

Part II
Division 26
Electrical

SECTION 26 00 00

ELECTRICAL

1 PART 1 GENERAL

1.1 GENERAL PROVISIONS

- A. Contractor shall visit the site and examine the prevailing conditions under which work must be performed. Commencement of work will be construed as complete acceptance of existing conditions and preparatory work done under other Sections. Additional work caused by unfamiliarity with site conditions shall be executed at no cost to the Owner.
- B. Contractor shall verify all measurements and dimensions necessary for his work and their accuracy will be his responsibility.

1.2 DESCRIPTION OF WORK

- A. This is a design build project. The contractor shall hire Registered Professional engineer (Maine State registration required) to prepare drawings and calculations for the owner's approval. Engineer will provide \$1,000,000.00 liability insurance. The engineer shall provide during the construction two-site visits and submit report. The engineer will also provide a final punch list and report. The engineer shall also provide all the site visits required by the inspection agencies and the building department. At the end of project a set of as build drawings shall be provided. All drawings shall be prepared on ACAD 2004 or higher version. The work covered in this section of the specifications consists of furnishing all labor, equipment, appliances and material and in performing all operations in connection with this Electrical System, complete, in strict accordance with this Section of the specifications and without limiting the generality thereof includes:

1. General Requirements:

- a) The intention is to provide all scope materials and work by the design built contractor.
- b) If any contradiction, ambiguity, error, inconsistency, omission or incomplete system appears in or between any contract documents, the contractor shall before submitting the final bid and signing the contract for construction, notify the architect and request a written resolution as to which methods or materials will be required. If the contractor fails to make a request for interpretation or resolution, no excuse will be accepted for failure to carry out the work in a

satisfactory manner, as interpreted by the architect. This generally means the use of the highest quality material, most expensive way of performing the work and providing complete functioning system for proper operation.

- c) Each and every trade or subcontractor will be deemed to have familiarized themselves with all the contract documents of this projects, including architectural, structural, mechanical, electrical, and site work, and to have visited the site, so as to avoid error, omissions and misinterpretations. Related information may be provided on contract documents other than those associated with the subcontractor's trade. The contractor is responsible for coordinating related work of all the contract documents. No additional compensation will be authorized for alleged errors, omissions or misinterpretations whether they are a result of failure to observe this requirement or not.
- d) All penetrations of assemblies exposed to the exterior environment shall be sealed with foam sealant or equivalent sealer to provide zero air infiltration. Coordinate with fire stopping requirements.
- e) No component of any system shall run through the stair enclosure that does not relate to or serve the stair enclosure.
- f) Refer to architectural drawings for type and location of all fire rated walls. Any penetration through wall bottom or top plates shall be Fire Stopped. Any penetration the fire rated wall shall be Fire Caulked. Refer to section 7250 for procedure.
- g) Without limitation pay attention to the following items:
 - a. Chases behind bathroom (wall between corridor and bathroom) and walls between units are fire rated. Fire Caulk all penetration.
 - b. Top and bottom wall plates at ceiling and at floor are part of fire separation. Fire Stop all penetrations through plates.

B. ELECTRIC SERVICE

- 1. Coordinate with utility Company for the manner of bringing service to building. See Utility plans for location. Provide all necessary Primary and Secondary work and utility vault as required by utility company.

C. BASE BID:

- 1. Base Bid: Existing 2000A frame electric service shall be utilized to serve Residential and Commercial spaces. Verify incoming service capacity and upgrade service if required to 1800A. Disconnect and

remove existing switchgear and install new to accommodate metering for residential spaces and commercial spaces. Subject to approval of utility company and other authorities existing switchgear may be modified by providing meter banks on the floors. Remove all wiring to accommodate the new design for the building. Provide new panel to accommodate new circuits as required.

