

Part 1 General

1.1 General

- .1 This Section covers items common to Sections of Division 16. This section supplements requirements of Division 1.

1.2 Codes and Standards

- .1 Do complete installation in accordance with CSA C22.1-2006 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CSA C22.3 No.1-M1979 except where specified otherwise.
- .3 Abbreviations for electrical terms: to CSA Z85-1983.

1.3 Care, Operation and Start-up

- .1 Instruct operating personnel in the operation, care and maintenance of equipment.
- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components.
- .3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with all aspects of its care and operation.

1.4 Voltage Ratings

- .1 Operating voltages: to CAN3-C235-83.
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.5 Permits, Fees and Inspection

- .1 Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.
- .2 Pay associated fees.

- .3 Consultant will provide drawings and specifications required by Electrical Inspection Department and Supply Authority at no cost.
- .4 Notify Consultant of changes required by Electrical Inspection Department prior to making changes.
- .5 Furnish Certificates of Acceptance from authorities having jurisdiction on completion of work to Consultant.

1.6 Materials and Equipment

- .1 Provide materials and equipment in accordance with Section 01610 - Basic Product Requirements.
- .2 Equipment and material to be CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Inspection Department.
- .3 Factory assemble control panels and component assemblies.

1.7 Electric Motors, Equipment and Controls

- .1 Control wiring and conduit is specified in Division 16 except for conduit, wiring and connections below 50 V which are related to control systems specified in Division 15 and shown on mechanical drawings.

1.8 Finishes

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
 - .1 Paint outdoor electrical equipment "equipment green" finish to EEMAC Y1-1-1955.
 - .2 Paint indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1-1958.
- .2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .3 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

1.9 Equipment Identification

- .1 Identify electrical equipment with nameplates as follows:

- .2 Nameplates:
- .1 Lamicoïd 3 mm thick plastic engraving sheet, black face, white core, mechanically attached with self tapping screws.

NAMEPLATE SIZES			
Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

- .3 Wording on nameplates to be approved by Consultant prior to manufacture.
- .4 Allow for average of twenty-five (25) letters per nameplate.
- .5 Identification to be English.
- .6 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .8 Terminal cabinets and pull boxes: indicate system and voltage.
- .9 Transformers: indicate capacity, primary and secondary voltages.

1.10 Wiring Identification

- .1 Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour code: to CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.

1.11 Conduit, Junction Box and Cable Identification

- .1 Code conduits, boxes and metallic sheathed cables with vinyl label.

- .2 Code with label identifying system at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals for the following systems:

System & Label
120/208V
600 V
Telephone/Data
Fire Alarm
Emergency Lighting
CCTV
CATV
Pool/Gym Alarm
Metysis (F.M.S.)
Pegasys (Security)

- .3 Lettering minimum 20 mm high.
- .4 Standard of acceptance: Thomas & Betts.
- .5 Submit sample for approval.

1.12 Wiring Terminations

- .1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.

1.13 Manufacturers and CSA Labels

- .1 Visible and legible after equipment is installed.

1.14 Warning Signs

- .1 As specified and to meet requirements of Electrical Inspection Department and Consultant.
- .2 Decal signs, minimum size 175 x 250 mm.

1.15 Location of Outlets

- .1 Locate outlets in accordance with Section 01720 - Preparation.
- .2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.

- .3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.
- .4 Locate light switches on latch side of doors. Locate disconnect devices in mechanical and elevator machine rooms on latch side of floor.

1.16 Mounting Heights

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
- .3 Install electrical equipment at following heights unless indicated otherwise.
 - .1 Local switches: 1200 mm.
 - .2 Wall receptacles:
 - .1 General: 400 mm.
 - .2 Above top of continuous baseboard heater: 300 mm.
 - .3 Above top of counters or counter splash backs: 175 mm.
 - .4 In mechanical rooms: 1200 mm.
 - .3 Panelboards: as required by Code or as indicated.
 - .4 Telephone and interphone outlets: 300 mm.
 - .5 Wall mounted telephone and interphone outlets (non-accessible): 1500 mm.
 - .6 Fire alarm stations: 1200 mm.
 - .7 Fire alarm horns: 2100 mm.
 - .8 Television/Data outlets: 300 mm.
 - .9 Wall mounted speakers: 2100 mm.
 - .10 Clocks: 2100 mm.
 - .11 Wall mounted pushbuttons: 1200 mm.

1.17 Load Balance

- .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance. Adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
- .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
- .3 Submit, at completion of work, report listing phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load. State hour and date on which each load was measured, and voltage at time of test.

1.18 Conduit and Cable Installation

- .1 Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete: schedule 40 steel pipe plastic sheet metal, sized for free passage of conduit, and protruding 50 mm.
- .2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .3 Install cables, conduits and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.

1.19 Field Quality Control

- .1 Conduct and pay for following tests:
 - .1 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
 - .2 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.
 - .3 Insulation resistance testing.
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
 - .3 Check resistance to ground before energizing.
- .4 Carry out tests in presence of Contract Administrator.
- .5 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .6 Submit test results for Contract Administrator's review.

1.20 Coordination of Protective Devices

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

1.21 Weatherproof/Moisture Proof Devices

- .1 All devices in the following area are to be weatherproof:
 - .1 Pool area
 - .2 Showers

- .3 Pool locker rooms
- .4 Pool washroom
- .5 Areas cleaned by hose down
- .6 Crawlspace
- .7 Building exterior
- .8 Parking lot
- .9 Roof
- .10 Areas exposed to weather

END OF SECTION

Part 1 General

Part 2 General

2.1 Equipment

- .1 Clamps for grounding of conductor, size as required to rod electrodes.
- .2 System and circuit, equipment, grounding conductors, bare stranded copper, soft annealed, un-armoured, size as indicated.
- .3 Insulated grounding conductors: green, type RW90.
- .4 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
 - .1 Grounding and bonding bushings.
 - .2 Protective type clamps.
 - .3 Thermit welded type conductor connectors.
 - .4 Bonding jumpers, straps.
 - .5 Pressure wire connectors.

Part 3 PART 3 - EXECUTION

3.1 Installation General

- .1 Install complete permanent, continuous, system and circuit, equipment, grounding systems including, conductors, connectors and accessories to conform to requirements of Contract Administrator, Owner, and local authority having jurisdiction over installation. Provide a ground wire in all conduit.
- .2 Install connectors in accordance with manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.
- .4 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .5 Soldered joints not permitted.
- .6 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

- .7 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.
- .8 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.

3.2 Equipment Grounding

- .1 Install grounding connections to typical equipment included in, but not necessarily limited to following list: Generator, service equipment, duct systems, frames of motors, starters, control panels, distribution panels, and propane storage tanks.
- .2 Reconnect existing ground conductors to new equipment where possible.

3.3 Field Quality Control

- .1 Perform tests in accordance with Section 16010 - Electrical General Requirements.
- .2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Contract Administrator and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.
- .4 Disconnect ground fault indicator during tests.

END OF SECTION

Part 1 General

1.1 Related Work

- .1 Fastenings and supports: Section 01610 - Basic Product Requirements.

Part 2 Products

2.1 Support Channels

- .1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted.

Part 3 Execution

3.1 Installation

- .1 Secure equipment to solid masonry, tile and plaster surfaces with lead anchors.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .5 Fasten exposed conduit or cables to building construction or support system using straps.
 - .1 One-hole malleable iron straps to secure surface conduits and cables 50 mm and smaller.
 - .2 Two-hole steel straps for conduits and cables larger than 50 mm.
 - .3 Beam clamps to secure conduit to exposed steel work.
- .6 Suspended support systems.
 - .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
 - .2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.

- .7 For surface mounting of two or more conduits use channels at 1.5 m oc spacing.
- .8 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .9 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .10 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .11 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Contract Administrator.
- .12 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

Part 1 General

1.1 References

- .1 CSA C22.2 No. 0.3-M1985, Test Methods for Electrical Wires and Cables.

1.2 Product Data

- .1 Submit product data in accordance with Division 1.

Part 2 Products

2.1 Building Wires

- .1 Copper conductors: size as indicated, with 600 V insulation of chemically cross-linked thermosetting polyethylene material rated RW90 and 600V power circuit min. #12 AWG).
- .2 RWU90 rated for cables installed underground.

