed and premises shall be "broom clean" to the satisfaction of the Owner.

### 1.10 GUARANTEE

- A. This contractor shall guarantee materials and installations under normal use to be free of defects and poor workmanship for a period of one (1) year from the date of acceptance. Any replacement of parts or adjustments, including labor made necessary by inherent defects, shall be provided by the contractor without cost to the Owner within the guarantee period.

### 1.11 PROTECTION OF EQUIPMENT AND MATERIALS

- A. Protect equipment and material for the electrical work after delivery, before and after installation. This protection must be extended against pilferage, dampness and damages from all causes until the work is accepted by the owner.

### 1.12 ELECTRICAL REFERENCE SYMBOLS

- A. Symbols shown on the Drawings show approximate locations of fixtures, outlet boxes, conduit runs and other equipment, unless otherwise detailed. The exact location shall be governed by structural conditions and obstructions. This is not to be construed as to permit redesigning systems. Outlets shall be connected from circuits as shown on the drawings. Locate and install boxes and equipment where they will be readily accessible.

### 1.13 MATERIALS AND INSTALLATION

- A. Only the best materials of each class specified shall be used and the installation shall be made in a neat and workmanlike manner, complete in every detail, ready for immediate satisfactory operation by the Owner.

### 1.14 WORK BY OTHERS

- A. Trenching and backfill
- B. Painting
- C. Cutting and patching
- D. Telephone and cable TV service entrance cable and interface.

## PART 2 PRODUCTS

### 2.1 MATERIALS, GENERAL

- A. Unless otherwise indicated, the materials to be furnished under this specification shall be the standard products of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest standard design that complies with the specification requirements.
- B. Materials shall be delivered to the site in the original sealed containers of packages bearing the manufacturer's name and brand designated. Materials shall be stored in a clean, well-ventilated, warm area. Care shall be exercised in handling materials during delivery, storage and installation. Materials damaged, in the opinion of the Architect, shall be replaced at no additional cost to the Owner.

### 2.2 EQUIPMENT MOUNTING AND SUPPORTS

- A. Provide supports including supplementary steel, channels, rods and guys required for the proper installation, mounting and support of equipment.

- B. Supports shall be firmly attached and connected to building structural elements and constructed in an acceptable manner. Continuously threaded rods less than 3/8" in diameter, tie wire, or metal straps are not acceptable.
- C. Supports in structural systems shall be installed as an integral part of the structural system. Explosive or cartridge driven type anchors, insert or supports are not acceptable.
- D. Except as otherwise required by the Contract Documents the type and size of supports shall be as determined by the Contractor and shall be of sufficient strength and size to allow only a minimum deflection as required by codes or standards and the support manufacturer's requirements for loading.
- E. Inform all parties as to location, size details and method of attachment of supports and the weight which the support is to carry, so that the installation may be coordinated.
- F. Supports shall be installed in a neat and workmanlike manner, perpendicular or parallel to walls, floor, columns, beams or ceilings.

### 2.3 GROUNDING

- A. Furnish and install grounding system as required by codes or standards.
- B. Grounding terminal on receptacles and switches shall be bonded to outlet box with grounding conductor to establish grounding continuity.
- C. Flexible metal conduit and electric metallic tubing feeder raceways shall include grounding conductor.
- D. Grounding conductors shall be stranded copper wire with green color insulation. Grounding conductors shall be run with all circuits, feeders, etc. Raceways only will not be considered as a grounding means.
- E. Grounding bushings shall be provided for raceways where required.

### 2.4 PANELBOARDS

- A. Panelboard cabinets shall be of the dead-front safety type, provided with the size and number of single, double or triple pole branches as indicated in the schedule. Cabinets shall be constructed of zinc coated sheet steel and shall conform to Underwriters Laboratories, Inc, Standard for Cabinet and Boxes. Cabinet heights shall not exceed 72" and cabinets shall be mounted so that the distance from the floor to center of the top circuit breaker will not exceed 6', Cabinets shall be provided with trims having adjustable trim clamps. Trims, unless otherwise noted, shall be fitted with hinged doors having combination lock and latch with locks keyed alike. A typewritten directory, properly identifying the circuits, shall be mounted in each frame. Panels shall be as scheduled on the Drawings. Provide Bolt On circuit breakers.
- B. Panelboards shall be surface or flush mounted with branch circuit breakers and main breaker or main lugs as indicated on the Drawings and/or specified herein.
- C. Branch circuit breakers installed in the panels shall have a minimum short circuit rating as indicated on the drawings.

