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Victoria School Condominiums

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Specifications

VOLUME
DIVISION
Issued for Tower Construction
Electrical

TORODE Residential LTD.

Project #: 202-131

July 25, 2005

LEOCOR

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Stebnicki, Robertson & Assoc. Ltd.
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ELECTIRCAL DESIGN GUIDELINES & SPECIFICATIONS

Victoria Park School Condominium
Calgary, AB

Stebnicki, Robertson & Assoc. Ltd.
Date: January, 2005

224231/book spec

1 Related Requirements

.1 Division 0 and Division 1 shall govern this Division of the Specifications.

2 Scope

.1 The work covered by this specification shall include the provision of all materials, labour, tools, equipment and services required for the construction, installation and putting into regular operation the complete electrical systems as shown on the drawings and as described and specified in this and accompanying sections.

.2 Testing, retesting, adjusting and readjusting as required or directed shall be done to place complete installation into an approved operating condition.

.3 The work shall include but shall not necessarily be limited to the following:

- Lighting and power distribution for all areas
- Emergency generator & emergency power systems
- Telephone system
- Television system
- F.A. system
- Power service and feeders to building
- Door entry system
- CCTV System
- Lightning Protection System

3 Governing Conditions

.1 All work and materials shall be in full accordance with C.S.A. Codes, Provincial and Local Inspection Department Regulations and to the requirements of Utility Company having jurisdiction.

.2 All governing regulations shall be considered as minimum requirements and shall be taken into account. In no case shall the requirements as designed or specified be reduced.

.3 All C.S.A. and Electrical Inspection Department bulletins in force at the time of tender submission while not identified and specified by number herein are to be considered as forming part of the related requirements and shall be complied with.

.4 "Alberta Construction Tendering System"., Rules and Regulations including Trade Definitions" shall be used to define the extent of the work to be carried out by each Trade regardless of where it may appear in the drawings or specifications. Exceptions to the above will be noted in the specifications.

4 Drawings, Specifications

.1 Consider the drawings and these specifications as complimentary.

.2 The drawings and specifications are not a detailed set of installation instructions but a guide establishing quality of equipment, materials, workmanship and performance.

.3 The drawings shall be considered as diagrammatic and are intended to serve as a guide indicating the general layout of the complete electrical systems; number, location and arrangement of equipment, outlets, fixtures, etc. The drawings are not intended to show every fitting, junction and accessory nor every difficulty that will be encountered during installation of the work.

.4 The drawings are not necessarily working drawings from which measurements may be taken except where dimension figures are specifically shown, since final locations, distances and levels will be governed by actual field conditions. Information involving accurate measurements shall be taken from figured dimensions on Architectural or Structural drawings or at site.

.5 Check Architectural, Structural and Mechanical drawings to avert possible conflicts in work. Discrepancies shown on different drawings or between drawings and specifications shall be clarified before proceeding. Decisions or additional instructions will be forwarded.

.6 No extras will be considered based on differences in interpretation of drawings and specifications. Final decisions as to intent remains with the Architect and Engineer.

.7 The intention of the specifications and drawings is to call for finished work, tested and ready for operation. Include minor items whose detail is not usually shown or specified but which are necessary to proper installation and operation as if herein specified or shown.

.8 Advise in writing with bids of any necessary items of work which are omitted or of any material or apparatus inadequate or unsuitable, in violation of laws, ordinances, rules, or regulations of authorities having jurisdiction. In the absence of such written notice, it is agreed that the cost of all required items is included.

5 Materials, Workmanship

.1 All electrical material and equipment shall be new, the best of their respective kinds, fully approved and listed by the Canadian Standards Association for the particular use intended or proposed; shall conform to CEMA Standards and shall be installed in strict accordance with the best practices of the industry and the electrical trade.

.2 Install and test all equipment and material in accordance with the detailed recommendations of the manufacturer.

.3 Where two or more items of equipment or material of the same type are required, they shall be products of a single manufacturer.

.4 Perform all work in a neat and workmanlike manner. Any materials or equipment condemned as not approved or work installed which is not to the satisfaction of the Engineer shall be removed, replaced and reinstalled by the Contractor at no additional cost.

6 Specified And Equivalent Products

.1 It is the intent of these specifications to establish standards of quality and performance of the material and equipment installed. Where an item or class of material is specified exclusively by manufacturer, brand name, type or catalogue number, only such items shall be used to form basis of Tender.

.2 Drawings and specifications are based generally on one manufacturer's product, hereinafter called "base product" (the first manufacturer listed in the specifications). Other manufacturers listed shall be considered as having "reviewed product" status.

.3 Other manufacturers not listed in the specifications may be submitted as equivalents to the "base product" during bidding period. Manufacturer's products reviewed at this time shall be considered as "reviewed products".

.4 Use of "reviewed products" in no way lessens the Contractor's obligation in fulfilling the requirements of the specifications. Space requirements for mechanical and electrical equipment are established on "base product" requirements. Changes to these requirements by the use of revised or "reviewed products" shall be at the Contractor's expense and shall be included in his Tender price.

.5 Request for "reviewed product" status must be made at least one week prior to date of Sub-trade Tender closing or at a time as noted in "Instructions to Bidders", whichever date is earliest. Requests shall be accompanied by all descriptive and technical data (electrical photometric, etc.) so that an accurate assessment can be made. Where this is not done, requests will be returned as not reviewed.

.6 Review of submittals by the Engineer is to check on conformance in principle with the general design concept. Review by the Engineer shall not relieve the Contractor or Manufacturer of the responsibility of meeting the requirements and detailed design of the specified base product.

7 Existing Conditions

.1 Examine site prior to submitting Tender and be responsible for ascertaining all conditions which will affect this trade whether shown on the drawings or not and to take all the necessary measurements.

.2 Investigate and confirm the locations, the method of connections and routes of existing and new electrical facilities. Report at once any discrepancy between drawings, specifications and existing conditions.

.3 Absorb any costs incurred by failure to carry out this investigation and examination.

8 Permits, Fees, Certificates

.1 Give all necessary notices, obtain all permits and pay all fees in order that the work herein specified may be carried out.

.2 Submit to Utility and Electrical Inspection Department necessary number of drawings and

specifications for examination and approval prior to commencement of work.

.3 At completion of work, provide a final certificate of inspection as evidence that all work installed conforms with the laws and regulations of all authorities having jurisdiction.

9 Equipment & Material Ordering

.1 The Contractor shall confirm in writing to the Engineer within 10 days of award of Contract, that all major items of equipment and material have been ordered. Confirmation shall include requested delivery date to site and a list of all manufacturers being used.

10 Inspection

.1 Work shall be subject to periodic inspections with a following Inspection Report. Correct all defective work as pointed out during inspections or as noted in Inspection Report.

.2 Completed work shall be subject to final inspection and correction of deficiencies before acceptance by Owners and final payment.

11 Shop Drawings

.1 Refer to Division 1.

.2 Submit shop drawings for all major pieces of equipment. Shop drawings shall be certified factory prints, not detached catalogue pages or inserts and shall include performance data, working dimensions, arrangements and connections to other work, kinds of materials and finishes and an itemized list of all accessories included with each piece of equipment. Variations from Contract requirements because of standard shop practice shall be noted.

.3 Check and endorse shop drawings and details for space limitations and for compliance with the drawings and specifications before submitting them to the Engineer for review. Submittal shall be well in advance of requirement date of equipment to allow sufficient time for review.

.4 The purpose of shop drawing review by the Engineer is to ascertain conformance in principle with the general design concept. Shop drawing review by the Engineer shall not relieve the Contractor submitting the shop drawings of his responsibility of approving the detail design in the shop drawings and for fulfilling the requirements of the Contract Documents.

.5 Shop drawings shall be stamped approved and signed by the Contractor before submitting to the Engineer for review. Where this is not done drawings will not be examined and will be returned as not reviewed.

12 Temporary Service

.1 Refer to Division 1.

13 Temporary Use Of Permanent Systems

.1 While permanent lighting fixtures may be used for light during construction of the project, any lamps which have been used for longer than 10 percent of rated life shall be replaced with new lamps. Fixtures shall be cleaned and restored to original condition and approved before work is accepted as completed.

.2 The General Contractor shall assume full responsibility of permanent systems used for temporary purposes until final project acceptance including attendance and maintenance costs of equipment and fixtures and the replacement of used lamps.

.3 Advise the General Contractor of above requirements in advance of Tender submission.

14 Temporary & Trial Usage

.1 The Owners shall have the privilege of temporary and trial usage of any device, equipment or system supplied as part of the Contract as soon as said work is completed for such reasonable length of time as shall be deemed to be sufficient for making a complete and thorough test of same.

.2 Such temporary and trial usage prior to final completion and written acceptance shall not be construed as evidence of the acceptance of the same by the Owner.

.3 No claims for damage will be allowed for damage to work so used whether caused by structural weakness of parts or by defective materials or workmanship.

15 Location, Relocation Of Outlets & Equipment

.1 The location of outlets and equipment is subject to reasonable change without extra costs to the Owners provided information is given before installation. No extra will be paid for outlets or equipment moved requiring extra labour and material up to 3 meters from original location nor will credits be anticipated where the relocation up to 3 meters reduces labour and materials. Other cases will be considered on their individual merits.

.2 Work in co-operation with the Mechanical Trades in determining proper location of outlets and equipment to avoid confliction between trades.

.3 Space requirements shall be determined before any equipment is installed. If space prohibits installation of equipment as shown on the drawings, clarification shall be obtained from the Architect or Engineer before proceeding.

16 As-Installed Drawings

.1 Obtain extra sets of drawings on which shall be kept accurate records and notes as job progresses, of all additions, changes and deviations to work as shown on original drawings. Drawings shall be corrected to include all changes covered by Addenda, Change Order and written instructions.

.2 At completion of job, transfer information to clean set of drawings and submit to Engineer for approval. If approved. Information shall then be transferred by the Engineer to CADD (AutoCADD Release 2000) files and resubmitted to the Owner for acceptance. Contractor shall certify and sign drawings as being accurate and complete. The cost of updating CADD files shall be included as part of this contract.

.3 Electrical contractor shall carry a cash allowance of $4,000.00 for engineer's cost for as-builts.

17 Equipment Identification

.1 Clearly mark all electrical equipment to indicate the nature of the service.

.2 Provide typewritten circuit indexes for all panels. Indexes shall indicate equipment and room controlled by each circuit.

.3 All disconnect switches, splitters, starters, panels, panelboards, cabinets, junction boxes, etc., shall be identified by nameplates fastened to the outside front of each piece of equipment indicating what it controls or the system as may be required i.e. Splitter No. 1, Panel A, Exhaust Fan No. 2, etc. and where it's fed from.

.4 Nameplates shall be secured with drive screws or rivets. Self adhesive type will not be accepted.

.5 Nameplates shall be of engraved phenolic stock and laminated in layers of contrasting colours. Raised letter plastic labels made with hand embossing tools will not be accepted. Nameplates shall be a minimum of 19 mm x 50 mm with 5 mm letters. Color coding shall be as follows:

.1 120/208 volts emergency power – white letters on red background
.2 120/208 volts – white letters on black background
.3 Fire Alarm System – white letters on red background
.4 Communication System – white letters on blue background
.5 Miscellaneous systems – white letters on green background.
.6 347/600 volts emergency power – white letters on red background
.7 347/600 volts power – white letters on beige background

18 Operating Instructions

.1 At completion of job provide qualified personnel to explain all electrical systems and to demonstrate operation, care and maintenance of equipment to Engineer and Owner's representative.

.2 Provide these services for such periods as necessary to put equipment in operation and ensure that operating personnel are conversant with all aspects of care and maintenance.

19 Inspection Certificates

.1 Inspection certificates from all authorities having jurisdiction (Fire Dept., Electrical Inspection, etc.) shall be available and submitted at or prior to time of acceptance and takeover.

20 Clean Up & Testing

.1 All equipment shall be megger tested to the requirements of the Canadian Electrical Codes for continuity and grounds before energizing. All equipment, devices, etc. shall be tested for polarity before energizing.

21 Cash Allowances

.1 As-built drawings - $4,000.00

.2 Fire alarm verification - $10,000.00

.3 Generator test - $500.00

22 Finishes Of Equipment

.1 All electrical fitting, supports, hanger rods, pull boxes, channel frames, conduit racks, outlet boxes, brackets, clamps, etc., shall have galvanized finish. Where the Engineer requires it, they also shall be given two coats of paint to match other equipment.

.2 All switchboards, panelboards, distribution and motor control centres, motor starters, etc., shall be factory finished with air-dry lacquer. All panels, distribution centres or similar factory finished units that are scratched or marked during installation, shall be touched up with matching lacquer or, if required by the Electrical Consultant, shall be completely repainted at the expense of the Contractor.

23 Equipment Protection

.1 Keep all conduit openings closed by means of plugs or caps to prevent the entrance of foreign matter. Protect all conduit, fixtures, equipment, etc., against dirty water, chemical or mechanical damage both before and after installation. Any such fixture, equipment, etc., damaged prior to final acceptance of the work shall be restored to irs original condition or replaced at the expense of the Contractor.

.2 Equipment standing on the job site shall be covered or otherwise suitably protected at the direction of, and to the satisfaction of, the Electrical Consultant. If coverings become torn,

etc., they shall be replaced until the equipment is connected and operating.

24 Adjustments And Instructions

.1 Make necessary adjustments for each system and piece of apparatus installed for such systems as fire alarm and sound, and whenever practicable, for other equipment and instruct the Owner and his staff thoroughly in the operation of each system installed.

25 Cutting, Patching, Etc.

.1 Structural members shall not be cut without the consent of the Structural Engineers, For all necessary cutting, channelling, core drilling, sleeving, etc., provide own forces and necessary equipment required to complete the electrical facilities.

.2 Specifically note that any cutting of wood, block, concrete, etc., shall be done with utmost care and that channelling and openings through walls, etc., for conduit shall not exceed the conduit by more than 25mm. All cutting, patching, painting, etc., will be done at this Contractor's expense under the direction of the General Contractor and to the satisfaction of the Architect and Engineer.