2. Inside the apartments remove all electric baseboard heat.
3. Rewire each apartment as follows: Provide load center in each apartment, provide wiring as follows (1) circuit for refrigerator, (2) circuit for the kitchen, (1) circuit for the dining area and (2) circuit for the living room and (1) circuit for each bed room.
4. Provide new addressable/voice evacuation type fire alarm for the entire building.
5. Provide telephone and cable TV and Data outlets in each living room and bedroom. Provide low voltage distribution box in each unit and provide radial distribution.
6. Wire all mechanical equipment. Coordinate with mechanical contractor.

C. WIRING REQUIREMENTS

- A. Review Mechanical Performance Specifications for the Scope of Mechanical Equipment wiring.
- B. Additional scope will minimum include the following equipment's to be wired in each space

D. APARTMENTS

- (1) 20/1 for each Refrigerator.
- (1) 20/1 for each Microwave.
- (2) 20/1 for above Counter outlets.
- (1) 20/1 for Dishwasher
- (1) 20/1 for Disposal
- (1) 50/2 for each Electric Range
- (1) 20/1 for Dining Room/ Breakfast room
- (1) 20/1 for each Bathroom GFI
- (1) 15/1 for living room,
- (1) 15/1 for each bedroom receptacles/lights
- (1) 15/1 for Lighting circuit

Provide AFI breakers as required by NEC.

Provide complete wiring for all apartments per NEC 70 and lighting as shown on architectural plans. All wiring within the units shall be Romex, feeders from the floor meterbank to apartment load centers shall be Aluminum cable per NEC. Any wire that originates or terminates in another floor will be minimum type MC. All common area wiring and commercial space wiring shall be MC where concealed and EMT where exposed.

For lighting within units provide

- Entry light with switch
- Kitchen light with switch, (4) down, (2) pendant, (6) undercounter lights with separate switching
- Dining room light with switch,
- Hallway light with switch, one light per every 12ft of hallway
- Vanity and ceiling light with switch and ceiling fan with timer switch, shower light with switch
- Closet light with switch for every closet
- Switched outlet in every bedroom,
- Switched S3 outlet in living room,

E. CORRIDORS AND STAIRS

- Outlets at every 30ft.,
- Unit entry lights,
- Ceiling lights on separate circuit, controlled by time clock, fixtures spaced 10ft on center max.
- Emergency lights per code, no more than 20ft on center and in every enclosed space plus exterior exit ways.
- Exit signs per code,
- Fire detection and alarm system per code and per FD requirements.
- In stairs two wall light and three ceiling light per floor per stair on two circuits.

F. LIGHTING (TO BE REVIEWED)

Provide fireproof enclosures for all recessed lights installed in rated ceilings.

Light fixtures shall be

Fixture Type	Manufacturer	Catalog#	Lamps	Volt	Mtg.
FR1 Reces. (Unit Showers)	Progress Ltg	P85-FB+P8367WL-28	(1)50PAR30	120	
FR2	Progress Ltg	P85-FB+P8168-28	(1)50PAR30	120	

	Reces. (Unit Bathroom)				
FR3	Progress Ltg	P85-FB+P8168-28	(1)50PAR30	120	
	Reces. (Unit Entry/ Hall)				
FR4	Prescolite	LF8CFH26EB8CFH1	(1)26TTCFL	120	
	Reces. (Under Canopy at entrance, Lobby and common corridors)				
FR5	Prescolite	LF8CFH26EBEM8CFH1	(1)26TTCFL	120	
	Reces. (Common Area Corridors)				
FR6	Columbia	4522-217G-SP-33-E120-EL	(2)F017/T8/835	120	
	Reces. (Office Area)				
FS1	Progress Ltg	P3408-09	(1)60W	120	
	Surface (Unit Laundry closet)				
FS2	Progress Ltg	P7137-30STR	(2)F17T8/835	120	
	Surface (Unit closet)				
FS3	Columbia	88C54-232-3120	(1)F032/T8	120	
	Surface (Mech/Elec. Rooms)				
FS4	Columbia	CS4-232-E120-EL	(2)F032/T8	120	
	Surface (Elevator Mach. Room)				
FS5	Columbia	47S4-232-E-120	(2)F032/T8	120	
	Surface (Parking Level, Storage)				
FS6	Columbia	47S4-232-E(EM-Emerg.)	(2)F032/T8	120	
	Surface (Parking Level, Storage)				
FW1	Restoration Hardware	6803.0072B2R	(1)60W	120	Wall
	(Unit Bathrooms)				

