PROJECT MANUAL FOR THE CONSTRUCTION OF:

FIRE REPAIR and RECONSTRUCTION

of the Bellaire Senior Apartments

RIVERVIEW, MICHIGAN

STA PROJECT NO: 2149

ISSUE DATE:
MAY 08, 2009 BIDS and PERMITS

SIEGAL/TUOMAALA ASSOCIATES ARCHITECTS AND PLANNERS INC.
29200 northwestern hwy suite 160 southfield, mi 48034 p•248•352•0099 f•248•352•0088 www.sta-architects.com

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INSTRUCTIONS TO BIDDERS

A. INSTRUCTIONS TO BIDDERS:

1. Sealed Bids will be received at the offices of Siegal/Tuomaala Associates Architects and Planners, Inc., 29200 Northwestern Hwy., Suite 160, Southfield, MI 48034, on or before June 9, 2009 at 3:00 pm, local time. Bids will be opened privately.

2. A Pre-Bid meeting and walk-through inspection will be conducted on May 19, 2009, at 3:00 pm local time at the Bellaire Senior Apartments, 12621 Hale Street, Riverview, MI 48192.

3. Bidders shall utilize the Bid Proposal Form provided and Bids shall be submitted in triplicate in sealed, opaque envelops containing only the project name, address, and the date and time of the Bids due.

4. Bids received after the deadline time will not be opened and will be returned to the Bidder.

5. Telephonic, electronic or faxed bids will not be accepted under any circumstances.

6. Unless otherwise specified, no bid may be withdrawn or modified in any way after the submittal deadline.

7. Bids must include all applicable taxes: local, state and federal.

8. Wherever the Bid Documents specify brand names, trade names or manufacturer's, it is for the establishment of a grade or level of quality only and is not intended to exclude other qualified products or manufacturers unless the term "no exceptions" is included.

9. The Bidder certifies that all materials and supplies shall be new and of the best quality specified. Furthermore, that his labor is experienced and will deliver the highest grade of workmanship.

10. Any and all permits required for the work will be obtained and paid by the Contractor.

11. The Owner may, at his option, require a Payment and Performance Bond in the amount of 100% of the Contract price. If the Owner exercises the option he will pay the cost of the Bond.

12. The Owner reserves the right to reject any or all Bids, to waive any irregularities and to accept other than the low Bid when deemed to be in the Owner's best interest.

End of Section

SCOPE OF WORK:

The description of the Scope of Work is intended as an outline of work to be performed and is not necessarily an all inclusive description but rather an overall view.

A. Reconstruct 23 Living Units located in the three-story, West Section of the Building in accordance with current code requirements and accessibility standards. Prior to new construction, apply a smoke inhibitive treatment to all exposed trusses, studs and wall/ceiling cavities.

B. Repair floors and floor trusses in the West Section of the Building. Install new gypcrete on two floors. Repair burned trusses as indicated. Repair fire damaged window bay on south side of West Section and replace designated windows in same.

C. Replace all wall and ceiling insulation in the West Section of the Building. Install draftstopping and fire blocking as required.

D. Provide and install new corridor doors, stairwell doors and unit entry doors, including frames and hardware as specified throughout the entire building as shown.

E. Provide and install new lay-in ceilings in all corridors throughout the entire building with new lighting in the West Section.

F. Provide and install new elevators (2) in the West and East Lobby areas of the building along with new building entries.

G. Provide and install new stairways (2) in the West and East Lobby areas with exit doors to the exterior.

H. Reconstruct West and East Lobby / Core areas to accommodate new elevators and stairways.

I. Provide and install new HVAC systems for corridors throughout the Building.

J. Construct 2 hour rated fire separation at Dining Room entry.

K. Construct new Sun Room Addition adjacent to Dining Room.

L. Construct new Vestibule with automatic door operators and Canopy at existing building entry.

M. Replace existing roof top, make-up air unit in Kitchen.

N. Provide and install pull cord safety alarm system in all Living Units Bedrooms and Baths.

O. Provide and install door intercom system in all Living Units activated from main entry.

P. Provide and install a new electrical generator to serve basic building functions and emergency systems. (Note: This is an Alternate)

Q. Work by Others:

1. Fire sprinkler system throughout building
2. Upgrading and installing emergency alarm and detection systems throughout building
3. New water service and riser for fire sprinkler system
4. New storm water system
5. New sidewalks and landscaping

End of Section

GENERAL REQUIREMENTS

1. General:

   A. The Contractor shall provide all materials and labor necessary for the complete construction of the Work as contemplated by the Drawings and Specifications.

   B. The Contractor shall comply with all applicable local, state and federal codes, ordinances and regulations including, but not limited to, safety, environmental provisions and fair employment practices.

   C. The Contractor shall classify and apportion the Work of the various Trades in accordance with local customs, rules, jurisdictions, regulations, etc., insofar as they are applicable to this Work.

2. Laying Out the Work:

   A. The Contractor shall be responsible for laying out the Work as required for accurate installation of same.
   B. Underground utilities and service lines shall be located and staked to prevent disruption of services. The Owner shall be notified 48 hours in advance of any necessary temporary shut down.

3. Field Office:

   A. The Contractor shall coordinate the location of his field office with the Owner. He shall provide and pay for the telephone service to the office. He shall, at his own expense, provide temporary toilet facilities.

4. Temporary Light and Power:

   A. The Contractor shall be responsible for providing temporary wiring and lighting necessary for his activities. The Owner will pay for electrical power.

5. Water for Construction:

   A. The Contractor shall be responsible for providing temporary waterlines, hoses, pumps, etc., necessary for his activities. The Owner will pay for water usage.

6. Weather Protection:

   A. The Contractor shall be responsible for providing and maintaining weather protection at all times in order to prevent water damage and intrusion.

   B. Any damage to building elements resulting from the failure of maintaining weather and watertight conditions at all times will be the sole responsibility of the Contractor and the cost of any and all repairs will be borne by him.

7. Barricades and Protectives:

   A. The Contractor will provide and install all barricades, warning signs, caution lights and other devices as may be required to protect the residents and pedestrians.

8. Disposal of Materials:

   A. The Contractor is responsible for the collection and removal, from the site, of all waste materials, products of demolition and debris resulting from his operations. He shall provide a dumpster on site in a location approved by the Owner.

   B. Excavated soils may be distributed on site in the form of earth berms, if space permits. This must be coordinated in advance with the Owner. Otherwise materials shall be removed from the site.

   C. All materials removed from the site shall be disposed of legally. No burning will be permitted.

   D. The Contractor shall maintain a clean site and premises at all times. If the Contractor fails to maintain the premises, the Owner, after notifying the Contractor, may cause to have debris and materials removed and charge all costs to the Contractor.

9. Fire Protection:

   A. The Contractor will take all necessary precautions to prevent fire and shall maintain such precautions until the completion of the Project.

   B. Combustible materials shall be stored in an orderly fashion and in minimal quantities. No flammable liquids are to be stored inside or within the perimeter of the building.

   C. Cutting and welding shall be performed in strict accordance with fire safety regulations.

10. Storage of Materials:

   A. The Contractor will coordinate his storage, staging and delivery of materials with the Owner.

11. Employee Parking:

   A. The Contractor shall cooperate with the Owner in terms of employee parking arrangements. Employees shall not use resident or facility staff parking spaces.

12. Owner's Contractors:

A. The Owner intends to employ his own Contractors for certain portions of the Work including, but not limited to, fire protection systems, alarm and detection system, site improvements and landscaping. This Contract shall coordinate and interface his work with the Owner's Contractors.

13. Safety Regulations:

A. All Work on site shall be governed by current standards and regulations of MIOSHA and OSHA.

14. Site Maintenance and Restoration:

A. The Contractor shall maintain the conditions of the site including, but not limited to, dust control and soil erosion.

B. Any damage to the existing facilities, paving, walks or structures caused by the Contractor's operations shall be repaired and/or restored by the Contractor at his expense.

15. Work Progress and Schedules:

A. Prior to the commencement of Work, the Contractor shall submit a schedule of his activities, with timelines and completion dates, to the Owner for his review and approval.

B. The Contractor shall maintain and update the schedule on a weekly basis and deliver progress reports to the Owner.

16. Shop Drawings and Submittals:

A. The Contractor shall submit four (4) copies of Shop Drawings and/or material submittals and cut sheets for all Work of all Trades.

B. The Architect will review all submittals within ten (10) days of receipt and return them stamped either "resubmit" or "approved". Prior to submittal to the Architect, the Contractor shall review each submittal and approved it before forwarding to the Architect.

C. No Work shall be installed without approved Shop Drawings or materials.

17. As-Built Drawings:

A. The Contractor shall maintain an accurate record of all deviations from the approved drawings which may occur during the Project. He shall submit a mark-up set of drawings at the completion of Work to the Architect showing all changes in the Work.

18. Construction Lien Act:

A. The General Contractor shall inform the Owner of the provisions of the current Construction Lien Act for the State of Michigan. The General Contractor shall assist the Owner in preparation, filing and posting of documents as required by the Construction Lien Act. These shall include, but are not limited to, the recording of a Notice of Commencement and Notice of Furnishing in the General Contractor's field office.

19. Insurance Requirements:

A. Prior to the commencement of construction, the Contractor shall deliver to the Owner valid Certificates of Insurance. All policies shall list the Owner as an "Additional Insured" party.

B. Limits of insurance, shall be not less than the amounts stated for each category listed below:

1) Workmen's Compensation: (Article 11.1.1)

(1) Applicable Federal, State	Statutory
(2) Employers' Liability	$2,000,000.

2) Contractor's Liability Insurance (Articles 11.1.1.2, 11.1.1.3, 11.1.1.4) including Contractual Liability: (Article 11.1.2) Insurance shall be Comprehensive General Liability:

(1) Bodily Injury: Each Occurrence	$2,000,000.
Aggregate	$2,000,000.
(2) Property Damage Including Completed Operations Broad Form:	
Each Occurrence	$2,000,000.
Aggregate	$2,000,000.
(3) Personal Injury:	
Each Person Aggregate	$2,000,000.
General Aggregate	$2,000,000.
(4) Automobile Liability-Owned, Non-Owned and Hired:	
Bodily Injury Each Person	$2,000,000.
Bodily Injury Each Occurrence	$2,000,000.
Property Damage Each Occurrence	$2,000,000.

ii) Completed operations and products liability must be provided and maintained for two (2) years after final payment.

C. The Insurance Coverage described below will be furnished by the Contractor with the following limits:

(4) Owners Liability: (Article 11.2)

(a) Bodily Injury:

Each Occurrence	$2,000,000.
Aggregate	$2,000,000.

(b) Property Damage:

Each Occurrence	$2,000,000.
Aggregate	$2,000,000.

(1) Personal Injury:

General Aggregate	$2,000,000.

(5) Property Insurance: (Article 11.3)

Property Insurance shall be All-Risk in a completed value form in the names of the Owner and Contractor as their interests may appear in an amount equal to the Contractor sum for the work.

20. Guarantee:

In addition to the specific guarantees required for certain portions of the Work to be performed under this Contract, the Contractor shall furnish a written guarantee for all of the Work to be performed under this Contract against defects in materials or workmanship for a period of one (1) year from the date of the final acceptance of the completed Work by the Owner. The Contractor shall, within a reasonable time after receipt of written notice thereof, make good any defects in materials or workmanship which may develop during said one (1) year period and any damage to other work caused by such defects or repairing of same, at his own expense, and without cost to the Owner.

End of Section

BIDDER'S NAME _____
BID PROPOSAL FORM
(Submit in Triplicate)

TO: Siegal/Tuomaala Associates
Architects and Planners, Inc.
29200 Northwestern Hwy., Suite 160
Southfield, MI 48034

PROPOSAL FOR: Fire Repair and Reconstruction of
Bellaire Senior Apartments
12621 Hale Street
Riverview, MI 48192

PROPOSALS DUE: June 9, 2009 at 3:00 pm local time

ALL SECTIONS OF THIS BID PROPOSAL FORM MUST BE COMPLETED FOR THE BID TO BE CONSIDERED.

1. The undersigned, having familiarized themselves with the local conditions affecting the cost of the work and with the Contract Documents, including the Bidding requirements, and any and all Addenda issued, hereby propose to perform everything required to be performed and to provide and furnish all labor, materials, tools, expendable equipment, utility, and transportation services, etc., necessary to complete in a workmanlike manner all of the Work required for the aforementioned project, all in strict accordance with the Contract Documents issued by Siegal/Tuomaala Associates Architects and Planners, Inc., 29200 Northwestern Hwy., Suite 160, Southfield, MI 48034. Therefore, the undersigned agrees to accept in payment the sum entered below which shall be the Base Bid.

BASE BID IN WORDS (AND FIGURES)

Base Bid: _____ Dollars ($_____)

2. For authorized changes in the work involving additions to or deductions from the contract price, the undersigned agrees to perform or omit (or cause to be performed or omitted by his subcontractors) such authorized work at net cost to him, plus the following percentages to be added to the new cost or credited to the Owner, which percentages shall include all charges for supervision, overhead, profit, and shall be based on the aggregate net total of all changes for any change in Contract Sum.

	Additions	Deductions
Work not under subcontract	____%	____%
Work under subcontract	____%	____%

3. For purposes of accounting, the undersigned provides the following breakdown of Trade Prices. Each Trade Price includes all labor, material, permits, fees, supervision, overhead, profit and taxes required to perform the Work.

A. Electrical Work: $ _____

B. Plumbing Work: $ _____

C. HVAC Work: $ _____

4. Separate Prices:

The Contractor furnishes the following Separate Prices for purposes of accounting or adjusting the Contract Price. Each Separate Price shall include all labor, materials, permits, fees, supervision, overhead, profit and taxes of all Trades associated with the Work.