26 Operating And Maintenance Manuals

.1 Include in operations and maintenance data:

.1 Details of design elements, construction features, component function and maintenance requirements, to permit effective start-up operation, maintenance, repair, modification, extension and expansion of any portion of feature of installation.
.2 Technical data, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items and parts lists, advertising or sales literature not acceptable.
.3 Names and addresses of local suppliers for items included in Maintenance Manual.
.4 Electrical Contractor's Guarantee.
.5 Operating Instructions for All Systems.

.2 Operation and Maintenance Data shall be contained within a 64mm thick hard cover three ring binder. Binder shall be labelled on the front cover as well as the spine. ("ELECTRICAL MAINTENANCE MANUAL - PROJECT NAME - YEAR").

The following index tabs shall be contained within the binder:

- Cover page including project name, date, names of owner, architect, electrical consultant and electrical contractor.
- Index page
- Contractor guarantee
- List of manufacturers and suppliers for all items.
- Names and addresses of suppliers.

The following index tabs shall be contained, but not limited to, within the binder.

- Lighting
- Distribution
- Emergency Generator
- Starters
- Disconnect Switches
- Telephones/TV Systems
- Door Entry System
- Control Systems
- Fire Alarm System
- Miscellaneous Systems
- Lightning Protection System

Divider tabs shall be plastic and coloured according to section.

.6 Provide three (3) operating and maintenance manuals. Turn over two (2) to the Owner and the remainder to the Electrical Consultant.

27 Clean-Up

.1 This contractor and/or his sub-contractor shall be responsible for daily cleaning of all debris accumulated during the course of the work, upon completion of the contract and whenever directed by the Owner. The complete installation shall be maintained in a neat and tidy manner during its entire course.

28 Conduit And Cable Identification

.1 Colour code all conduit, junction boxes, pullboxes and metallic sheathed cables in accordance with the colour code specified.

.2 Colour code covers of junction boxes and pullboxes. Provide 150 mm band of paint on all conduits and cables. Bands to be at the following points.

.1 Within 300mm of entering a wall or non-accessible ceiling.
.2 Within 300mm of entering a pullbox or junction box.
.3 At a minimum of 12 metre centres where conduits or cable run exposed or through accessible ceiling spaces.

.3 Colours: 25mm wide prime colour and 20mm wide auxiliary colour.

	Prime	Auxiliary
600V	Sand	
Up to 250V	Yellow	
Telephone	Green	
Other Communication systems	Green	Blue
Fire Alarm	Red	
Door Access Systems	Blue	Yellow

29 Testing

.1 Prior to energizing the various portions of the electrical systems, perform Megger Tests on all feeders and branch circuits. Results shall comply with the requirements of the Canadian Electrical Code (1990 Edition) and the Local Inspection Authority. Submit results of tests to the Electrical Consultant.

.2 Upon completion of the building and immediately prior to final inspections an takeover, check the load balance of all feeders and at distribution centres, panels, etc. These tests shall be carried out by turning on all possible loads in the building and checking load current balance. If load unbalance exceeds 15%, reconnect circuits to balance the load. Submit final readings to the Engineer.

.3 In co-operation with the Mechanical Contractor, take clip-on, ammeter readings on all phases of all mechanical equipment motors with motors operating under full load conditions. Test readings shall be turned over to the Mechanical Contractor and the Engineer, when available. Record of readings must be included in operators manuals. Table of readings to include motor horsepower, motor designation, motor nameplate amps, actual measured amperage and overload heater number and amperage.

.4 The above clauses refer only to the portions of the electrical systems provided under this contract.

30 Guarantee

.1 Furnish a written guarantee/warranty countersigned and guaranteed by the General Contractor stating:

.1 That all work executed under this contract will be free from defects of workmanship and materials for a period of one (1) year from the date of final acceptance of this work, except for incandescent lamps which shall be for a period of six (6) months.

.2 The above parties further agree that they will, at their own expense, repair and replace all such defective work and other work damaged thereby, which fails or becomes defective during the term of the guarantee/warranty provided that such failure is not due to improper usage.

.3 The period of the guarantee specified shall in no way supplant any other guaranteed of a longer period but shall be binding on work not otherwise covered.

31 Breakdown

.1 During the course of construction, when the Contractor is requested to submit a lump sum price for the performance of additional work, the price shall be broken down as requested by the Engineer to show quantity, material and labour charges for each item.

.2 Submit the following Contract Price Breakdown to the Engineer within thirty (30) days of Contract Award.

ELECTRICAL CONTRACT PRICE BREAKDOWN

Project:
Progress Claim #: Date:
Contract Progress Claim

	CONTRACT		PROGRESS CLAIM Amount Complete		
	Labour	Material	Labour	Material	%Claim
· General					
· Conduit, Outlet Boxes					
· Conductors					
· Distribution Equipment					
· Lighting					
· Mechanical Equipment					
· Telephone, TV and Data Systems					
· Emergency Generator					
· Fire Alarm System					
· Controlled Access Systems					
. Security & CCTV System					
. Lightning Protection System					
SUBTOTAL					
TOTAL					

.3 This cost breakdown is required in order that monthly progress claims can be properly evaluated. No progress claims will be approved unless this cost breakdown is submitted in full. Monthly progress claims must also be submitted broken down as per the list above. Failure to do so may delay approval of progress claims.

.4 Each progress claim shall include as part of its documentation, a detailed list of all material and equipemnt which is on site but not installed. The list shall include detailed quantities and costs allocated to each item of material or equipment.

.5 Submit the Contract Price Breakdown to the Electrical Consultant within 30 days of the award of contract.

32 Final

.1 Specifically note that the Architectural, Structural and Mechanical drawings shall be checked for door switches, counter height, grille locations, millwork, etc., before outlets and conduits are roughed-in and shall proceed as directed under "Work-Co-ordination", Section 16010 of these specifications. If this is not done and conflict occurs, the outlets and/or conduits shall be moved and any repairs made at the expense of the Contractor.

.2 Points not specifically mentioned shall be in strict accordance with the Canadian Electrical Code and regulations of the Electrical Inspection Department from which the permit was

obtained. The latest revisions and/or amendments to this code with applicable date restrictions shall also govern work on this contract.

.3 It is the intent that these drawings and specifications provide for an electrical installation complete and in operating condition and the contractor shall be responsible for supplying and installation complete and in operating condition and the contractor shall be responsible for supplying and installing all material necessary to accomplish this, except where specifically noted that such work or material is not included.

.4 These drawings and specifications are to be read in conjunction with the Architectural and Mechanical and what may be called for in another shall be binding on this contract.

.5 Leave the work complete to the approval of the Owner.

END OF SECTION

1 General

1.1 REQUIREMENTS

.1 Provide underground conduits for electrical, telephone and other miscellaneous services as indicated on drawings.

2 Products

2.1 MATERIALS

.1 Conduit - rigid PVC for all incoming service conduits and outside of building, or DBII from distribution centres to field panels.

.2 Spacers - preformed interlocking rigid plastic.

3 Execution

3.1 INSTALLATION

.1 Installation shall be on undisturbed soil or on well compacted granular fill, 150mm thick.

.2 Install at minimum of 1 meter below finished grade.

.3 Install rigid PVC conduit in configuration indicated. Spacers installed at maximum intervals of 1.5 meters.

.4 Clean conduits before laying. Cap ends during construction and after installation to prevent entrance of foreign materials.

.5 Route of conduit runs shall be marked with marking tape, Brady Identoline, laid in trench approximately 300 mm below grade.

.6 Check all conduits for clear bore before backfilling. Install fish wires in all conduits.

.7 Co-ordinate routing and depth of all conduits with General Contractor.

.8 Conduits shall be encased in concrete where run below parking or vehicle traffic areas.

END OF SECTION

1 General

2 Products

2.1 MATERIALS

.1 Conduit - Electrical metallic tubing, rigid PVC (Schedule 40), electrical non-metallic tubing (EMT).

.2 Flexible conduit - liquid tight.

3 Execution

3.1 INSTALLATION

.1 All conduit shall be installed so as to permit easy removal of conductors at any time and size according to the Canadian Electrical Code unless otherwise noted.
Where conduit sizes are shown on the drawings these are minimum and shall not be reduced in size without the written approval of the Engineer.

.2 Conduits shall be laid out so as to avoid interference with other work and shall be clear of all mechanical pipes, vent sources, flues, etc.

.3 Conduits shall be installed concealed or exposed as shown on the drawings. Where concealed, conduits shall be run in a direct line with minimum number of bends and offsets. Where exposed, conduits shall be run parallel or at right angles to the building lines.

.4 Conduits shall not be bent over sharp objects and not more than three 90 degree bends shall be installed between adjacent boxes or fittings. Conduits improperly bent or not installed as they should be shall be taken out and replaced without extra cost to the Owners.

.5 Conduits shall be continuous from outlet to outlet, from outlets to cabinets, pull or junction boxes and shall be secured to all boxes in such a manner that each system shall be electrically continuous throughout. Conduit ends shall be capped during construction to prevent entrance of foreign materials.

.6 All conduit systems shall be installed complete before conductors are pulled in and shall be supported as required by Code.

.7 Conduit systems which are to be left empty for the installation of conductors by others at a later date shall be tested for clear bore and capped. Clear any plugged conduit and bear costs involved such as cutting and replacing of defective conduit and restoring surfaces to original condition. Provide suitable fish wires.

.8 Single and multiple conduit runs where attached directly to structure shall be fastened at suitable intervals by screw held conduit straps.

.9 Multiple conduit runs where exposed or in dropped ceiling spaces and are not directly attached to structure shall be racked in a neat and orderly fashion on trapeze type hangers especially designed for electrical conduits.

.10 Single conduit runs 31mm or over where exposed or in drop ceiling spaces and are not directly attached to structure shall be supported by band or clevis type hangers.

.11 Where conduits penetrate fire walls, fire separations, etc., the openings shall be filled and sealed to maintain required fire ratings.

.12 Where conduits enter surface mounted splitters, panels, junction boxes, cabinets, etc. they shall be racked neatly and supported clear of wall on channels designed for electrical conduits.

.13 Where flexible conduit is used for connections to motors and equipment (except lighting fixtures) it shall be the liquid tight type. Connections shall be made with approved liquid tight connectors.

.14 A minimum of two empty 19mm conduits shall be stubbed up into ceiling space from each new branch circuit panel.

.15 All conduit in concrete slabs on grade or where in contact with earth or fill shall be rigid PVC. Where possible all conduit shall be installed below slabs on grade. Where PVC conduit is used and is stubbed up exposed (not in concealed space in wall or equipment base) a transition shall be made to rigid or EMT before leaving slab.

.16 PVC conduit shall be sized for conductors as specified plus a ground wire sized to CSA requirements.

.17 Where conduits are installed in the concrete slab, this Contractor must obtain approval on both maximum dimension and crossovers which may be used therein. In general, conduits in concrete shall have an outside diameter of less than 1/3 the thickness of the slab, beam or wall in which they are embedded and their spacing on centre shall exceed 3 times their diameter.

.18 All stub-ups shall be braced and capped before concrete is placed. Where stub-ups miss partitions or equipment locations the concrete shall be chiselled out and the conduit bent into proper location.

.19 Where conduits enter the bottom of surface mounted splitters, panels, junction boxes, cabinets, etc., a 102mm concrete curb shall be provided. Arrange with the General Contractor for completion of this work.

.20 EMT conduit, if used, shall be installed to meet the manufacturers recommendations. Any installation of EMT that does not meet Code regulations or satisfaction of the Owner shall be removed and re-installed at the Contractors cost.

END OF SECTION

1 General

2 Products

2.1 MATERIALS

.1 All wiring not otherwise specified shall be softdrawn copper of 98 % conductivity, type RW90, a minimum of #12 B&S gauge and insulated for 600 volt operation. All conductors shall be sized for a maximum voltage drop of 5%. #14 AWG conductors may be used in suites only.

.2 Fire alarm wiring shall be type RW90 a minimum of #18 gauge or approved multi-conductor cable.

.3 Aluminium conductors may be used for non mechanical equipment with ampacities of 100 amperes or greater. Copper conductors must be used for connections to mechanical packaged units to maintain warranty.

3. Execution

3.1 INSTALLATION

.1 No wire or cable shall be drawn into a conduit or placed in a wireway until work of any nature which might cause injury to such wire or cable has been completed. Conductors shall not be installed until all foreign material has been thoroughly swabbed out or otherwise removed from the conduit.

.2 The number of conductors indicated for various control, alarm, signal and communications circuits are intended to show general control scheme requirements. The actual number of conductors installed in each conduit shall be as required to accomplish specified results with equipment furnished.

.3 Bx cable may be used as follows:

- .1 From suite panel to all suite devices.
- .2 From device to ceiling junction box, within 2m of device. See detail.
- .3 To feed devices in same wall.
- .4 Loop between light fixtures in areas with inaccessible ceilings.

.4 NMD7 cable shall <u>not</u> be used.

3.2 COLOUR CODING

.1 All feeders, sub-feeders and branch circuit conductors shall be colour coded as follows:

	120/208 Volt	347/600 Volt
Phase A	Red	Orange
Phase B	Black	Brown
Phase C	Blue	Yellow
Neutral	White	White

.2 Conductors of #8 gauge and over may be colour coded with colour coding tap, but only black coloured conductor insulation may be used. The tap shall be applied for a minimum of 51mm at all terminations, junctions, pullboxes, etc. Painting of conductors will not be accepted.

END OF SECTION

1 General

1.1 REQUIREMENTS

.1 Provide all cabinets as indicated or required for miscellaneous systems.

2 Products

2.1 MATERIALS

.1 Cabinets shall be Code gauge metal for surface or flush mounting as indicated.

.2 Cabinets shall have concealed flush hinges, flush lock and latch assembly, finished in ASA 61 grey enamel and complete with 19mm painted plywood backboard. See drawings for sizes.

3 Execution

3.1 INSTALLATION

.1 Mount cabinets at 2000mm to top unless otherwise noted.

END OF SECTION

1 General

2 Products

2.1 MATERIALS

.1 Outlet boxes: galvanized pressed sheet metal.

.2 Pull and junction boxes: Code gauge metal with hinged or screw-on cover.

.3 Surface outlets : F.S. cast boxes.

3 Execution

3.1 INSTALLATION

.1 Provide pullboxes where necessary in raceway systems to facilitate conductor installation. In general, conduit runs of more than 30 meters or with more than three 90 degree bends shall have a pullbox installed at a convenient intermediate location. Physical size shall be as required by Canadian Electrical Code for the number and size of conduits and conductors involved. All pullboxes shall be installed so as to be accessible after building is completed and shall be securely mounted to building structure. Location of all pull boxes shall be indicated on record drawings.