### 2.5 RACEWAYS

- A. Install wiring in electric metallic tubing (EMT), and or schedule 40 PVC. Schedule 40 PVC may be used outside only, raceways within the building shall be metal.

- B. Raceways and wiring, except as otherwise noted, shall be installed exposed in unfinished areas such as electrical and mechanical rooms.
- C. Electric metallic tubing shall not be installed in concrete on grade, in concrete in contact with earth or underground.
- D. Buried rigid steel conduits (RSC) shall have two coats of bituminous protection.

## 2.6 CONDUCTORS - WIRE AND CABLE

- A. Branch circuit conductors installed in the building shall be type "MC" cable.
- B. Conductor sizing shown on the Drawings is based on copper. Contractor can substitute aluminum of equal ampacity for all panel feeders and service conductors.
- C. Joints and splices shall be made in a manner equivalent electrically and mechanically to the conductor itself.
- D. Conductors shall be color coded - Phase A: black, Phase B: red, phase C: blue, Neutral: white, Ground: green.
- E. Colors, except colors for conductors No. 4 and larger, shall be factory applied the entire length of the conductors by solid color compound, solid color coating or colored striping or bands, 2 sets 180 degree apart. On-site coloring shall not be done, except color coding by means of paint or tapes is acceptable only for conductors No. 4 and larger.
- F. Voltage rating, manufacturers, type and conductor, AWG size indication shall be continuous, factory applied the entire length for each conductor.
- G. Wire No. 8 AWG and larger shall be stranded. Wires smaller than No. 8 AWG shall be solid.
- H. Minimum wire size is #12 AWG per MSHA standard.

## 2.7 WIRING DEVICES

- A. Switches, receptacles and other utilization devices shall be specification grade back and side wired, grounding type. Color by Architect.
- B. Receptacles and switches shall have a grounding pole and grounding terminal, which shall be connected to the outlet box with grounding conductor to establish grounding continuity.
- C. Verify mounting height of devices prior to roughing.

## 2.8 WIRING DEVICE PLATES

- A. Provide device plates for devices, switches, receptacles, and miscellaneous outlets.
- B. Plates shall be plastic to match the installed device. Color by Architect.

## 2.9 PULL BOXES AND JUNCTION BOXES

- A. Pull boxes of code gauge galvanized steel with screw covers to match, shall be as required and shall be as shown on Contract Drawings.
- B. Conductors passing through pull boxes shall be identified to indicate their origin and termination.

## 2.10 NAMEPLATES

- A. Provide nameplates for panelboards, motor disconnect switches, and motor starters designating equipment controlled and function.
- B. Nameplates shall be laminated plastic with engraved white letters. Letters shall be 1/4 inches high. Nameplates shall have identifying color background for each system.

## 2.11 OUTLETS

- A. Outlets shall be centered in panels and spaces provided therefore. If any discrepancy is found to exist between outlets as shown on Electrical Drawings and Architectural Drawings notify Architect to have location verified prior to installation.
- B. Verify power wiring with equipment wiring diagrams before wiring equipment. Disconnects and starters shall have nameplates indicating the loads they control.

## 2.12 LIGHTING FIXTURES AND LAMPS

- A. Fixtures shall be by the manufacturers specified or as otherwise determined by the Architect.
- B. Energy Saving Ballasts for fluorescent fixtures shall be Class P: high power factor; Ballast Factor = 1.0 shall incorporate UL listed automatic resetting protection: shall be classified for quiet operation, "A" sound rating: shall be designed for a nominal 120 volt system as shown.
- C. Energy saving lamps of wattage, type and color indicated shall be furnished and installed in necessary quantity to completely lamp every fixture. Incandescent lamps installed in permanent lighting fixtures and used for lighting during construction shall be replaced on or just after the date of substantial completion.
- D. Fixtures shall be complete with all accessories such as close nipples, extension couplings, connecting straps, screws, locknuts, hickies, plaster rings, to provide complete fixture installation for use with any type of standard outlet or switch box. Special fittings required to support fixtures shall be supplied as well as wood, or metal supports or grounds to support surface or pendant mounted fixtures.