A. Elevators: $ _____ East Elevator

$ _____ West Elevator

The elevator work shall include all work necessary to provide a complete installation including, but not limited to, demolition, utility relocations, pits, shafts, cabs, doors, equipment, electrical and mechanical work for each of the two (2) new elevators.

B. Stairways: $ _____ East Stairway

$ _____ West Stairway

The stairway work shall include all work necessary to provide a complete installation including, but not limited to, the removal of the existing elevator and shaft, filling the existing pit, building demolition, utility relocations, stair construction, landings, new exterior wall, doors, roof extension, canopy, exterior porch slab and foundations, electrical and mechanical work for each of the two (2) new stairways.

C. Kitchen Make-Up Air: $ _____

The kitchen rooftop MAU work shall include all work necessary to provide a complete installation including, but not limited to, the removal of the existing unit, curb and utility connections, and the installation of a new unit and curb, all associated roofing work, carpentry, electrical, plumbing and ductwork.

D. Sun Room Addition: $ _____

The Sun Room work shall include all work necessary to provide a complete addition including, but not limited to, demolition, foundations, slabs, walls, roof, skylight, interior finishes, all electrical and HVAC work.

E. Vestibule and Canopy: $ _____

The Vestibule and entry Canopy work shall include all work necessary to provide a complete addition including, but not limited to, demolition, foundations, slabs, walls roof, columns, beams, doors with automatic operators, electrical and mechanical work.

5. Alternate Price:

The Contractor furnishes the following Alternate Price to provide and install an Electrical Generator complete with concrete pad, switches, wiring and all other work as indicated on the drawings and as specified for a complete installation. (See Sheet E-1)

The Base Bid shall include emergency, battery pack type lighting in corridors, stairways and public spaces.

A. To provide generator Add $ _____

B. To delete battery pack emergency lights Deduct $ _____

6. The undersigned acknowledges the receipt of the following Addenda modifying the Contract Documents and has incorporated all changes in the Work in the Base Bid.

Addendum No. _____ Dated _____Addendum No. _____Dated ____

Addendum No. _____ Dated _____Addendum No. _____Dated ____

7. The undersigned acknowledges that he/she was aware of the scheduled Pre-Bid meeting and (check one)

☐ Did attend
☐ Did not attend

8. In the event that the Owner may require the Contractor to furnish a Payment and Performance Bond for 100% of the Base Bid, the Contractor agrees to furnish the Bond for an additional sum of $ _____ which is not included in the Base Bid.

9. The undersigned agrees to hold all Prices stated in this Proposal firm and unchanged for a period of not less than sixty (60) days from the date of this Proposal.

10. The undersigned agrees to commence work within five (5) days after the Award of Contract, subject to the delivery of specified insurance certificates.

11. The undersigned recognizes that time is of the essence and will endeavor to complete all of the work in a timely manner. Furthermore, the undersigned agrees to submit a schedule of work prior to the execution of a Contract. The undersigned agrees to complete the entire project no later than _____ calendar days after the commencement of construction.

    The above completion date may be extended only if due to circumstances beyond the control of the Contractor such as strikes or "acts of God". Weather delays, if claimed, must be documented on a weekly basis and approved by the Architect.

12. The undersigned agrees that he will submit a list of subcontractors and suppliers within 48 hours of notification of being low or second low qualified bidder. He shall jointly, with the Owner and Architect, select the subcontractors and suppliers deemed to be in the best interest of the Owner, and this list shall be used for the Work, unless otherwise directed.

13. The undersigned affirms that he has inspected the site and has familiarized himself with the field conditions, Drawings and Specifications of the Work for which he has submitted a bid, as set forth in the Instructions to Bidders, and agrees that the total cost of all work, specifically called for or that may be reasonably inferred to be done as part of the Work, has been included in his price.

14. The undersigned certifies that all applicable State and Local Sales and Use Taxes and Federal Excise Taxes are included in the Proposal.

15. The undersigned herein submits this proposal and agrees to enter into an agreement with the Owner in accordance with the Contract Documents. In submitting this completed and signed proposal, it is understood that the right is reserved by the Owner to reject any and all bids and to make such award that, in the opinion of the Owner, is in its best interest.

NAME OF BIDDER:

_____

BUSINESS ADDRESS OF BIDDER:

_____

_____

_____

BUSINESS TELEPHONE NO. OF BIDDER:

_____

AUTHORIZED SIGNATURE:

_____

DATE OF SIGNATURE:

_____

LEGAL STATUS BIDDER

Fill out the appropriate section and strike out the other two.

Corporation: State in which incorporated
Official title of person signing proposal:
Address of signer:

Names and Titles of the corporation's officers:

Name	Title

Partnership:

Name of Members	Address

Individual:

Official Name	Address

(The Bidder shall fill out the appropriate form and strike out the other two)

End of Section

GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to General Conditions, Supplementary Conditions and General Requirements which are hereby made a part of this Section.

1.02 INTENT

A. The Electrical Specifications are, for convenience, divided into the following Sections which contain the requirements applicable to the systems named:

16010 - General Electrical Requirements
16050 - Basic Electrical Materials and Methods
16400 - Electric Service System and Required Modifications
16420 - Distribution Type Panelboards
16450 - Branch Distribution and Control Equipment
16460 - Fuses
16500 - Lighting Systems
16610 - Emergency Power Generator System
16700 - Voice Communication System
16730 - Emergency Call System
16800 - Fire Alarm System
16850 - Miscellaneous Systems
16900 - Demolition and Renovation Work

B. The "General Electrical Requirements" contained herein are hereby made a part of all the above named Sections of the Specifications, Division 16.

1.03 PROPOSED SUBSTITUTIONS

A. In the event that substitute equipment is approved for use on the project, the Trade Contractor using the substitute material or equipment shall pay all subsequent additional costs, if any regardless of cause, by all other Trades and including compensation for additional time by Engineer.

1.04 DEFINITIONS

A. "Provide" shall mean "furnish and install" or "furnish labor and material required for installation of".

1.05 QUALITY ASSURANCE

A. References to standards, codes, Specifications, recommendations etc., shall mean the latest edition of such publications adopted and published at date of invitation to submit Bid Proposals.

B. In addition to requirements shown or specified, comply with the applicable standards, specifications and codes listed below. Where requirements of the Contract Documents are in excess of these requirements, the Contract Documents shall govern.

C. The following associations, codes, standards and abbreviations are included herein by reference:

ANSI	American National Standards Institute
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
UL	Underwriters' Laboratories, Inc.

D. Approved manufacturers shall be considered for material in accordance with the requirements of Division 16, subject to the approval of the Architect. Such approval concerns of the manufacturer only and does not in any way act to permit any deviation from strict compliance with the requirements of these Specifications.

1.06 CONTRACT DRAWINGS

A. Contract Drawings for electrical work are diagrammatic, intended to convey the scope of the work and indicate general arrangement of systems and approximate locations of equipment and outlets. Do not scale Drawings for measurements.

B. Consult Architectural, Structural and Mechanical Contract Drawings and Specifications to become familiar with all conditions affecting the work, coordinate interconnecting work and other Trades affected, and verify all spaces in which the work will be installed.

C. Where job conditions require reasonable changes, as determined by this Contractor and the Engineer in indicated locations and arrangements, make changes without extra cost to the Owner.

D. The Contract Drawings and Specifications are to be cooperative, and whatever is called for by either shall be binding as if called for by both.

E. Various items of apparatus and equipment will be furnished and set under the Contracts.

1.07 SUBMITTALS

A. Submit Shop Drawings for all major components or systems of the project. Shop Drawings for lighting fixtures, distribution equipment, Fire Alarm and Emergency Call Systems are mandatory. Submit additional Shop Drawings if requested by Engineer.

B. Refer to General Conditions and Division 1, General Requirements, for Shop Drawings to be submitted in transparency form, procedure and other pertinent data. For brochures and other non-reproducible forms of Shop Drawings, submit to the Architect for review, the required number of copies of Shop Drawings, of each piece of equipment and/or apparatus to be used, together with such descriptions and/or explanatory notes as may be required to give a clear idea of its arrangement and construction.

C. No apparatus or equipment shall be shipped from stock or fabricated until Shop Drawings for same have been stamped "Reviewed" or "Reviewed as Noted".

D. All Shop Drawings must be clearly marked to show equipment submitted and any deviations from specifications shall be noted thereon. Electrical Contractor must review and sign all shop drawings prior to submittal.

E. Shop Drawings that are incomplete, unsigned and not plainly marked will not be reviewed.

1.08 SCHEDULING OF WORK

A. Construction Manager and/or Architect may schedule work in phases. Contractor shall cooperate fully to maintain project schedule.

1.09 SEPARATE PRICES

A. Not Required.

1.10 WORK INVOLVING OTHER TRADES

A. Certain items of equipment or materials specified in the Electrical Division may have to be installed by other Trades such as Mechanical Trades or Architectural Trades due to code requirements or union jurisdictional requirements. Where this occurs, Electrical Trades shall include the full cost for completing the work installed by others.

1.11 FIELD DRAWINGS (AS-BUILTS):

A. After completion of the work, provide a complete set of "As-built" Drawings to the Engineer. Contractor shall obtain from Engineer at cost ($10.00 per drawing) the project electronic files on which Contractor shall record all as-built data. Submit updated files along with a set of marked up drawings with as-built changes for final approval.

1.12 USE OF EQUIPMENT

A. The use of any equipment, or any part thereof, for any purpose including testing even with the Owner's consent, shall not be construed to be an acceptance of the work on the part of the Owner, nor shall it be construed to obligate him in any way to accept improper work or defective materials.

1.13 WORK INCLUDED

A. Furnish all labor and material, appliances, equipment and supervision to put in place a complete and functioning electrical system, ready for operation as specified herein and as indicated on the Drawings. System shall include, but not necessarily be limited to the following major equipment or operations:

1. Electric Service Modifications.
2. Complete Lighting System.
3. Complete Power Distribution System.
4. Panels, Safety Switches and Control Equipment.
5. Branch Circuits, Wiring and Devices.
6. Telephone Outlets.
7. Electrical Service to Building and Mechanical Equipment, Final Connection and Testing.
8. Emergency Call System.
9. Fire Alarm System.
10. Miscellaneous Systems.
11. Emergency Generator and Automatic Transfer Switch.

1.14 CODES, PERMITS, INSPECTIONS AND FEES

A. All work shall be in accordance with National Electrical Code, latest edition and all local, state and national bodies having jurisdiction thereof.

B. Contractor shall be licensed in the municipality in which the work is located.

C. Contractor shall take out all permits required and arrange for all necessary inspections as required by local or state laws and shall pay all fees and expenses in connection therewith, and shall include same in Base Bid prices.

D. Upon completion of the work, furnish to the Architect/Engineer all certificates of inspection and/or approvals which are customary for the classes of work involved.

1.15 COORDINATION AND COOPERATION

A. Electrical Contractor shall coordinate his work with that of the General Contractor and other Subcontractors for the Project.

B. Contractor shall coordinate with designated Representative the placing of panels, flush devices or other equipment installed in masonry walls or partitions. All such flush installations shall be coordinated with masonry coursing as applicable.

1.16 SITE EXAMINATION

A. Examination of the site is mandatory. Contractor is hereby held to have examined the site and have satisfied himself as to the conditions under which the work will be performed and have included in his Bid price all costs related thereto.

1.17 OPERATION AND MAINTENANCE MANUALS

A. Upon completion of the work and fourteen (14) days before final inspection, the Contractor is to compile and deliver to the Architect, three (3) sets of Specifications of material and equipment used in the building. This shall include, but shall not be limited to, transformers, switchboards, light fixtures, panels, switches, wiring devices, etc.

B. In each set of Specifications, the following information shall be included for each item of material, equipment and hardware installed:

1. Name and address of manufacturer and/or fabricator.

2. Trade names, catalog number, serial number, contract number of other accurate provision for ordering replacement and spare parts.

3. Certified Drawings, where applicable, showing the amount of parts and general dimensions.

4. Operating and maintenance instructions and/or manuals.

1.18 TEMPORARY LIGHT AND POWER

A. Consult Supplementary General Conditions, for requirements pertaining to this work and comply.

B. Provide complete systems of adequate capacity and design, and in accordance with Federal, State and local codes.

PART 3 - EXECUTION

3.01 INSERTS AND SLEEVES

A. Provide and install all necessary inserts, conduit sleeves, hanger bolts, etc., to hang equipment and to run conduit through walls, floor slabs or footings.

B. Holes through walls, ceilings or floor slabs shall be sealed completely in an approved manner to form a fire barrier.

C. All electrical lines to roof mounted equipment shall be installed within equipment curbs.

3.02 PROTECTION AND HANDLING

A. All electrical systems or divisions thereof shall be duly cared for and properly protected until all systems have been completely tested, inspected and finally accepted by Owner.

B. After delivery, before and after installation, protect equipment and material against theft, injury or damage from all causes.

C. Protect equipment outlets, conduit openings and electrical raceways with temporary plugs or caps.

D. Receive, properly house, hoist, handle and deliver to the proper location, equipment and material required for this Division of the work.

E. Deliver materials to the job site in original containers and packages, bearing the manufacturer's labels indicating name, type and brand.

3.03 PAINTING, CLEANING AND TOUCH-UP

A. Any required painting of electrical equipment in existing areas will be done by Architectural Trades. Whenever painting is required by this Trade for certain portions of the work, it will be specifically specified hereinafter.

B. All factory finished equipment shall be thoroughly cleaned at the completion of the work. Any equipment showing mars or rust spots shall be refinished and restored to original factory finish.