FW2	Progress Ltg	P5645	(1)100WA19	120	Wall
(On the Deck)					
FW3	Rab Ltg	VXBR100P-W-3/4	(1)60WA19	120	Wall
(Elevator pit)					
FW4	Progress Ltg	P7169-57EBWB	(1)26WQuad	120	Wall
(Corridor and Stairwell)					
FW5	Lumark	MH -1P-S-52-120E-PE120	(1)100WA19	120	Wall
(Exterior wall sconce)					
MS1	Devine Ltg	RBF-S-100MH-MED	(1)100WMH	120	
Floor					
(At Courtyard)					
UC	Juno	TL202	(2)T3 3/4	120	
Surface					
(In Kitchen)					
EB	Dual Lite	LZ2	(2) {(2)6V 5W}	120	
Wall					
(Interior)					
			MR16Hal		
EB2	Cooper-Sure-Lites	UEL1-*-SD	(2) {(2)12V 12W}	120	
Wall					
(Parking Level-Cold weather rated)					
			MR16Hal		
Exit S.	Dual Lite	LEDSUEMRWW	Led	120	
Wall					
Clg.					
Exit S(2)	Dual Lite	SC*.*XTR	Led	120	
Wall					
Clg.					
(Parking Level-Cold weather rated)					

G. LIFE SAFETY SYSTEMS

1. Provide emergency lighting and exit signs (With Battery) throughout common areas and within the office floor. Criteria will be that an Exit Sign at each Exit Door located such that at the egress path at any point at least one exit sign is visible.
2. Emergency Lighting shall be provided so that the entire egress path is illuminated with min of 1fc.

Provide Fire Detection and Alarm System for the Building.

System shall be Analog Addressable, Voice Evacuation type Class "A" Panel with the following devices.

- Pull Stations at every Exit door.
- Smoke Detectors in all spaces, bedrooms, corridors and in office space
- Smoke/Heat Detection System for Elevator Recall/Shunt trip operation
- Horn/Strobe devices as required meeting "ADA" and NFPA 72.
- Mini horns within bedrooms.
- Provide CO detection system for all residential areas.
- Sprinkler Flow/Tamper Switch wiring.
- Top of the elevator shaft Smoke Detector and damper interlock.
- System shall be tied to Fire Department as required by Fire Department.
- FACP shall be located in the mechanical room with remote annunciator panel at the entrance.
- Provide Red Beacon and Knox Box as required.
- Included in the scope to have UL Listed Company testing for Certification.
- Contractor shall be responsible to coordinate and obtain approvals from Local Fire Department for the system design and installation

Fire Alarm System shall be in compliance with IBC 2003, NFPA 101-2006 and NFPA 72

H. GENERAL REQUIREMENTS SPECIFIC TO PROJECT

1. Provide power for all mechanical equipments including boiler room, garage ventilation systems and life safety systems. Some major items listed below.

- Elevator in each building,
- Corridor Ventilation Units in each building,
- Unit heaters scattered around building per MEP specifications,

2. Exterior Lighting

Provide total of (16) sixteen bollards at the courtyard as per landscape

drawings wired on two circuits controlled via contactor and tc.
Provide power to sidewalk light fixtures as per city of Portland requirements.
Provide exit and entry lights at exterior on building controlled by PC.
Provide exterior emergency lighting per code.

3. Provide sealed type outlet boxes at perimeter walls.
4. Wiring of all electric heats as listed in mechanical specifications.