## 2.13 FIRE ALARM SYSTEM

- A. The fire alarm system shall consist of the fire alarm control panel, pull stations, horns and strobes, strobes only (ADA), smoke detectors, heat detectors. Furnish and install wire, cables, conduit and conduit fittings, wiring and wiring devices, junction boxes and outlet boxes, fire alarm boxes, fire detectors and control equipment and accessories indicated or specified herein for a complete fire detection installation. System shall be Notifier or equal.
- B. The system shall be fully addressable, fully supervised fire alarm installed according to the drawings and specifications and in accordance with NFPA Codes 72 and local codes and the Portland Fire Department. Material shall be new, except as noted, first quality and the best of each class specified. Work shall be executed in a workmanlike manner and shall present a neat appearance when completed. Equipment shall be installed in accordance with the recommendations of the manufacturer and best standard practice for this type of work.
- C. Require the manufacturer of the equipment to include the battery calculations for standby batteries. The furnishing of complete installation Drawings and Riser Diagram and connection diagrams and catalog cuts of components shall also be required of the manufacturer by this contractor.

- D. Provide the services of the manufacturer of the equipment to supervise the installation, to adjust and test the system, to assure a complete and fully operative facility in accordance with the Specifications and to instruct designated personnel in the operation, adjustment, testing and maintenance of the system.
- E. Notify the Architect, Owner and Portland Fire Department when the system is ready for final approval tests. The system shall be considered ready for such testing only after all necessary preliminary tests have been made and all deficiencies found have been corrected to the satisfaction of the equipment manufacturer's technical representative. Two copies of the test report shall be submitted to the Owner.
- F. Furnish and install a complete 24VDC closed circuit, electrically supervised, zone annunciated fire alarm system as specified herein and indicated on the drawings. The system shall include but not be limited to all control equipment, power supplies, signal initiating devices, audible and visual alarm devices, conduit, wire, fittings and other accessories required to provide a complete and operable system. The system shall operate as a non-coded, continuous sounding system.
- G. Provide and install required equipment and accessories necessary for the proper operation of the system.
- H. Fire system equipment shall be labeled with the manufacturer's name and logo to assure the integration of the complete system.
- I. Wiring for the fire alarm system shall be subject to the same restriction as herein before specified for light and power circuitry. (NEC Article 760) Raceways containing conductors shall not contain any other conductors and no A.C. carrying conductors will be allowed in the same raceway with the D.C. fire alarm detection and signaling conductors. Plenum rated fire alarm cable may be used if allowed by the authority having jurisdiction.
- J. Equipment shall be listed by Underwriters Laboratories, Inc. or approved by Factory Mutual or as accepted by the authority having jurisdiction. The catalog numbers specified are those of Notifier Fire Alarm Systems. The fire alarm system in its entirety shall be in compliance with all applicable fire and electrical codes and comply with the requirements of the local authority having jurisdiction over said systems.
- K. General requirements as follows:
  - 1. A riser diagram of the complete fire alarm system extension, (Typical riser diagrams are not acceptable).
  - 2. A complete point-to-point installation diagram for the extension. (Typical wiring diagrams are not acceptable).
  - 3. A complete list of current drain requirements during normal supervisory, trouble and alarm condition.
  - 4. Battery standby calculations showing total standby power required to meet the specified system requirements.
- L. The operation of any manual station or automatic activation of any smoke detector, or waterflow device shall cause:
  - 1. Fire alarm horns to sound in the building.
  - 2. Evacuation lamps to flash in the building.