3.04 ELECTRICAL REQUIREMENTS FOR MECHANICAL WORK

A. Generally all motor starters, except for those included with packaged mechanical equipment, will be furnished and installed by the Electrical Trades Contractor. These starters will be sized and shown on the Electrical Drawings. Reference is made to Mechanical Section 15010 and Electrical Sections 16050 and 16450.

B. Furnish and install disconnects for all mechanical and building equipment requiring the same unless otherwise specified herein.

3.05 TEMPERATURE CONTROL REQUIREMENTS

A. All temperature control work, except as noted on Drawings, will be done under Mechanical Trades Specifications.

B. It is mandatory to consult Mechanical Specifications for this work and be governed accordingly.

3.06 BUILDING AND HVAC MECHANICAL EQUIPMENT

A. Provide and install all electrical work required to put in operation building and mechanical equipment requiring electrical service.

B. Connections to new equipment shall be done in accordance with manufacturer's Shop Drawings. Requirements generally vary from one manufacturer to another and Contractor is bound to comply and provide all work as required although certain discrepancies regarding requirements may exist.

C. Provide power wiring, protection and disconnect devices to all mechanical equipment and make final connections, including testing of motors for proper rotation. Exhaust fans are generally provided with integral disconnects by Mechanical Trades, unless otherwise noted.

D. Packaged equipment is provided as a unit by manufacturer including all control and power wiring at a main junction box. Install disconnect switch, power wiring and make final connections.

E. All electric unit heaters are furnished by Mechanical Trades with integral disconnects. Provide power wiring and make final connections.

3.07 IDENTIFICATION

A. Identify all electrical system components with the name or designation given on design Drawings. Identification shall be legible and accurate and subject to final approval by Architect/Engineer.

B. Identification shall be all inclusive and shall include switchboards and switchboard individual devices, distribution panels and individual devices, power panels and individual devices, lighting and receptacle panels, time switches, relays, contractors, push-button stations, pull and junction boxes, toggle switches used for motor disconnects, disconnects and safety switches, manual and magnetic motor starters, etc.

C. All lighting and receptacle panels shall be provided with a typewritten directory on inside of panel given complete and accurate description of all circuits and devices and/or equipment connected to each circuit. Description shall include number of outlets and a readily identifiable location statement.

D. Nameplates shall be black plastic laminate with 1/4" white engraved letters. Nameplates shall be fastened to equipment with machine screws. Magic markers and Dymo labels are strictly prohibited.

3.08 TESTS AND CERTIFICATION

A. Test all circuits as soon as conductors are installed. If circuits are not properly controlled and insulated, make all necessary repairs.

B. Check motor rotation without causing damage to the driven equipment. Motor rotation shall be as directed by the equipment manufacturer.

C. Perform any additional tests specified hereinafter and any other tests deemed necessary by Architect/Engineer for systems supplied or installed.

D. Certify to Architect/Engineer any system or component thereof whenever requested. Certification shall be in manner prescribed by Architect/Engineer.

3.09 EQUIPMENT CONNECTIONS

A. Connection to equipment, fixtures, etc., shall be made in accordance with the Shop Drawings and rough-in measurements provided by the manufacturer of the particular equipment furnished.

3.10 MOUNTING HEIGHTS

A. Height above finished floor for all control and wiring devices shall be in accordance with the Americans With Disabilities Act (ADA). Switches shall not be more than 48" above finish floor (AFF). General purpose receptacles shall not be less than 12" AFF and no more than 48" AFF.

B. General purpose convenience receptacles shall be mounted at 16" AFF to the bottom of outlet box. Telephone outlets shall be installed at the same height as receptacles except for wall mounted instruments, outlets shall be installed at 48" AFF.

C. Light control switches, dimmers, manual starters and similar devices shall be generally mounted at 48" AFF.

D. Consult Drawings for special mounting heights, base mounted devices, horizontally mounted receptacles and other special mounting requirements.

E. Receptacles in Toilet Rooms, Janitor Closets and Mechanical Rooms shall be installed at 48" AFF. Receptacles and switches at counters shall be installed at 6" above counter measured to the center of the box. Height of special devices shall be as indicated on the Drawings or as directed.

F. Mounting heights indicated on the Drawings shall take precedence over the requirements stated herein.

G. Whenever the mounting height of any device is in question, consult the Architect for direction.

3.11 RESPONSIBILITY FOR VOLTAGE VERIFICATION

A. Contractor shall be responsible for verification of correct voltages for all mechanical and building equipment. In case of discrepancy, notify Engineer immediately and prior to Shop Drawing submittals. Failure to comply with this requirement holds Contractor fully responsible for any subsequent problems.

END OF SECTION 16010

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to General Conditions, Supplementary Conditions and General Requirements which are hereby made a part of this Section.

1.02 DESCRIPTION OF WORK

A. General: Provide basic materials and methods for electrical work and install in accordance with the Contract Documents.

B. Major items of work and equipment included under this Section of the Specifications are conduit, wiring, devices, boxes, cover plates, hangers, supports, wireways and general materials for Electrical work.

C. References to other Sections of the Specifications: All Sections of this Division.

1.03 MATERIAL AND EQUIPMENT STANDARDS

A. All material and equipment shall be of new stock and of the grade herein specified.

B. All material and equipment used on this project shall have Underwriters' Label for intended use.

PART 2 - PRODUCTS

2.01 CONDUIT SYSTEMS

A. Conduit systems shall consist of an electrically continuous raceway system, suitable for the installation of electrical wiring, and may be made up of rigid conduit, "thin wall" electric metallic tubing, or non-metallic conduit as specified herein.

B. All metallic conduit shall be hot dip galvanized. All non-metallic conduit shall be heavy wall PVC, Schedule 40. Minimum conduit size shall be 1/2" diameter.

C. Heavy wall galvanized rigid steel conduit (GRS) shall be used for all hazardous locations, for conduits larger than 4" in diameter, for aboveground service risers and for general slab burial up to 1" in diameter.

D. Thin wall conduit (EMT) may be used, concealed or exposed within building proper and for feeders 4" and less in diameter. EMT conduit may not be buried in or under concrete slabs.

E. Non-metallic conduit shall be used for exterior applications as indicated on the Drawings and for certain interior applications as provided herein. PVC installed under slab shall be kept at least 6" below slab.

F. Fittings for EMT conduit shall be either compression type or double set screw type. Rigid conduit fittings shall be threaded. PVC fittings shall be glue-on type and shall be same manufacturer as the conduit. Termination of PVC conduit into device boxes or equipment enclosures without proper fitting is prohibited.

G. Flexible conduit shall be galvanized single strip steel equal to Greenfield or Flexsteel with single screw type fitting equal to Appleton #7265V. A separate, green insulated ground wire shall be installed in all flexible steel conduits and used as the primary grounding means.

H. In damp locations, flexible conduit shall be liquid tight, neoprene jacketed, grounded type equal to "Sealtite" Type #UA with Appleton Type "ST" fittings or equal.

I. Manufacturers: General Electric, Youngstown, Allied Tube, Anaconda, Carlon, Triangle or approved equal.

2.02 BOXES AND OUTLETS

A. Provide outlet boxes for all work. Boxes shall be stamped galvanized steel or cast metal. Non-metallic boxes may be used where approved by N.E.C. Outlet boxes exposed to weather shall be cast metal with gasketed covers.

B. Where two or more devices are called for at one location, they shall be installed in gang boxes and provided with suitable gang plates. All boxes in finished areas shall be flush mounted. Boxes shall be suitable to receive the devices specified.

C. Lighting fixture outlets shall consist of a pressed steel 4" octagonal outlet box not less that 1-1/2" deep, equipped with ears for cover screws and suitable cover.

D. Wall or side outlet boxes on concealed work for wall switches or receptacles shall consist of pressed steel outlet box not less than 2 gang, 1-1/2" deep and equipped with plaster ring suitable to accommodate the device(s) specified.

E. Outlet boxes in brick, tile, block or stone shall be square to facilitate cutting and providing a neatly finished job.

F. Wall switch outlets when installed near doors shall be installed on the lock side of the door.

G. Receptacle outlets in general areas shall be installed with units mounted vertically. When horizontal mounting is required, horizontally mounted outlets will be indicated on Drawings.

H. Floor boxes shall be flush type, formed metal with cast hub, fully adjustable and provided with proper cover for use/devices indicated. Flanges shall be for type of floor covering installed. Boxes in general shall be Walker 886 Series. Duplex receptacle boxes shall be provided with #895 brass duplex flip lid cover plate. Telephone boxes shall have an #896 CK combination cover.

I. Whenever a location or height of an outlet is in question it shall be coordinated in the field to suit job conditions or as directed. Consult previous paragraph on mounting heights and Drawings for additional requirements.

2.03 JUNCTION AND PULL BOXES

A. Wherever required to facilitate the pulling of wire, pull boxes shall be installed.

B. All pull boxes shall be fabricated from No. 12 or heavier gauge galvanized steel of not less than the minimum size required by the National Electrical Code, and shall be equipped with screwed covers.

C. All junction boxes must have covers and be accessible after completion of the building. Where several feeders pass through a common pull box or junction box, the feeders shall

be tagged to indicate clearly their electrical characteristics, circuit number and panel designation. Paint same information on the cover of the box.

2.04 600V. WIRE AND CABLE

A. Service cable shall be used between first floor distribution panel and apartment load centers. Cable shall be type SER, 600V, 3/C + G, #2 minimum, XLP insulation, 75°C, PVC jacket. SER cable may be also used for other loads per N.E.C. (See notations on riser diagram for this work).

B. All conductors shall be AWG, soft drawn copper of sizes indicated on the Drawings. All conductors shall be insulated for 600V. and with 90 degrees C. code grade insulation. Aluminum is acceptable for #6 and larger SER circuits.

C. All conductors, in dry locations, shall be made up of stranded single conductor cable and shall be THHN insulation. Underground and damp location wiring shall be THWN or XHHW insulation.

D. Branch circuit conductors #10 and smaller shall be code grade insulation type THW or THHN/THWN. Conductors #10 and #12 are preferred to be solid.

E. Branch circuit conductors shall not be less than #12 AWG on 20 ampere lighting and receptacle circuits. Control wiring for push buttons, relays, thermostats, etc., may be #14 AWG. #14 AWG may be used in apartment units per N.E.C.

F. All wires and cables shall be installed in conduit without use of any oil or grease lubricant. Conductors terminating in outlets shall be extended no less than 8" beyond outlet.

2.05 WIRING DEVICES

A. Local wall switches shall be 20 ampere, 120/277V. specification grade, toggle type, quiet operation and shall be single pole, double or 3-way as indicated. Switches shall be Hubbell #1221/22/23 or approved equal. Key operated switches shall be Hubbell #1209. Residential grade devices are acceptable.

B. Light switches for all dwelling units shall be of the illuminated type – to glow when OFF.

C. Receptacles shall be duplex, 2 pole, 3 wire, grounding type, 15 ampere, 125V., Hubbell #5262 or approved equal. Single receptacles on a single circuit shall be 20 amperes. Residential grade devices are acceptable.

D. All receptacles installed outdoors, on roof top equipment, or designated GFR shall be ground fault receptacle units equipped with cast box and weathertight cover plate, Hubbell #GF5362 with WPFS26 cover plate or equal. All GFR receptacles installed indoors shall be same as above except with standard box and standard plate. (Contractor at his option may use GFI circuit breaker and standard receptacles for designated GFR receptacles and their respective circuits). Residential grade devices are acceptable.

E. Switch and pilot light units shall be lighted handle type, Hubbell #1201-PL Series or approved equal.

F. Cover plates shall be provided for all wiring devices installed. Plates shall be of gangs, type and configuration required for the devices installed. Cover plates shall be vinyl.

2.06 INCANDESCENT DIMMERS

A. Incandescent dimmers shall be single or 3-way as indicated, linear slide, pre-set type. Linear slide shall provide intensity control with the movement of the slider. Slide shall incorporate push-on/push-off single or 3-way switch. All dimmers shall be provided with matching cover plate and no visible fins. Whenever several dimmers are installed at one location, Contractor shall furnish a separate box for each dimmer and shall provide a 2" space between any two (2) adjacent dimmers.

PART 3 - EXECUTION

3.01 CONDUIT INSTALLATION

A. Conduit runs as indicated on the Drawings are diagrammatic. Exact routing of conduit shall suit job conditions.

B. All conduit shall be run concealed in building construction except in unfinished areas, it may be exposed. Exposed conduit shall be run parallel to building lines. Exposed conduit subject to mechanical damage shall be heavy wall rigid.

C. All conduit shall be securely fastened in place, carefully reamed before installation and provided with suitable protection of wire against edge of conduit equal to Thomas & Betts "Insuline" bushings and connectors.

D. Groups of conduits shall be supported on trapeze type hangers; Unistrut, Kindorf or equal. Individual conduits not supported on pipe straps shall be provided with clevis type hangers; Thomas & Betts or equal. Hanger supports shall be rod or pipe with threaded connections.

E. No conduit shall be supported from roof deck, ductwork, ceiling hangers or ceiling support wires.

F. Conduit running through expansion joints of building shall be provided with expansion fittings as required.

G. All conduit installed and capped for future use shall be identified with metal tags indicating purpose and provided with pull rope and nylon bushings at both ends.

H. Conduit shall be kept at least 3" clear from all hot water lines, steam lines, flues, etc., and shall be run so that it will not interfere with proper installation of other work.

I. Conduit, other electrical raceways or electrical boxes shall not be in any way attached to, fastened, suspended or supported from roof deck or ceiling suspension system. Conduit shall be supported from building structural system.