5. in commercial spaces, provide

- Exit signs, emergency lighting at egress doors
- Fire alarm pull station and A/V devices per code and as required by FD.
- Full panel installed.
- A/C units wired to space panels,
- Exterior outlets one per space.

6. In common areas and offices maximum 6 outlet shall be on a 20A/1p circuit. Provide dedicated circuits for other appliances as required.

I. TELEPHONE/CATV SYSTEM

- 1) Provide Tel/Catv Service into building from street. Coordinate with utility company for service local Provide Telephone and CATV services and distribution using Cat 6 and Coax cables. Service from the street will enter into main Tel/Catv room and distributed to each building. Provide sub-main Tel/Catv closet in each building with (4)4" conduits to main tel/catv room. Each apartment will have a tel/catv pre-manufactured distribution center with necessary splitters to serve each device within the unit. Superior Modular Products or approved equal with hinged door. Provide (2)4pair cat6 for telephone, (2) RG6 for cable and (1)3/4" emt w/pull for future fiber.

J. COMPUTER WIRING

- 1) Computer system wiring at offices room. Scope of work for computer system wiring is limited to installing CAT 6 wires for each office.

K. LIGHTING SYSTEM

- 1) Provide lighting as described above and as required by code. All light fixtures shall be as approved for "Energy Star"

L. INTERCOM SYSTEM

- 1) Provide no-subscriber type telephone entry system for each building.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. The following work is performed under other sections.

1. Payment for all energy for temporary light and power.
2. Access panels.
3. Finish painting.
4. All automatic temperature control wiring.

1.4 CODES, STANDARDS AND REGULATIONS

A. Unless otherwise specified all materials and work shall conform to the latest edition of the following standards, codes, Specifications, ordinances and regulations.

- State Of Main Electrical Code.
- Underwriter's Laboratories, Inc. (UL).
- Occupational Safety and Health Act (OSHA).
- "Energy Star Homes" Technical Standards (requires air tight Electrical Boxes)

1.5 GUARANTEE AND WARRANTIES

A. Guarantee work in writing for a period of one year from the date of final notice of Acceptance. Submit guarantee to Architect before final payment. If any defects in materials or workmanship or installation of equipment occurs within this period, they shall be corrected promptly and to Architect's satisfaction at no cost to the Owner.

1.6 SUBMITTALS AND SHOP DRAWINGS

A. Before ordering any material, submit to the Architect for his approval eight sets of each product data giving all details, dimensions, etc. of the following:

- Switchboard, panelboards.
- Lighting fixtures and accessories.
- Disconnect switches, safety switches, and fuses.
- Circuit breakers.

- Starters, contactors.
- Wiring devices, switches, receptacles, and plates.
- Time clocks, photocells.
- Fire Alarm System

1.7 RECORD DRAWINGS

- A. Provide "As-Built" drawings.

1.8 TEMPORARY LIGHT AND POWER

- A. This Contractor shall provide temporary power and lighting for construction. Temporary power will be based on 1/4 W/Sq. Ft. and shall be minimum of 100A, single-phase system. Layout shall be per MEC 02 and OSHA requirements.

1.9 IDENTIFICATION

- A. All equipment furnished shall be marked for identification as required by NEC.

1.10 PROTECTION AND CLEANUP

- A. This Contractor shall be responsibility for the maintenance and protection of all material and equipment furnished under this section from loss, damage and deterioration.
- B. After installation all equipment, fixtures, devices supplied under this section shall be cleaned by this Contractor and damaged spots shall be touched up to the satisfaction of Architect.
- C. All the completion of work removed all rubbish, surplus materials, and debris from the site and leave the premises in a clean condition. Upon failure of this Contractor to fulfill his obligation, this work will be taken care of at his expense.

2 PART 2 MATERIALS AND PRODUCTS

2.1 MATERIALS

- A. The materials used on all systems shall be new and of the same manufacturer for any particular classifications. Such as all panels will be of one manufacturer.
- B. Where materials, equipment and devices are specified by manufacturer and catalog number they are meant to set standards of performance, quality, type and style. Other manufacturers with equal quality may be

considered upon request with the approval of Architect.