.2 Each device or other outlet shall be provided with an outlet box. All outlet boxes shall be adapted to their respective locations and shall be supported independently of the conduit.

.3 In dropped or furred ceilings 102mm octagon boxes shall be used for all surface mounted equipment. 102mm octagon or 102mm square boxes shall be used for all recessed equipment.

.4 In stud walls all outlet boxes shall be 102mm square boxes with plaster rings. Boxes shall not be fastened to studs but shall be fastened to properly supported headers or if fastened directly to studs, fastening shall be on both sides of box.

.5 Sectional boxes shall not be used unless otherwise specified. Sectional boxes can be used for receptacles and switches in suites only.

.6 All communications outlets, telephone, TV, data, etc. shall have a 102mm square box complete with single gang plaster ring. No exceptions.

.7 Where condulets are required on exposed conduits they shall be of type suited to the particular use. Condulets with covers held on by screws which enter the wire chamber shall not be used.

.8 In walls where the masonry itself forms the finished surface all outlets shall be 102mm square boxes with plaster rings. Plaster rings shall be minimum 31mm deep. The masonry shall be sawn so that the wall plates will cover any gap between the masonry and boxes. Ensure that boxes are firmly grouted into place as the masonry work is proceeding.

.9 Provide access panels for all electrical equipment requiring same. Access panels shall be located so as to make all equipment serviceable.

.10 Boxes left empty for installation of conductors and equipment by others shall be blanked off.

.11 Blank covers for square boxes with plaster rings shall match device plates. Blank covers for flush mounted octagon or square boxes (without plaster rings) shall be of a type similar to Columbia 9002 and shall be painted in with wall or ceiling.

.12 Only F.S. or other suitable castings with threaded hubs shall be used for surface mounted switches and receptacles. Handy boxes will not be permitted.

3.2 MOCK-UP

.1 Electrical contractor shall rough in mock-up of each suite type for engineer's, architect's, and owner's approval prior to proceeding with suite rough in. Once approved by all parties, suite rough in can proceed. Failure to do so could require the contractor to relocate devices a their cost.

END OF SECTION

1 General

1.1 RELATED WORK

.1	General Electrical Provisions	Section 16010
.2	Identification	Section 16030
.3	Outlet Boxes	Section 16130

2 Products

2.1 COMPONENTS

.1 Line voltage switches: 120 volt, 20 amp rated, decora style, Leviton #5691-2, spec grade in non-suite areas, residential grade, Leviton #5611, in suites, white in colour.

3 Execution

3.1 INSTALLATION

.1 All switches, unless otherwise noted, shall be installed at 1200 mm from finished floor. Where in block walls, mount box on top of block course closest to 1200 mm height. Check the latest Architectural drawings to determine the final door installations before installing any switches.

.2 Devices installed before painting is completed shall be suitably protected. Devices spotted with paint will not be acceptable.

.3 Provide white nylon plates for all switch outlets, in finished areas and suites, stainless steel in storage, mechanical and non-public areas.

.4 Check Architectural and Interior Design drawings and details for final locations, heights, etc. of all devices prior to installation.

END OF SECTION

1 General

1.1 RELATED WORK

.1	General Electrical Provisions:	Section 16010
.2	Outlet Boxes:	Section 16030
.3	Identification:	Section 16040
.4	Grounding:	Section 16160

2 Products

2.1 COMPONENTS

.1 Receptacles: full gang size, polarized, duplex, parallel blade, U-grounding slot, rated at 15 amps., 125 volts, Leviton decora series #16242 or approved equivalent.

.2 Special Receptacles: 20 amp, 125/250 volt, 2 pole, 3 wire, grounding, configuration as per Code Table 46 No. 5-20R.

.3 Ground fault receptacles shall be equal to Bryant #GFR52FTI for indoor application and Bryant #GFRWPH for exterior applications.

.4 All receptacles in suites, public areas and fitness area shall be 15 amp, 120 volt, decora style, Leviton #16242, residential grade, Leviton #5325 in suites, white unless noted otherwise.

3 Execution

3.1 INSTALLATION

.1 In utility and control areas receptacle height to be co-ordinated with benches, counters, etc.

.2 Wall mounted duplex receptacles shall be installed approximately 400 mm from finished floor unless otherwise noted, 300mm in suites. Check Architectural drawings for locations and heights of counters, etc. and mount receptacles at suitable heights above counters, splashbacks, etc.

.3 Devices installed before painting is completed shall be suitably protected. Devices spotted with paint will not be acceptable.

.4 Outlets for telephone, sound, etc. shall match receptacle heights unless otherwise noted.

.5 Provide plates for all receptacle, communication, etc. outlets.

.6 Check Architectural and Interior Design drawings and details for final locations, heights, etc. of all devices prior to installation.

.7 All devices ganged together shall be mounted at 150mm on centre.

.8 All suite devices mounted in suite part walls shall be minimum three (3) stubs away from devices in next suite. See detail on drawings.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1	General Electrical Provisions:	Section 16010
.2	Identification:	Section 16040
.3	Switches:	Section 16140
.4	Receptacles:	Section 16145

2 Products

2.1 MATERIALS

.1 Bakelite: completely smooth white nylon heavy duty type in all areas using flush mounted devices, unless otherwise noted.

.2 Stainless steel: type 302 or 304, brushed finish, 1 mm thick accurately die cut, protective release paper in all service and storage rooms.

.3 Cast metal: diecast profile, ribbed for strength, flash removed, primed with grey enamel finish and complete with four mounting screws to box.

.4 Gaskets: resilient rubber or close cell foam urethane.

.5 Steel: hot dip galvanized to 381 g/sq.m minimum.

2.2 COMPONENTS

.1 Flush mounting plates: bevelled type with smooth rolled outer edge, plain design, stainless steel.

.2 Surface box plates: bevelled, pressure formed for smooth edge free fit to box.

.3 Weatherproof plates: cast metal gasketed coverplates for receptacles, spring loaded cast gasketed doors. Double doors for standard duplex receptacles.

3 Execution

3.1 INSTALLATION

.1 Install coverplates on all wiring device boxes.

END OF SECTION

1 General

2 Products

2.1 COMPONENTS AND MANUFACTURERS

.1 Support Channels - Electrovert, Burndy, Unistrut.

3 Execution

3.1 INSTALLATION

.1 Provide fastenings, supports and support channels as required for all conduit and equipment.

.2 Fastenings to concrete shall be by expandable insert type fasteners.

.3 Power driven fastening devices shall not be used.

.4 Support framing, hangers, etc. for conduit runs shall be of a type especially designed for electrical conduits.

.5 Conduits shall be held to support channel, framing, etc. by attachment straps compatible with the supporting channel.

END OF SECTION

1 General

1.1 SECONDARY SERVICE

.1 The two secondary services to the building shall each be 120/208 volts 3 phase, 4 wire and shall be underground from the Enmax transformer vault to the main distribution panels. See drawings.

.2 Rough in for future secondary service to future second tower.

.3 Size and location shall be as indicated on the drawings.

2. PRODUCTS

3. EXECUTION

3.1 INSTALLATION

.1 Co-ordinate installation of secondary service with General Contractor and Enmax to insure proper installation and scheduling.

.2 Service ducts shall be rigid PVC and shall be encased in concrete where installed inside building. Check with General Contractor and Structural Engineer regarding the routing and location of service conduits and requirements of all applicable governing conditions.

.3 Red coloured concrete shall be used to be determined duct locations complete with 100mm high stencil, every 15m, text to be determined.

END OF SECTION

1 General

1.1 REQUIREMENTS

.1 Provide two main distribution switchboards, one for retail/suite panels, second for building house loads, as detailed on the drawings and as specified herein.

.2 Check drawings for electrical room sizing and limitations of switchboard dimensions and clearances before ordering. Room cannot be enlarged.

2 Products

2.1 COMPONENTS & MANUFACTURERS

.1 The retail/resident main distribution switchboard shall include main breaker section, sub-distribution sections and metering equipment section. Switchboard shall be completely factory assembled, checked and tested before shipping. Distribution sections shall have hinged door over breakers and be CSA approved for sub-metered distribution.

.2 The building house distribution section shall include 208 volt main breaker section, enclosed transformer sections, 347/600 volt main breaker section, meter section and 347/600 volt distribution section. Switchboard shall be completely factory assembled, checked and tested before shipping.

.2 Utility metering equipment section shall be sized as required by local authorities. Size and installation of metering transformers shall be co-ordinated with the Utility.

.3 The switchboard enclosure shall be made up of individual vertical sheet metal enclosures bolted together as required to form complete rigid, free-standing units, suitable for mounting on and complete with channel sills. Sections shall be constructed of code gauge steel with metal barriers provided as required. Exterior and interior to be primed with rust resistant primer and finished with two coats of standard ASA 61 grey enamel. All 600V sections shall be sand.

.4 Bussing shall be plated aluminum. All connections shall be bolted. Bussing shall run the full length of distribution sections including space allocated for future units. Bussing shall extend into wiring section and shall be located and spaced so that incoming service can be brought directly up onto lugs.

.5 Bussing shall be braced for 200,000 amperes symmetrical. Multiple lugs shall be provided for parallel conductor connections and shall be four hole tongue type, Burnby Qiklug or similar. Single gang lugs will not be accepted.

.6 Interrupted rating of switchboard breakers shall be minimum 100,000 amp symmetrical at 208 volts.

.7 Main distribution switchboard shall be FPE; Eaton-Cutler Hammer; Siemens, G.E.

3 Execution

3.1 INSTALLATION

.1 Switchboard shall be complete with equipment, accessories, etc. as required and as indicated on the drawings. Arrange with the General Contractor for provision of 102 mm concrete housekeeping pad under the switchboard.

.2 Make megger test, check all bolted connections for tightness and vacuum out switchboard before energizing.

.3 All conduit terminations shall be duct sealed.

END OF SECTION

1 General

1.1 REQUIREMENTS

.1 Provide modular meter centres as detailed on the drawings and as specified herein.

2 Products

2.1 COMPONENTS AND MANUFACTURERS

.1 The meter centres shall be galvanized steel modular enclosures with vertical bus bars, meter sockets and sub-service molded case breakers. All components except the breakers will be factory installed.

.2 The meter centre will be complete with minimum 600 amp, main bus for use on 120/208 volt, 3 phase, 4 wire system. The individual stacks shall bolt together and the main bus will be joined by main bus links. Bussing shall be braced for 50,000 amperes symmetrical.

.3 Modular stacks shall contain six (6) 1 phase, 3 wire cold metered sub-service sections. Individual meter sockets and circuit breakers shall be separated by barriers. Interrupting rating of meter centre breakers shall be minimum 50,000 amp symmetrical.

.4 Tap boxes, number of meters per modular centre, et. are as indicated on the drawings. Centres shall be complete with equipment, accessories, etc. as required including covers or blank offs for unused sections.

3 Execution

3.1 INSTALLATION

.1 Meter centre shall be complete with equipment, accessories, etc. as required and as indicated on the drawings.

.2 Make megger test, check all bolted connections for tightness and vacuum out switchboard before energizing.

END OF SECTION

1 General

1.1 REQUIREMENTS

.1 Provide fused/unfused disconnect or safety switches where shown or required.

2 Products

2.1 COMPONENTS & MANUFACTURERS

.1 Fused switches shall be normal duty, quick-make, quick-break with fuse holders for HRC fuses. Disconnect switches for motors shall be horsepower rated.

.2 Switches shall be FPE, Eaton Cutler Hammer, Siemens, G.E.

.3 All 600 volt switches shall be painted sand.

END OF SECTION

1 General

2 Products

2.1 MATERIALS

.1 Ground Conductor - copper.

.2 Ground Rods - copper clad steel.

3 Execution

3.1 INSTALLATION

.1 All equipment requiring grounding by the Canadian Electrical Code or Local Inspection Authority shall be grounded. Grounds shall be so arranged that under normal conditions of operation, no injurious amount of current will flow in any grounding conductor.

.2 Install complete grounding system as indicated and in accordance with Canadian Electrical Code and to the approval of the Local Inspection Authorities. If water system not suitable for use as ground, a grid of ground rods shall be provided.

.3 Measure ground grid resistance with earth test megger and install additional ground rods and conductors as required until resistance to ground complies with code requirements.

.4 Ground grid shall consist of copper clad steel ground rods with # 3/0 bare stranded copper interconnecting cable. Connection from ground grid to main distribution shall be by # 3/0 ground conductor in 25mm conduit.

.5 Compression type connections shall be used for connection of ground wire to ground rods. Have connections inspected and approved before covering.

END OF SECTION

1 General

1.1 REQUIREMENTS

.1 Provide transformers located and sized as indicated on the drawings and as specified herein.

2 Products

2.1 COMPONENTS & MANUFACTURERS

.1 Transformers shall be as follows:

.1 Designed for 600 volt primary, 120/208 volt secondary, delta wye operation, unless otherwise noted. Mounted as indicated.
.2 Have a minimum of 4 – 2 ½% primary taps, full two capacity above normal and two full capacity below normal.
.3 Have centre point of secondary wye connection grounded. Grounding shall be to local Inspection Authority requirements.
.4 Be of dry type with minimum of Class H insulation.
.5 Be of the three core type. Two core type using Scott connection will not be accepted.

.2 1500kVA transformer shall be as follows:

.1 Designed for 208 volt primary, 347/600 volt secondary, delta wye operation complete with class 1 enclosure, floor mounted.
.2 Have a minimum of 4 – 2 ½% primary taps, full two capacity above normal and two full capacity below normal.
.3 Have centre point of secondary wye connection grounded. Grounding shall be to local Inspection Authority requirements.
.4 Be of dry type with minimum of Class H insulation.
.5 Be of the three core type. Two core type using Scott connection will not be accepted.
.6 All windings to be copper.

.3 transformers shall be Polygon, F.P.E., Hammond, Siemens, Delta, G.E.

3 Execution

3.1 INSTALLATION

.1 Floor mounted transformers shall be mounted on rubber pads and 100mm concrete pad.

.2 The 1500 kVA transformer shall be part of the building house distribution section.

END OF SECTION

1 General

1.1 REQUIREMENTS

.1 Provide all distribution panels (CDP type) located and sized as shown on the drawings and as specified herein.