3. Automatically shut down fans and/or close doors to prevent the re-circulation of smoke.
  4. Notify the Portland Fire Department via a radio master box.
- M. Each initiating circuit shall be represented in the control panel by an amber trouble LED and a red alarm LED. The LED's for each zone shall be identified on the control panel by custom lettering showing the zone designation. Circuit trouble shall be indicated by the amber LED. Audible trouble and alarm devices shall be supervised. Flashing lights to be supervised.
- N. Each initiating circuit shall be electrically supervised for opens and ground faults in wiring, and for short circuit faults and shall be so arranged that a fault condition in any circuit or groups of circuits will not cause an alarm to be sounded. The occurrence of any fault will light a trouble LED and sound the sonalert but will not interfere with the proper operations of any circuit which does not have a fault condition.
- O. The installer shall coordinate the installation of the fire alarm equipment with the manufacturer. Conductors and wiring shall be installed per the manufacturer's recommendations. It shall be the installer's responsibility to coordinate with the manufacturer the correct wiring procedures in accordance with the latest revisions of the appropriate NFPA pamphlets, the requirements contained herein, National Electrical Code, local and state regulations, the requirements of the fire department and other applicable authorities having jurisdiction (AHJ). Pigtail connections between circuit wires and detector terminals are not acceptable. Devices shall be connected to the circuit line wires.
- P. Guarantee equipment and wiring free from inherent mechanical and electrical defects for a period of one year from date of the final acceptance. Before the installations shall be considered completed and acceptable by the awarding authority, a test on the system shall be performed as follows: The contractor's job foreman, in the presence of a representative of the manufacturer, a representative of the owner, and the fire department shall operate the building annunciator and control panel. One half of all tests shall be performed on battery standby power. Where applying heat would destroy any detector, they may be manually operated. The initiating circuit and the signaling circuits shall be opened in at least two locations per zone to check for the presence of correct supervisory circuitry. When the testing has been completed to the satisfaction of both the contractor's job foreman and the representatives of the manufacturer and owner, a notarized letter co-signed by each attesting to the satisfactory completion of said testing shall be forwarded to the owner and the fire department. The contractor shall leave the fire alarm system in proper working order and without additional expense to the owner, shall replace any defective materials or equipment provided by him under this contract within one year from the date of final acceptance by the awarding authority. Prior to final test, the fire department must be notified within a reasonable time of test date (at least 24 hours). The contractor shall provide the necessary personnel and equipment to conduct the tests outlined above.
- Q. Detection and signaling circuits shall be run separate from all other conductors. Wiring shall be number 14 solid.
- R. Connection within the control equipment and devices shall be made with T and B "stakon" spade terminals. Wiring within the control equipment shall be secured with T and B "tyeraps" and placed in wired gutters.
- S. Part numbers specified are for Notifier. Fire alarm system components shall be as follows:
1. Fire alarm control panel: Notifier NFS-640 addressable panel, supply with all modules and relays for complete operational system. Supply with NFPA required battery back-up and charger located in electrical room. Provide digital alarm communicator transmitter and all associated telephone interface hardware. Shell contractor responsible for complete operational system.

2. System Smoke Detectors: Notifier FSP-751 low profile, intelligent, addressable photoelectric head with B710LP base - Provide quantity as shown on the plans and at least one over the fire alarm control panel and power extender modules for NFPA compliance. Smoke detectors within apartments shall be system connected but shall not trip the building fire alarm system.
3. Manual Pull Stations: Notifier NBG12LX - addressable, dual action, key reset station with integral LED visible from the front of the pull station that blinks when the pull station is addressed by the control panel.
4. Horn/Strobe Alarms: Notifier NS-24-MC-WFR series with adjustable candela settings and adjustable volume taps. Provide synchronized strobes in rooms where more than 2 strobes are visible within the same sightlines, provide Notifier DSM12/24R synchronization modules as required. Provide wire guards for gym horn/strobes. Provide the proper candela strobes for the room sizes as follows:

Room Size	Candela Rating
20' x 20'	15/75 cd
30' x 30'	30/75 cd
40' x 40'	75 cd
50' x 50'	110 cd

Use equivalent ratings for larger rooms per NFPA 72 Code.