2.2 Armoured Cables

- .1 Conductors: insulated, copper size as indicated.
- .2 Type: AC90.
- .3 Armour: interlocking type fabrication from aluminum strip.
- .4 For use in partition drywall walls or fixture drops in T-bar ceilings.

2.3 Fire Alarm Cable

- .1 Non-metallic sheathed cable 300 V rated 4/c #18 AWG for smoke/heat detectors.
- .2 Non-metallic sheathed cable neoprene jacketed 300V rated 2/c minimum #12 AWG for signal devices.

2.4 TECK Cable

- .1 Conductors:
 - .1 Grounding conductor: copper
 - .2 Circuit conductors: copper, size as indicated.

- .2 Insulation:
 - .1 Type: ethylene propylene rubber
 - .2 Chemically cross-linked thermosetting polyethylene rated Type RW90.
- .3 Inner jacket: polyvinyl chloride material.
- .4 Armour: interlocking aluminum.
- .5 Overall covering: thermoplastic polyvinyl chloride material.
- .6 Fastenings:
 - .1 One hole malleable iron straps to secure surface cables 2 in. and smaller. Two hole steel straps for cables larger than 2 in.
 - .2 Channel type supports for two or more cables at 30 in. centres.
 - .3 One-quarter in. diameter threaded rods to support suspended channels.
- .7 Connectors:
 - .1 Watertight, approved for TECK cable.

Part 3 Execution

3.1 Installation of Building Wires

- .1 Install wiring as follows:
 - .1 In conduit systems in accordance with Section 16133.

3.2 Installation of 0-1000V TECK Cable

- .1 Install cables.
- .2 Group cables wherever possible on channel with cable clamps.
- .3 Terminate cables in accordance with Section 16151 – Wire and Box Connectors 0-1000V.

END OF SECTION

Part 1 General

1.1 References

- .1 CSA C22.1-2006 Canadian Electrical Code, Part 1.

Part 2 Products

2.1 Outlet and Conduit Boxes General

- .1 Size boxes in accordance with CSA C22.1.
- .2 4 inch square or larger outlet boxes as required for special devices.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 Sheet Steel Outlet Boxes

- .1 Electro-galvanized steel utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 4 x 2 1/8 x 2 inch.

2.3 Fittings-General

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 1 ¼ inch and pull boxes for larger conduits.
- .4 Double lock nuts and insulated bushings on sheet metal boxes.

Part 3 Execution

3.1 Installation

- .1 Support boxes independently of connecting conduits.

- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3 For flush installations, mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
- .4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not allowed.

END OF SECTION

Part 1 General

1.1 References

- .1 .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA C22.2 No.18-92, Outlet Boxes, Conduit Boxes, and Fittings.
 - .2 CSA C22.2 No.45-M1981(R1992), Rigid Metal Conduit.
 - .3 CSA C22.2 No.56-1977(R1977), Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .4 CSA C22.2 No.83-M1985(R1992), Electrical Metallic Tubing.
 - .5 CSA C22.2 No.211.2-M1984(R1992), Rigid PVC (Unplasticized) Conduit.
 - .6 CAN/CSA C22.2 No.227.3-M91, Flexible Nonmetallic Tubing.

Part 2 Products

2.1 2.1 Conduits

- .1 Rigid metal conduit: to CSA C22.2 No.45, hot dipped galvanized steel threaded.
- .2 Electrical metallic tubing (EMT): to CSA C22.2 No.83, with couplings.
- .3 Rigid pvc conduit: to CSA C22.2 No.211.2.
- .4 Flexible metal conduit: to CSA C22.2 No.56, liquid-tight flexible metal or flexible metal conduit as specified.

2.2 Conduit Fastenings

- .1 One hole steel straps to secure surface conduits 50 mm and smaller. Two hole steel straps for conduits larger than 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at 1.5 m oc.
- .4 Threaded rods, 6 mm dia., to support suspended channels.

2.3 Conduit Fittings

- .1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.

- .2 Factory "ells" where 90bends are required for 25 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT. Set-screws are not acceptable.

2.4 Fish Cord

- .1 Polypropylene.

Part 3 Execution

3.1 Installation

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits except in mechanical and electrical service rooms.
- .3 Use hot dipped galvanized steel threaded conduit except where specified otherwise.
- .4 Use electrical metallic tubing (EMT) except in cast concrete.
- .5 Use flexible metal conduit for connection to motors in dry areas.
- .6 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.
- .7 Minimum conduit size for lighting and power circuits: 19 mm.
- .8 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .9 Mechanically bend steel conduit over 19 mm dia.
- .10 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .11 Install fish cord in empty conduits.
- .12 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
- .13 Dry conduits out before installing wire.

3.2 Raceways in Existing Building

- .1 Surface mounted metallic wiremold on block/concrete walls in finished areas:
 - .1 Standard of acceptance: Wiremold V500, V700, 2000 and 4000 series
 - .2 Maximum 40% fill.

- .3 Paint to match wall finish.
- .2 Recessed in drywall walls. Patch and paint wall.

3.3 Rigid PVC conduit.

- .1 Use in:
 - .1 Pool area
 - .2 Showers
 - .3 Pool locker rooms
 - .4 Washrooms
 - .5 Areas cleaned by hose down.

3.4 Surface Conduits

- .1 Surface conduits in service spaces only (new and existing areas).
- .2 Run parallel or perpendicular to building lines.
- .3 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
- .4 Run conduits in flanged portion of structural steel.
- .5 Group conduits wherever possible on surface channels.
- .6 Do not pass conduits through structural members except as indicated.
- .7 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.5 Concealed Conduits

- .1 Run parallel or perpendicular to building lines.
- .2 Do not install horizontal runs in masonry walls.
- .3 Do not install conduits in terrazzo or concrete toppings.

3.6 Conduits in Cast-in-Place Concrete

- .1 Locate to suit reinforcing steel. Install in centre one third of slab.
- .2 Protect conduits from damage where they stub out of concrete.
- .3 Install sleeves where conduits pass through slab or wall.

- .4 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed. Use cold mastic between sleeve and conduit.
- .5 Do not place conduits in slabs in which slab thickness is less than 4 times conduit diameter.
- .6 Encase conduits completely in concrete with minimum 25 mm concrete cover.
- .7 Organize conduits in slab to minimize cross-overs.

END OF SECTION

Part 1 General

1.1 Shop Drawings and Product Data

- .1 Submit shop drawings and product data in accordance with Division 1.

Part 2 Products

2.1 Manufacturers

- .1 Acceptable manufacturers:
 - .1 Leviton
 - .2 Pass & Seymour
 - .3 Hubble

2.2 Switches

- .1 15 A, 347 V, single pole, double pole, three-way, four-way switches, commercial grade.
- .2 20 A, 120 V single pole for 120 V lighting source.
- .3 Manually operated general purpose ac switches with following features:
 - .1 Terminal holes approved for No. 10 AWG wire.
 - .2 Silver alloy contacts.
 - .3 Nylon molding for parts subject to carbon tracking.
 - .4 Suitable for back and side wiring.
 - .5 Ivory toggle.
- .4 Toggle operated, fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.
- .5 Switches of one manufacturer throughout project.
- .6 Standard of acceptance: Pass & Seymour 2601 347-I and 2601-I.

2.3 Receptacles

- .1 Decorative duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, commercial grade, with following features:
 - .1 Ivory nylon molded housing.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Break-off links for use as split receptacles.

- .4 Eight back wired entrances, four side wiring screws.
- .5 Triple wipe contacts and riveted grounding contacts.
- .6 Standard of acceptance: Pass & Seymour 885I Series.
- .2 Other receptacles with ampacity and voltage as indicated. Orange isolated ground receptacles Pass & Seymour IG26262 as indicated.
- .3 GFCI Leviton receptacles standard of acceptance: 8598-Ivory, Smart GFCI with LGD indicator light.
- .4 Receptacles of one manufacturer throughout project.
- .5 Mount weatherproof receptacles horizontal.