2 Products

2.1 COMPONENTS & MANUFACTURERS

.1 Panel tubs and trim shall be of code gauge steel. Trim shall have hinged door construction with concealed hinges and combined lock and latch, finished in ASA 61 grey enamel for 120/208 volt panels, sand for 347/600 volt panels. One key shall operate all locks. Two keys for each panel shall be provided to the Owners.

.2 Bussing for each panel shall be electro-tinned and equipped with main lugs sized as required. Bussing shall run the full length of the panel including the space allocated for the installation of future circuit breakers.

.3 Circuit breakers shall be of the bolt-on type quick-make, quick-break with thermal magnetic trips.

.4 Circuit breakers shall be sized as shown on the panel schedule and for operation at the voltage indicated. Minimum interrupting rating as required to meet local code requirements.

.5 Distribution panels shall be FPE, Eaton-Cutler Hammer, Siemens, G.E.

3 Execution

3.1 INSTALLATION

.1 "Spare" indicates a complete breaker, sized as shown on the panel schedule and "space" indicates that provision shall be left for the installation of an additional breaker at a later date.

END OF SECTION

1 General

1.1 REQUIREMENTS

.1 Provide all branch circuit panels located and sized as shown on the drawings and panel schedules and as specified herein.

2 Products

2.1 COMPONENTS AND MANUFACTURERS

.1 Panel tubs and trim shall be of code gauge steel. Trim shall have hinged door construction with concealed hinges and combined lock and latch, finished in ASA 61 grey enamel for 120/208 volt panels, sand for 347/600 volts. One key shall operate all locks. Two keys for each panel shall be provided to the Owners.

.2 Bussing for each panel shall be electro-tinned and equipped with main lugs sized as required. Bussing shall run the full length of the panel including the space allocated for the installation of future circuit breakers.

.3 Circuit breakers shall be of the bolt-on type, quick-make quick-break, with thermal, magnetic trips.

.4 Circuit breakers shall be sized as shown on the panel schedule and for operation at the voltage indicated. Minimum interrupting rating shall be 10 kVA for all suite panels. See one line diagram for IC rating of panels.

.5 Where breakers are protecting H.I.D. lighting circuits, install breakers specifically designed for that application.

.6 Branch circuit panels shall be FPE, Eaton-Cutler Hammer, Siemens, G.E.

3 Execution

3.1 INSTALLATION

.1 "Spare" indicates a complete breaker, sized as shown on the panel schedule and "space" indicates that provision shall be left for the installation of an additional breaker at a later date.

.2 The circuit numbers indicated on the drawings shall be strictly adhered to and completely typewritten legend shall be provided on the inside of the door of each panel to indicate the areas controlled by each breaker.

.3 Where double tubs are indicated, double lugging for inter-connection between panels shall be provided.

.4 Provide field mounted isolated ground bus connection in panels when required.

.5 Provide ground fault breakers in panels when indicated.

END OF SECTION

1 General

1.1 REQUIREMENTS

.1 Provide contactors located and sized as shown on the drawings and as specified herein.

2 Products

2.1 COMPONENTS & MANUFACTURERS

.1 Contactors for control of miscellaneous loads (heating, lighting, etc.) shall be surface mounted located as indicated. They shall be suitable for type of loads controlled and shall be complete with 120 volt coils and HOA switch and pilot light mounted in cover.

.2 Contactors shall be Allen Bradley, Eaton-Cutler Hammer, Siemens, Schneider Group.

.3 Colour to match system and voltage.

END OF SECTION

1 General

1.1 REQUIREMENTS

.1 Provide all motor starters as shown on the drawings. All motor starter enclosures shall be based on Cema listed sizes. Enclosures shall be Cema rated for intended location and service. Starters shall be of one manufacture throughout.

2 Products

2.1 COMPONENTS & MANUFACTURERS

.1 Starters for single phase motors unless otherwise indicated shall be:

.1 Manual motor starting switch with thermal protection and heaters of proper ratings.
.2 Suitable for surface or flush mounting as required with neon pilot light in cover.

.2 Starters for three phase motors shall:

.1 Be across the line, combination magnetic type unless otherwise indicated. Circuit breaker disconnect type.
.2 Be complete with heaters of proper size, control transformer, pilot lights and other accessories as indicated on starter schedule.
.3 Provide no-voltage and thermal overload protection. Each starter shall have three overload relays. When not indicated otherwise provide a minimum of two N.O. auxiliary contacts.

.3 Motor starters and accessories shall be Allen Bradley, Eaton-Cutler Hammer, Siemens, Schneider Group.

.4 Motor disconnects unless otherwise indicated shall be as follows:

.1 For 120 volt single phase motors up to ½ horsepower; standard type horsepower rated toggle switches, Hubbell 1121 or equal.
.2 For 208 volt single phase motors, 3/4 and 1 horsepower; standard type, horsepower rated toggle switches, Hubbell 1122 or equal.
.3 For 600 volt three phase motors up to 5 horsepower; toggle type horsepower rated manual motor switch, Bryant 30002 or similar.
.4 For 208 volt 3 phase motors up to 5 horsepower toggle type horsepower rated manual motor switch, Bryant 30003 or similar.
.5 For 208 volt three phase motors over 5 horsepower; unfused safety switches type, horsepower rated.
.6 For 600 volt three phase motors up to 15 horsepower, Bryant 40003 or similar.
.7 For 600 volt three phase motors over 15 horsepower, unfused safety switch type, horsepower rated.

END OF SECTION

1 General

1.1 REQUIREMENTS

.1 Provide motor control centres as detailed on the drawings and as specified herein.

2 Products

2.1 COMPONENTS & MANUFACTURERS

.1 The motor control centre enclosure shall be made up of individual vertical sheet metal sections, bolted together to form a complete rigid, free standing unit, suitable for mounting on and complete with channel sills. Exterior and interior to be primed with rust resistant primer and finished with two coats of standard ASA61 grey enamel for 120/208 volt, sand for 347/600 volt.

.2 Bussing shall be electro-tinned and shall run the full length of unit, including the space allocated for the installation of future equipment. Bussing shall be braced at standard rating, minimum of 42,000 amperes. See single line drawing for IC.

.3 The motor control centres shall be class 1, type B assembly of combination starter units. The interiors shall be factory assembled, complete with starters and shall be designed and constructed so that units may be inserted or removed without modifications to buswork or adjacent units.

.4 Each section shall have two horizontal wiring spaces, at top and bottom and shall have vertical wiring space from the top to bottom between starter unit and side sheet, complete with cable tie supports.

.5 Individual units shall be noted in Section 16486 Motor Starters and as indicated in schedule on the drawings.

.6 Fan shutdowns from fire alarm and BMS systems.

.7 Motor control centres shall be Allen Bradley, Cutler Hammer, Siemens, G.E. or equal.

3 Execution

3.1 INSTALLATION

.1 Motor control centres to be complete with accessories, equipment, etc., as required and as indicated on the drawings. Arrange with the General Contractor for provision of 150mm concrete housekeeping pad under motor control centres.

.2 Make megger test, check all bolted connections for tightness before energizing.

END OF SECTION

1 General

1.1 REQUIREMENTS

.1 Provide ground fault equipment as indicated on the drawings and as specified herein.

.2 Ground fault detection equipment on main service breaker shall be as required by code and local authority requirements.

2 Products

2.1 COMPONENTS & MANUFACTURERS

.1 Main service ground fault equipment shall:

.1 Ground fault equipment as part of and included in main distribution switchboard.
.2 Ground fault relay shall be equal to Schneider, Siemens or equal, MFGR series solid state relay.

.2 Ground fault receptacles shall be of the same manufacturer as standard devices provided.

3 Execution

3.1 INSTALLATION

.1 Install ground fault receptacles, breakers, etc., circuits as indicated or required.

END OF SECTION

1 General

1.1 REQUIREMENTS

.1 Provide all lighting fixtures complete with lamps, ballasts, etc. located as shown on the drawings and as specified herein.

.2 Fixture types, lamp types and sizes shall be as noted in the fixture schedule on the drawings.

.3 Provide 5% spare of each kind of lamp.

2 Products

2.1 COMPONENTS & MANUFACTURERS

.1 All lighting fixtures and lamp holders shall be equipped with best quality new lamps.

.2 Lamp types shall be as noted in the fixture schedule and shall be Osram, Phillips, Westinghouse. All incandescent to be 125 - 130 volt, 5000 hour life.

.3 Fluorescent ballasts shall be electronic, with harmonic distortion of 10% or less.

.4 H.I.D. ballasts shall be high power factor.

3 Execution

3.1 INSTALLATION

.1 Co-ordinate fixture locations and method of suspension with General and Ceiling Contractor before installation of outlet boxes, conduit, hangers, etc. Check fixture/ceiling layouts and bring to the attention of the Architect for a decision any conflicts or problems before installation.

.2 Where fluorescent fixtures are surface mounted on drywall ceilings, proper header material shall be provided for fastening and support of fixtures. Fixtures shall be screw fastened to header through drywall. Toggle bolts shall not be used.

.3 Where fluorescent fixtures are recessed in T-bar ceilings, the ceiling structure shall support the fixtures without the requirement for additional hangers.

3.2 LAMP USE

.1 As noted in Section 16010 all lamps used for construction lighting for a longer than 10% of rated life shall be replaced with new lamps. All burned out lamps shall be replaced with new immediately prior to final inspection and up to thirty (30) days thereafter.

END OF SECTION

1 General

1.1 REQUIREMENTS

.1 Provide all exit lights complete with lamps, located as shown on the drawings and as specified herein.

2 Products

2.1 COMPONENTS AND MANUFACTURERS

.1 Exit lights shall be as indicated on schedule.

3 Execution

3.1 INSTALLATION

.1 Co-ordinate exit light locations with General Contractor and other trades before installation of outlet boxes, conduit, etc. Check layouts and bring to the attention of the Architect/Engineer for a decision, any conflicts or problems prior to installation.

END OF SECTION

1 General

1.1 REQUIREMENTS

.1 Provide equipment and wiring for control of lighting as indicated on the drawings and as specified herein.

.2 Area and building exterior lighting shall be controlled by photocell/time clock combination operating a contactor.

2 Products

2.1 COMPONENTS AND MANUFACTURERS

.1 Photocells - Intermatic K4221

.2 Time Clocks - Intermatic Series T170CR Series

.3 Contactors - (120 volt coils) - Allen Bradley Square D.

3 Execution

3.1 AREA LIGHTING

.1 Operation to be such that photocell controls on operation and timeclock controls off operation.

.2 Provide HOA switch and pilot light in cover of contactor. "Hand" position bypasses all controls.

3.2 INSTALLATION

.1 Photocell, timeclocks, contactors, etc., to be located as indicated. Provide connections between equipment.

.2 Test all systems for proper operation and instruct building personnel on the operation of systems.

.3 Provide 120 volt circuits as required for operation of time clocks, contactor coils, etc.

END OF SECTION

1 General

1.1 REQUIREMENTS

.1 Provide a complete packaged emergency power unit consisting of:

.1 A diesel fuelled engine directly coupled to an alternator and mounted on a common fabricated steel base.
.2 Control and safety equipment.
.3 Miscellaneous accessories as specified.

1.2 OPERATION

.1 Operation of the emergency power unit and system shall be such that upon failure of the normal power supply to automatic transfer switch, a control relay in the transfer switch, after a delay, will operate to initiate the engine starting circuit. When the alternator reaches the rated voltage and speed, the transfer switch will operate to transfer the emergency power load to the alternator.

.2 Upon return of the normal power supply, the transfer switch, after a time delay (adjustable from 0.5 to 30 minutes) will operate to transfer emergency power load back to normal supply. The engine will continue to run in the unloaded condition for a pre-determine cool-off period before being shut down and returning to starting condition ready for another operating cycle. Shutdown to be initiated from the control panel.

2 Products

2.1 ENGINE

.1 The engine shall be diesel fuelled, 1800 rpm, direct connected to alternator, water cooled with mounted radiator.

.2 Horsepower rating shall be as required to handle alternator specified. Derating for ambient conditions, site elevation, fuel type, etc. shall be taken into consideration.

.3 The engine shall be equipped with a gear driven electronic hydraulic governor to maintain alternator frequency within 3 cycle band width from no load to full load and to override transient conditions.

.4 Engine shall operate on #2 diesel fuel.

.5 The engine shall be standard production model and shall be complete with:

.1 Full pressure lubrication by gear type pump.
.2 Air cleaner, coolant, fuel and oil filters with replaceable elements.
.3 Lube oil cooler.
.4 Fuel transfer pump.
.5 Automotive type oil pan and sump.

.6 Oil pressure gauge, coolant temperature gauge, RMP gauge.

.7 Immersion type block heater thermostatically controlled to maintain coolant temperature around the combustion chamber to a minimum of 40 degrees C.

2.2 ENGINE FUEL SYSTEM

.1 The engine fuel system using #2 diesel fuel shall meet all requirements of authorities having jurisdiction and shall be complete with fuel transfer pump, primary and secondary fuel filters, fuel solenoid, etc.

.2 Fuel tank shall be supplied by the mechanical contractor and shall be filled with diesel fuel by the electrical contractor prior to and after completion of testing.

2.3 COOLING SYSTEM

.1 The engine cooling system shall be a closed circuit type, thermostatically controlled and having capacity sufficient for continuous engine cooling at full load in an ambient temperature of 40 degrees C. Radiator shall be engine mounted and shall have attached air ducts flanges.

.2 Engine shall be equipped with an engine driven, centrifugal type water circulating pump and thermostatic valve to maintain the engine at recommended temperature level.

.3 Engine cooling system shall be filled with a minimum concentration of 50% ethylene glycol good for -40^{0}C.

2.4 EXHAUST SYSTEM

.1 hospital type supercritical exhaust silencer and flexible header exhaust pipe shall be provided. Exhaust manifolds shall be water cooled. Exhaust pipe shall be insulated and shall have condensate trap and drain and flapper type rain cap.

2.5 STARTING SYSTEM

.1 The engine starting system shall be 12 or 24 volt DC and shall include heavy duty battery, battery cables, battery rack, engine-mounted alternator and required accessories and controls. Battery ampere hour rating shall be sized for double cranking sequence specified.