J. Flexible conduit shall be used for final short connections to motors, vibrating equipment, between outlet boxes in hung or furred ceilings and flush lighting fixtures. It shall not be used in place of standard thin wall or rigid conduit. Flexible conduit shall not be used as the sole grounding mean of a circuit or system.

3.02 WIRING METHODS

A. All wiring shall be installed using an approved cable system or electrical conduit system as specified hereinbefore. Armored cable type MC + G may be used for branch circuit wiring. Also type NM cable may be used in the residential occupancies as permitted by N.E.C.

B. All plastic and flexible conduits shall be provided with a separate insulated ground wire within conduit.

C. Multi-wire circuits shall be color coded as follows:

1. 120/208V. Systems: Phase A-black, B-red, C-blue, N-white.

2. Ground wire for all systems shall be green in color and insulated.

3.03 600V. WIRE TERMINATIONS AND CONNECTIONS

A. All wiring systems for 600V. or less, and including low voltage systems shall be properly installed and terminated as specified herein.

B. Connection of conductors to terminal posts or other conductors shall assure a good connection without damaging the conductors and shall be made by means of solderless compression type terminals or lugs.

C. All joints in outlet or junction boxes shall be taped in such manner and thickness that the insulation value of the joint or splice will be at least equal to the insulation value of the conductor to which it is applied.

D. Tape shall be as required by the application. In damp location, varnish cambric tape shall be applied first then covered with all-weather tape. In dry locations all-weather tape shall be used.

E. Cast splice kits similar to Scotch Cast by 3M shall be used for all splices in underground circuits.

F. Terminals and lugs for copper cable shall be copper.

G. Lugs, terminals and connectors for all wires shall be solderless compression type similar to T&B "Sta-Kon", Burndy "Hydent" or Penn Union.

H. Connectors for #8 AWG and larger wires shall be made only with heavy duty compression type double indent solderless connectors.

I. Terminal connections of conductors in sizes from #14 to #10 inclusive shall be made with T&B "Sta-Kon" lugs or other approved equal.

J. Wing nut wire connectors by Ideal, Buchanan or 3M shall be used for termination of lighting and power branch circuit wiring connections only.

END OF SECTION 16050

ELECTRICAL SERVICE SYSTEM AND REQUIRED MODIFICATIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to General Conditions, Supplementary Conditions and General Requirements which are hereby made a part of this Section.

1.02 DESCRIPTION OF WORK

A. General: Provide basic materials and methods for electrical work and install in accordance with the Contract Documents.

B. Major items of work and equipment included under this Section of the Specifications are utility standards, voltage of systems, grounding and existing service modifications.

C. Reference to other Sections of the Specifications: Basic Electrical Materials and Methods - Section 16050.

1.03 SCOPE

A. Provide all service work specified herein and indicated on Drawings.

B. Work shall consist of all equipment and material necessary for complete installations, but shall not be limited to the following major divisions of the work.

1. Coordination and compliance with the utility service requirements and regulations in effect.

2. Coordination of the installation of The Emergency Generator, Automatic Transfer Switch and Connection to Existing System.

1.04 RULES OF LOCAL UTILITY

A. Rules and required construction standards of local utility company shall be complied with. Before submitting bid, check utility company supplying service to the project and comply with their requirements in full.

1.05 EXISTING ELECTRICAL SERVICE

A. The existing electrical service consists of a 300 KVA outdoor pad mounted service transformer. Transformer is connected via underground wiring to existing switchboard no. (1) one.

1.06 DETROIT EDISON STANDARDS

A. Underground Service General Policy - Section 3-1

B. Underground Service Installations - Section 3-3

1.07 VOLTAGE OF SYSTEMS

A. Building Distribution: 120/208 volts, 3 phase, 4 wire, grounded.

B. Lighting Systems: 120 volts, grounded, via the 3 phase system.

C. Heavy Power System: 208 volts, 3 phase, 3 wire, conduit ground.

D. Receptacles and Small Power: 120/208 volts, 3 phase, 4 wire, via lighting or receptacle panels.

E. Emergency Lighting: Served by new Emergency Generator plus existing EB lighting units.

F. Exit Lighting Units: Served by new Emergency Generator and existing emergency exit lights.

G. Control System: 120 volts maximum, via individual dry type, single phase transformers, being integral part of control equipment or via lighting or receptacle panels.

1.08 GROUNDING

A. Maintain existing ground continuity throughout the entire system.

B. Continuous conduit may be used as equipment ground provided it is electrically continuous from the source to equipment. Install bonding jumpers where this continuity is broken. Install equipment ground wiring indicated although the conduit system is electrically continuous.

C. Ground all enclosures, neutrals, panels, conduits systems, motor frames, etc., as required. Install separate ground wires in all plastic conduits. Metal conduits provided with ground wires within conduit shall be provided with grounding bushings.

D. Provide ground wire to all telephone closets and bond this wire to system ground or to a cold water pipe.

E. All ground wires installed in concrete shall be bare tinned copper. All equipment ground connections shall be bolted.

F. Ground rods shall be 3/4" x 10'-0" minimum size and shall be driven 2'-0" minimum below grade where indicated. All connections of ground wires to ground rods shall be cadwelded. Ground rods shall be copper clad, by Copperweld, Blackburn or Weaver.

G. Minimum size of equipment ground wire shall be in accordance with N.E.C. latest edition, but not smaller than #14. Where ground wires are subject to damage, they shall be installed in conduit.

1.09 EXCAVATION, TRENCHING AND BACKFILLING

A. Perform all necessary excavation as required by underground work and remove whatever substances are encountered as required by field conditions.

B. Remove excess excavated material from the premises or deposit on the premises as directed by Owner.

C. Restore all surfaces damaged in performing this work to original satisfactory state, when required.

D. Where blacktop is encountered, pavement shall be saw cut prior to excavation. Cut shall be 3" greater than trench width on each side. Restoration of blacktop will be completed under Building Work Trades.

E. Consult Architectural work Specifications for additional compaction and restoration requirements and be governed accordingly.

1.10 CONCRETE WORK

A. Where concrete work is required for Electrical Trades work, such as duct envelopes, equipment pads, lighting standards bases, etc., it shall be in accordance with requirements of applicable Architectural Trade Specifications.

1.11 UTILITY METERING REQUIREMENTS

A. Comply with utility company requirements for secondary metered electric service.

END OF SECTION 16400

DISTRIBUTION TYPE PANELBOARDS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Attention is directed to General Conditions, Supplementary Conditions and General Requirements which are hereby made a part of this Section.

1.02 DESCRIPTION OF WORK:

A. General: Provide basic materials and methods for electrical work and install in accordance with the Contract Documents.

B. Major items of work and equipment included under this Section of the Specifications are distribution and power panels.

C. References to other Sections of the Specifications: Basic Electrical Materials and Methods - Section 16050 and Fuses - Section 16460.

PART 2 - PRODUCTS

2.01 SCOPE:

A. Panelboards shall be fuse-switch type, surface mounted. Layout of panelboards, voltage and ampere rating, number of protective devices, spare or space positions are generally indicated on the Drawings.

2.02 CONSTRUCTION:

A. Cabinets shall be dead front construction, finished in manufacturers standard gray color, conforming to NEC requirements and bearing UL label. Bussing shall be copper or aluminum, braced for 75,000 amperes minimum short circuit current at operating voltage.

B. Overall operating temperature rating shall be 75 degrees C.

C. Fuse switch units shall be "quick-make", "quick-break", heavy duty switch mechanism, cover interlock and provisions for pad locking. Spare positions shall be complete with devices indicated. Space positions shall be completely bussed for future addition of devices indicated.

D. Fuses shall be as specified in Section 16460.

E. All interiors shall be completely assembled with protective devices, wire connectors, and ground bus or lugs as indicated. All wire connectors except for screw terminals, shall be of the anti-turn solderless type and shall be suitable for copper or aluminum wire.

F. Interiors shall be so designed such that the protective devices can be replaced without disturbing adjacent units and without removing the main bus connectors. Circuits shall be interchangeable without machining, drilling or tapping.

G. Doors shall be provided in all trims and shall be hinged. Doors shall have a semi-flush cylinder key lock and catch except doors over 48" in height, which shall be provided with vault type handle and three point catch, complete with lock. Door hinges shall be

concealed and all doors shall be keyed alike. Opening of doors shall not expose any live parts.

H. Whenever distribution type panelboards are used as Service Entrance Equipment they shall be labeled.

2.03 MANUFACTURERS:

A. Distribution panels shall be manufactured by Cutler Hammer, Square D, Siemens or G.E.

END OF SECTION 16420

BRANCH DISTRIBUTION AND CONTROL EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Attention is directed to General Conditions, Supplementary Conditions and General Requirements which are hereby made a part of this Section.

1.02 DESCRIPTION OF WORK

A. General: Provide basic materials and methods for electrical work and install in accordance with the Contract Documents.

B. Major items of work and equipment included under this Section of the Specifications are panels, safety switches, motor control and lighting controls.

C. References to other Sections of the Specifications: Basic Electrical Materials and Methods - Section 16050, Grounding - Section 16400 and Fuses - Section 16460.

PART 2 - PRODUCTS

2.01 LIGHTING AND BRANCH CIRCUIT PANELBOARDS

A. Panels shall be of voltage, phase and service as required and further specified herein. All panels shall be equipped with thermal magnetic, toggle type, molded case circuit breakers with "quick-make", "quick-break" operating mechanism. Breakers shall be rated 10,000 A.I.C. minimum at 240 V.A.C. or 14,000 A.I.C. at 277 V.A.C. and single, double or triple pole as indicated. Single pole circuit breakers, rated 20 amperes or less shall be "SWD" marked in compliance with NEC Article 240-83(d). Provide arc-fault circuit interrupter (AFCI) circuit breakers on all branch circuits serving dwelling unit bedrooms. AFCI circuit breakers are not specifically indicated on panel schedules.

B. Cabinets shall be dead front construction, flush or surface type as indicated, constructed of code gauge galvanized steel and with 4" wiring gutters on all sides. Fronts shall be heavy gauge steel, equipped with flush doors to fit the cabinet boxes, hinged and supplied with flush key locks and interchangeable keys.

C. Panels shall be designed for 75 degrees C. minimum operating temperature.

D. Cabinet fronts shall be finished in manufacturer's standard color. Tops of all cabinets shall be 6'-0" above finish floor. Provide 2 keys for each panel.

E. All panels shall be provided with a directory frame and a typewritten directory.

F. Where space positions are called for on the plans, the panel shall be fully equipped for the simple addition of these future breakers.

G. Upon completion of the project, the Contractor shall check each panel and properly balance the load on all phases.

H. Panels shall be factory assembled, similar to Square "D" type "NQOD" for 120/208V service and as manufactured by Square "D", Siemens, G.E. or Cutler Hammer.

2.02 SAFETY SWITCHES, FUSES AND HEATERS

A. Safety and disconnect switches shall be 250V, as applicable, heavy duty, 2 or 3 pole as required, "quick-make", "quick-break" switch mechanism and cover interlock.

B. Switches shall be fused or unfused as indicated on the Drawing and they shall be same manufacturer as motor starters.

C. All switches exposed to weather shall have NEMA-3R raintight enclosure.

D. Provide all necessary fuses and replace all those blown during construction. All fuse sizes shall be in accordance with NEC. Fuses shall be as specified in Section 16460.

E. Heaters shall be thermal alloy, melting type and shall be used for all motors. Check all thermal overload elements supplied with motor starters against motor nameplate data. If said overloads are not of proper size and capacity, replace with the proper size and capacity, replace with the proper size overloads.

F. A complete set of suitable and intact fuses shall be installed in all fuse holders.

2.03 MOTOR CONTROLLERS (INDIVIDUAL)

A. Three phase motor starters shall be magnetic, with three thermal overload elements, pilot light and control device (i.e., H.O.A. switch or start-stop push button as required or indicated). Starters shall have integral control transformer, 120V maximum for control power, and one set of auxiliary contacts, one NO and one NC, in addition to those used for controls.

B. Combination starters shall consist of a disconnect switch as previously specified and a 3 phase magnetic motor starter in one enclosure.

C. Manual motor starters shall be toggle switch type, with ambient compensated thermal overload element and pilot light. Starters shall be flush in all finished areas and shall have stainless steel cover plates.

2.04 TIME SWITCHES

A. Time switches shall be electronic, programmable, four circuit, full year or seven day programming, NI-CAD battery back-up with charger, 365 day Astro dial and momentary feature for all circuits, with automatic daylight savings and leap year adjustment, Intermatic #ET70415CR or approved equal.

2.05 LIGHTING CONTACTORS

A. Lighting contactors shall be electrically operated, electrically held, NEMA general purpose enclosure, 600 volt rating with the number of poles indicated on Drawings. Contactors shall be Square "D" Class #8903 or equal by G.E., or Cutler Hammer.

2.06 PHOTOCELL CONTROLS

A. Photocell controls shall be "on-off" control equipped with 1/2" threaded stem, adjustable yoke, fail-safe operation, one to three foot candle "On" adjustment, hermetically sealed, lighting arrestor, S.P.S.T. switch, 105 - 130 volt, 60 HZ, 1500 watts tungsten, Intermatic Time Control Model #K1121 or equal.

2.07 CONTROL DEVICES

A. Push buttons, selector switches or other control stations not in starter covers shall be heavy duty, oil-tight, mounted in a cast metal enclosure.

B. Push buttons shall be of the momentary contact type unless otherwise indicated or specified. Selector switch units shall be of the maintained contact type with either two (2) or three (3) positions as required or indicated.

C. Push buttons shall be colored "Green" for "Start", "Red" for "Stop", and "Black" for "Reset", etc., unless otherwise shown or specified.