2.4 Manual Motor Disconnects'

- .1 Double pole, 120V, 30A rated starting switch.
- .2 Standard of acceptance: Pass & Seymour PS30AC2-HP.

2.5 Cover Plates

- .1 Cover plates for wiring devices.
- .2 Cover plates from one manufacturer throughout project.
- .3 Stainless steel cover plates, for wiring devices mounted in flush-mounted outlet box.

2.6 Weatherproof Device Coverplates

- .1 Grey thermoplastic with independent covers (non GFI)
- .2 Standard of acceptance: Leviton 4976-GY.
- .3 GFI receptacles cover standard of acceptance: Leviton 4978-GY.

Part 3 Execution

3.1 Installation

- .1 Switches:
 - .1 Install single throw switches with handle in "up" position when switch closed.
 - .2 Install switches in gang type outlet box when more than one switch is required in one location.

- .3 Mount toggle switches at height specified in Section 16010 - Electrical General Requirements, or as indicated.
- .2 Receptacles:
 - .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
 - .2 Mount receptacles at height specified in Section 16010 - Electrical General Requirements, or as indicated.
 - .3 Where split receptacles has one portion switched, mount vertically and switch upper portion.
- .3 Cover Plates:
 - .1 Install suitable common cover plates where wiring devices are grouped.
 - .2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

END OF SECTION

Part 1 General

1.1 References

- .1 CSA C22.2No.65-1956(R1965) Wire Connectors.
- .2 EEMAC 1Y-2, 1961 Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

Part 2 Products

2.1 Materials

- .1 Pressure type wire connectors: with current carrying parts of copper sized to fit copper conductors as required.
- .2 Fixture type splicing connectors: with current carrying parts of copper sized to fit conductors 10 AWG or less.
- .3 Bushing stud connectors: to EEMAC 1Y-2 to consist of:
 - .1 Connector body and stud clamp for stranded round copper conductors.
 - .2 Clamp for stranded round copper conductors.
 - .3 Bolts for copper conductors bar.
- .4 Clamps or connectors for armoured cable, aluminum sheathed cable, flexible conduit, as required.

Part 3 Execution

3.1 Installation

- .1 Remove insulation carefully from ends of conductors and:
 - .1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer.
 - .2 Install fixture type connectors and tighten. Replace insulating cap.
 - .3 Install bushing stud connectors in accordance with EEMAC 1Y-2.

END OF SECTION

Part 1 General

1.1 Related Work Specified Elsewhere

- .1 Basic Electrical - Section 16010 Materials and Methods
- .2 Conduit, Conduit Fastenings and Conduit Fittings - Section 16133
- .3 Wires and Cables 0-1000V - Section 16122
- .4 Mechanical Equipment Connections - Section 16010

1.2 Shop Drawings and Product Data

- .1 Submit shop drawings in accordance with Division 1.
- .2 Indicate:
 - .1 Mounting method and dimensions.
 - .2 Starter size and type.
 - .3 Layout of identified internal and front panel components.
 - .4 Enclosure types.
 - .5 Wiring diagram for each type of starter.
 - .6 Interconnection diagrams.

1.3 Operation and Maintenance Data

- .1 Provide operation and maintenance data for motor starters for incorporation into manual specified in Division 1.
- .2 Include operation and maintenance data for each type and style of starter.

1.4 Maintenance Materials

- .1 Provide maintenance materials in accordance with Section 16010.
- .2 Provide listed spare parts for each different size and type of starter:
 - .1 4 contacts, stationary.
 - .2 4 contacts, movable.
 - .3 2 contacts, auxiliary.
 - .4 2 control transformers.
 - .5 2 operating coils.
 - .6 2 fuses.

- .7 10 indicating lamps.
- .8 1 HOA kit.

Part 2 Products

2.1 Materials

- .1 Starters: EEMAC E14-1.
 - .1 Half size starters not acceptable.

2.2 Manual Motor Starters

- .1 Single and Three phase manual motor starters of size, type, rating, and enclosure type as indicated, with components as follows:
 - .1 Switching mechanism, quick make and break.
 - .2 Overload heaters, manual reset, trip indicating handle.
- .2 Accessories:
 - .1 Toggle switch labelled as indicated.
 - .2 Indicating light: type and colour as indicated.
 - .3 Locking tab to permit padlocking in "ON" or "OFF" position.
 - .4 Flush mounted type in public areas or as indicated.

2.3 Control Transformer

- .1 Single phase, dry type, control transformer with primary voltage as indicated and 120V secondary, complete with secondary fuse, installed in with starter as indicated.
- .2 Size control transformer for conduit circuit load plus 20% spare capacity.

2.4 Finishes

- .1 Apply finishes to enclosure in accordance with Section 16010 - Electrical General Requirements.

2.5 Equipment Identification

- .1 Provide equipment identification in accordance with Section 16010 - Electrical General Requirements.
- .2 Manual starter designation label, white plate, black letters, size 1, engraved as indicated.
- .3 Magnetic starter designation label, white plate, black letters, size 4 engraved as indicated.

2.6 Acceptable Manufacturers

- .1 Cutler Hammer, Square D, Siemens.

Part 3 Execution

3.1 Installation

- .1 Install starters, connect power and control as indicated.
- .2 Ensure correct fuses and overload devices elements installed.

3.2 Tests

- .1 Perform tests in accordance with Section 16010 - Electrical General Requirements and manufacturer's instructions.
- .2 Operate switches, contactors to verify correct functioning.
- .3 Perform starting and stopping sequences of contactors and relays.
- .4 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.
- .5 Ensure motor rotation corresponds with the direction required by the driven equipment.

END OF SECTION

Part 1 General

1.1 Related Work

- .1 Section 16010 - Electrical General Requirements.

1.2 References

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA-Q9000-92, Quality Management and Quality Assurance Standards - Guidelines for Selection and Use.

1.3 Product Data

- .1 Submit product data in accordance with Section 01330 - Submittal Procedures.
- .2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01330 - Submittal Procedures. WHMIS acceptable to Labour Canada, and Health and Welfare Canada.
- .3 Submit product data sheets for sills, busbars and compartments. Include product characteristics, physical size and finish.
- .4 Manufacturer's Instructions: Provide to indicate special handling criteria, installation sequence, cleaning procedures.

1.4 Shop Drawings

- .1 Submit shop drawings in accordance with Section 01330 - Submittal Procedures.
- .2 Indicate:
 - .1 Outline dimensions
 - .2 Configuration of identified compartments.
 - .3 Floor anchoring method and dimensioned foundation template.
 - .4 Cable Bus duct entry and exit locations.
 - .5 Dimensioned position and size of busbars and details of provision for future extension.
 - .6 Schematic and wiring diagrams.

1.5 Closeout Submittals

- .1 Provide operation and maintenance data for motor control centre for incorporation into manual specified in Section 01780 - Closeout Submittals.

- .2 Include data for each type and style of starter.

1.6 Extra Materials

- .1 Provide maintenance materials in accordance with Section 01780 - Closeout Submittals.

Part 2 Products

2.1 Supply Characteristics

- .1 600 V, 60Hz, delta connected, 3 phase, 3 wire, ungrounded neutral.

2.2 General Description

- .1 Compartmentalized vertical sections with common power busbars.
- .2 Floor mounting, free standing, enclosed dead front.
- .3 Indoor NEMA 12 gasketed enclosure, front mounting.
- .4 Class I, Type B.

2.3 Vertical Section Construction

- .1 Independent vertical sections fabricated from rolled flat steel sheets bolted together to form rigid, completely enclosed assembly.
- .2 Each vertical section divided into compartment units, minimum 305 mm high, as indicated.
- .3 Each unit to have complete top and bottom steel plate for isolation between units.
- .4 Horizontal wireways, equipped with cable supports, across top and bottom, extending full width of motor control centre, isolated from busbars by steel barriers.
- .5 Vertical wireways c/w doors for load and control conductors extending full height of vertical sections, and equipped with cable tie supports. Installation wiring to units accessible with doors open and units in place.
- .6 Openings, with removable coverplates, in side of vertical sections for horizontal wiring between sections.
- .7 Incoming cables to enter at top with terminals as indicated.
- .8 Provision for outgoing cables to exit via top or bottom with terminals.