.2 An automatic battery charger shall also be provided. It shall be automatic two rate type and shall include ammeter, voltmeter, selector switch and pilot lights. Input shall be 120 volt. The charger shall be capable of restoring the batteries from no charge to full charge in six hours.

.3 The starter shall be directly connected to the engine fly wheel housing and the rotor shall be driven through a semiflexible driving flange.

2.6 ALTERNATOR

.1 The alternator shall be 4 pole, revolving field type, brushless, drip proof construction. Insulation shall be Class F. The voltage regulator shall be temperature compensated solid state.

.2 Voltage regulation shall be ± 2% from no load to full load. Instantaneous voltage dip shall be less than 000 of rated voltage when full load and rated power factor is applied with recovery to stable operation within two seconds. Steady state operation shall provide constant terminal voltage within ± 1% of rated voltage.

.3 The cooling blower shall be direct centrifugal type.

.4 The alternator shall be standby duty rated, 347/600 volts, 3 phase, 4 wire, 60 Hz. Minimum capacity shall be 350 kW, 0.8 P.F.

2.7 ENGINE ALTERNATOR MOUNTING

.1 The engine and alternator shall be directly coupled through a flexible disc coupling and mounted and aligned on a common fabricated steel base. High efficiency adjustable steel spring vibration isolators shall be provided. A torsional analysis of the major rotating components will be conducted by the manufacturer prior to assembly to ensure no harmful torsional vibration is present at operating speed. The entire unit shall be assembled, tested and delivered ready for mounting on a concrete pad.

2.8 CONTROL PANEL

.1 A unit mounted control panel in Cema 1 enclosure shall be provided. Panel shall be arranged to initiate the engine starting sequence upon receipt of a signal from automatic transfer switch. The engine shall be limited to three cranking attempts with intervening rest periods during a period of not less than 45 seconds and not more than 75 seconds. If the engine should fail to start by the end of that period, a light on the control panel shall illuminate to indicate the reason for the failure to start and the starting circuit shall be blocked out until manually reset.

.2 The panel shall be arranged to shut down the engine when any one of the listed trouble conditions occur. Shut-down conditions shall be:

.1 High water temperature.
.2 Low oil pressure.
.3 Overspeed.
.4) Overcrank (failure to start).

.3 All shutdown conditions shall be indicated by individual alarm signal lights and shall remain on until manually reset. Lamp test switches shall be provided.

.4 The control panel shall also contain:

.1 Engine selector switch - test/stop/remote.
.2 Manual reset circuit breaker overload protection.
.3 Frequency meter.
.4 Running time meter.
.5 Voltage adjusting rheostat.
.6 AC voltmeter (dual range).
.7 AC ammeter (dual range).
.8 Meter selector switches with off position.
.9 Time delay, adjustable 0-30 mins. for engine shutdown after power has returned to normal.
.10 Terminal for remote alarm.
.11 Notification to elevator controllers.
.12 Contacts for fire alarm panel.

.5 All devices located in the control panel shall be clearly identified with lamicoid nameplates.

2.9 TRANSFER SWITCH

.1 The operation shall be such that when any phase of the normal supply at transfer switch falls below 70% of the normal voltage, a relay in the transfer switch operates to indicate that emergency power is required and to start up emergency generating unit. When voltage is up to rated level the transfer switch shall operate to transfer load to emergency supply. When the normal supply is restored and voltage on all phases is 90% or more of normal 600 volts, the switch shall transfer back to normal position after selected time delay. Engine shall continue to run for an adjustable cool down period.

.2 The automatic transfer switch shall have an amperage rating as indicated on drawings for continuous operation at 347/600 volts, 3 phase, 4 wire, 60 Hz. Switch shall be electrically operated, mechanically held and shall be inherently interlocked, mechanically and electrically so that a failure of any coil or disarrangement of any part shall not permit a neutral position. Transfer switch shall be 4 pole (switched neutral).

.3 A test switch (test-normal) and pilot light shall be provided for mounting in the face of the switch. Pilot lights shall indicate normal and emergency position.

.4 Time delay relays shall be provided in transfer switch for the following:

.1 Delay engine start.
.2 Delay normal to emergency transfer. Adjustable 0-60 seconds.
.3 Delay emergency to normal retransfer. Adjustable 0.5-30 minutes. Synchronized in phase transfer.
.4 Delay engine control contact opening. Adjustable 0-60 seconds.

.5 Two N.O. and two N.C. contacts rated at 10 amperes shall be provided in transfer switch in the emergency position allowing specified circuits to be controlled.

.6 Transfer switch shall be as manufactured by Onan, Asco or approved equal.

.7 Manual test operation of the system shall be from test switch at transfer switch and shall simulate power failure which initiates start-up of emergency facilities, transfer to emergency power and operation under emergency load. Transfer switch will remain in emergency position until test switch is returned to normal position.

2.10 MANUFACTURERS

.1 Manufacturers must have local representation, spare parts stock and suitable servicing facilities and must have had and maintained these facilities in Calgary for at least the past five years.

.2 Manufacturers must also be able to list 3 projects of a comparable nature where their equipment has been satisfactorily installed.

.3 Manufacturers shall observe carefully and take note of all specific requirements as indicated on the drawings and in the specifications. All requirements shall be met.

.4 Acceptable manufacturers/suppliers - Onan.

3 Execution

3.1 SHOP TESTS

.1 The complete engine alternator unit, control panel and accessories shall be shop tested prior to shipment. Test results shall be submitted for approval prior to shipment. Results shall be certified by the manufacturer as to their accuracy.

.2 The shop tests shall include but not be limited to:

.1 Simulate power failure: allow the engine to come up to speed (frequency) and voltage and transfer to:
- Half load, 0.8 P.F. return to no load after 30 mins.
- Full load, 0.8 P.F. return to no load after 30 mins.
- Full load, unity P.F. return to no load after 60 mins.

.2 Check and record for each load listed 3.1.2a) the following:
- Type and power factor of the load.
- Recovery time on speed (frequency).
- Recovery time on voltage.
- Maximum voltage dip on transfer or change in load.
- Steady state voltage and frequency variance.

.3 Record at the beginning and end of tests:
- Room ambient temperature.

- Engine temperature.
- Alternator temperature.
- Altitude above sea level.

3.2 ON SITE TESTS

.1 Under the direction of the Engineer carry out tests at the site on the engine alternator unit before acceptance of same. Provide a qualified service man for the time required for start-up, testing and adjusting of the unit to the satisfaction of the Engineer.

.2 The on-site tests shall occur only after the unit has been verified in writing by the manufacturer or his representative as being installed and mounted correctly, stating that the exhaust, fuel, cooling air and combustion air are of the proper size and quantities required for the unit to perform correctly.

.3 The supplier shall supply all loads and accessories (cable, meters, etc.) required to test the unit on site prior to approval and acceptance by the Engineer.

.4 The tests shall include, but not be limited to:

.1 Simulating a power failure: the unit shall start up, transfer full load to unit, run for two hours, shut down.

.2 After a cool down period as specified by the manufacturer, then simulating a power failure: the unit will transfer to the actual building maximum emergency loads. Operate these loads for two hours or a length of time indicated by the Engineer after which it shall be retransferred back to normal power.

.5 During these tests the supplier shall record all data, similar to that requested in par 3.1.2b). This data shall be certified as correct by the supplier prior to submitting to the Engineer for approval.

.6 Upon completion of testing and acceptance by the Engineer, the manufacturer or his representative shall provide instructions to operating personnel in the correct operation and maintenance of the unit. Allow a minimum of one full day for a qualified service man for this instruction.

.7 Electrical contractor shall carry a cash allowance of $500.00 (Five Hundred Dollars) for engineer's costs for on-site test.

3.3 SHOP DRAWINGS

.1 Shop drawing requirements for emergency unit shall be in addition to standard requirements of General Provisions.

.2 The supplier shall submit three (3) copies of detailed drawings of equipment for approval prior to assembly and shipment. Final copies, three (3) of drawings along with three (3) copies of parts books and maintenance manuals shall be provided with

the unit.

.3 The supplier shall provide detailed shop drawings and specifications on all services required for fuel, exhaust piping, cooling and combustion air, etc. plus size, shape and construction details of the mounting arrangement.

.4 The supplier shall also submit the following ratings of the unit when operated continuously at a location, in a room with an ambient temperature of 40 degrees C.

.1 Maximum kVA
.2 Maximum kW
.3 Continuous kVA
.4 Continuous kW
.5 Maximum engine h.p.
.6 Continuous engine h.p.

3.4 RATINGS, LOADINGS

.1 A minimum rating and capacity for the complete power system has been indicated. Larger units may be provided and shall be provided if actual loads and sequence of load application is such that a larger unit is required. Manufacturers/suppliers shall note loads and sequence of application and shall ensure that unit provided is sized properly to handle these requirements.

.2 Actual loads and sequence of application will be as follows:

.1 Applied automatically, immediately at transfer:
- lighting and small miscellaneous power loads.

3.5 INSTALLATION

.1 The unit shall be located approximately as indicated on the drawings and shall be mounted on spring isolators. A minimum of three spring isolators per side shall be provided.

.2 Complete engine alternator unit (on steel skid) shall be mounted on concrete base. Mounting shall be to manufacturers recommendations. Arrange with General Contractor for installation of 102 mm concrete base.

.3 Services and connections required for fuel, exhaust, air distribution, etc., shall be provided by Mechanical Contractor.

.4 Provide separate 120 volt, 15 amp circuit, wiring and connections as required from emergency panel to mechanical control panel (for room thermostat, ventilation dampers, etc.)

.5 Run a 25mm conduit from elevator transfer switch in mechanical penthouse to elevator controllers, c/w 4 pair Cat. 5E cable and 6 meters of slack. Final tie in to elevator controllers by others.

END OF SECTION

1 General

1.1 SCOPE

.1 Furnish all labour, materials and items of service required to complete a functional and unobtrusive lightning protection system approved by the architect and engineer in strict accordance with the specifications and contract drawings. If any departure from the contract or submittal drawings covered below are deemed necessary by the contractor, details of such departures and reasons therefore shall be submitted to the architect for approval. No such departures shall be made without the prior written approval of the architect and engineer.

.2 The following standards of the latest issue form a part of this specification:

.1 Lightning Protection Institute Standard LPI-175.
.2 National Fire Protection Association Code NFPA 780 (1995 ed.).
.3 Underwriters' Laboratories Standards UL96A and UL96.

1.2 QUALITY ASSURANCE

.1 The system shall conform to the above cited standards. The system furnished shall be the standard product of a single, ULC listed manufacturer regularly engaged in the production of lightning protection systems and shall be the manufacturer's latest approved design. All material specified is manufactured by Thompson Lightning Protection, Inc., 901 Sibley Highway, St. Paul, Minnesota 55118, or approved equal. For approval of a manufacturer other than specified, proposed material data and installation drawings must be submitted for review.

1.3 SUBMITTALS

.1 Complete shop drawings shall be prepared by the manufacturer and submitted to the engineer for approval prior to work. System installer shall submit to the engineer an original, project specific, notarized certification from the equipment manufacturer verifying their qualifications as a lightning protection installer. Samples and catalog data shall be submitted to the engineer for approval upon request.

2 Products

2.1 STANDARD

.1 All equipment shall be factory inspected, approved and properly labelled in accordance with LPI and ULC requirements. All equipment shall be new, the product of a single manufacturer, and of a design and construction to suit the application where used.

2.2 EQUIPMENT

.1 All materials shall be copper or copper alloy and of the size, weight, and construction to suit the application where used in accordance with LPI, ULC, and NFPA requirements for Class II structures per manufacturer recommendations. Should there by any roof areas of the building below 75' above grade that require protection, the cable and air terminal sizes shown can be reduced to Class I equipment of the same material as Class II equipment specified. Requirements for bases, splicers, and other fittings will remain the same. Conductors shall be copper, 28 strands 14 gauge, Cat. No. 28R. Air terminals shall be solid, round, copper, ½" diameter, Cat. No. 55, 56, etc., and shall project 10" minimum above the object to be protected. Locate and space according to LPI, ULC and NFPA requirements. Air terminal bases shall be of cast bronze with bolt pressure cable connections and shall be securely mounted with stainless steel screws or bolts Cat. No. 690X, 678, 611, etc. as required. Crimp type connections are not acceptable. Bases on built-up tar and gravel or single membrane roofs shall be secured with adhesive and shall have a minimum surface contact area of 18.5 square inches, Cat. No. 688. Co-ordinate with the roofing contractor to ensure compatibility of any adhesive with the roofing system in use. Ground rods shall be a minimum of 5/8" in diameter and 10' long, Cat. No. TL5810. They shall be connected to the system with a two-bolt cast bronze clamp Cat. No. 231, having a minimum length of 1-1/2" and employing stainless steel cap screws. Cable fasteners shall be substantial in construction, electrolytically compatible with the conductor and mounting surface and shall be spaced according to LPI, ULC, and NFPA code requirements, cat. No. 730, 166, etc. Bonding devices, cable splicers, and miscellaneous connectors shall be of cast bronze with bolt pressure connections to cable. Cast or stamped crimp fittings are not acceptable. Splicers similar to Cat. No. 423B, 705, 706, etc., bonding devices similar to Cat. No. 702, 704, 551, 142, 561, 142X, etc. All miscellaneous bolts, nuts, and screws shall be stainless steel.

3 Execution

3.1 INSTALLATION

.1 The installation shall be accomplished by an experienced installer who is a Certified Master Installer of the LPI or working under the direct supervision of the manufacturer as listed above or their authorized LPI Certified Master Installer representative. All equipment shall be installed in a neat workmanlike manner in the most inconspicuous manner possible. The system shall consist of a complete cable network on the roof including all air terminals, splicers, and bonds with cable downleads routed concealed either directly in the building construction or in conduit to ground. Downlead cables shall not be brought directly through the roof. Through-roof connectors with solid rods or conduit through approved flashings shall be utilized for this purpose. Copper equipment shall not be connected to aluminum surfaces except by means of an approved bimetal transition fitting.

3.2 CO-ORDINATION

.1 The installer will work with other trades to ensure a correct, neat, and unobtrusive installation. The lightning protection installer shall assure a sound bond to the main water service and interconnection with other building ground systems, including both telephone and electrical. Arresters shall be installed on the power and telephone service by either the utility or the electrical contractor as applicable. All final flashing and sealing of lightning protection system roof penetrations shall be furnished and installed by the roofing contractor in compliance with the roofing system in use. A copy of the lightning protection system shop drawings shall be forwarded by the architect to the roof contractor for co-ordination purposes.