D. Plates for flush mounted push buttons, selector switches or other controls shall be satin finish stainless steel.

E. Push buttons, selector switches and control stations shall be manufactured by Allen Bradley Bulletin 800T, G.E. CR.2940, Westinghouse Class 15-022 type OR, or approved equal.

F. Pilot light stations shall be mounted on a molded bakelite block provided with candelabra base socket for 120 volt service and shall be "Push-To-Test" type with transformer. The lens shall be glass with threaded base which screws into a tapped collar mounted on the front of pressed steel covers or into tapped holes in cast iron covers.

G. Control stations, such as float switches, pressure stats, interlocking devices, etc. shall be provided and installed, unless otherwise specified, as a part of the equipment they are intended to control.

H. All devices installed in finished areas shall be flush mounted. Suitable outlet boxes, of the type and size required by the device specified, shall be provided and installed.

I. Control stations shall be legibly marked with manufacturer's name or symbol, voltage, and in case of special purpose enclosures, with the proper classification of the enclosure.

J. All control devices shall be provided with name plates.

PART 3 - EXECUTION

3.01 STANDARD REQUIREMENTS FOR MOTORS AND MOTOR CONTROLS

A. In general, all motors will be furnished and installed in place by Mechanical Trades. The Electrical Trades Contractor shall furnish and install all 3 phase magnetic starters except for packaged equipment furnished by Mechanical Trades. In addition, Electrical Trades shall furnish and install suitable starters where required or indicated and make final connections.

B. Furnish and install remote control devices where shown or indicated.

C. In general, motors larger than 1/2 HP shall operate on 208V, 3 phase power system. Motors 1/2 HP and smaller shall operate on 120V, single phase power system. Actual motor voltages are indicated on Drawings – (See Mechanical Schedules).

END OF SECTION 16450

FUSES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to General Conditions, Supplementary Conditions and General Requirements which are hereby made a part of this Section.

1.02 DESCRIPTION OF WORK

A. General: Provide basic materials and methods for electrical work and install in accordance with the Contract Documents.

B. Major items of work and equipment included under this Section of the Specifications are the provision and installation of fuses.

C. References to other Sections of the Specifications: Basic Electrical Materials and Methods - Section 16050, Main Distribution Switchboard - Section 16410, Distribution Type Panelboards - Section 16420 and Branch Distribution and Control Equipment - Section 16450.

1.03 SCOPE

A. Furnish and install all fuses required for the project work, all as specified herein and as indicated on the Drawings.

1.04 SUBSTITUTION

A. Bids shall be based on equipment specified and manufacturers named.

B. Coordination and current limitation for the protection of the electrical system have been designed using the particular characteristics of the named equipment.

C. Contractors wishing to substitute other manufacturers shall submit complete and supporting data; including short circuit calculations, selective coordination studies, etc.; for evaluation and approval by Engineer.

D. Engineer will issue written appropriate documentation should the substitute equipment receive approval.

PART 2 - PRODUCTS

2.01 YELLOW LABELS

A. For "low peak yellow" fuses install appropriate label notice to alert end user of the Engineered level of protection.

B. Label shall be marked with the proper fuse ratings and placed in a conspicuous location on the enclosure.

C. Labels are provided by the manufacturer.

2.02 MAINS, FEEDERS AND BRANCH CIRCUITS (0 - 600 AMPERES)

A. Circuits 1/10 to 600 amperes shall be protected by current limiting dual element time delay Fuses, UL Class "J", low peak yellow.

2.03 MAINS, FEEDERS AND BRANCH CIRCUITS (601 - 6,000 AMPERES)

A. Circuits 601 to 6,000 amperes shall be protected by current limiting dual element time delay fuses, UL Class "L", low peak yellow.

2.04 MOTOR CIRCUITS

A. All individual motor circuits with full load ampere ratings (FLA) of 480 amperes or less shall be protected by Bussmann Low Peak Dual Element Time Delay Fuses LPN-RK, LPS-RK or LPJ.

B. Fuses for motors with a marked service factor not less than 1.15 shall be installed in ratings of 125% of motor full load current (or next size larger if 125% does not correspond to a fuse size) except where high ambient temperatures prevail, or where the motor drives a heavy revolving part which cannot be brought up to full speed quickly, such as large fans. Under such conditions the fuse may be 150% to 175% of the motor full load current.

C. Larger HP motors shall be protected by Bussmann Low Peak Time Delay KRP-C Fuses of the ratings shown on the Drawings. For all other motors, (such as 1.0 service factor motors) fuses shall be sized in ratings of 115% of the motor full load current (or next size larger if 115% does not correspond to a fuse size) except as noted above.

D. The following guidelines apply where fuses are used as the only overload protection for the motor: for motors with a 1.15 service factor or more, fuses should be sized at 125% of motor full load current or next size smaller if 125% does not correspond to a fuse size.

E. For all other motors, fuses should be sized at 115% of motor full load current, or next size smaller, if 115% does not correspond to a fuse size. The fuses shall be UL Class RK, or J, dual element time delay. Fuses shall be "low peak yellow" color.

PART 3 - EXECUTION

3.01 MANUFACTURERS

A. Fuses shall be as manufactured by Bussmann.

B. Approved equals by Edison or Gould-Shawmut.

END OF SECTION 16460

LIGHTING SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to General Conditions, Supplementary Conditions and General Requirements which are hereby made a part of this Section.

1.02 DESCRIPTION OF WORK

A. General: Provide basic materials and methods for electrical work and install in accordance with the Contract Documents.

B. Major items of work and equipment under this Section of the Specifications are luminaires, lamps, hangers and supports.

C. References to other Sections of the Specifications: Basic Electrical Materials and Methods - Section 16050; Branch Distribution and Control Equipment - Section 16450.

1.03 INTENT

A. Provide and install lighting systems as specified and indicated including material and labor required for installation, cleaning and placement in operation.

B. Provide trim to fit each ceiling condition actually encountered, notwithstanding the manufacturer's catalog number set forth in the luminaire schedule. Verify actual ceiling construction prior to ordering fixtures.

C. Coordinate work with other Trades so that each luminaire is positioned in the ceiling as shown on Reflected Ceiling Plan.

D. Wire clean all fixtures, glassware, lenses, diffusers, refractors and lamps at start-up.

E. All parabolic and paracube diffuser media shall be protected with removable plastic cover. Cover shall not be removed until after the space is in finished state. Louvers that are covered with dust or construction debris will be replaced at no cost to Owner.

F. Coordinate luminaire mounting and support systems with the building work systems in which the fixtures are to be mounted.

1.04 SUBSTITUTIONS

A. Refer to the General Conditions, Supplementary Conditions, Division 1 General Requirements and Section 16010 - General Electrical Requirements for conditions applicable to substitutions for specified equipment, materials and systems.

B. A luminaire substitution submittal shall consist of a physical description, dimensioned drawing and complete photometric report of the proposed luminaire.

C. A lamp substitution submittal shall consist of lamp performance data including initial and mean lumen output, life, color, photometric distribution, voltage and operating

temperature. Performance should be as per published data of lamp and manufacturer(s) specified.

1.05 LUMINAIRES

A. Luminaires (lighting fixtures) shall include all lamps or tubes, ballasts, fuses, supports, hangers, plaster frames, brackets, canopies, globes, grid clips, etc., for a complete and functioning installation conforming to the architectural treatment of the areas in which these fixtures are to be installed.

1.06 LENSES AND DIFFUSERS

A. All plastic material used for diffusion of light such as lighting fixture lenses and/or diffusers shall meet with the requirements of the Michigan Department of State Police, Fire Marshal Division Policy Number 11-06 dated June 4, 1996.

PART 2 - PRODUCTS

2.01 FLUORESCENT LUMINAIRES

A. Fixtures shall be rigid, constructed of 20 or 22 gauge reinforced aluminum or steel. Fixtures shall be rustproofed before finish painting and all enamel finishes shall be baked-on. Reflecting surfaces unless otherwise specified shall be baked-on enamel, 85% minimum reflectance.

B. All components of lighting fixtures shall be E.T.L. certified. Fluorescent fixtures for wet or exterior location shall be vapor-proof, gasketed and provided with low temperature ballasts.

C. Lenses shall be virgin acrylic, clear, prismatic, similar to KSH pattern #12.

2.02 INCANDESCENT LUMINAIRES

A. Fixtures shall be of type and design specified in Schedule shown on Drawings. Canopies and holders shall be constructed of brass, 20 gauge minimum and shall match in design. Holders shall be safety screwless.

B. Lamp socket position in downlight luminaires shall be adjusted for the specified lamp wattage, as per manufacturer's recommendation, to properly locate light center within the reflector.

C. Recessed luminaires installed in other than suspended ceilings or poured concrete shall be UL approved for direct contact with insulation or shall be thermally protected.

D. Recessed luminaires shall be marked to indicate the maximum allowable wattage of lamps including lamp type. The markings shall be permanently installed in letters at least 1/4" high and shall be located where visible during relamping, but not visible under normal viewing conditions.

2.03 HI-INTENSITY DISCHARGE (H.I.D.) LUMINAIRES

A. Recessed luminaires shall be constructed to allow ballast replacement without removing luminaire from ceiling. Fixture design shall be such to minimize ballast noise. Noisy fixtures will be replaced at no cost to Owner. (See Ballast Specifications.)

B. HID luminaires shall be equipped with factory installed fuses.

2.04 STANDARD FLUORESCENT BALLASTS

A. Ballasts for standard fluorescent systems shall be energy saving magnetic, instant start, Class P, UL listed and CSA certified.

B. Ballasts shall be as manufactured by Advance, Magnetek or Motorola and shall be guaranteed for 5 years. Approved equal makes may be submitted for approval as part of lighting fixtures Shop Drawings.

2.05 COMPACT FLUORESCENT BALLASTS

A. Ballasts shall be electronic, rapid start designed for 0.5 second pre-heat cycle before starting voltage is applied. Total start time shall not exceed over one (1) second.

B. Starting temperature shall be 0 degrees F. minimum.

C. Ballasts shall be thermally protected, Class A sound rating, UL listed and conforming to FCC for RFI interference.

D. Ballasts shall be usable on 120V and 277V system and they shall leave a dimming option when specified.

E. Ballasts shall be as manufactured by Robertson or Advance.

2.06 H.I.D. BALLASTS

A. All HID ballasts shall be non-PCB type, high power factor, quiet, integrally fused and shall be of style and voltage as indicated in Lighting Fixture Schedule.

B. HID ballasts used for interior applications shall be comparable to KIRLIN's "Whisperpack". Ballasts deemed noisy by Engineer shall be replaced at no cost to Owner.

C. Ballasts used indoors shall be capable of starting the lamp(s) in an ambient temperature of zero degrees F. (minimum 18 degrees C.) and shall be capable of operating in an ambient temperature of at least 105 degrees F. (40 degrees C.)

D. Ballasts used outdoors shall be capable of starting the lamp(s) in an ambient temperature of minus 20 degrees F. (minus 29 degrees C.).

E. High Pressure Sodium: Ballasts shall be a HPF Autotransformer type for 150 watt lamps and below and lead type for 200 watt lamps and above.

F. Metal Halide: Ballasts shall be peak load Autotransformer type for all lamps.

2.07 ALTERNATE BALLASTS

A. Ballast types other than those specified above are generally described in "Lighting Fixture Schedule" shown on Drawings.

2.08 LAMPS

A. Fluorescent lamps in general, shall be 3500 degrees K, T8, rapid start, 15,000 hours lamp life and not less than 2850 initial lumens for 4 foot, 32W lamp.

B. Incandescent lamps shall be Type "A", "C", or "P.S.", 125V, inside frosted, except in fixtures where special lamps are required.

C. Metal halide lamps shall be, as far as practical, the same color rendition throughout the project.

D. Lamps shall be manufactured by Sylvania, Osram, General Electric or Philips.

2.09 LIGHTING FIXTURE SCHEDULE

A. Consult Schedule on Drawings for various types of luminaires. Information contained in this Schedule takes precedence over the requirements in this Section of Specifications.

PART 3 - EXECUTION

3.01 FIXTURE INSTALLATION

A. All fixtures shall be rigidly supported in an approved manner, whether or not the method is detailed or specified. Suspended fixture stems shall be finished to match fixture and shall be equipped with self-aligning ball and socket or other suitable joint so that fixtures hang perpendicular to the floor. Fixtures shall not be supported from roof deck. Exit lights shall not be supported from ceiling tiles.

B. Install luminaires after the possibility of mechanical injury to the luminaire during the work of other Trades is eliminated.

C. For suspended ceilings, insure that luminaires are supported without bowing or deflection of the ceiling system.

D. Coordinate the lighting system with the relevant Trades to eliminate interferences with hangers, ducts, sprinklers, pipes, etc.

E. Where air is supplied or returned through the luminaire, coordinate with the mechanical system installer to insure compatibility with the mechanical air booths and/or attachments.

F. Mounting height of luminaire shall be as scheduled or indicated on Drawings.

G. Fixtures shall be, as far as practical, factory wired in accordance with the job requirements. Installed fixtures shall be protected against possible damage from Trades until work is complete. New fixtures shall not be used for temporary lighting during the construction period.

END OF SECTION 16500

EMERGENCY POWER GENERATOR SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Attention is directed to General Conditions, Supplementary Conditions and General Requirements which are hereby made a part of this Section.

1.02 REFERENCE STANDARDS

A. The generator covered by these specifications shall be designed, tested, rated, assembled and installed in strict accordance with all applicable standards of ANSI, NEC, ISO, IEEE and NEMA.

1.03 WORK INCLUDED

A. The work includes supplying and installing a complete integrated emergency generator system to provide an alternate source of power to the plant emergency load in the event of a utility outage. The system consists of a diesel generator set with related component accessories and automatic transfer switches specified under a separate section.