- C. Material and products shall be UL listed wherever such listed products are available. All equipment shall be listed or labeled for intended use.

2.2 RACEWAYS AND FITTINGS

A. Electrical Metallic Tubing

1. Electrical metallic tubing shall be hot dipped galvanized steel.
2. Tubing smaller than 3/4 inch or larger than 4 inch electrical trade size shall not be used.
3. All connectors shall be set screw type.
4. Electrical metallic tubing shall be used where wiring is installed exposed for all main feeders to panels.

B. Flexible Metal Conduit (Greenfield)

1. Flexible metal conduit shall be galvanized, spiral wrapped metallic conduit.
2. Conduit smaller than 3/4 inch electrical trade size shall not be used.
3. Flexible metallic conduit may be used for whips to recessed lighting fixtures only and shall contain insulated grounding conductor.

C. Liquid-Tight Flexible Conduit

1. Liquid-tight flexible metal conduit shall be hot dipped galvanized spiral wrapped steel metallic conduit having an outer liquid-tight, non-metallic, sunlight resistant jacket.
2. Conduit smaller than 3/4 inch or larger than 4 inch electrical trade size shall not be used.
3. All cut ends shall be trimmed inside and outside to remove rough edges.

D. Connectors, Couplings and Fittings

1. Wire connectors for branch circuit wiring shall be of the pressure type.
2. All connectors for wires, sizes #8 AWG and larger shall be of the split-bolt type as manufactured by Burndy or approved equal.
3. All fire penetrations shall be sealed off with heat-activated material for fire rating at least equal or higher than of fire rated floor or wall as manufactured by O.Z/Gedney or approved equal.

2.3 OUTLET BOXES, JUNCTION AND PULL BOXES

- A. Furnish and install all required outlet boxes to suit the conditions encountered. Concealed boxes shall be galvanized sheet metal type as manufactured by Appleton, Raco or approved equal.
- B. Provide junction boxes and pull boxes as the field conditions require.
- C. All boxes mounted on exterior walls shall be air-tight as manufactured by R&S Enviro product Limited, Enviroseal or equal.

2.4 CONDUCTORS AND CABLE

- A. Minimum conductor size shall be No. 14 AWG copper.
- B. Metal Clad cable shall be type "MC".
- C. Type THHN for dry locations, Type THWN or XHHW for wet locations shall be used.
- D. All conductors shall be continuous from outlet to outlet.

2.5 WIRING METHODS

- A. All exposed wiring shall be in EMT, feeders "MC".
- B. All common area wiring shall be Type "MC". Apartments "RX"
- C. For surface mount panel applications, all termination at the panels shall be via minimum 1" EMT between a wire trough in ceiling and panel. Do not enter panel with individual circuits.
- D. All low voltage wiring in return air plenums shall be Teflon coated.
- E. For all motors located outdoors, connections shall be via water tight/oil-tight flexible conduit.
- F. All exposed raceways shall be painted as directed by the Architect.
- G. For all the spaces that have Architectural importance, this contractor shall coordinate the installation of surface raceways with the Architect prior to roughing-in. Provide one line diagram showing the routing and size of all exposed raceways for Architect's approval. Architect has right to change any raceway routing for Architectural reasons at no change to original contract price. No exposed work shall be executed prior to Architect's approval.
- H. No receptacle or wall fixture or any electrical box shall be installed back to

back unless as directed by the Architect. On fire rated walls, outlets located on either side of the wall shall be separated by a horizontal distance of 24 inches.

- I. All conductors flexible or in conduit shall run parallel to structural members. They shall run in a raceway fashion together and split to destination. Crossing across the structure members is not acceptable.
- J. All conduits shall be installed as high as possible to the ceiling in strict coordination with other disciplines. Obstructions limited in number will not set the criteria for conduit heights except beams, which repeat themselves in periodic intervals.