3.3 COMPLETION

.1 The lightning protection installer shall secure and deliver the lip System Certification and the UL Master Label to the architect for the owner upon completion of the installation. The contractor shall also submit copies of as-built shop drawings with LPI Form LPI-1-R91 to finalize the LPI Certified System Application.

END OF SECTION

1 General

1.1 REQUIREMENTS AND REGULATIONS

.1 Provide complete network fire detection/alarm and voice communications system as shown on the drawings and as specified herein.

.2 Equipment, material and installation shall meet all present Code requirements. Complete system shall be in accordance with National Building Code, Alberta Building Code and CAN/ULC-S524-M86 Standard for the Installation of Fire Alarm systems. All equipment shall be ULC listed and approved at time of actual Tender. Equipment under review by ULC but not actually approved at time of Tender will not be accepted.

.3 Verification shall be in accordance with CAN4-S537-86.

.4 System must be able to accommodate a sleend tower the same size as this project.

1.2 SYSTEM

.1 The complete system shall include fire detection/alarm and public address facilities (Class B).

.2 Public address capabilities shall be used as alarm signalling method where applicable. Public address and alarm signalling shall be zoned, dual channel with Class B wiring for speaker circuits.

.3 The complete system shall be a combination of addressable for detection, standard hard wired for voice and signal and multiplex equipment and techniques and shall include network display unit (NDU), transponder, manual stations, thermal detectors, ionization smoke detectors, photo-electric smoke detectors, audible and visual signal devices, accessories, etc.

.4 Transponders as defined for this specification shall be intelligent, microprocessor based devices that connect to, and handle network communications in a peer-to-peer manner. In order to maintain network integrity, systems using a single master with remote slave units will not be acceptable. Decisions pertinent to the network shall be distributed among the transponders such that there is no need for a central controller.

.5 Network operations shall be via communication links that connect all transponders and include data transfer, an audio signalling bus serving all remote primary and backup amplifiers. All communications trunk wiring shall be Class A and electrically supervised.

.6 The network shall operate using half-duplex, digital RS485 communication techniques at a data rate of 57.6 kbaud. Communications shall be via twisted and shielded #18 AWG wire and shall be Pyrotenics fire rated cable from control panel to transponder and from transponder to control panel.

.7 Minimum equipment submissions must include:

.1 Complete description data indication ULC listing for all network components.

.2 Complete sequence of operation of all functions of the network.
.3 A list of every address of every device connected to a transponder that is provided for purposes of alarm initiation, status monitoring, supervised notification appliance circuits, and auxiliary control.
.4 Complete network wiring diagrams for all components and interfaces to equipment supplied by others.
.5 A listing of the manufacturer's representatives responsible for installation co-ordination and service.
.6 Location of all controls, alarm actuating devices and notification appliance devices as shown on drawings.

.8 Fire Detection/Alarm

.1 The system shall be zoned, non coded, two stage, (first phase-alert, second phase-evacuate) general alarm and shall be electrically supervised throughout. Power supply shall be 24 volt DC for all supervisory and control functions.
.2 Alarm initiating devices shall be grouped in address loops with each detector addresses being indicated at control panel. The number and location of loops will be as designated as noted herein.
.3 Each address loop shall be capable of accepting any combination of addressable manual stations, thermal detectors or smoke detectors.
.4 Detection devices shall be capable of being interchanged without any changes required to the wiring or control equipment.
.5 Smoke detectors (photo) and (ion) shall be capable of being interchanged without changes to mounting base.
.6 Control points shall be able to be operated by real time clock and programme.

.9 Public Address

.1 The system shall provide intelligible one way voice communications via microphone/speaker arrangement to all areas of the building equipped with speakers.
.2 Speakers shall be zoned type system as noted on drawings with a maximum of 25 speakers per zone.
.3 When public address system is activated at main control panel, suite 10 minute silence button shall be overridden. Public address announcement shall not be silenced.
.4 Stairwell speakers shall voice message and public address, no tones, only. Voice message shall activate only upon stairwell smoke detection being alarmed. Voice message type shall be determined later.

1.3 NETWORK OPERATION

.1 Network communication details shall be per the following:

.1 Transponder shall communicate to the main control panel by a token ring configuration.
.2 The communication method shall be NFPA 72 style 7.
.3 If the transponder becomes isolated from the rest of the network ring, the transponder shall form a sub-network with all common interaction of monitoring

and control remaining intact. The network shall be notified with the exact details of the lost communications.

.4 In the event that the transponder becomes unable to handle the network token, the network interface card shall continue communications to the rest of the network. The off-line transponder is reported as such to the network and is periodically interrogated to determine if it is ready to be brought back on-line with the rest of the network.

.2 Network operation for any manual or automatic fire alarm initiating device activation shall be as follows:

.1 The transponder connected to the alarmed device shall operate in accordance with its programmed response.

.2 When the network token message reaches that transponder, it shall be updated with the alarm condition to include:

.1 Identification and point location.

.2 The red ALARM LED shall flash on the monitoring transponder, and on all connected network transponders programmed to recognize that alarm, until the alarm has been manually acknowledged. When the alarm has been acknowledged, this same LED shall latch on. A subsequent alarm received after any acknowledgement shall again flash the same LEDs.

.3 The source of alarm shall be annunciated via English language description on the alphanumeric display at the monitoring transponder and all other transponders programmed to respond to that alarm.

.4 All transponders shall respond to the alarm information in accordance with their individually programmed response which may include operation of control functions both connected to that transponder and on the other transponders if public.

.5 All alarm conditions shall be visually indicated at the owner transponder and at the remote annunciators as programmed.

.6 All alarms shall be recorded with the time and date.

.7 The network operation shall be such that the alarm operation of any alarm initiating device shall not prevent the subsequent alarm operation of any other initiating device due to wiring or power limitations.

.3 Voice Annunciation

.1 The network communications shall be capable of controlling speaker circuits by appropriately programming control points throughout the network.

.2 Audio wiring shall be routed separately from the network data communications wiring in accordance with specifications.

.3 Time Keeping.

.1 Network time synchronization with seconds resolution accuracy shall be provided.

.4 Smoke Control

.1 Network communications shall activate any and all transponders programmed for control of dedicated supply and exhaust fans in an alarm situation. Network transponders shall, by individual program, have dedicated override control points located near the fan control centres.

This function is for future, however, the system must be capable of performing this function.

.5 Elevator Recall

.1 Network communications shall activate any and all transponders programmed for control of all required elevator recall operations. When alarms are reported, either manually or automatically, control relays at the designated transponders and connected to the elevator control circuitry shall energize and the elevators shall be recalled to the ground floor for fire fighters use. Should the fire be on the ground floor the elevators shall be sent to the alternate safe floor all per programming at the applicable transponders.

1.4 SYSTEM OPERATION

.1 Fire Detection/Alarm

.1 Operation of any manual station, automatic detector (thermal, ionization or photo electric) or standpipe, sprinkler flow switch shall indicate initiating device and detector address at control panel and sequence the following:

.1 Sound second stage evacuation tone (1000 hertz at 120 pulses per minute) throughout initiating floor, floor above and floor below. The 4 parkade levels will act as one 91) floor.
.2 Sound first phase alert tone (1000 hertz at 20 pulses per minute) throughout remaining floors for 15 seconds.
.3 Visual indication (strobe) 45 - flashes per minute @ 4.75 candela/second (effective candle power) @ 24 VDC. First and second phase alarm.
.4 Total time not to exceed 4 minutes.
.5 If alert signal is not silenced by supervisory personnel (Safety Officer or Senior Building Warden) within 4 minutes, entire building will go into evacuation stage.
.6 Evacuation tone will sound on all floors.
.7 Tone to continue until system is silenced or reset.
.8 On initiation of a second zone during alert phase, the entire building will go into evacuation phase.

.2 The system shall include an automatic second stage evacuation tone control device and device for manually initiating second stage at the network display unit. An acknowledgement push button, lamp and adjustable automatic time, shall also be provided. If first phase alert tone not acknowledged "by supervisory personnel" before preset time expires, the second stage evacuation tone shall be automatically initiated.

.3 Both the fire alarm and the public address communication shall share common signal circuits and audible signalling devices.

.4 Tone generators, pre-amplifiers and power amplifiers shall be used in conjunction with the audible signalling devices to sound the fire alarm signal and for public address communication. Upon activation of paging system, the suite 10-minute silence button shall be overridden. Any and all paging signals shall not be silenced.

.5 All smoke detection devices shall have an indicating lamp on the device (remote lamp for concealed devices) which shall illuminate and indicate device that has initiated alarm.

.6 When the alarm initiating devices have been restored to normal position, the system control shall be reset by depressing a single reset pushbutton.

.7 When trouble on system is indicated, trouble alarm shall sound and zone of trouble shall be indicated at main panel and network display unit.

.8 Closure of any monitored sprinkler or standpipe valve shall indicate zone trouble at the main panel and network display unit, but general building alarm shall not sound.

.9 Loss of system pressure (due to problems in water supply) to sprinkler or standpipe system shall indicate zone trouble at the main panel and network display unit, but general building alarm shall not sound. Zones shall be different and separate from valve closure trouble zones.

.10 Start up of Emergency Generator shall indicate generator trouble at main panel and network display unit, but general building alarm shall not sound.

.11 Opening of roof hatch smoke removal duct shall indicate roof hatch trouble at main panel and N.D.U. but general building alarm shall not sound.

.12 When fire alarm is initiated the system will perform the following functions:

.1 Sound alarms (sequence as noted previously)
.2 Indicate loop and device address
.3 Shut down fans (duct detector only).
.4 Send alarm to Monitoring Company
.5 Close contact for fire alarm indication circuit to elevator controller
.6 Operate strobe lights

.13 Public Address

.1 System shall provide common use for fire alarm and public address as noted previously.

.2 System shall provide approved electrically supervised public address communications throughout the building by means of building speakers and a microphone at the control panel. A press to talk switch on the microphone shall permit announcements to be made from the main control panel. All alarm signals if in operation shall be silenced when press to talk switch is operated. Signals shall resound after 3 second delay once press to talk switch is released. This will permit brief pauses during announcements.

.3 The public address portion of the system shall provide and incorporate the following:

.1 Distinctive and automatic fire alarm signals.
.2 One way voice transmission to each zone of the building, selected at control panel.
.3 One way voice transmission to all floors or zones (all call).

.14 Starting of fire pump shall indicate fire pump trouble at main panel and N.D.U., but general building alarm shall not sound.

1.5 SUPERVISION AND CONTROLS

.1 All wiring and components for fire detection/alarm and voice communications systems shall be fully supervised. Any trouble on the supervised lines shall be indicated by audible and visual alarms. Visual alarms shall be by amber coloured indicating lamps.

.2 Indicating lamps shall also be provided which will allow testing to locate a lamp failure.

.3 A lamp test switch shall be provided which will allow testing to locate a lamp failure.

.4 Additional control items to be included are:

.1 One bypass switch for each function on auxiliary relays and signal circuits to bypass during testing.
.2 Panel reset button.
.3 Door switches on all fire alarm, voice, equipment cabinets.

.5 All components of voice communications system shall be supervised; amplifiers, preamplifiers, tone generator, etc., and shall have individual trouble indication.

.6 Operation shall be such that all circuits are supervised under any operating condition (normal power or battery operation).

.7 Normal power and battery power supplies shall be supervised so that if either one or both fail, trouble will be indicated. Dry contacts shall be provided (N.O. & N.C.) for remote indication of power supply failure.

.8 Trouble on any circuit or component of the complete system (fire detection/alarm/fire Department telephone and voice communication facilities) shall be indicated by audible and visual alarms at main control panel.

.9 All information regarding trouble (time, area, type, etc.) shall be indicated and recorded.

.10 Provide motor on/off switches complete with green and red status LED for mechanical units EF-1, MUA-1, AH-1, and AH-2, at main control panel.

1.6 TESTING, VERIFICATION & CERTIFICATION

.1 The entire fire detection/alarm and voice communication system shall be checked and tested upon completion of installation by manufacturer's representative (agents will not be accepted as testing representatives). Written verification of satisfactory installation

and operation shall be submitted. Copies of verification shall be included in maintenance manuals.

.2 The manufacturer shall make an inspection of the equipment including those components necessary to the direct operation of the system such as initiating devices, signalling devices and controls. The inspection shall comprise of an examination of such equipment for the following:

.1 That the type of equipment installed is that designated by the specification.
.2 That the wiring connections to all equipment components show that the installer undertook to have observed ULC and CSA requirements.
.3 That the equipment of the manufacturer has been installed in accordance with the manufacturer's recommendations and that all devices have been operated or tested to verify their operations.
.4 That the supervisory wiring of those items of equipment connected to a supervised circuit are operating and that the governmental regulations, if any, concerning such supervisory wiring, have been met to the satisfaction of inspecting officials.

.3 The system shall be checked and tested for proper operation. Testing shall include the following:

.1 Satisfactory operation of all initiating devices, communications devices, equipment functions and supervision functions.
.2 Verification of entire system as outlined in CAN4-S537-86 Standard for the Verification of Fire Alarm System Installations.

.4 Acceptance of system shall require demonstration of stability of system. Stability shall be adequately demonstrated if system operates satisfactorily for a ninety (90) day period without unwarranted alarm. Ninety day period should be when building is in normal use with all environmental systems operational.

.5 The manufacturer shall supply to the installing contractor reasonable amounts of technical assistance with respect to any changes necessary to conform to the work noted above. During the period of inspection by the manufacturer, the installing contractor shall make available to the manufacturer manpower assistance as designated by the manufacturer.

.6 To assist the installing contractor in preparing costs, the manufacturer shall indicate the number of hours necessary to complete this inspection.

.7 The manufacturer shall supply as part of shop drawing submittal of a schematic wiring diagram of fire detection/alarm/voice communications system. Diagram shall be complete, showing all devices, wiring, etc. as required to install system, test and put into proper working order.

.8 After completion of all testing, verification, etc. the manufacturer/installing contractor shall submit the following which shall be separate and in addition to standard shop drawings and maintenance manual requirements.