B. The CONTRACTOR shall provide a base-mounted fuel tank, piping, plumbing and valves and a full tank of diesel fuel at the completion of all testing.

C. The equipment supplied and installed shall meet the requirements of the NEC and all applicable local codes and regulations. All equipment shall be of new and current production by a MANUFACTURER who has 25 years of experience building this type of equipment.

1.04 SUBSTITUTION

Proposed deviations from the specifications shall be treated as follows:

A. Requests for substitutions shall be made a minimum of seven (7) days prior to bid date. Manufacturers catalog data shall accompany each request and authorized acceptance shall be addenda only.

B. The emergency power system has been designed to the specified manufacturer's electrical and physical characteristics. The equipment sizing, spacing, amounts, electrical wiring, ventilation equipment, fuel and exhaust components have all been sized and designed around CATERPILLAR equipment. Should any substitutions be made, the CONTRACTOR shall bear responsibility for the installation, coordination and operation of the system as well as any engineering and redesign costs, which may result from such substitutions.

1.05 SUBMITTALS

A. Engine-generator submittals shall include the following information

1. Factory published specification sheet indicating standard and optional accessories, ratings, etc.

2. Manufacturer's catalog cut sheets of all auxiliary components such as isolators, battery charger, silencer, exhaust flex, main circuit breaker, etc.

3. Dimensional elevation and layout drawings of the generator set, enclosure and transfer switchgear and related accessories.

4. Weights of all equipment.

5. Concrete pad recommendation, layout and stub-up locations of electrical and fuel systems.

6. Interconnect wiring diagram of complete emergency system, including generator, switchgear, day tank, remote pumps, battery charger, remote alarm indications.

7. Engine mechanical data at varying loads up to full load, including heat rejection, exhaust gas flows, combustion air and ventilation air flows, noise data, fuel consumption, etc.

8. Generator electrical data including temperature and insulation data, cooling requirements, excitation ratings, voltage regulation, voltage regulator, efficiencies, waveform distortion and telephone influence factor.

9. Generator resistances, reactances and time constants.

10. Generator current decrement curve.

11. Generator motor starting capability.

12. Generator thermal damage curve.

13. Jacket water heater connection diagram.

14. Control panel schematics.

15. Automatic load transfer switch (es).

16. Oil sampling analysis, laboratory location, and information.

17. Manufacturer's and dealer's written warranty.

18. Emissions data

1.06 FACTORY PROTOTYPE TESTING

A. The system manufacturer must certify that engine; generator, controls, and switchgear have been tested as complete system of representative engineering models (not on equipment sold). The manufacturer shall supply equipment that is a current factory production model.

Prototype testing shall include:

Fuel consumption at 1/4, 1/2, 3/4, and full load

Exhaust emissions

Mechanical and exhaust noise

Governor speed regulation at 1/4, 1/2, 3/4, and full load; and during transients

Motor starting kVA

Generator temperature rise in accordance with NEMA MG1-22.40

Harmonic analysis, voltage waveform deviation and telephone influence factor

Generator short circuit capability

Cooling system performance

Generator revolving field assembly for 2 hours at 2700 rpm (150% over speed) and 70C, and each production unit tested at 2250 rpm (125% over speed) at room temperature.

1.07 SYSTEM RESPONSIBILITY

A. To qualify as a MANUFACTURER, the engine must be the principal item manufactured and the completed engine generator set shall be supplied by that, MANUFACTURER's authorized distributor only. Packagers or suppliers that do not manufacture the engine are not acceptable.

B. The equipment supplied and installed shall meet the requirements of NEC and all-applicable local codes and regulations. All equipment shall be new, of current production. There shall be one source responsibility for warranty; parts and service through a local representative with factory trained service personnel.

C. The equipment supplier shall be the local authorized distributor for the product supplied.

D. The automatic transfer switch (es) specified in another section shall be supplied by the engine-generator manufacturer in order to establish and maintain a single source of system responsibility and coordination.

1.08 WARRANTY

A. The manufacturer's standard warranty shall in no event be for a period of less than two (2) years from date of initial start-up of the system and shall include repair parts, labor, reasonable travel expense necessary for repairs at the job site, and expendables (lubricating oil, filters, antifreeze, and other service items made unusable by the defect) used during the course of repair. Running hours shall not be a limiting factor for the system warranty by either the manufacturer or servicing distributor. Submittals received without written warranties as specified will be rejected in their entirety.

1.09 PARTS AND SERVICE QUALIFICATIONS

A. The engine-generator supplier shall have service facilities within 50 miles of the project site and maintain 24-hour in-house parts and service capability. The distributor shall maintain a local stock parts as needed to support the generator set package for this specific project. Evidence of the parts inventory and service capability shall be demonstrated to the specifying engineer upon request. Suppliers that depend on others (local or out of State) for parts inventory or that depend on subcontractors to service the equipment will not be approved.

B. The dealer shall maintain qualified; factory trained service personnel that can respond to an emergency call within 4 hours of notification.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. The generator set shall be Standby rated at 150 kW, 1800 RPM 80% power factor, 120/208 VAC, 3 phase, 4 wire, 60 hertz, including radiator fan and all parasitic loads. The generator set shall be provided by Caterpillar, Kohler or Onan providing these specifications are adhered to.

B. All materials and parts comprising the unit shall be new and unused.

2.02 DIESEL ENGINE

A. The engine shall be as manufactured by Caterpillar or approved equal. The engine shall be water-cooled inline or Vee-type, four-cycle compression ignition diesel. It shall meet specifications when operating on number 2 domestic burner oil. Two cycle engines will not be considered. The engine shall be equipped with fuel, lube oil, and intake air filters, lube oil cooler, fuel transfer pump, fuel priming pump, service meter, gear-driven water pump.

B. The governor shall maintain isochronous speed regulation from no load full rated load. Steady state speed regulation shall be +/- 0.33%. The governor shall be equipped with a vernier control and positive locking to allow manual speed adjustment.

C. The complete engine block shall be machined from one casting. Designs incorporating multiple blocks bolted together are not acceptable.

D. The engine shall utilize a gear-type, positive displacement, full pressure lubricating oil pump and water-cooled lube oil cooler. Pistons shall be spray-cooled. Provide oil filters, oil pressure gauge, dipstick and oil drain.

E. Fuel filter and serviceable fuel system components shall be located to prevent fuel from spilling onto generator set batteries.

2. 03 GENERATOR:

A. The synchronous three-phase generator shall be a single bearing, self-ventilated, drip-proof design in accordance with NEMA MG 1 and directly connected to the engine flywheel housing with a flex coupling.

B. The insulation material shall meet NEMA standards for Class H insulation and be vacuum impregnated with epoxy varnish to be fungus resistant. Temperature rise of the rotor and

stator shall not exceed NEMA class F (105 ºC rise by resistance over 40 C ambient). The excitation system shall be of brushless construction.

C. The self excited, brushless exciter shall consist of a three-phase armature and a three-phase full wave bridge rectifier mounted on the rotor shaft. Surge suppressors shall be included to protect the diodes from voltage spikes.

D. The automatic voltage regulator (AVR) shall maintain generator output voltage within +/- 0.5% for any constant load between no load and full load. The regulator shall be a totally solid state design, which includes electronic voltage buildup, volts per Hertz regulation, three phase sensing, over excitation protection, loss of sensing protection, temperature compensation, shall limit voltage overshoot on startup, and shall be environmentally sealed.

2.04 CIRCUIT BREAKERS

A. Provide generator mounted circuit breaker, molded case or insulated case construction, 600 ampere, 3-pole, NEMA 1P22. Breakers shall be American made and shall utilize a thermal magnetic trip unit and 24 VDC shunt trip. The breaker shall be UL listed with shunt trip device connected to engine/generator safety shutdowns. Mechanical type lugs, sized for the circuit breaker feeders shown on drawing, shall be supplied on the load side of breaker.

2. 05 CONTROL PANEL

A. Provide a generator mounted control panel for complete control and monitoring of the engine and generator set functions. Panel shall include automatic start/stop operation; adjustable cycle cranking, digital AC metering (0.5% true rms accuracy) with phase selector switch, digital engine monitoring, shutdown sensors and alarms with horn and reset, adjustable cool down timer and emergency stop push-button. Panel shall incorporate self-diagnostics capabilities and fault logging. Critical components shall be environmentally sealed to protect against failure from moisture and dirt. Components shall be housed in a NEMA 1/IP22 enclosure with hinged lid.

B. Provide the following digital readouts:

1. Engine oil pressure
2. Coolant temperature
3. Engine RPM
4. System DC Volts
5. Engine running hours
6. Generator AC volts

7. Generator AC amps
8. Generator frequency
9. KW meter
10. Percentage of rated Power
11. KVA meter
12. KVAr meter
13. Power Factor meter
14. KWHR meter

C. Provide the following indications for protection and diagnostics according to NFPA 110 level 1:

1. Low oil pressure
2. High water temperature

3. Low coolant level
4. Overspeed
5. Overcrank
6. Emergency stop depressed
7. Approaching high coolant temperature
8. Approaching low oil pressure
9. Low coolant temperature
10. Low voltage in battery
11. Control switch not in automatic (position)
12. Low fuel main tank
13. Battery charger ac failure
14. Generator supplying load
15. Spare

D. Provide a remote annunciator with flashing LED's and horn to annunciate low coolant temperature alarm, high coolant temperature shut down, low oil pressure shut down, over speed shut down, over crank shut down, low fuel level alarm, generator supplying load and battery charger malfunction. The annunciator ring-back capability so that after silencing the initial alarm any subsequent alarms will sound the horn. Locate in East Boiler Room.

E. Provide programmable protective relay functions inside the control panel to include the following:

1. Under voltage
2. Over voltage
3. Over frequency
4. Underfrequency
5. Reverse power
6. Overcurrent (phase and total)
7. KW level (overload)
8. Three spare LED's
9. Four spare inputs

2.06 COOLING SYSTEM

A. The generator set shall be equipped with a rail-mounted radiator and engine-driven blower fan and all accessories. The cooling system shall be sized to operate at full load conditions and 134 F ambient air entering the enclosure without de-rating the unit and 50/50 anti-freeze mixture.

2.07 FUEL SYSTEM

A. Filter/Separator - In addition to the standard fuel filters provided by the engine manufacturer, there shall also be installed a primary fuel filter/water separator in the fuel inlet line to the engine.

B. Flexible fuel lines rated 300 degrees F and 100 PSI.

C. A UL 142 listed, painted, double wall steel fuel storage tank with capacity to operate the generator set for 24-hours operation at 75% load shall be furnished. The system shall contain required vents, fuel level gauge and alarm switches with dry contacts for "low fuel level" and "leak detected".

2.08 EXHAUST SYSTEM

A. A critical type silencer and flexible stainless steel exhaust fitting properly sized shall be furnished with the generator set and installed by the installing contractor according to the manufacturer's recommendation. The silencer shall be mounted so that its weight is not supported by the engine nor will exhaust system growth due to thermal expansion be imposed on the engine.

2.09 STARTING SYSTEM

A. A 24-volt DC electric starting system with positive engagement shall be furnished.

B. A unit mounted thermal circulation type water heater. The heater Watt rating shall be sized by the manufacturer to maintain jacket water temperature at 90 degrees F, and shall operate on 120 or 240 volts, single phase, 60 hertz.

C. A lead-acid storage battery set of the heavy-duty diesel starting type shall be provided. Battery voltage shall be compatible with the starting system. The battery set shall be rated no less than 172-ampere hours. Necessary cables and clamps shall be provided.

D. A battery tray shall be provided for the batteries and shall conform to NEC 480-7(b). It shall treated to be resistant to deterioration by battery electrolyte. Further, construction shall be such that any spillage or boil-over battery electrolyte shall be contained within the tray to prevent a direct path to ground.

E. A current limiting battery charger shall be furnished to automatically recharge batteries. Charger shall float at 2.17 volts per cell and equalize at 2.33 volts per cell. It shall include overload protection, silicon diode full wave rectifiers, voltage surge suppressor, DC ammeter, DC voltmeter, and fused AC input. Ac input voltage shall be 120 volts, single phase. Charger shall have LED annunciation for low DC volts, rectifier failure, loss of AC power, high DC volts. Amperage output shall be no less than ten (10) amperes. Charger shall be generator or wall-mounting type in NEMA 1 enclosure.

2.10 OUTDOOR HOUSING

A. Steel weather protective, sound attenuated enclosure with 14 gauge sheet metal and a minimum ambient capability of 43 C (110 F). Shall have removable hinged doors and removable end panels to allow easy routine maintenance. All hinges and latches shall be rust resistant and doors shall be equipped with rubber seals. A lockable service access cover shall be provided for easy access to the radiator fill cap.

The roof shall be pitched to prevent moisture accumulation. The enclosure shall be painted utilizing an electrostatically applied powder baked paint. The enclosure shall reduce the noise produced by the generator set to 75 dba at 7 meters while operating at rated load. The silencer shall be mounted inside the sound attenuated enclosure. A provision for draining moisture shall be included.

2.11 AUTOMATIC TRANSFER SWITCH

A. Furnish and install automatic transfer switches (ATS) with number of poles, amperage, voltage and withstand current ratings as shown on the plans. Each automatic transfer shall consist of an inherently double throw power transfer switch unit and a microprocessor control panel, interconnected to provide complete automatic operation. All transfer switches and control panels shall be the product of the same manufacturer.

B. Automatic transfer switches shall be ASCO Series 300. Any alternate shall be submitted to the consulting engineer in writing at least 10 days prior to bid. Each alternate bid must list any deviations from this specification.