- .9 Removable lifting means.
- .10 Provision for future extension of both ends of motor control centre including busbars without need for further drilling, cutting or preparation in field.
- .11 Divide assembly for shipment to site, complete with hardware and instructions for re-assembly.

2.4 Sills

- .1 Continuous 38 mm channel iron floor sills for mounting bases with 19 mm diameter holes for bolts.

2.5 Busbars

- .1 Main horizontal and branch vertical, three phase high conductivity tin plated copper busbars in separate compartment self-cooled, extending entire width and height of motor control centre, supported on insulators and rated:
 - .1 Main horizontal busbars: 600 A.
 - .2 Branch vertical busbars: 300 A.
- .2 Branch vertical busbars for distribution of power to units in vertical sections.
- .3 No other cables, wires, equipment in main and branch busbar compartments.
- .4 Brace buswork to withstand effects of short-circuit current of 42 kA rms symmetrical.
- .5 Bus supports: with high dielectric strength, low moisture absorption, high impact material and long creepage surface designed to discourage collection of dust.

2.6 Ground Bus

- .1 Copper ground bus extending entire width of motor control centre.
- .2 Vertical ground bus strap, full height of section, tied to horizontal ground bus, engaged by plug-in unit ground stab.

2.7 Motor Starters and Devices

- .1 Section 16223 – Motor Starters to 600 V.

2.8 Starter Unit Compartments

- .1 Units EEMAC size 5 and smaller, circuit breaker units 225A and smaller, plug-in type with self-disconnect. Guide rail supports for units to ensure that stabs make positive

contact with vertical bus. Provision for units to be installed or removed, off load, while buses energized.

- .2 Unit mounting:
 - .1 Engaged position - unit stabbed into vertical bus.
 - .2 Withdrawn position - unit isolated from vertical bus but supported by structure. Terminal block accessible for electrical testing of starter.
 - .3 Provision for positive latching in either engaged or withdrawn position and padlocking in withdrawn position.
 - .4 Stab-on connectors free floating tin plated clips, self-aligning, backed up with steel springs.
- .3 External operating handle of circuit switch interlocked with door to prevent door opening with switch in "on" position. Provision for 3 padlocks to lock operating handle in "off" position and lock door closed.
- .4 Hinge unit doors on same side.
- .5 Overload relays manually reset from front with door closed.
- .6 Pushbuttons, selector switches and indicating lights mounted on door front.
- .7 Devices and components by one manufacturer to facilitate maintenance.
- .8 Pull-apart terminal blocks for power and control to allow removal of starter units without removal of field wiring.

2.9 Wiring Identification

- .1 Provide wiring identification in accordance with Section 16010 - Electrical General Requirements.

2.10 Equipment Identification

- .1 Provide equipment identification in accordance with Section 16010 - Electrical General Requirements.
 - .1 Motor control centre main nameplate: size No. 7, engraved MCC-P, 600 V, 3 PH, 3 W.
 - .2 Individual compartment nameplates: size No. 5, engraved as indicated.

2.11 Finishes

- .1 Apply finishes in accordance with Section 16010 - Electrical General Requirements.
- .2 Paint motor control centre exterior light gray and interiors white.

2.12 Source Quality Control

- .1 Provide manufacturer's type test certificates including short circuit fault damage certification up to short circuit values specified under bus bracing.
- .2 Contract Administrator to witness standard factory testing of complete motor control centre including operation of switches, circuit breakers, starters and controls.
- .3 Manufacturer to provide proof of quality control program in accordance with CAN/CSA-Q9000.

2.13 Approved Manufacturer

- .1 MCC shall be as manufactured by Square D, Cutler-Hammer or Siemens.

Part 3 Execution

3.1 Installation

- .1 Set and secure motor control centre in place on channel bases, rigid, plumb and square to building floor and wall.
- .2 Make field power and control connections as indicated.
- .3 Ensure correct overload heater elements are installed.

3.2 Field Quality Control

- .1 Perform tests in accordance with Section 16010 - Electrical General Requirements.
- .2 Ensure moving and working parts are lubricated where required.
- .3 Operate starters to prove satisfactory performance of motor control centre during 8 hours period.

END OF SECTION

Part 1 General

1.1 Product Data

- .1 Submit product data in accordance with Section 01330 – Submittal Procedures.

Part 2 Products

2.1 Transformers

- .1 Use transformers of one manufacturer throughout project.
- .2 Design 1.
 - .1 Type: ANN.
 - .2 KVA and voltage rating as indicated on plans.
 - .3 Voltage taps: standard.
 - .4 Insulation: Class H, 220°C temperature rise.
 - .5 Basic Impulse Level (BIL): standard
 - .6 Hipot: standard
 - .7 Average sound level: standard
 - .8 Impedance at 170C: standard
 - .9 Enclosure: EEMAC 1, removable metal front panel, drip hood.
 - .10 Mounting: as indicated on plans
 - .11 Finish: in accordance with Section 16010 - Electrical General Requirements.
 - .12 Acceptable Manufacturer: Delta, Hammond or approved equivalent.

2.2 Equipment Identification

- .1 Provide equipment identification in accordance with Section 16010 - Electrical General Requirements.
- .2 Label size: 7. Indicate:
 - .1 KVA
 - .2 Primary voltage
 - .3 Secondary voltage
 - .4 1 phase or 3 phase
 - .5 Circuit number

Part 3 Execution

3.1 Installation

- .1 Ensure adequate clearance around transformer for ventilation.
- .2 Install transformers in level upright position.
- .3 Remove shipping supports only after transformer is installed and just before putting into service.
- .4 Loosen isolation pad bolts until no compression is visible.
- .5 Make primary and secondary connections in accordance with wiring diagram.
- .6 Energize transformers after installation is complete.

END OF SECTION

Part 1 General

1.1 Related Work Specified Elsewhere

- .1 Electrical General Requirements - Section 16010
- .2 Service Entrance Board - Section 16402

1.2 Product Data

- .1 Submit product data in accordance with Section 01300 – Submittals.
- .2 Include time current characteristic curves for breakers with ampacity of 100A and over.

Part 2 Products

2.1 Breakers General

- .1 Moulded case circuit breakers: to CSA C22.2 No. 5.
- .2 Bolt-on moulded case circuit breaker: quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40 deg. C ambient.
- .3 Common-trip breakers: with single handle for multi-pole applications.
- .4 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting. Trip settings on breakers with adjustable trips to range from 3 – 10 times current rating.
- .5 RMS symmetrical current interrupting capacity to match panel.

2.2 Thermal Magnetic Breakers

- .1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices and instantaneous tripping for short circuit protection.

2.3 Solid State Trip Breakers

- .1 Moulded case circuit breaker to operate by means of a solid-state trip unit with associated current monitors and self-powered shunt trip to provide inverse time current trip under overload condition, and long time, short time, instantaneous tripping for phase, ground, fault short circuit protection.

2.4 Manufacturers

- .1 Acceptable manufacturer: Square D, Cutler Hammer, Siemens.

Part 3 Execution

3.1 Installation

- .1 Install circuit breakers as indicated.

END OF SECTION

Part 1 General

1.1 Product Data

- .1 Submit product data in accordance with Section 01330 – Submittal Procedures.

Part 2 Products

2.1 Disconnect Switches

- .1 Fusible, horsepower rated disconnect switch in CSA Enclosure 1 or 3 as shown, size as indicated.
- .2 Provision of padlocking in on-off switch position by three locks.
- .3 Mechanically interlocked door to prevent opening when handle in ON position.
- .4 Fuses: size as indicated.
- .5 Fuseholders: relocatable and suitable without adaptors, for type and size of fuse indicated.
- .6 Quick-make, quick-break action.
- .7 ON-OFF switch position indication on switch enclosure cover.
- .8 Solid neutral block as required.
- .9 Acceptable Manufacturer: Square D Series CH.

2.2 Equipment Identification

- .1 Provide equipment identification in accordance with Section 16010 – Electrical General Requirements.
- .2 Indicate name of load controlled on size 4 nameplate.

Part 3 Execution

3.1 Installation

- .1 Install disconnect switches complete with fuses if applicable.