.1 Complete as-built wiring drawings.
.2 Detailed catalogue data on all installed system components.
.3 Copy of all testing reports (procedures and results).
.4 Training and information on maintenance and servicing of all equipment supplied.

.9 Subsequent to testing and verification as noted above by system manufacturer, an independent check and verification shall be performed on completed system. This check and verification shall be done by the Engineer, installer and manufacturer. This testing and verification shall comprise the following:

.1 Complete verification of system operation as per CAN4-S537-86.
.2 That all equipment specified is installed and functioning as designated by the specifications.
.3 That all wiring and connections are properly installed and meet all code requirements.
.4 That all supervision of wiring and components is complete and operational and all requirements of supervision have been met.

.10 The installing contractor and manufacturer's representative shall provide all equipment and labour as necessary to complete verification to requirements and approval of the Engineer. Work shall include but shall not necessarily be limited to the following breakdown:

.1 Contractor
  .1 Co-ordinate and schedule verification.
  .2 Provide ladders, scaffolding, etc.
  .3 Remove and reinstall devices.
  .4 Activate alarms, trouble, etc.
  .5 Correct any deficiencies.
.2 Manufacturer
  .1 Insure correct operation of all system alarm, trouble, auxiliary, etc. functions.
  .2 Check, calibrate, adjust and confirm correct operation of all panels, annunciators, etc.
  .3 Correct any deficiencies.
  .4 Generally insure that all aspects of the system function properly.
  .5 Provide all test equipment including sound pressure level meter, voltmeter, heat and smoke test equipment, etc.
  .6 Record all data and issue report and certificate of verification.
.3 Engineer
  .1 Direct and supervise verification.
  .2 Check and insure that system is applied and installed to all applicable Codes.
  .3 Review verification documentation and issue confirmation to owner and building authorities.

.11 The manufacturer/installing contractor shall upon receipt of the Engineer results proceed to perform required work as indicated in report, to place system in proper, acceptable working order and to the approval of the Owner.

.12 Electrical contractor shall carry a cash allowance of $10,000.00 (Ten Thousand Dollars) for engineer's cost to verify system.

2 Products

2.1 COMPONENTS

.1 Main fire alarm control panel (MFCP) with Voice Communication.

.1 MFCP shall be wall mounted (semi-recessed) and of sufficient size to house all equipment described herein. Cabinet flange shall be provided to accommodate semi-recessed mounting.
.2 The cabinet shall have lockable hinged door. Opening of the cabinet door shall provide access to all operating controls.
.3 The Main Fire Alarm Control Panel (MFCP) shall be micro processor based utilizing distributed processing and digital transmission techniques.
.4 The MFCP shall include internal electrical supervision of all normal and standby power conditions and network data communications. In the event of any troubles, the condition shall be indicated at the MFCP remote annunciator and at other transponders as programmed.
.5 One NO and one NC contact will allow testing to be carried out within building without alarm indication at Central Monitor company. Trouble indication only indicated.
.6 Cabinet lock shall be supplied and installed by the manufacturer.
.7 Push button initiation to provide status change summary recall facility.
.8 Class A communication lines between MFCP and transponder.
.9 The network display unit shall include, but not be limited to the following equipment and functions:
.1 80 column by 2 line back-lighted LCD readout of point status.
.2 Capacity to annunciate 1000 network point and/or point lists.
.3 Programming and interface flexibility shall be similar to the transponder control units.
.4 Historical event logs shall maintain 1200 events.
.5 Single acknowledge button.
.6 Single reset button.
.7 Field programmable (by manufacturer).
.8 Standby batteries and charger.
.9 Any or all monitor or control points capable of being bypassed via software programming.
.10 Any monitor or control point status change can be called up on the display.
.11 Fire alarm and fire detection system equipment.
.12 Public address system equipment.
.13 Manual evacuation switch.
.14 LED zone annunciator panel. Red indicating lights for alarm. Amber indicating lights for trouble.
.15 Audible trouble signal and silencing switch.

.16 Audible alarm signal silence switch.
.17 Indicating lights for system trouble. Indication required for:
- Fire detection and signal circuits by zone.
- Public address circuits.
- Power supply failure.
- Battery and charger removal or failure.
- Signal circuit bypass switch on.
- Amplifier, preamplifier, tone generator, etc. failure (individual indication)
- digital message failure or malfunction.
- Auxiliary relay bypass switch on.
- Telephone circuits.

.18 Power "on" indicating lamp.
.19 Indication of power supply (normal and battery) supervision.
.20 Bypass switches for each auxiliary control relay and each signal circuit for use during system testing. Supervised to indicate trouble when on.
.21 Panel reset push button (behind door). Reset not key operated.
.22 Facility to operate strobe lights.
.23 All indicating lights shall be L.E.D. type.
.24 Pilot lights for indication of certain miscellaneous functions such as:
- emergency generator operating
- smoke damper positions (monitor)(future)

.25 Fire Department telephone system equipment.
.26 The panel is to have space to be designed to accommodate the operation of a future smoke control system.
.27 Auto dialer.
.28 Manual on/off control switch complete with greed/red LED status lights for mechanical units.

.2 Transponders

.1 Transponders shall be wall mounted (surface) and of sufficient size to house all equipment described herein.
.2 The cabinets shall have lockable hinged doors. Opening of the cabinet doors shall provide access to all operating controls.
.3 The transponders shall be an integrated part of system and shall function as data gathering cabinets for connection of portions of system.
.4 The transponders shall include, but not be limited to:
.1 Addressable interface module.
.2 Network interface card and custom network programming capabilities.
.3 Preamplifiers, amplifiers, tone generator, etc. for sound portion of system.
.4 Auxiliary relays for:
- fan shutdown
- remote trouble indication
- connection to elevator controller (2) alternate floor
- door holder release

.5 Door switch and cabinet lock as CPU and control panel
.6 Standby batteries and charger

.3 Initiating Devices

.1 Manual Addressable Stations
- .1 Single action pull down lever type, second stage key operated unless otherwise specified.
- .2 When operated, locks in pull down position
- .3 Reset by opening cover, closing and relocking
- .4 Constructed of durable cast metal material
- .5 Finished in red with white raised lettering.
- .6 The addressable electronics shall be mounted in the same common outlet box as the station.

.2 Thermal Detectors
- .1 59 degrees Celsius fixed temperature and rate of rise or 88 degrees Celsius fixed temperature as indicated on drawings.
- .2 Visible means provided for determining detector that has initiated alarm. Where required by specific details.
- .3 Shall have locking screw or device to prevent unauthorized removal.
- .4 Two wire.

.3 Photo Electric Smoke Detectors - Ceiling Mounted
- .1 Base capable of also accepting ionization smoke detectors without the use of adapters.
- .2 Operate on the light scatter principle and equipped with matched photocell circuit.
- .3 Set at nominal 2% light obscuration.
- .4 Shall have locking screw or device to prevent unauthorized removal.
- .5 Controlled porosity filter incorporated in the smoke chamber to prevent false alarms from dust, insects, etc.
- .6 Suitable for field testing.
- .7 Light emitting device on detector to indicate detector has operated.
- .8 Two wire.
- .9) Light source to be L.E.D. type.

.4 Photo Electric Smoke Detectors - Duct Mounted
- .1 Features as ceiling mounted. True alarm photo electric smoke detectors.
- .2 Complete with duct connection and sampling tubes suitable for mounting on air system duct work.
- .3 Duct detectors to send signal to fire alarm system for fan control by software and control points.
- .4 Provide remote alarm indicators as indicated on drawings.

.5 Zone Addressable Module – Monitor
- .1 Provide monitor zone addressable modules as required to interface flow switches, tamper switches, etc. into system. The unit is to be Class A.

.6 Zone Addressable Module - Control
- .1 Provide control zone addressable modules as required to interface damper control, pre-action sprinkler control, pressurization fan control, etc. into system. The unit is to be Class A.

.7 Zone Addressable Module – Isolation

.1 Provide isolation module as required when address or signal loops leave or enter fire compartments. See drawings. The unit is to be Class A.

.4 Audio/Visual Signalling Devices

.1 Refer to Voice Communication Equipment Section for specification information.

.5 Sprinkler, Standpipe Flow Switches

.1 Devices are existing to be reused, complete with new monitor modules.
.2 Provide initiation upon water flow.
.3 Compatible for operation within system.

.6 Sprinkler, Standpipe Low Water Pressure Switches

.1 Devices are existing to be reused, c/w new monitor Zams.
.2 Provide initiation on low water pressure due to problems with water supply system.
.3 Compatible for operation within system.

.7 Sprinkler/Standpipe/Fire Protection Water Supply - Valve Tamper

.1 Devices are existing to be reused, c/w new monitor Zams.
.2 Causes fire alarm trouble when valve is not in normal position.

.8 Voice Communication Equipment

.1 The amplifier(s) shall be of a solid state design and shall be capable of operating at 120V AC or 24V DC. Each amplifier circuit shall be protected by an internal circuit breaker. The amplifier circuit shall consist of a power amplifier(s) and preamplifier(s).
.2 Amplifier output rating shall be RMS power output for continuous operation.
.3 The amplifier(s) output power shall be 20% greater than the speaker load connected to the amplifier(s) output (to allow for field adjustments). Size to accommodate complete building.
.4 Standby units for power amplifier(s), preamplifier(s), tone generator, microphone wiring, etc., shall be provided for use if primary units fail. Standby units shall be sized as primary units and shall be supervised.
.5 Power amplifier(s), preamplifier(s), tone generator, microphone wiring, etc., shall be electrically supervised against opens and shorts. A fault on the circuits shall cause the communications system trouble indicator to illuminate and the audible trouble signal to sound.
.6 Failure of a power amplifier, preamplifier, tone generator, etc., shall cause the failure lamp at the control panel to illuminate and the common audible trouble signal to sound in the control panel. Standby unit(s) shall be automatically transferred to replace the defective unit(s). A lamp on the control equipment shall illuminate to indicate that the standby unit(s) have been transferred. Operation of the trouble silence switch shall silence the audible trouble signal. All indications shall be self extinguishing once the trouble has been corrected.

.7 System shall have frequency response from 50 to 10,000 HZ and have the ability to prevent distortion or over amplification (compression devices) if shouting into microphone occurs.
.8 Amplifier shall be housed in control cabinets and properly ventilated.

9 Audible/Visual Signalling Devices

.1 Baffle held on with tamperproof screws.
.2 Baffle designed to prevent entrance of foreign materials, rods, wires, etc., which could damage speaker.
.3 Components of moisture, heat and corrosion resistant construction.
.4 Mounting accessories to permit recessed, semi-recessed, surface and bi-directional mounting. Type and mounting arrangement as indicated on the drawings.
.5 Shall provide full range of voice and tone signal with acceptable frequency response.
.6 Shall provide minimum sound level of 90 db on 3 meter axis. Multi-taps shall be provided.
.7 Provide visual signalling device integrated with the speaker. Visual signalling to be strobe type flashing c/w clear lens with the word "FIRE" in red letters. Unit to operate on 24 V D.C.
.8 In each suite provide a push button to silence audio only signals, not visual or paging signals.
.9 Types:
#1 Recessed (Ceiling) (Round)
#2 Surface (Wall) (Square) (stairwells)

.10 Microphone

.1 Hand held with approximately 1500 mm of coiled cord.
.2 Push to talk, dynamic, noise cancelling type.
.3 Frequency response from 200 to 4000 HZ.

.11 Miscellaneous Equipment

.1 Standby Power
.1 The fire detection/alarm and voice communication systems shall have standby power.
.2 The system shall automatically transfer to standby power once normal AC power fails.
.3 Network display unit and transponders shall contain standby batteries and battery chargers. Fully charged the standby batteries shall have sufficient capacity to operate at normal supervised conditions for 24 hours and at the end of which shall be capable of sounding alarm for minimum of 15 minutes and operating voice communications at full capacity for 30 minutes.
.4 Chargers shall be capable of restoring batteries from no charge to full charge in 12 hours.
.5 Once normal AC power returns, the system will automatically transfer to AC power and the standby batteries will automatically be recharged by the battery chargers.

.6 The wiring from the batteries to chargers will be supervised.

.12 End of Line Resistors

.1 Located in separate box beyond last device, as indicated on drawings.
.2 Where located in separate box, box shall be painted red, with appropriate identification.

.13 Door Closer/Holder

.1 Fail safe electronic release.
.2 Controlled through control modules. Powered from separate 24 V D.C. circuit.
.3 Co-ordinate requirements and types with Owner.

.14 Relays

.1 Relays shall be provided for indication or operation of remote functions as noted.
.2 These relays shall not be an integral part of printed circuit modules but shall be standard type industrial relays, Allen Bradley 700 with 4 contacts (convertible NO or NC) 10 amp rating, minimum.

.15 Conductors

.1 Conductors shall be of the type and size recommended and approved by the manufacturer. Minimum requirements shall be as follows:
- Minimum conductor size #18 AWG.
- Initiating devices - Addressable loop on floor 4 #18 cable (2 #18 loop, 2 #18 power for zams approved for fire alarm use.
- Addressable loop risers from transponder to floor junction - 4 #18 loop, 2 #18 AWG (2 #18 loop, 2 #18 power for zams) (2 hour fire rated) Pyrotenax 324/198/2T.
- Multiplex communication cables from Network Display Unit and transponder - 2 #18 AWG (2 hour fire rated) Pyrotenax 298/198/2T.
- Speakers - 2 #18 AWG twisted pair shielded approved for fire alarm use.
- Strobe - 2 #18 AWG twisted pair approved for fire alarm use.
- Shielding shall be bonded at source and insulated throughout building system.

.16 Remote Cabinets

.1 Where remote cabinets are provided to house amplifier, batteries, etc. they shall be modular, free standing, ventilated enclosures. They shall have lockable hinged doors with locks and keying to match control cabinet.

.17 In addition to fire detection/alarm and voice communications system equipment, a standard telephone outlet shall be provided adjacent to control panel. A lockable wall cabinet shall be provided to house standard wall mounted telephone at this location. Cabinet shall be suitably identified and shall have locking and keying to match control panel.

3 Execution

3.1 INSTALLATION

.1 All wiring shall be installed in conduit and shall conform with requirements of Canadian Electrical Code, National Building Code, Alberta Building Code and CAN 4 - S524 - M86 Standard for the Installation of Fire alarm Systems.