C. The automatic transfer switches and accessories shall conform to the requirements of:

1. UL 1008 - Standard for Automatic Transfer Switches

2. NFPA 70 - National Electrical Code

3. NFPA 110 - Emergency and Standby Power Systems

4. IEEE Standard 446 - IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications

5. NEMA Standard ICS10-1993 (formerly ICS2-447) - AC Automatic Transfer Switches

D. Mechanically Held Transfer Switch

1. The transfer switch unit shall be electrically operated and mechanically held. The electrical operator shall be a single-solenoid mechanism, momentarily energized. Main operators which include overcurrent disconnect devices will not be accepted. The switch shall be mechanically interlocked to ensure only one of two possible positions, normal or emergency.

2. The switch shall be positively locked and unaffected by momentary outages so that contact pressure is maintained at a constant value and temperature rise at the contacts is minimized for maximum reliability and operating life.

3. All main contacts shall be silver composition. Switches rated 600 amperes and above shall have segmented, blow-on construction for high withstand current capability and be protected by separate arcing contacts.

4. Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. A manual operating handle shall be provided for maintenance purposes. The handle shall permit the operator to manually stop the contacts at any point throughout their entire travel to inspect and service the contacts when required.

5. Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof which are not intended for continuous duty, repetitive switching or transfer between two active power sources are not acceptable.

6. Where neutral conductors must be switched, the ATS shall be provided with fully-rated neutral transfer contacts.

7. Where neutral conductors are to be solidly connected, a neutral terminal plate with fully-rated AL-CU pressure connectors shall be provided.

E. Microprocessor Control Panel With Membrane Interface Panel

1. The control panel shall direct the operation of the transfer switch. The panel's sensing and logic shall be controlled by a built-in microprocessor for maximum reliability, minimum maintenance, and inherent serial communications capability. The control panel shall be connected to the transfer switch by an interconnecting wiring harness. The harness shall include a keyed disconnect plug to enable the control panel to be disconnected from the transfer switch for routine maintenance.

2. The control panel shall be enclosed with a protective cover and be mounted separate from the transfer switch unit for safety and ease of maintenance. Sensing and control logic shall be provided on printed circuit boards. Interfacing relays shall be industrial grade plug-in type with dustcovers.

3. The control panel shall meet or exceed the requirements for Electromagnetic Compatibility (EMC) as follows:

   a. IEEE472 (ANSI C37.90A) Ring wave test.
   b. ENC55011 1991 Class A Conducted and radiated emission.
   c. IEC801-2 1991 (EN61000-4-2) Electrostatic discharge immunity, direct contact & air discharge.
   d. IEC801-3 1984 (ENV50140) Radiated electromagnetic field immunity.
   e. IEC801-4 1988 (EN61000-4-4) Electrical fast transient immunity.
   f. ENV50142 (EN61000-4-5) Surge immunity.
   g. ENV50141 HF Conducted disturbances immunity.
   h. EN61000-4-11 Voltage dips and interruptions immunity.
   i. Mil Std 461, Class 3C, Group 1 Test UM05 Radiated & conducted electromagnetic emissions.

F. Enclosure

1. The ATS shall be furnished in a NEMA type 1 enclosure unless otherwise shown on the plans.

G. Voltage and Frequency Sensing

1. The voltage of each phase of the normal source shall be monitored, with pickup adjustable to 95% of nominal and dropout adjustable from 70% to 90% of pickup setting.

2. Single-phase voltage and frequency sensing of the emergency source shall be provided.

H. Time Delays

1. An adjustable time delay shall be provided to override momentary normal source outages and delay all transfer and engine starting signals.

2. An adjustable time delay shall be provided on transfer to emergency, adjustable from 0 to 5 minutes for controlled timing of transfer of loads to emergency.

3. An adjustable time delay shall be provided on retransfer to normal, adjustable to 30 minutes. Time delay shall be automatically bypassed if emergency source fails and normal source is acceptable.

4. A 5 minute cooldown time delay shall be provided on shutdown of engine generator.

5. All adjustable time delays shall be field adjustable without the use of tools.

I. Elevator Pre-Signal:

1. Provide two Form C contacts or contact/relay combination to signal elevator before transfer occurs.

J. Compressors Lockout:

1. Provide 4-pole relay with Form C contacts to allow locking of AC compressors when ATS is in emergency position. Relay shall operate to open compressor circuit.

K. Additional Features

1. A set of gold-flashed contacts rated 10 amps, 32 VDC shall be provided for a low-voltage engine start signal. The start signal shall prevent dry cranking of the engine by requiring the generator set to reach proper output, and run for the duration of the cool down setting, regardless of whether the normal source restores before the load is transferred.

2. A push-button type test switch shall be provided to simulate a normal sourcefailure.

3. A push-button type switch to bypass the time delay on transfer to emergency, the engine exerciser period on the retransfer to normal time delay whichever delay is active at the time the push-button is activated.

4. Terminals shall be provided for a remote contact which opens to signal the ATS to transfer to emergency and for remote contacts which open to inhibit transfer to emergency and/or retransfer to normal.

5. Auxiliary contacts, rated 10 amps, 250 VAC shall be provided consisting of one contact, closed when the ATS is connected to the normal source and one contact, closed, when the ATS is connected to the emergency source.

6. Indicating lights shall be provided, one to indicate when the ATS is connected to the normal source (green) and one to indicate when the ATS is connected to the emergency source (red). Also provide indicating lights for both normal and emergency source availability.

7. Terminals shall be provided to indicate actual availability of the normal and emergency sources, as determined by the voltage sensing pickup and dropout settings for each source.

8. Engine Exerciser - An engine generator exercising timer shall be provided, including a selector switch to select exercise with or without load transfer.

9. Inphase Monitor - An Inphase monitor shall be inherently built into the controls. The monitor shall control transfer so that motor load inrush currents do not exceed normal starting currents, and shall not require external control of power sources. The inphase monitor shall be specifically designed for and be the product of the ATS manufacturer.

10. Selective Load Disconnect - A double throw contact shall be provided to operate after a time delay, adjustable to 20 seconds prior to transfer and reset 0 to 20

seconds after transfer. This contact can be used to selectively disconnect specific load(s) when the transfer switch is transferred. Output contacts shall be rated 6 amps at 28 VDC or 120 VAC.

L. Withstand and Closing Ratings

1. The ATS shall be rated to close on and withstand the available rms symmetrical short circuit current at the ATS terminals with the type of overcurrent protection shown on the plans. WCR ATS ratings as be as follows when used with specific circuit breakers:

ATS Size	Withstand & Closing Rating MCCB	W/CLF
30	10,000A	100,000
70-200	22,000A	200,000
225-400	42,000A	200,000
600-800	**65,000A**	**200,000**
1000-1200	65,000A	200,000
1600 - 2000	100,000A	200,000

M. Tests and Certification

1. The complete ATS shall be factory tested to ensure proper operation of the individual components and correct overall sequence of operation and to ensure that the operating transfer time, voltage, frequency and time delay settings are in compliance with the specification requirements.

2. Upon request, the manufacturer shall provide a notarized letter certifying compliance with all of the requirements of this specification including compliance with the above codes and standards, and withstand and closing ratings. The certification shall identify, by serial number(s), the equipment involved. No exceptions to the specifications, other than those stipulated at the time of the submittal, shall be included in the certification.

3. The ATS manufacturer shall be certified to ISO 9001 International Quality Standard and the manufacturer shall have third party certification verifying quality assurance in design/development, production, installation and servicing in accordance with ISO 9001.

N. Service Representation

1. The ATS manufacturer shall maintain a national service organization of company-employed personnel located throughout the contiguous United States. The service center's personnel must be factory trained and must be on call 24 hours a day, 365 days a year.

2. The manufacturer shall maintain records of each switch, by serial number, for a minimum of 20 years.

3. For ease of maintenance and parts replacement, , the switch nameplate shall include drawing numbers, part numbers for main coil and control.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install equipment in accordance with manufacturer's recommendations, the project drawings and specifications, and all applicable codes.

3.02 START-UP AND TESTING

A. Coordinate all start-up and testing activities with the Engineer and Owner.

B. After installation is complete and normal power is available, the manufacturer's local dealer shall perform the following:

1. Include in price a $1,000 allowance to fill tank with diesel fuel.
2. Verify that the equipment is installed properly.
3. Check all auxiliary devices for proper operation, including battery charger, jacket water heater(s), generator space heater, remote annunciator, etc.
4. Test all alarms and safety shutdown devices for proper operation and annunciation.
5. Check all fluid levels.
6. Start engine and check for exhaust, oil, fuel leaks, vibrations, etc.
7. Verify proper voltage and phase rotation at the transfer switch before connecting to the load.
8. Connect the generator to building load and verify that the generator will start and run all designated loads in the plant.
9. Providing a factory certified test report at 100% load and rated power factor (0.80) is furnished with the generator set perform a site load test using available building load. In lieu of the certified factory test report perform the following test at 100% load using resistive load bank complete with cables furnished by the generator supplier.

Observe and record the following data at 15-minute intervals:

A. Service meter hours
B. Volts AC - All phases
C. Amps AC - All phases
D. Frequency
E. Power factor
F. Jacket water temperature
G. Oil Pressure
H. Fuel pressure
I. Ambient temperature

3.03 OPERATION AND MAINTENANCE MANUALS

A. Provide two (2) sets of operation and maintenance manuals covering the generator, switchgear, and auxiliary components. Include parts manuals, final as-built wiring interconnect diagrams and recommended preventative maintenance schedules.

B. Provide sufficient on-site, hands on training to instruct the owner's personnel in the proper operation and maintenance of the equipment. Review operation and maintenance manuals, parts manuals, and emergency service procedures.

3.04 TRAINING

A. Provide sufficient on-site, hands on training to instruct the owner's personnel in the proper operation and maintenance of the equipment. Review operation and maintenance manuals, parts manuals, and emergency service procedures.

END OF SECTION 16610

VOICE COMMUNICATION SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Attention is directed to General Conditions, Supplementary Conditions and General Requirements which are hereby made a part of this Section.

1.02 DESCRIPTION OF WORK:

A. General: Provide basic materials and methods for electrical work and install in accordance with the Contract Documents.

B. Major items of work and equipment included under this Section of the Specification is The Voice Communication (Telephone) System.

C. References to other Sections of the Specifications: Basic Electrical Materials and Methods - Section 16050.

1.03 SCOPE:

A. Provide all labor and materials required for the complete installation of the Voice Communication Systems as hereinafter specified and as shown on the Drawings.

B. Utilize existing telephone wiring to accomplish the task. Provide additional wiring as required.

C. Provide complete telephone outlets as indicate on drawings. Provide RJ-11 telephone jack at each outlet.

D. Each apartment shall have one telephone line. Telephone lines shall be connected to the existing system.

PART 3 - EXECUTION

3.01 Contractor shall employ the services of a Telephone Company to complete The Voice Communication System.

END OF SECTION 16700

SECTION 16730

EMERGENCY CALL SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to General Conditions, Supplementary Conditions and General Requirements which are hereby made a part of this Section.

1.02 DESCRIPTION OF WORK

A. General: Provide basic materials and methods for electrical work and install in accordance with the Contract Documents.

B. Major items of work and equipment included under this Section of the Specifications is the Emergency Call System Equipment and Wiring.

C. Reference to other Sections of the Specifications: Basic Electrical Materials and Methods - Section 16050.

D. Match existing system and connect the west wing units (all 3 floors) to existing master annunciator panel.

1.03 SCOPE

A. Furnish and install emergency call devices at locations indicated on the Drawings.

B. Match existing system in every detail.

1.04 FUNCTIONS

A. Pulling an emergency pullcord shall immediately cause an annunciator lamp to light indicating the calling station location and an audible signal to sound at the annunciator location and all system duty stations.

B. System may be reset only at the originating station.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. Existing system is manufactured by Tec Tone.

PART 3 - EXECUTION

3.01 INSTALLATION

A. All wiring shall be concealed and run in an approved manner acceptable to Local Authority.

B. All cable shall be as required by the manufacturer. Install all cables and make final connections.

C. Test system and certify for complete operation and functions.

END OF SECTION 16730

FIRE ALARM SYSTEM - PERFORMANCE SPECIFICATION

PART 1 - GENERAL

A. A/E will not show devices on plans. System's quality and performance shall be as covered in these specifications.

1.01 SCOPE OF WORK:

A. Provide a complete manual/automatic addressable Fire Alarm Detection and Notification System including all work for a complete, functioning and approved installation but not limited to the following major items:

1. System design.
2. Device location.
3. Battery calculations.
4. Circuit voltage drop calculations.
5. Building plans with location of all devices and equipment.
6. Interface with other systems or equipment.
    a. Elevators Fire Suppression and Power Shutoff.
    b. Kitchen Ansul System.
    c. Air Handling Units Smoke Detection.
    d. Fire Curtains and Smoke Barriers.
    e. Any other Fire Related Devices or Equipment.
7. System riser.
8. Legend for all devices and equipment shown on plans and riser.
9. System operation matrix and as required for full compliance with requirements of NFC 72 and applicable local, state and national rules and regulations.

B. Employ the services of a qualified certified fire alarm contractor/consultant to prepare the system design and related construction documents including all related calculations and device placement; fully complete with all information and related data, as required, to obtain system approval by the local authority having jurisdiction.

C. System design shall provide for 25% spare capacity all across in the front end control equipment and in every circuit capacity and conductor sizing.