5. Strobe Only Alarms: Notifier RSS-24-MC-WFR remote strobes with adjustable candela settings. Provide proper candela for each rooms as outlined above under horn/strobes. Provide wire guards for gym strobes.
6. Duct smoke detectors: Notifier for AHU in attic by manufacturer.
7. Heat detectors: Provide Notifier FST-751 (135 fixed temp) or FSD-751R (combination 135 fixed temp and rate of rise) heat detector heads with B-710LP addressable or HD-604 (200 fixed temp) wired to FMM-101 monitor module.
8. Sprinkler devices: Provide Notifier FMM-101 monitor module for each sprinkler alarm or tamper switch.
9. Control relay modules: Provide Notifier FRM-1 programmable relay modules as required to perform other specified or code required contacts to control other life safety alarm function in the building.
10. Knox Box - #3270 recessed provided and installed by EC. Install where indicated and in accordance with the requirements of the City of Portland Fire Prevention Bureau.
11. Carbon Monoxide Detectors: system connected, addressable.
12. Radio master box per city of Portland standards.

## 2.14 MECHANICAL SYSTEM CONNECTIONS

- A. Connect mechanical equipment as shown on the drawings. Control wiring shall be furnished and installed by the Mechanical Contractor.

## 2.15 TELEPHONE/DATA

- A. Provide and install telephone backboard in voice data 120. Twisted pair cabling inside building and phone/data or phone only jacks where indicated on the drawings. Punch down blocks, etc. for an operational system.
- B. Qty (2) 4" PVC conduit from Voice Data 120 to existing telco room in Maine Nephrology space. Approximately 150'
- C. Qty (2) 4" PVC with 25 pair cable to existing telco dmark in existing electrical closet from Voice data 120 approximately 200'.
- D. Telephone equipment (phones, processors, etc.) by others.
- E. Provide CAT 5E cable, jacks, plates, terminations and testing for complete operational system. All cables shall be run to Voice Data 120. Not to exceed 300 feet.

## 2.16 CABLE TELEVISION

- A. Provide and install RG5 cabling, jacks and plates inside building where indicated on drawings. Back to Voice Data 120. Cabling shall terminate on telephone backboard in Voice Data 120.
- B. 4" PVC and qty (2) RG5 cables from existing electrical room to Voice data 120 approximately 200'.

## 2.17 ENCLOSED DISCONNECTS

- A. Disconnect Switches:
  - 1. Acceptable Manufacturers
    - a. Square D
    - b. Westinghouse
    - c. Eaton (CH)
    - d. General Electric
  - 2. Fusible Switch Assemblies: NEMA KS 1; Type HD; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: Designed to accommodate Class R or J fuses as applicable.
  - 3. Non-Fusible Switch Assemblies: NEMA KS 1; Type HD; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.
  - 4. Enclosures: NEMA KS 1; as indicated on Drawings. Provide labels for all disconnects describing loads served. Provide Arc Flash labels in accordance with NFPA 70, Article 110.

- B. Fuses:
  - 1. Manufacturers:
    - a. Buss
    - b. Chase Shawmut
    - c. Cooper
  - 2. Fuses 600 Amperes and Less: ANSI/UL 198C, Class J; ANSI/UL 198E, Class RK1; RK5; dual element, current limiting, time delay, one-time fuse, 250 or 600 volt as indicated or required.
  - 3. Interrupting Rating: 200,000 rms amperes.
  - 4. Provide spare fuses as indicated.