.2 Wiring for fire detection/alarm and voice communications systems shall be of the type and size as recommended by the manufacturer with special consideration given to distances.

.3 Speaker/strobe wiring shall be run in its own conduit. Do not mix with initiating circuit wiring or conduit. Do not exceed 40% fill for any conduit runs.

.4 Speaker/strobe backboxes shall be used for speaker/strobe wiring only.

.5 Wiring shall be done with multi conductor cable of the type listed and approved for use a fire alarm system wiring. All terminations and connections in junction boxes, shall be made on terminal strips, control panel, devices, etc., shall be soldered before terminating.

.6 Wire counts indicated on the drawings are for general estimating purposes only. Exact number and type of conductors shall be as required by actual system installed, final layout of devices, etc., and as recommended by the manufacturer. Final layout, of devices, routing of conduit, etc., shall be co-ordinated between the installing contractor and the manufacturer. This information should be indicated on schematic wiring diagram and on as installed drawings.

.7 Fire alarm riser junction boxes where indicated shall be painted red and sized to accommodate number, size and type of conductors installed.

.8 All terminations, connections, etc., shall be identified and shall be in conformance with identification or numbering system used on manufacturer's wiring diagram. Identification shall be provided at all junction boxes, control panels and devices.

.9 Prior to commencement of construction or installation, the installing contractor shall verify in writing that he is authorized and approved by the manufacturer of the equipment to make the installation.

.10 All junction boxes (exposed or in ceiling spaces) shall have covers painted red.

.11 Blank covers on recessed octagon or square boxes shall not be standard blank covers (54C1,52C1, etc.) but shall be of a type similar to Columbia 9002.

.12 Location of duct mounted detectors shall be selected and approved by the Engineer before installation.

.13 Conduit, wiring, connections. etc., shall be provided between certain areas or equipment with indication or control being provided at control panel. Items shall include but not necessarily be limited to:

- Connections to emergency generator and fire pump with indication that it is operating
- Connection to elevator controller
- Connection for fan shutdown
- Connection to central monitoring company
- Connections to magnetic door holders
- Connections to smoke dampers (future)
- Connections to stairwell pressurization and fan retum air smoke shaft fan (future)
- Connections to parkade mechanical units and stair pressurization units for local control at fire alarm panel.

3.2 MANUFACTURERS

.1 Manufacturers must have local representation, spare parts stock and suitable factory trained servicing facilities and must have had and maintained these facilities in Calgary for at least the past 10 years.

.2 Manufacturers shall observe carefully and take note of all specific requirements of the systems as indicated on the drawings and in the specifications. All requirements shall be met.

.3 Where specific items, functions or requirements as indicated in the specifications and drawings cannot be met by a particular manufacturer, these shall be noted and indicated by the manufacturer and shall be included by the contractor with his Tender Submission. Any variance from specification and drawing requirements may influence acceptance of Tender (subsequently contractor and manufacturer) so must be specifically pointed out and included in Tender information. All variances from specification and drawing requirements must be submitted.

.4 Submittal (3 copies) of variances from specification and drawing requirements shall include complete list of alternates (equipment, methods, etc.) proposed along with manufacturers literature, technical information drawings, etc., so that an accurate assessment can be made of the acceptability of such proposed variances.

.5 Acceptable manufacturers:
- Simplex – 4100**U** series
- Edwards – EST3 series
- Notifier – AM2020 series

3.3 ZONING

.1 Zoning shall be as required to meet all applicable codes and shall take into account size, use and peculiarities of the particular project or building.

.2 Zoning shall be as noted on drawings.

3.4 MISCELLANEOUS

.1 In addition to fire detection/alarm and voice communications system equipment, a standard A.G.T. telephone outlet shall be provided adjacent to control panel. Cabinet shall be suitable identified and shall have locking and keying to match control panel.

.2 Allow for programming and identification of all zones and devices with Owner.

.3 Co-ordinate equipment sizes, locations, space requirements, etc., with Engineer before mounting equipment.

3.5 SHOP DRAWINGS

.1 Indicate on shop drawings layout of all equipment, zoning and provide a complete wiring schematic.

END OF SECTION

1 General

1.1 REQUIREMENTS

.1 Provide a system of conduits, outlets, junction boxes, cable, jacks, etc., for telephone system as indicated on the drawings.

.2 System shall include EMT conduit in building, PVC conduit underground to point of Utility connection.

.3 Minimum conduit sizes shall be 19 mm unless otherwise indicated on the drawings.

2 Products

2.1 MANUFACTURER & COMPONENTS

.1 Entire system must be one manufacturer, Nortel, Lucent, AMP, or other approved supplier.

.2 Cable – 4 pair Category 6, white in colour.

.3 Jack - RJ11 connector at all suites (white in colour).
- RJ12 for all non-resident outlets (white in colour).

.4 Faceplate – white in colour, capable of 1 jack plus 3 future jacks.

3 Execution

3.1 INSTALLATION

.1 Provide #6 ground and duplex receptacles at each telephone backboard location.

.2 Backboards (painted) shall be as indicated on the drawings, 19 mm plywood. Backboard supplied and installed by General Contractor.

.3 Provide fish wires in all empty telephone service and feeder conduits.

.4 Installation of all portions of the telephone system shall be to the requirements of this contractor.

.5 Conduit installation shall be provided to all telephone outlets as shown.

.6 Service conduits shall be installed at minimum of 1 meter below grade and shall be encased in concrete when installed below paved areas. Route of service conduits shall be marked with green marker tape, Brady Identoline, laid in trench approximately 300 mm below grade.

.7 Terminate and cap service conduits approximately in location shown. Co-ordinate exact location and depth with Utility.

.8 Run a 4 pair Category 5+, BDN, UTP cable to each telephone outlet shown on drawings, terminating at a RJ11 jack in suites and RJ12 jacks elsewhere.

.9 Run all suite cables to telephone cabinets located on drawings, terminating in BIX block.

.10 Run a tie service cable from each telephone cabinet to main telephone backboard located in main electrical room leaving 30% spare capacity. Terminate in BIX block. Each suite shall be capable of having two (2) separate lines, +30% spare capacity.

.11 All telephone faceplates in suites shall be white in colour complete with 1 – RJ11 jack and provisions for two future jacks.

.12 All cables shall be identified at both ends, at all junction boxes, and at all other accessible locations indicating room number and line number, i.e. 338A. Use final suite and room numbers to be supplied by owner.

.13 Test all telephone lines to conform to requirements, and provide a written report to engineer and owner upon completion.

.14 All work must be done by a certified installer of said manufacturer. Engineer and owner reserve the right to reject any communications contractor.

.15 Provide shop drawings and complete schematic of system to Engineer prior to installation for approval.

END OF SECTION

1 General

1.1 REQUIREMENTS

.1 Provide a system of conduits, outlets, junction boxes, control panel, CCTV cameras, etc. for door intercom system.

.2 Minimum conduit sizes shall be as indicated on the drawings.

.3 Installation of intercom system wiring and equipment will be by electrical contractor.

2 Products

2.1 MATERIALS

.1 System shall consist of recessed enclosed intercom cabinet complete with 12 key push pad, CCTV camera, audio mic, postal lock and scrolling direction, Mircom #MRK-IRKS.

.2 Provide Mircom #CAM-1 panel mounted CCTV camera complete with Netmedia modulator for interface to building TV system.

3 Execution

3.1 INSTALLATION

.1 Locate intercom cabinets, recessed in wall at ground floor main entry and at rear entry. See drawings. Run a Category E cable to each cabinet from control unit located in electrical room.

.2 Provide a dedicated 120 volt power to control unit in electrical room.

.3 Run a RGU-6 cable from each of 2 CCTV cameras to modulator located at main television backboard. Interface of modulator to TV system by this sub-contractor.

.4 All cables shall be run in conduit.

.5 System shall operate through building telephone and tV system to suite telephone and TV. Suite phone shall be signaled by a separate distinct ring and each of 2 doors shall be opened by a separate number punched on dialer. Door CCTV camera image shall appear on suite TV on channel to be selected by owner.

.6 Fun a 19mm conduit from controller to elevator machine room, complete with cabling, for elevator access control. Elevators shall home to main floor once someone is let in and elevator will be able to go only to floor person is going to.

.7 Run a 19mm conduit between controller and resident access system located in fire alarm control room.

END OF SECTION

1 General

1.1 REQUIREMENTS

.1 Provide a system of conduits, wire, intelligent monitoring equipment and software for resident door entry system, as shown on drawings and described in specifications.

.2 The contractor shall provide a complete riser and wiring diagram of the system with the shop drawings to be included in the maintenance manuals.

.3 Electrical contractor shall provide a complete system interlocking intercom system, elevator controls and parkade door.

2 Products

2.1 MATERIALS

.1 All products shall be provided by AX10M111 Systems, RBH Technologies and Active Control Technology as listed.

.2 Door entry components shall be provided s follows:

.1 Transmitter, infra-red type, Viscount
.2 Receiver, infra-red type, Viscount
.3 CPU and monitor, Axiom III

3 Execution

3.1 INSTALLATION

.1 Locate CPU and monitor in fire fighters control room as shown on drawings.

.2 Consult with manufacturer regarding communications and power wiring to run between head end and field devices.

.3 All wiring shall be run in conduit.

.4 All door strikes supplied by door hardware supplier.

.5 Interface door entry system with intercom system, elevators, and parkade overhead door.

.6 Run a 25mm conduit from CPU to elevator machine room, intercom system and parkade door controller. Tie in to elevator controller by elevator installer. Co-ordinate all work with installer.

END OF SECTION

1 General

1.1 REQUIREMENTS

.1 Provide a system of conduits, outlets, junction boxes, cables, terminations, etc. for TV system as indicated on the drawings.

.2 System shall include PVC service conduit to point of Cable Company connection.

.3 Minimum conduit sizes shall be as indicated on the drawings, unless otherwise noted.

.4 System shall be non-proprietary. All cabling, jacks, etc. shall be supplied by electrical contractor.

2 Products

2.1 COMPONENTS

.1 Horizontal cable to outlets – RG6.

.2 Vertical cable to backboards – RG11.

.3 Outlet – white coverplate complete with termination jack.

3 Execution

3.1 INSTALLATION

.1 Provide duplex receptacles at TV backboard location and at termination cabinets.

.2 Backboards (painted) shall be as indicated on the drawings, 19mm plywood. Backboard supplied and installed by General Contractor.

.3 Provide fish wires in all TV service and feeder conduits.

.4 Conduit installation shall be provided to all TV outlets as shown.

.5 Underground service conduit shall be installed as shown on drawings and shall be marked with green marker tape.

.6 Terminate and cap service conduit approximately in location shown. Co-ordinate exact location with Utility.

.7 All television outlets shall be 100mm square backbox complete with single gang plaster ring.

.8 Run a RG6 cable from each television outlet shown to floor cabinet or main backboard

leaving 6 feet slack at termination end and connect to coax outlet at outlet end. Termination of cables by Shaw Cable.

.9 Run a RG11 cable from main backboard to each of terminal cabinets, leave 6 feet slack for terminations by Shaw Cable.

.10 Label ach end of all cables with room number. Actual room numbers will be provided by owner.

.11 Final terminations in cabinets and main backboard by Shaw Cable. Shaw Cable shall be a sub-trade of their contractor. All work shall be co-ordinated by Electrical.

END OF SECTION

1 General

1.1 REQUIREMENTS

.1 To limit responsibility and to specifically define the work the following procedure will be followed with regard to all motors and equipment supplied under the Mechanical Contract.

.2 The Mechanical Contractor shall:

- .1 Provide motors and drives for all equipment which he supplies.
- .2 Provide all control devices such as thermostats, float switches, level switches, pressure switches, etc.
- .3 Provide the Electrical Contractor with a list of all motor sizes, characteristics, etc. and wiring diagrams for all equipment which he supplies so that proper heaters, etc. can be supplied.
- .4 Provide wiring for controls forming part of automatic control system.

.3 The Electrical Contractor shall:

- .1 Provide all disconnect switches, manual and magnetic starters, starter accessories, etc. which are not an integral part of packaged equipment but which are required for performance and sequence of operation of equipment supplied by Mechanical Contractor.
- .2 Be responsible for checking wiring diagrams and for pointing out discrepancies to actual conditions.
- .3 Provide all line side wiring to starters and all load side wiring from starters to motors.
- .4 Provide wiring of line voltage thermostats for force flow heaters, unit heaters and wiring to float, level, flow and pressure switches for sump pumps, condensate pumps, air compressors, etc.
- .5 Provide 120 volt circuits where required for controls.

.4 In general all control work shall be the responsibility of the Control Contractor generally in accordance with Alberta Construction Tendering System. Specifically the Electrical Contractor will supply all starters with the exception of starters that are part of packaged equipment. He will wire to magnetic starters and wire from magnetic starters to motors. The magnetic starters will be complete with control transformer, H.O.A. switch, pilot light and required number of auxiliary N.O. and N.C. contacts required to perform control function. Control wiring from magnetic starters to various pieces of control equipment, interlocking, etc. shall be the responsibility of the Control Contractor.

.5 For information only, motors supplied under the mechanical contract shall be as follows unless otherwise indicated.

.1 Up to and including 1/2 h.p. - 120 volt, single phase, 60 Hz.
.2 3/4 h.p. and over - 600 volts, 3 phase, 60 Hz, unless otherwise noted.

END OF SECTION

1 General

1.1 REQUIREMENTS

.1 To limit responsibility and to specifically define the work the following procedure will be followed with regard to all motors and equipment supplied by the Owner or under the General Contract for installation on the project.

.2 The Owner or General Contractor shall:

.1 Provide motors and drives for all equipment which they supply.
.2 Provide all control devices for all equipment which they supply.

.3 The Electrical Sub-Contractor shall:

.1 Provide all disconnect switches, starters, heaters, etc. which are not an integral part of packaged equipment but which are required for operation of equipment supplied by Owner or General Contractor.
.2 Provide wiring and connections from protection devices to equipment.
.3 Provide wiring and connections not supplied with, but required for the operation of equipment supplied by Owner or General Contractor.

.4 Refer to manufacturer's or supplier's drawings for detailed requirements and co-ordination between trades where pertaining to Owners or General Contractor equipment. Obtain copies of equipment shop drawings prior to installation of conduit, boxes and wiring and co-ordinate type and location of connections required.

END OF SECTION