END OF SECTION

Part 1 General

1.1 Related Work Specified Elsewhere

- .1 Electrical General Requirements - Section 16010
- .2 Conduit, Conduit Fastenings and Conduit Fittings - Section 16133
- .3 Moulded Case Circuit Breakers - Section 16412

1.2 Shop Drawings

- .1 Submit shop drawings in accordance with Section 01330 – Submittal Procedures.
- .2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

1.3 Plant Assembly

- .1 Install circuit breakers in panelboards before shipment.
- .2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

Part 2 Products

2.1 Manufacturers

- .1 Acceptable Manufacturer:
 - .1 Square D, Cutler Hammer, Siemens

2.2 Panelboards

- .1 Panelboards: to CSA C-22.2 No. 29.
- .2 Panelboards: product of one manufacturer.
- .3 250V branch circuit panelboards: bus and breakers rated for 10kA (symmetrical) interrupting capacity minimum or as indicated.
- .4 Sequence phase bussing such that circuit breakers will be numbered in consecutive order, with each breaker identified by permanent number identification as to circuit number and phase.

- .5 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .6 Two keys for each panelboard and key panelboards alike.
- .7 Copper bus with neutral of same ampere rating as mains.
- .8 Main: suitable for bolt-on 1" wide breakers.
- .9 Isolated ground bus on panels.
- .10 Trim and door finish: baked grey enamel.
- .11 Panelboards shall have sprinkler hoods.
- .12 Panels shall have piano hinge front door covers. Panel NMD600-1-1 shall also have hinged front trim cover.

2.3 Breaker

- .1 Breakers: to Section 16412 – Moulded Case Circuit Breakers.
- .2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.
- .3 Branch circuit breakers to be 15A single pole unless otherwise indicated on drawings.

2.4 Equipment Identification

- .1 Provide equipment identification in accordance with section 16010 – Electrical General Requirements.
- .2 Nameplate for each panelboard size 5 engraved as indicated.
- .3 Complete circuit directory with typewritten legend showing location and load of each circuit.

Part 3 Execution

3.1 Installation

- .1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.
- .2 Mount panelboards to height specified in Section 16010 – Electrical General Requirements or as indicated.

- .3 Connect loads to circuits.
- .4 Connect branch circuit neutral conductors to common neutral bus.
- .5 Trims of recessed panelboards to be flush with wall. Coordinate installation with wall installer to ensure that walls with recessed equipment will be deep enough to accept same.
- .6 Locate all panelboards as shown on the drawings.
- .7 Wiring in panelboards shall be neat and organized. All neutral conductors shall be identified in the panel with their associated circuit numbers by means of Brady Markers.
- .8 All panelboards throughout the building shall be phased together such that the left-hand, centre and right-hand panelboard busses represent phases A, B and C respectively. All indicating meters shall be identified to this sequence.
- .9 All existing panelboards modified by this contract shall be supplied with new updated, typewritten panel schedules.

END OF SECTION

Part 1 General

1.1 System Description

- .1 Telecommunications raceways systems consist of outlet boxes, cover plates, terminal cabinets, conduits, pull boxes, sleeves and caps, fish wires, service fittings, cable tray

1.2 Section Includes

- .1 Raceways for the following:
 - .1 Data/telephone cabling systems.
 - .2 Public address system
 - .3 Pool alarm and gym alarm
 - .4 Security system (Pegasus)
 - .5 CCTV system
 - .6 CATV system.

Part 2 Products

2.1 Material

- .1 Conduits: EMT type, to Section 16133 – Conduits, Conduit Fastenings and Conduit fittings.
- .2 Junction boxes: to Section 16132 – Outlet Boxes, Conduit Boxes and Fittings.
- .3 Cable Trays:
 - .1 Aluminum vented
 - .2 Minimum 6” side rails
 - .3 Bonded at each joint
 - .4 Standard of acceptance: Thomas & Betts “U” style.
- .4 Fish wire: polypropylene type.

Part 3 Execution

3.1 Installation

- .1 Provide a separate conduit system for each system.
- .2 Mark conduits at intervals with labels as per 16010.

- .3 Install raceway system, terminal cabinets, outlet boxes, floor boxes, pull boxes, cover plates, conduit, sleeves and caps, miscellaneous and positioning material to constitute complete system.
- .4 Install pull boxes at a maximum of 30 m interval.
- .5 Include fish wire in empty conduits.

END OF SECTION

Part 1 General

1.1 Introduction

- .1 This Architecture and Engineering specification provides detailed information on Johnson Controls' P200 Integrated Security Management System (Pegasys)
- .2 The City of Winnipeg currently operates a centralized P2000 server, and as such, no server is required for this project.

1.2 Work Included

- .1 The work includes furnishing all labour, materials, tools, equipment, and documentation required for a complete and working Integrated Security Management System as specified in this section. This scope of work shall cover the requirements for the access control, alarm monitoring and integrated systems.

1.3 References

- .1 Design and operation of the system shall conform to the following referenced codes, regulations and standards as applicable:
 - .1 CSA C22.1-2006 – Canadian Electrical Code, Part 1.
 - .2 NFPA 70

1.4 General Product Description

- .1 The Security Management System (SMS) shall be capable of integrating multiple building functions including access control, alarm management, intrusion detection, video imaging and badging, database partitioning, interfacing to closed circuit television monitors (CCTV) and digital video recording (DVR) matrix switches, and interfacing with intercom equipment. It shall also be capable of controlling multiple banks of elevators, as well as allowing cardholder information and queries from external system databases (MIS interface).
- .2 CCTV and DVR interface is a future requirement for the system.
- .3 The system shall be modular in nature, and will permit expansion in both capacity and functionality through the addition of controllers, card readers, workstations, or by increasing the number of cards and sensors.
- .4 The system shall incorporate the necessary hardware, software, and firmware to collect, transmit, and process alarm, tamper and trouble conditions, access requests, and advisories back to the City of Winnipeg central monitoring facility. The system shall control the flow of authorized personnel traffic through the secured areas of the facility.

1.5 Submittals

- .1 Contractor shall submit all items in accordance with the requirements of the Submittals sections and shall include, but not be limited to, the following:
 - .1 Model numbers from all furnished job components.
 - .2 Manufacturers catalog data sheets for all components.
 - .3 Input power requirements for all SMS components.
 - .4 Complete engineered drawings indicating:
 - .1 Manufacturer model numbers and specifications.
 - .2 Dimensions, layouts and installation details.
 - .3 Point-to-point wiring diagrams for all SMS devices.
 - .4 Termination details for all SMS devices.
 - .5 Single-line system architecture drawings representing the entire SMS.
 - .6 Interfaces with all sub-systems.
 - .5 Owner Acceptance Form with a check box associated with each card reader and input point. A check mark in the box will indicate that each point has been correctly installed and that communication between the controller and the server has been established. This form shall be completed prior to Owner acceptance of the system.
 - .6 Six (6) sets of the Manufacturer's User and Installation Manuals.
 - .7 Course outlines for each of the end user training programs. The course outlines shall include the course duration, and a brief description of the subject matter.

1.6 Delivery, Storage, and Handling

- .1 SMS components shall be shipped to the job site in original manufacturer's shipping containers.
- .2 All shipping and handling costs shall be paid for by the Contractor at no additional cost to the Owner.
- .3 All equipment stored on the job site shall be secured in a locked storage area as designated by the General Contractor or Owner.

1.7 Testing and Commissioning

- .1 The Contractor shall be responsible for testing and commissioning the installation in accordance with all applicable documents in the Contract set.
 - .1 Testing shall be comprehensive and sufficient to demonstrate compliance with each requirement.
 - .2 A proposed test plan shall be submitted to the Owner's representative for approval before commencement of final test.
 - .3 Final tests shall be conducted in the presence of the Owner's representative.

Part 2 Products

2.1 Manufacturers

- .1 Pegasys P2000 Integrated Security Management System by Johnson Controls L.P.