## 2.18 MOTOR STARTERS

- A. Combination Reduced-Voltage Solid-State Controller: Factory-assembled combination of reduced-voltage solid-state controller, OCPD, and disconnecting means.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
    - b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
    - c. Rockwell Automation, Inc.; Allen-Bradley brand.
    - d. Siemens Energy & Automation, Inc.
    - e. Square D; a brand of Schneider Electric.
- B. Enclosures:
  - 1. Enclosed Controllers: NEMA ICS 6, to comply with environmental conditions at installed location.
    - a. Dry and Clean Indoor Locations: Type 1.
    - b. Outdoor Locations: Type 3R.
    - c. Kitchen Areas: Type 4X.
    - d. Other Wet or Damp Indoor Locations: Type 4.
- C. Accessories: as indicated
  - 1. General Requirements for Control Circuit and Pilot Devices: NEMA ICS 5; factory installed in controller enclosure cover unless otherwise indicated.
    - a. Push Buttons, Pilot Lights, and Selector Switches: Heavy-duty type.
      - 1) Push Buttons: Recessed type; maintained as indicated.
      - 2) Pilot Lights: LED type; colors as indicated.
      - 3) Selector Switches: Rotary type.
    - b. Elapsed Time Meters: Heavy duty with digital readout in hours; non-resettable.
    - c. Meters: Panel type, 2 ½" minimum size with 90- or 120-degree scale and plus or minus two percent accuracy. Where indicated, provide selector switches with an off position.
  - 2. Reversible N.C./N.O. auxiliary contact(s).

3. Control Relays: Auxiliary and adjustable solid-state time-delay relays.
4. Phase-Failure, Phase-Reversal, and Under-voltage and Overvoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connections. Provide adjustable under-voltage, overvoltage, and time-delay settings.
5. Cover gaskets for Type 1 enclosures.

### PART 3 EXECUTION

#### 3.1 LICENSE

- A. Electrical work shall be installed by persons duly licensed by the Electricians Board of the State of Maine.

#### 3.2 COORDINATION

- A. It shall be the responsibility of this contractor to coordinate his work with other trades to insure that his work is terminated in a satisfactory manner.

#### 3.3 WORKMANSHIP AND PREPARATION

- A. Work shall be executed in a workmanlike manner by experienced electricians in accordance with the most modern engineering practice and shall present a neat appearance when completed. The work shall be carefully laid out in advance and where cutting, channeling, chasing, or drilling of floors, walls, partitions, and ceiling or other surfaces is necessary for the proper installation, support or anchorage of the conduit, raceways or other electrical work, this work shall be carefully done and any damage to the building, piping or equipment shall be repaired by skilled mechanics of the trades involved and at no additional cost to the Owner.
- B. After installation, electrical equipment shall be protected to prevent damage during the construction period. Openings in conduits and boxes shall be closed to prevent entrance of foreign materials. The interior of boxes and cabinets shall be left clean, exposed surfaces shall be cleaned and plated surfaces polished.

#### 3.4 OBTAINING INFORMATION

- A. Obtain information from the manufacturers of the apparatus which is to be provided for the proper methods of installation. Also obtain information from the General Contractor and other Sub-Contractor which may be necessary to facilitate work and the completion of the whole project.

#### 3.5 GIVING INFORMATION

- A. The Contractor shall keep himself fully informed as to the shape, size and position of openings and foundations required for his apparatus and shall give full information to the General Contractor sufficiently in advance of the work so that such openings and foundation may be built in advance. Also furnish supports herein specified so the General Contractor may build same in place. In the case of a failure on the part of the Contractor to give proper information as noted above, he shall assume the cost of having the work done.

#### 3.6 RACEWAYS

- A. Raceways, where applicable, shall be supported and secured at intervals of not more than 10 ft. with minimum of two supports shall be provided if required. Tie wire or perforated metal straps shall not be used to support or secure raceways or other equipment. Electric

metallic tubing shall be supported within 18" of each coupling or connector. In finished areas, furnish and install escutcheons for exposed conduit passing through or entering finished floors or walls.

- B. Expansion coupling shall be provided in each raceway crossing building expansion joint and when length of raceway requires expansion coupling, expansion coupling shall have a total minimum expansion of 4" and shall have a flexible bonding conductor. Setting of expansion coupling shall be a function of the temperature at the time of installation. Flexible couplings shall be provided where required.
- C. Raceways shall have runs installed parallel or perpendicular to walls, structural members or intersections of vertical planes and ceilings. Field-made bends and offsets shall be avoided where possible, but where necessary, shall be made within an approved hickey or conduit bending machine. Crushed or deformed raceways shall not be installed. Trapped raceways shall be avoided. Care shall be taken to prevent the lodgement of plaster, dirt or trash in raceway boxes, fittings and equipment during the construction. Clogged raceways shall be entirely free of obstructions or shall be replaced. Wooden plugs inserted in concrete or masonry are not acceptable as a base for raceway fastenings nor shall raceways or pipe straps be welded to steel structures. Raceways shall be secured by pipe straps or shall be supported by wall brackets, strap hangers or ceiling trapeze fastened by wood screws on wood, toggle bolts on hollow units, expansion bolts on concrete or brick and machine screws or welded studs on steel work.