2.6 CONDUIT AND CABLE SUPPORTS

- A. All conduits, cables and fittings are to be secured in accordance with the NEC requirements.

2.7 WIRING DEVICES

- A. All wiring devices shall be of same manufacturer. Catalog numbers of Leviton are specified to establish standards of quality for materials and performance appearance shall match model unit in sales center.
- B. Receptacles (Commercial Grade)
20A duplex grounding type
NEMA 5-20R
Residential Grade within Apartments / Bedrooms (Tamper Proof)
Receptacles (Residential Grade)
15A duplex grounding type
NEMA 5-
Within units all outlets shall be Tamper Proof type,
- C. Lighting switches (Commercial Grade)
-20A, 120-277V AC single pole

-20A, 120-277V AC three-way

-20A, 120-277V AC four-way

Residential grade within units.

Lighting switches (Residential Grade)
15A, 120-277V AC single pole
15A, 120-277V AC three-way

15A, 120-277V AC four-way

D. Ground fault receptacles with indicator light.

-15A duplex grounding type
NEMA 5-15R,

E. Cover plates shall be nylon.

2.8 FUSES

A. All fuses shall be high-interrupting capacity, current limiting type as manufactured by Bussman, Reliance or approved equal.

B. Obtain recommended fuse rating data from equipment suppliers. Revise switch sizes to accommodate fuse valves as recommended by supplier. Submit changes to Architect for approval.

C. All fuses that serve motors, transformers shall be current limiting dual element type.

2.9 PANELBOARDS

A. Furnish and install circuit breaker panelboards as specified. Panelboards shall be equipped with thermal-magnetic molded case circuit breakers.

B. Cabinets shall be as specified in UL Standard SD. Wiring gutter space shall be in accordance with UL Standard 67 for panelboards. Panelboards shall be listed by Underwriter's Laboratories and bear the UL label. When required, panelboards shall be suitable for use as service equipment.

2.10 FIRE ALARM SYSTEM

A. Provide an analog/addressable-voice evacuation type with floor-by-floor speaker zones fire detection, alarm and control system with general audio/visual evacuation signaling. The system shall interface to related building system to conduct monitoring and control functions as described herein.

B. The system shall have full analog sensing capabilities; will be able to identify the exact location of every sensor and monitored device in the system, and shall operate as described elsewhere in these specifications.

C. Provide equipment by one of the following manufacturers:

1. Simplex.
2. Gamewell.
3. FCI.

- D. Standby batteries shall support the system. In the event of a loss of primary power, batteries shall support 60 hours of full supervisory operation, followed by a 10 minute of alarm.
- E. The Fire Alarm Control Panel (FACP) shall provide the overall system monitoring, testing, display, reporting and fire fighting controls to override automatic actions.
- F. Circuiting Guidelines. Each manual or automatic detection device or circuit shall be individually addressable. Circuit wiring shall be as follows:
 - 1. Addressable monitor modules shall be used for waterflow, tamper or any other status indications from related sub-systems.
 - 2. Addressable-loop wiring shall allow for 25% spare capacity for future additions.
 - 3. Addressable control modules shall provide auxiliary control functions.
 - 4. Audible circuits shall be addressable at 2 circuits per floor (minimum) with a minimum of 25% spare capacity.
 - 5. ADA strobe circuits shall operate all strobes shown plus 25% spare capacity.
 - 6. Audible and visual signals shall be on separate circuits to allow silencing of the audible signals while maintaining an active visual signal.

2.11 SEQUENCE OF OPERATION

- A. The operation of a manual station or activation of any automatic alarm initiating device shall automatically:
 - 1. Sound all audible devices throughout the building.
 - 2. Flash all visual signals throughout the building.
 - 3. Flash a red alarms LED and sounds an audible signal at the FACP. Upon knowledge, the alarm LED shall light steadily and the audible shall silence.
 - 4. Recall elevator that serve the floor of initialization to the ground floor. If the alarm initiates on the ground floor, return the elevator to the floor above or as directed by the local authority having jurisdiction.
 - 5. Visually indicate the addressable device or the circuit of alarm initiation via the 80-character LCD display at the FACP and any corresponding remote panels.
 - 6. Visually annunciate on the system annunciator, the zone, floor, or area as required.
 - 7. Automatically shut down all HVAC units that is larger than 2000cfm.