2.2 Operational Requirements

- .1 System Capabilities:
- .1 General
 - .1 The SMS shall operate in client-server architecture. Any SMS software and firmware required for the system shall be fully tested and compatible with the existing City of Winnipeg SMS application system.
 - .2 Database Management
 - .1 The system shall create and maintain a master database of all cardholder records and system activity for all connected points.
 - .3 Audit Trail
 - .1 The SMS shall maintain an audit trail file of operator activity, and provide the ability to generate a report by operator, time and date, and type of activity. The system shall allow the operator to direct the audit trail report to screen, printer or file.
 - .4 Remote Monitoring and Configuration
 - .1 The system shall transmit all information back to the City of Winnipeg central monitoring facility and shall be configurable from this facility.
 - .5 Input Point Monitoring
 - .1 The SMS shall collect and process status information from all monitored points.
 - .6 Input Point Supervision
 - .1 The SMS shall electrically supervise all 2-state and 4-state input points.
 - .7 Web Access Option
 - .1 The Web Access feature shall enable users to perform various security management tasks from any web-ready PC or compatible PDA device. This feature shall support different permission levels for each user, and requests can be approved and/or validated prior to being implemented to prevent unauthorized operations or changes to the SMS. Rules shall be established to determine how requests are submitted. If requests require approval, pre-defined approvers shall approve or reject requests. If validation shall be required, a user with the proper permission shall confirm the validity of the request before it can be fully processed. Web Access features shall include:
 - Visitor requests
 - Contract requests

- Cardholder management
- Customizable user interface
- Request approval and validation
- Badge activities
- Guard services
- Emergency access disable

.8 Future CCTV Capability

.1 The system shall have the capability to operate the cameras and monitors forming part of the CCTV system as part of a future expansion. The system shall then provide the controls to define and run the following:

- Alarms, macros, and tours
- Sequences from the monitors
- Pan, tilt, zoom focus, iris, wiper, washer and light controls for any given camera
- Patterns, presets, and auxiliaries

The CCTV capability will provide for a single-seat integrated security solution when used with the SMS and shall support at a minimum the following CCTV protocols.

- General ASCII protocol
- American Dynamics switch: AD1024
- BetaTech switch: Ademco VideoBlox Switch
- Geutebruck - GST Interface: CPX 24/8; CPX 48/8; VX 3 (Vicros III); KS 48 (Vicros II); and KS 40 switches.
- Panasonic SX850 switch, other models may be supported if they are compatible with SX850 Protocol Version 1.4 01.24/00.
- Pelco 9760, CM 6700 and CM 6800 switches.
- Philips Burle (Bosch) LTC 8100; LTC 8200; LTC 8300; LTC 8500; LTC 8600; LTC 8800 and LTC 8900 series switches.
- Ultrak MaxPro-1000 switch.
- Vicon VPS1300; VPS1344; VPS1422 and VPS1466 switches.

.9 Future DVR Integration Capability

.1 The systems shall have the capability to provide seamless integration of the SMS with compatible Digital Video Recording (DVR) systems as part of a future expansion. The integration shall then allow authorized users to manage camera functions, including frame rate and resolution, from a single workstation, as well as to tie an event generated on the system to live or recorded audio visual (AV) recording. Audio and video may be accessed via a real time list, real time graphical map, or alarm monitor screen.

- .2 Users shall be able to search, retrieve, and download real time or archived AV recording from any surveillance camera, from any place, at any time. Query options shall include time/date, alarm events, camera ID and DVR ID. The playback interface shall have fast forward, rewind, go to first frame, go to last frame, pause and stop controls. The AV integration shall allow for Pan, tilt, zoom control, including presets.
- .3 The system shall support at a minimum the following DVR protocols:
 - Nice protocol, version 8.0 (with alarm forwarding and message filtering)
 - Loronix protocol, versions 4.4 and 4.5
 - Verint SmartSight
 - Johnson Controls Digital Vision Network DVN 5000 series and DVN 3000 series.
- .10 Future Metasys® System Extended Architecture Capability
 - .1 The Metasys System Extended Architecture capability shall allow the SMS to interface using web-based technology to the Johnson Controls Metasys Building Management System as part of a future expansion. It shall allow the Metasys workstations to view and acknowledge certain SMS alarms, send access control commands, print reports, and to create interlock events.
 - .2 The option shall require no special hardware subset, but rather be a simple upgrade, via software.

2.3 Software Requirements

- .1 Provide additional 5 client licenses to add-on to the existing server.

2.4 Hardware Requirements

1. Controllers shall be Johnson Controls, Inc. CK721 v2.4+
 - .1 The controller shall be a fully stand-alone processor capable of making all access control decisions without the involvement of the server computer based on a set of parameters passed to the controller from the server.
 - .2 The controller shall support up to sixteen (16) card readers in addition to either 256 input points or 128 input and 128 output points. It shall further support up to 12 facility codes per reader, 40 unique holidays, 32 access group and time zone pairs.
 - .3 Memory Requirements:
 - .4 Standard number of cards: 15,000 expandable to 200,000.
 - .5 Minimum number of historical transactions: 5,000 expandable to 50,000 at full card capacity.
 - .6 The controller shall require no firmware changes and shall use flash memory modules to provide non-volatile storage of both data and operational code.

- .7 Each controller shall be provided with built-in hardware to support hard-wired communications between the controller(s) and readers of up to 4000 feet.
 - .8 Communications between the controller(s) and the server shall be via Ethernet TC/IP at 10Mbps.
 - .9 An alarm summary relay shall be built-in to the CK7xx controller motherboard. If so programmed, the alarm relay shall be activated whenever a connected alarm point transfers to the alarm state and whenever soft alarms become active.
 - .10 A SPDT tamper switch shall be attached to the inner surface of the controller enclosure. The tamper switch shall change state whenever the enclosure door is opened to signal the SMS of the condition. The tamper switch input shall be user programmable to be suppressed, to be recognized as an input point, to be processed by the alarm queue at the server computer, to printout at an optional printer connected directly to the controller, and to activate the alarm summary relay described above.
 - .11 The controller shall include a battery module to back-up the controller's applications programs and database for 30 days after the failure of the primary AC power service. The controller database, the time clock, the transaction history, and all operator entered parameters shall be backed-up by the battery.
 - .12 If required elsewhere in the drawings or Specification, the controller(s) shall be furnished with an UPS battery configuration instead of a standard AC linear power supply configuration. The battery shall power the controller upon failure of the primary AC service for a minimum of one hour.
 - .13 While on UPS service, the controller shall continue to process event activity, card transactions, and record history transactions.
 - .14 The controller shall provide built-in LED to indicate whether the controller is properly communicating with the server computer.
- .2 Alarm monitoring and Output Control terminal boards. Intelligent alarm monitoring and output control terminal boards shall be Johnson Controls, Inc. plug-in modules to CK7xx series controller with at least the following functionality:
- .1 Sixteen two-state alarm input points.
 - .2 Eight four-state supervised alarm input points.
 - .3 Eight two-state alarm input points and eight SPDT output relays.
 - .4 Eight four-state supervised alarm input points and eight SPDT output relays.

2.5 Cards and Card Readers

- .1 General
 - .1 All readers shall be configured with the reader electronics mounted separately, on the "secure" side of the door such that only the reader head and pilot lights are mounted in the reader housing on the "entry" side of the door.
- .2 Proximity Technology

- .1 Standard range Proximity 4000 reader (contact to 20 in.)
 - .1 The reader shall be integrated and contain all reader electronics inside a single polycarbonate enclosure.
 - .2 The reader shall operate when mounted on a variety of surfaces, including metal. Maximum read range degradation when mounted on a metal surface shall be 50-percent.
 - .3 The reader shall contain an integral color LED and audio tone to indicate if the card has been successfully read.
 - .4 The reader shall be 8" x 8" x 2" maximum.
 - .5 Read range shall be dependent on model selected.
 - .6 The reader shall be rated for normal operation from -5 to 150°F.
 - .7 The proximity card shall be encased in sealed plastic with a surface suitable to receive an adhesive backed photo ID or shall be capable of direct printing.
- .2 Mullion Style Proximity Readers
 - .1 The reader shall be integrated and contain all reader electronics inside a single polycarbonate enclosure.
 - .2 The reader shall operate when mounted on a variety of surfaces including metal. Maximum read range degradation when mounted on a metal surface shall be 50-percent.
 - .3 The reader shall contain an integral color LED and audio tone to indicate if the card has been successfully read.
 - .4 The reader shall be 1.7" x 6" maximum.
 - .5 Read range shall be up to 5".
 - .6 The reader shall be rated for normal operation from -5 to 150°F.
 - .7 The proximity card shall be encased in high impact sealed plastic with a surface suitable to receive an adhesive backed photo ID.
- .3 Proximity Family Smart Card Readers
 - .1 All electronics shall be integrated and contained inside a single polycarbonate enclosure.
 - .2 Reader shall operate when mounted on a variety of surfaces including metal. Maximum read range on metal shall be degraded to a point as specified by model selected.
 - .3 The reader shall contain an integral color LED and audio tone to indicate a successful read.
 - .4 Reader size shall be no greater than 6" x 6" x 3".
 - .5 Technology of read shall be Johnson Controls specific, 26 or 34-bit with site code, user level and badge number output in 2 wire Wiegand (D1/D0).
 - .6 Readers shall be personalized according to the controller type the data is sent.