### 3.7 OUTLETS

- A. Each outlet in the wiring or raceway systems shall be provided with an outlet box to suit the conditions encountered. Each box shall have sufficient volume to accommodate the number of conductors entering the box in accordance with the requirements of the National Electrical Code. Boxes shall not be less than 1-1/2" deep unless shallower boxes are required by structural conditions and are specifically approved.
- B. Ceiling and bracket outlet boxes shall be not less than 4" except that smaller boxes may be used where required by the particular fixture to be installed. Boxes shall be installed in a rigid and satisfactory manner and shall be fastened directly with wood screws on wood, bolts and expansion shield on concrete or brick, toggle bolts on hollow masonry units and machine screws or welded threaded studs on steel work.

### 3.8 FIXTURES

- A. Incandescent and fluorescent fixtures shall be supported by building structural elements independent of furred or suspended ceilings.
- B. Subsequent to review of shop drawings and prior to ordering fixtures, verify voltage at each fixture, also consult with others to determine the type of ceiling and ceiling suspension system in each and every room and order fixtures to suit and fit the particular ceiling and ceiling suspension system. Any extra costs because of failure on the part of this Contractor to verify voltage or ceiling requirements shall be paid for by this Contractor. It is not the intent of fixture catalog numbers shown to classify the voltage, ceiling or ceiling suspension.

### 3.9 WIRING DEVICES

- A. Switches and convenience outlets shall have a rating as indicated on the drawings. Light switches shall be silent type. Outlets connected to exposed conduits shall be installed in a surface mounted, conduit device box, 4-1/2" long by 2-1/8" wide and with a suitable cover for the device to be installed (box shall be galvanized). Plates on finished walls and on boxes connected to concealed cable and conduits shall be as noted in the specifications.

### 3.10 INTENT OF DRAWINGS

- A. It is not intended that the drawings show in detail every conduit, junction box, etc., but material necessary to complete the electrical system in accordance with the best practices of the trade and to the complete satisfaction of the Architect, shall be furnished without additional recompense under this section of the specifications. No deviation from the layout shall be made without written approval from the Architect.

### 3.11 RECORD DRAWINGS

- A. During the progress of the work, keep a set of drawings marked up to record deviations and changes from the Contract Drawings due to field conditions, change orders, amendments, revisions, addenda and other reasons to represent an accurate record of all work as actually installed. Include an accurate layout of all in-slab, under-slab, and buried conduits.
- B. Deviations from the Contract Documents shall be approved by the Architect before installation.
- C. At the completion of the work, furnish to the Architect a complete set of prints of the original Contract Drawings on polyester film, corrected in a neat manner to reflect all the above changes and representing an accurate record of all work as actually installed.
- D. The record drawings shall be submitted to the Architect for approval and corrected as deemed necessary.
- E. After approval, the record drawings shall become the property of the Owner.

### 3.12 INSTRUCTIONS, OPERATION AND MAINTENANCE DATA

- A. At the completion of the work, turn over to the Owner, one (1) set of operating and maintenance instructions of equipment and systems. Submit name and address of nearest available source of repair service and replacement equipment and parts to the Owner and Architect. Explain and demonstrate the operation of the fire alarm system and the apartment intercom/security system to the Owner's representative. The manufacturer's field technician shall be present at this demonstration.
- B. Arrange data in complete sets, properly indexed and marked.
- C. Data shall include a complete set of shop drawings.
- D. Material shall first be submitted in preliminary form for review by the Architect. After review, submit two (2) copies in bound volumes to the Architect for distribution.

**\*\*END OF SECTION\*\***