8. Operate prioritized outputs to release all future magnetically held smoke doors and magnetically locked doors throughout the building.
9. Activate the exterior strobe/beacon.
10. Automatically summons Fire Department by Auto-dialing the Alarm Company.

2.12 INSTALLATION

- A. All wiring for the system shall be in accordance with Articles 760,725 and 800 of the National Electrical Code and Local Electrical Codes.
- B. All wiring types and sizes shall be as follows or as otherwise required by the equipment manufacturer:
 1. Provide separate loops for horns and strobes.
 2. Addressable Loop shall be via minimum #16 shielded twisted red jacketed Fire Alarm Cable. (Unshielded cable may be used subject to FACP manufacturers approval)
 3. Increase wire size according to length of the run.
 4. Signal circuits shall be minimum #14 Cu Red Jacketed Fire Alarm Cable.
- C. Fire Alarm Control System and equipment shall be connected to separate dedicated branch circuits, sized as required for proper service. Circuits shall be labeled "FIRE ALARM".
- D. FINAL TEST
 - A. A copy of the final test report and UL certification shall be submitted indicating proper functioning of the system and conformance to specifications. The test shall be performed by UL certified and factory-trained qualified technicians. Each and every device shall be tested, and stand-alone operation shall be verified.

3 PART 3 EXECUTION

3.1 WORK COORDINATION AND JOB OPERATION

- A. The electrical equipment shall not be installed in congested and possible problem areas without first coordinating the installation of same. Prior to start of job coordinate work with other trades and if necessary prepare coordination drawings. Conduit runs will not block access to other equipments, valves or similar devices.

- B. Particular attention shall be directed to the coordination of lighting fixtures installed in the ceiling areas. Coordinate the elevations of all equipment in hung ceiling areas to insure adequate space for the installation of recessed fixtures before mechanical equipment is installed.
- C. Furnish to the General Contractor, and all other Contractors, all information relative to the portion of the electrical installation that will effect them, sufficiently in advance, so that they may plan their work and installation accordingly.
- D. In case of failure to give proper information, as indicated above, sufficiently in advance, pay for all back charges for the modifications, renovation, and relocation of any portion of the work already performed.
- E. Obtain from the other trades all information relative to electrical work which he, the Electrical Contractor, is to execute in conjunction with the installation of their respective equipment.

3.2 WORKMANSHIP AND INSTALLATION METHODS

- A. All work shall be installed in a first class manner, consistent with the best current practices. All materials shall be securely installed plum and/or level and all flush mounted outlet boxes shall have front edge flush with finished wall surface. Lighting switches are to be installed within six inches of doorjamb.
- B. Raceways shall be properly aligned, grouped and supported. Exposed raceways shall be installed at right angles to or parallel with the principal structural members. Concealed raceways, unless otherwise indicated, may take the most direct route between outlets. Supports for steel raceways shall be provided as specified hereinafter. Raceways shall be firmly held in place. All necessary sleeves through expansion bolts used in securing the work shall be as specified. Raceways shall be cut to proper length so that ends will fit accurately in the outlets. All conduit joints shall be made up tight and no running threads will be permitted. All raceways shall be cleaned and brushed prior to cable pull.
- C. Where conduit is cut, the inside edge shall be reamed smooth to prevent injury to conductors. Where conduits enter or leave all outlet boxes, cabinets, tap boxes, other than those having threaded hubs, a standard locknut shall be used on the outside, and a locknut and bushing on the inside thereof. Unless otherwise indicated, conduits shall be supported at intervals not exceeding six (6) feet, and maximum of three (3) feet from any box or coupling.
- D. In general, all conduits shall be run concealed unless otherwise indicated to be run exposed.