- .7 Readers shall comply with ISO 14443 A or B as specified by smart card use.
- .8 Smart cards shall be dual use (insert or non-contact) containing at least an 8K microprocessor.

Part 3 Execution

3.1 Installation

- .1 All consoles, terminals, and controllers shall be factory wired before shipment to the job site.
- .2 Cabinet doors shall open a minimum of 170 degrees to avoid blocking personnel movement. Each door shall be equipped with a cylinder lock, a tamper switch and a piano-type hinge with welded tamperproof pins.
- .3 Provisions shall be made for field wiring to enter the cabinet via standard knockouts at the top, bottom and sides of controller cabinets.
- .4 Each wire shall be identified at both ends with the wire designation corresponding to the wire numbers shown on the wiring diagrams.
- .5 All exposed wiring within the cabinets, consoles, and terminals shall be formed neatly with wires grouped in bundles using non-metallic, flame-resistant wiring cleats or wire ties.
- .6 All ferrous metal work shall be painted, in accordance with the manufacturer's standards.

3.2 Terminations

- .1 Electrical contractor to provide all raceways and pull wires ready for field terminations to be made by system supplier.
- .2 Provide wire markers on all cables.

END OF SECTION

Part 1 General

1.1 Related Work

- .1 Wiring: Section 16122, Wires and Cables 0-1000V; Section 16702, Telecommunication Receiving Systems.
- .2 Conduits: Section 16133, Conduits, Conduit Fastenings and Conduit Fittings.

1.2 References

- .1 CAN/ULC-S524-M91, Installation of Fire Alarm Systems.
- .2 ULC-S525-1978, Audible Signal Appliances for Fire Alarm.
- .3 CAN/ULC-S527-M87, Control Units, Fire Alarm.
- .4 CAN/ULC-S528-M91, Manual Pull Stations.
- .5 CAN/ULC-S529-M87, Smoke Detectors, Fire Alarm.
- .6 CAN/ULC-S530-M91, Heat Actuated Fire Detectors, Fire Alarm.
- .7 CAN/ULC-S536-M97, Inspection and Testing of Fire Alarm Systems.
- .8 CAN/ULC-S537-M97, Verification of Fire Alarm Systems.
- .9 Manitoba Building Code, Regulation 127/2006

1.3 System Description

- .1 Fully supervised, microprocessor-based, single stage, fire alarm system, utilizing digital techniques for data control, and multiplexing techniques for data transmission.
- .2 System to carry out fire alarm and protection functions; including receiving alarm signals; initiating general alarm; supervising components and wiring; actuating annunciators and auxiliary functions; initiating trouble signals and signalling to fire department.
- .3 Sequence of Operation:
 - .1 Activation of any heat detector, smoke detector (standard alarm level) or manual pull station shall constitute general alarm condition and both components of horn/strobes shall operate.
- .4 Zoned, non-coded single stage.

- .5 Modular in design to allow for future expansion.
- .6 Operation of system shall not require personnel with special computer skills.
- .7 System to include:
 - .1 Central Control Unit in separate enclosure with power supply, stand-by batteries, central processor with microprocessor and logic interface, main system memory, input-output interfaces for alarm receiving, annunciation/display, and program control/signalling.
 - .2 Power supplies.
 - .3 Initiating/input circuits.
 - .4 Output circuits.
 - .5 Auxiliary circuits.
 - .6 Wiring.
 - .7 Manual and automatic initiating devices.
 - .8 Audible/strobe signalling devices.
 - .9 End-of-line resistors.
 - .10 Capable of disconnecting auxiliary relays (fan shutdown, door holder, etc.) for fire alarm testing and drills. This function to activate "Trouble Signal".
 - .11 Local and remote annunciator displays.
 - .12 Printer Event log memory chip.
 - .13 Historic time/date event recorder.

1.4 Requirements of Regulatory Agencies

- .1 System:
 - .1 Subject to Manitoba Fire Commissioner (FC) approval.
 - .2 Subject to FC inspection for final acceptance.
- .2 System components: listed by ULC and comply with applicable provisions of National Building Code and Local/Provincial Building Code, and meet requirements of local authority having jurisdiction.

1.5 Shop Drawings

- .1 Submit shop drawings in accordance with Division 1.
- .2 Include:
 - .1 Detail assembly and internal wiring diagrams for control units.

- .2 Overall system riser wiring diagrams identifying control equipment, initiating zones and signaling circuits; identifying terminations, terminal numbers, conductors and raceways.
- .3 Details for devices.
- .4 Details and performance specifications for control, annunciation and peripherals with item by item cross reference to specification for compliance.
- .5 Step-by-step operating sequence, cross central control unit referenced to logic flow diagram.
- .6 Wording for device identification for Central Control Unit Annunciator Display and Remote Annunciator.
- .7 Consultant will provide electronic copy of floor plans at no charge.

1.6 Operation and Maintenance Data

- .1 Provide operation and maintenance data for fire alarm system for incorporation into manual. Contractor to submit four (4) copies of O&M manuals to Owner upon completion of the project.
- .2 Include:
 - .1 Instructions for complete fire alarm system to permit effective operation and maintenance.
 - .2 Technical data - illustrated parts lists with parts catalogue numbers.
 - .3 Copy of approved shop drawings with corrections completed and marks removed except review stamps.
 - .4 Fire alarm manufacturer's drawings with device designations.
 - .5 List of recommended spare parts for system.
 - .6 Certificate of Verification from fire alarm system manufacturer's agent and Authority Having Jurisdiction.

1.7 Maintenance

- .1 Inspection tests to conform to CAN/ULC-S536. Submit inspection report to Contract Administrator.
- .2 Provide individual price with tender for temporary program changes during construction period, to include zone labels, control functions, system operation.

1.8 Spare Parts

- .1 Provide 3 spare control fuses for each size supplied.
- .2 Provide 1 detector for each type supplied (smoke, heat).
- .3 Provide 1 pull station.

- .4 Provide 1 horn/strobe of each type.
- .5 Provide 1 End of Line Resistor.

Part 2 PART 2 - PRODUCT

2.1 Manufacturers

- .1 Acceptable Manufacturers: Notifier, Simplex, Mircom, Cerberus Pyratronics.

2.2 Materials

- .1 Equipment and devices: ULC listed and labelled and supplied by single manufacturer.
- .2 Power supply: to CAN/ULC-S524.
- .3 Audible signal devices: to ULC-S524.
- .4 Control unit: to CAN/ULC-S527.
- .5 Manual pull stations: to CAN/ULC-S528.
- .6 Thermal detectors: to CAN/ULC-S530.
- .7 Smoke detectors: to CAN/ULC-S529.
- .8 Visual alarms to CAN/ULC-S526.

2.3 System Operation: Single Stage - Signals Only

- .1 Actuation of any alarm initiating device to:
 - .1 Cause electronic latch to lock-in alarm state at central control unit.
 - .2 Indicate zone and initiating device of alarm at central control unit, remote annunciator and graphic display.
 - .3 Cause audible signalling devices to sound continuously throughout building and at central control unit.
 - .4 Transmit trouble and alarm signal to fire department via central station.
 - .5 Cause air conditioning and ventilation fans to shut down or to function to provide required control of smoke movement.
 - .6 De-energize 24 VDC or 120 VAC magnetic door holder during alarm state.
- .2 Acknowledging alarm: indicated at central control unit.