D. Provide system testing and correct all defects prior to final demonstration and Owner acceptance.

E. Provide four (4) hours of training in operation and maintenance for two persons as selected by the Owner/User.

1.02 SUBMITTALS TO LOCAL AUTHORITY:

A. The following documents shall be submitted for review prior to installation:

1. Floor plans.
2. Location of control and annunciation equipment.
3. Location of initiating devices and alarm indicating appliances on plans.
4. Power connection.
5. System riser diagram.
6. Device circuiting on plans and or riser.
7. Battery calculations.
8. Circuit conductors, type and size.
9. Voltage drop calculation for every circuit with the 25% spare capacity included.
10. Interface with other systems or equipment (control functions) as required, specified or noted.
11. System matrix for events (functional matrix).
12. Manufacturer data, cuts, sheets, listing and all related information for the equipment and devices provided for the system.

1.03 ARCHITECTS/ENGINEERS REVIEW:

A. Architect/Engineer will review system documents after they have been approved by Local Authority.

B. Review will cover general compliance with project requirements and the intent of these specifications.

1.04 SUGGESTED CONSULTANTS/CONTRACTORS:

A. Security Consulting Service, Inc.
B. National Time and Signal.
C. Gamewell.

1.05 CODES AND STANDARD:

A. NFPA 72 – National Fire Alarm Code

B. NFPA 101 – Life Safety Code

C. NEC 760 – Fire Protective Signaling Systems

D. NEC 725 – Signaling and Power Limited Circuits

D. Local Ordinances as Applicable

1.06 REGULATORY REQUIREMENTS:

A. Conform to requirements of National Fire Code (NFC).

B. A.D.A. Federal guidelines

C. Conform to State and local Fire Codes

D. Conform to rules and requirements of Local Governing body.

1.07 SYSTEMS SUPERVISION:

A. Provide electronically supervised system, with supervised alarm initiating and alarm signaling circuits. Occurrence of single ground or open condition in initiating or signaling circuit places circuit in TROUBLE mode. Occurrence of single ground condition on alarm initiating or signaling circuit does not disable that circuit from transmitting an ALARM.

PART 2 - PRODUCTS

2.01 The following is intended to establish general quality of system but not intended to limit system design or exclude any required devices.

2.02 MANUAL STATIONS:

A. Semi flush, addressable and with priority alarm modules. Manual stations shall be individually identifiable by the fire alarm control panel.

2.03 REMOTE INTERFACE MODULES:

A. Addressable, programmable interface modules as required to monitor, control and initiate required fire alarm functions.

2.04 SMOKE DETECTORS: (Intelligent Analog Addressable)

A. Photoelectric, listed for use as open area protective coverage and shall be insensitive to air velocity changes.

B. Detectors shall be operational with relay bases, audible bases, and remote indicating LED's programmable by the control panel.

2.05 SINGLE STATION SMOKE DETECTORS (AS APPLICABLE):

A. Photoelectric 120VAC / 9VDC battery back-up, interconnectable, auxiliary contacts and with internal 90db audible sounder for physically handicap units. Detectors shall incorporate a 177cd visual strobe.

2.06 ALARM HORNS/SPEAKERS:

A. Alarm horns/speakers fully enclosed and dustproof. Designed to be mounted on a wall, 80" AFF or 6" from ceiling which ever is lower.

B. Mini Horns when used for living units shall be rated 90db at 10' and shall mount to a single gang box.

2.07 ALARM STROBES:

A. Flush back boxes, complying with A.D.A. guidelines for light intensity and the following:

1. Xenon strobe with minimum repetition rate of 1 HZ, not exceeding 3 HZ and a maximum duty cycle of 40% with a pulse duration of .2 seconds.

2. Unfiltered or clear white light.

3. Visual signals shall be mounted at a height of maximum 80 inches above finish floor level, or six inches below ceiling level whichever is lower.

2.08 AUXILIARY DEVICES:

A. Devices such as magnetic door holders, water flow switches, tamper switches and the like shall be provided as required.

2.09 DUCT SMOKE DETECTORS:

A. Provide detectors for all air handling units as required.

B. Photoelectric listed for use in duct detection.

C. Insensitive to air velocity changes.

D. Capable of sensitivity tested after removal from base.

E. Capable of being operational with relay bases.

F. Remote indicating LED programmable from central panel.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. The system as described shall be installed, tested, and delivered to the Owner in first class condition. The system shall include all the required hardware, raceways, interconnecting wiring and software to accomplish the intent of these specifications and the contract documents, whether or not specifically itemized herein.

B All equipment furnished shall be new and include the latest state of the art products from a single manufacturer, engaged in the manufacturing and sale of fire detection systems for over five years. The installing contractor shall contract with a single source for supplying devices/materials, services, and programming, including final inspection/test services for the fire alarm system.

C. Control and other panels shall be mounted with sufficient clearance for observation and testing. All fire alarm junction boxes must be clearly marked for easy identification.

D. Fire alarm pull stations and horns installed in finished areas shall be mounted semi-flush and may be surface mounted in existing and non-finished areas. Smoke detectors and

thermal detectors shall be mounted on a recess mounted junction box in finished areas and to surface mounted junction boxes in non-finished areas.

E. Install manual station flush mounted with operating handle 48 inches above floor. Install audible and visual signal devices no more than 80 inches above highest floor level or 6 inches below the ceiling, whichever is lower.

F. Mount outlet box for electric door holder to withstand 80 pounds pulling force.

3.02 WIRING:

A. No wiring other than that directly associated with fire alarm detection, alarm or auxiliary fire protection functions shall be permitted in fire alarm conduits. Wiring splices are to be avoided to the extent possible, and if needed they must be made only in junction boxes and shall be crimp connected. Transposing or changing color coding of wire shall not be permitted. All conductors in conduit containing more than one wire shall be labeled so that each drops off directly opposite to its terminal. All wiring shall be checked and tested to unsure and harnessed so that each drops off directly opposite to its terminal.

B. All wiring shall be checked and tested to insure that there are no grounds, opens, or shorts.

3.03 TESTING, APPROVAL AND CERTIFICATION:

A. Fire alarm system shall be tested in presence of Local Inspecting Authority and test report of results shall be filed with Owner/Architect/Engineer as part of systems documentation.

B. Make all revisions or changes necessary to maintain final approval at no extra cost to Owner.

C. Provide all personnel and materials required for system testing.

END OF SECTION 16800

MISCELLANEOUS SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Attention is directed to General Conditions, Supplementary Conditions and General Requirements which are hereby made a part of this Section.

1.02 DESCRIPTION:

A. General: Provide basic materials and methods for electrical work and install in accordance with the Contract Documents.

B. Major items of work and equipment included under this Section of the Specifications are provisions applicable to Cable TV and Communication Systems.

C. References to other Sections of the Specifications: Basic Electrical Materials and Methods - Section 16050.

1.03 CABLE TV SYSTEM:

A. System equipment, wiring and installation will be provided by others.

1.04 TENANT COMMUNICATION SYSTEM:

A. System is existing and operational in the center and east wings. Contractor shall reconnect the west wing intercom stations to the existing system.

B. Verify by field examination the usability of existing wiring. Provide new wiring as required.

C. The existing system is manufactured by AiPhone.

D. Match existing system in every detail.

END OF SECTION 16850

DEMOLITION AND RENOVATION WORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Attention is directed to General Conditions, Supplementary Conditions and General Requirements which are hereby made a part of this Section.

1.02 DESCRIPTION OF WORK:

A. General: Provide basic materials and methods for electrical demolition and renovation work and complete in accordance with the Contract Documents.

B. Major items of work and equipment included under this Section of the Specifications are removal and/or replacement of existing electrical equipment and material as specified, indicated maintenance of existing services to remain as applicable, existing to remain conditions, and miscellaneous relocations.

C. Where existing slabs/floors are to be cut or demolished, the contractor, shall inspect, test, and perform all required investigations to identify the presence of telecommunication raceways, electrical feeders, branch circuits and or services which are to be maintained whether noted on the drawings or not and take all steps necessary to protect and maintain those services.

D. References to other Section of the Specifications: 16010 – General Electrical Requirements, Basic Electrical Materials and Methods - Section 16050.

1.03 INTENT:

A. Demolition and renovation work shall be carried on in a workmanlike manner with minimum disturbance to the existing structure and its occupants.

B. All surfaces damaged by this contractor in the course of performing his work shall be restored to satisfactory condition, as directed by the architect and all costs of repairs shall be paid for by the contractor. Similarly all equipment, systems, building and site components damaged shall be repaired to pre-work condition.

C. It is the intent of these Documents to render a complete and functioning installation in accordance with design intent. All work required to accomplish the above shall be included and performed and shall be considered as basic to the Contract work.

D. Disconnect, remove, relocate, rewire or dispose of, any equipment interfering with new construction or effected by renovation work.

1.04 FIELD CONDITIONS:

A. In instances where actual field conditions dictate methods or materials other than those indicated on the Drawings, Contractor shall consult Architect for direction and shall be

governed accordingly in carrying out the work. All work necessitated by field conditions shall be considered as incidental to the proper performance of the Contract work.

B. Where panelboards and other electrical equipment are installed in existing spaces, survey proposed location prior to installation. Verify that no interferences exist which would infringe on electrical equipment working clearances and panelboard dedicated electrical space as required by the National Electrical Code. Notify the Architect/Engineer of any conflicts prior to installation of equipment and related raceways.

PART 3 - EXECUTION

3.01 EXISTING EQUIPMENT AND SERVICES:

A. All services indicated to remain shall be maintained in safe and satisfactory operation at all times.

B. All removed equipment shall remain the property of the Owner and shall be disposed of as directed, either to storage or "off" the site.

C. Relocated equipment shall be inspected, repaired when required, and thoroughly cleaned prior to installation.

D. Where services or circuits are disconnected or discontinued, it is mandatory that any existing unused wiring be removed to the source unless specifically excepted on the Drawings. It is the intent of this article to permanently disconnect all unused circuits at the main source whenever possible. No energized circuit shall be taped and abandoned in outlet boxes unless so specified on Drawings for reuse in new work.

E. Where penetrations are left in rated walls, floors and ceilings, seal the penetration to achieve a listed fire/smoke rating which matches the rating of the existing penetrated surface. Coordinate with Architect for ratings of existing surfaces.

3.02 BRANCH CIRCUITS AND PANELBOARDS:

A. Any existing panel schedules shown are not intended to imply actual installed conditions. Existing schedules are issued for reference only. Information indicated is taken from Owner's existing circuit directories and design drawings, which may not reflect existing conditions. Contractor is to field verify all existing conditions by circuit tracing panel feeder and all branch circuits. Contractor is required to indicate actual conditions on as-built documentation including loads of existing to remain circuits.

B. Work involving existing branch circuit panelboards, shall be such that when all work is completed, existing panels are provided with new, updated and accurately typed directories. Circuit trace existing to remain circuits as required to update directories. Submit as-built directories as specified in "Record Drawings," Section 16010.

C. All vacant circuits shall be marked spare. When new breakers are required, they shall be installed in existing spaces and shall match those that are existing. In the event that more breakers are required than the spaces available, Contractor shall consult Engineer for direction.

D. Where circuits are removed from existing relay panels contactors and control devices due to demolition, remove existing control equipment such as relays and contactors if they are

unused at the completion of new work. Maintain control equipment if any circuits are existing to remain. Where all circuits and control equipment are removed from the existing relay panels, or panelboards, remove the entire enclosure itself and patch the surface where the panel was removed.

E. Fill void left by flush mounted panels or fill anchoring holes left by surface mounted panels. Coordinate with Architect for all fill and finish. Include in bid costs to remove all affected panels.

3.03 WIRING METHODS:

A. Contractor may utilize existing conduits and outlet boxes provided they are in acceptable condition to Authority Having Jurisdiction.

B. Re-support existing reused conduit and boxes if required. If contractor chooses not to reuse existing raceways, include in bid work for providing new raceways.

C. Provide new raceway where specified and indicated and where existing raceways are not in satisfactory condition to Authority Having Jurisdiction.

D. Provide pricing to re-support existing to remain conduit and boxes above finished ceilings in renovation area if required. Provide separate add alternate as line item price in bid for work, and perform work only if directed by Owner/GC/CM.

3.04 EXPOSED WORK:

A. It is the intent of the overall design to conceal all work except in unfinished areas. Contractor shall utilize wall and ceiling spaces to conceal all work.

B. Only in cases where it is impossible to conceal the work, short exposed metal surface raceways (not conduit) may be used subject to approval of Architect. Paint to match wall.

3.05 EQUIPMENT AND WORK ABANDONED IN PLACE:

A. Electrical outlet boxes that are abandoned in walls, ceilings or floor shall be provided with suitable blank brushed stainless steel cover plates. Abandoned floor outlets shall be provided with .040 brass plates.

B. Wiring in abandoned conduits and outlets shall be disconnected, removed to the source and properly disposed of. There shall be no exception to this rule.

C. Conduits and other parts of electrical systems that become exposed as part of new work shall be removed as required to a point where the abandoned portion is totally concealed.

3.06 SURFACE REPAIR:

A. Repair finished surfaces around removed electrical equipment to match final finished condition. Coordinate with Architect for finish requirements.

3.07 SERVICE SHUTDOWN AND POWER OUTAGE:

A. No service shutdown will be allowed except as scheduled. Service shutdown and power outages shall be scheduled with Owner or his Representative prior to any work on existing services is done. Schedule shall be in writing and shall show a detailed description of the proposed work and the duration of outage. Coordinate shutdowns with other building

Owners for any buildings/properties served by the same utility source. Verify with utility if any other customers are served by the same source prior to shutdown.

B. Contractor shall have sufficient number of workers on the job to accomplish the work during the allotted time as per agreed upon schedule.

C. All outage work and service modification shall be included in Base Bid and subject to the conditions in the Contract Documents.

END OF SECTION 16900