- E. Conduits shall be continuous from outlet to outlet, and from outlet to cabinets, junction boxes to pull boxes, and shall enter and be secured to all boxes in such a manner that each system shall be electrically continuous from service to all outlets.
- F. Conduits shall be installed in such a manner as to insure against trouble from collection of trapped condensates.
- G. Any holes required through slabs shall either be sleeved prior to pouring concrete or shall be core drilled. Installation of electrical equipment shall be done so as not to destroy the fire rating of the various surfaces. Adequate means shall be taken to prevent the passage of fire or smoke. "UL" approved equipment shall be used wherever there is a "UL" approved item for the applications.
- H. All cable runs shall be neatly arranged and located so that cables are properly installed. Cables shall be located so as to avoid nail penetrations and other means of physical damage. All cable installations shall be reviewed by the inspector of wires prior to closing the walls.

3.3 GROUNDING

- A. This Contractor shall furnish and install all grounding electrodes, fittings, clamps, conduits, and wire of proper size to make ground connections between all apparatus and conduit and piping as required by Article 250 in the latest edition of the local Electrical Codes. All ground wires shall be run in conduit of size.
- B. All water service meters shall be grounded by proper jumpers.

3.4 SLEEVES AND OPENINGS

- A. This Sub-contractor, in order to coordinate the early phases of the work, shall prepare one or more clearly marked up sets of plans for the General Contractor before the work begins, showing all sleeves and openings required for the electrical installation. Before distribution, the marked up plans shall be presented to the Architect for approval.
- B. It shall be the duty of this Sub-contractor to provide all core drilling necessary for the electrical work. All cutting and patching will be done by the General Contractor. All locations for core drilling shall have prior approval of the Architect before being drilled.

3.5 PENETRATION AND FIRE STOPPING

- A. All wire, cable or metal conduit penetrating through a fire-rated wall assembly shall have the space between the conduit and the fire rated membrane (drywall) filled with a UL approved fire caulk installation.
- B. All wire, cable or metal conduit penetration through fire-rated floor assembly shall have the space between the conduit and the fire rated membrane (drywall, concrete or plywood decking) filled with a UL approved fire caulk installation.
- C. Install an expandable collar where a PVC conduit penetrates each membrane of a fire rated wall assembly.
- D. Install an expandable collar where a PVC conduit penetrates each membrane of a fire rated floor/ceiling assembly.
- E. Install a UL: approved fire caulk installation where any conduit penetrates a fire stop (top and bottom wall framing plates) inside the walls.
- F. Large openings in slabs which accommodate many conduits shall be filled with concrete so that the rodent protection of the slab is maintained.
- G. All penetrations of assemblies exposed to the exterior environment shall be sealed with foam sealant or equivalent sealer to provide zero air infiltration through or around penetration. Coordinate with fire stopping requirements.

...END OF THIS SECTION

ESTIMATED LOAD BREAKDOWN

Estimated load breakdown for Residential Building is as follows:
Typical Load breakdown for a Unit is as follows (600 sf):

Residential

Lighting & Power	1,800 w
Kitchen	3,000 w
Range	10,000 w
Dishwasher	1,200 w
Disposal	800 w
Air Conditioning	500 w

Total 17,300 w

Provide 100A / 1 Phs-3 Wire / 120-208 V Service to each Apartment.

Total load for building is:

62 Units x 17.3 kw @ 25% =250 kw

Common Area Load

Lighting	20kw
Power:	30kw
A/C:	200kw
Elevator:	30kw
Total:	270kw

Commercial Spaces

Lighting/Power:140kw (5,000sqf)

Residential:	250kw
House:	270kw
Commercial:	140kw
Total:	660kw

Building needs minimum 1800A/120-208V/3phs-4wire service.

For gas cooking building, minimum service required is 1600A