- .3 Possible to silence signals by "alarm silence" switch at control unit, after 60 s period of operation.
- .4 Subsequent alarm, received after previous alarm has been silenced, to re-activate signals.
- .5 Actuation of supervisory devices to:
 - .1 Cause electronic latch to lock-in supervisory state at central control unit.
 - .2 Indicate respective supervisory zone and initiating device at central control unit and at remote annunciators.
 - .3 Cause audible signal at central control unit to sound.
 - .4 Activate common supervisory sequence.
- .6 Resetting alarm and supervisory device not to return system indications/functions back to normal until control unit has been reset.
- .7 Trouble on system to:
 - .1 Indicate circuit in trouble at central control unit.
 - .2 Activate "system trouble" indication, buzzer and common trouble sequence. Acknowledging trouble condition to silence audible indication; whereas visual indication to remain until trouble is cleared and system is back to normal.
 - .3 Initiate "Trouble" signal to Monitoring Station.
- .8 Trouble on system: suppressed during course of alarm.
- .9 Trouble condition on any circuit in system not to initiate alarm conditions.
- .10 Class B wiring.

2.4 Control Panel

- .1 Central control unit (CCU).
 - .1 Features specified are minimum requirements for microprocessor-based system with digital data control and digital multiplexing techniques for data transmission.
 - .2 Minimum capacity of 94 intelligent detectors and 99 monitor/control modules.
 - .3 System to provide for priority reporting levels, with fire alarm points and pre-alarm assigned highest priority, supervisory and monitoring lower priority, and third priority for troubles. Possible to assign control priorities to control points in system to guarantee operation or allow emergency override as required.
 - .4 Integral power supply, battery charger and standby batteries.
 - .5 Basic life safety software: retained in non volatile Erasable Programmable Read-Only-Memory (EPROM). Extra memory chips: easily field-installed. Random-

Access-Memory (RAM) chips in panel to facilitate password-protected field editing of simple software functions (e.g. zone labels, priorities) and changing of system operation software.

- .6 Circuitry to continuously monitor communications and data processing cycles of microprocessor. Upon failure, audible and visual trouble indication to activate.
- .7 Support up to 4 RS-232-C I/O ports. CCU output: parallel ASCII with adjustable baud rates to allow interface of any commercially available printer, terminal or PC.
- .8 Equipped with software routines to provide Event-Initiated-Programs (EIP); change in status of one or more monitor points, may be programmed to operate any or all of system's control points.
- .9 Software and hardware to maintain time of day, day of week, day of month, month and year.
- .10 Software to operate variable sensitivity addressable smoke detectors and annunciate their status and sensitivity settings at control panel.
- .11 Replacement of initiating/signalling devices shall not require additional programming or external programming devices.
- .12 Fire Alarm Control Panel and all components to be Year 2000 compliant.
- .13 Standard of acceptance: Notifier NFS-640.

2.5 Power Supplies

- .1 120 V, 60 Hz as primary source of power for system.
- .2 Sized to 125% of devices shown to allow for future expansion.
- .3 Voltage regulated, current limited distributed system power.
- .4 Primary power failure or power loss (less than 102 V) will activate common trouble sequence.
- .5 Interface with battery charger and battery to provide uninterruptible transfer of power to standby source during primary power failure or loss. Battery power supply to provide 30 minutes of alarms after 24 hour power failure.
- .6 During normal operating conditions fault in battery charging circuit, short or open in battery leads to activate common trouble sequence and standby power trouble indicator.
- .7 Standby batteries: sealed, maintenance free, 10 year long life.
- .8 Continuous supervision of wiring for external initiating and alarm circuits to be maintained during power failure.

2.6 Initiating/ Input Circuit

- .1 Receiving circuits for alarm initiating devices such as manual pull stations, smoke detectors, heat detectors, sprinkler flow and tamper switches wired in DCLB configuration to central control unit.
- .2 Alarm receiving circuits (active and spare): compatible with smoke detectors and open contact devices.
- .3 Actuation of alarm initiating device: cause system to operate as specified in "System Operation".
- .4 Receiving circuits for supervisory, N/O devices. Devices: wired in DCLB configuration to central control unit.
- .5 Actuation of supervisory initiating device: cause system to operate as specified in "System Operation".
- .6 The loading of device loops shall be based on approximately 80% load. Provide additional loops to comply with this loading.

2.7 Alarm Output Circuits

- .1 Alarm output circuit: connected to signals, wired in class B configuration to central control unit.
 - .1 Signal circuits' operation to follow system programming; capable of sounding horns and activating strobes separately and continuously. Each signal circuit: rated at 2.5 A, 24 VDC; fuse-protected from overloading/overcurrent.
 - .2 Manual alarm silence, automatic alarm silence and alarm silence inhibit to be provided by system's common control.
 - .3 The loading of bell and strobe circuits shall not exceed 75% circuit capacity. Provide additional circuits to comply with this loading.

2.8 Auxiliary Circuits

- .1 Auxiliary contacts for control functions.
- .2 Actual status indication (positive feedback) from controlled device.
- .3 Alarm and supervisory trouble on system to cause operation of programmed auxiliary output circuits. Relays shall be monitored for open coil or shorted conditions.
- .4 Upon resetting system, auxiliary contacts to return to normal or to operate as pre-programmed.

- .5 Fans: stagger-started upon system reset; timing circuit to separate starting of each fan or set of fans connected to auxiliary contact on system. Timing circuit: controlled by CCU.
- .6 Auxiliary circuits: rated at 2 A, 24 V dc or 120 V ac, fuse-protected, independent Form C contacts, 4 relays/module.

2.9 Wiring

- .1 Shielded, twisted copper conductors: rated 300 V minimum.
- .2 To initiating circuits: 18 AWG minimum, and in accordance with manufacturer's requirements.
- .3 To signal circuits: 12 AWG minimum, and in accordance with manufacturer's requirements.
- .4 To control circuits: 14 AWG minimum, and in accordance with manufacturer's requirements.

2.10 Manual Alarm Stations

- .1 Addressable manual pull station.
 - .1 Pull lever, surface or semi-flush wall mounted type, single action, single stage, electronics to communicate station's status to addressable module over 2 wires and to supply power to station. Station address to be set on station in field.
- .2 Approved Product: Notifier NBG-12LX or Simplex equal.

2.11 Automatic Alarm Initiating Devices

- .1 Addressable thermal fire detectors, combination fixed temperature and rate of rise, non-restorable fixed temperature element, self-restoring rate of rise, fixed temperature 88°C.
 - .1 Electronics to communicate detector's status to addressable module/transponder.
 - .2 Device to be provided with isolator base for every 25 devices.
 - .3 Detector address to be set on detector base in field.
 - .4 Approved Product: Notifier FST-851A Series or Simplex equal.
- .2 Addressable regular smoke detectors.
 - .1 LED type.
 - .2 Electronics to communicate detector's status to addressable module/transponder.
 - .3 Device to be installed with isolator base for every 25 devices.
 - .4 Detector address to be set on detector base in field.

- .5 Ability to annunciate minimum of 2 levels of detector contamination automatically with trouble condition at control panel.
- .6 Approved Product: Ceiling; Notifier FSI-851 or Simplex equal.

2.12 Remote Annunciator

- .1 80 character LCD display.
- .2 Mimic display of Fire Alarm Control Panel.
- .3 Control switches for system acknowledges Signal Silence, Drill and Reset.
- .4 System Status LED for: Power, Alarm, Trouble, Supervisory and Alarm Status.
- .5 Standard of acceptance: Notifier FDU-80.

2.13 Audible/Strobe Signal Devices

- .1 Red enclosure.
- .2 Selectable strobe levels – 15, 15/75, 75, 95, 110, 115, 135, 150, 177, 185, cd.
- .3 Open Areas: 110 cd
Corridors: 15 cd
- .4 Standard of acceptance: Notifier Spectralert.
- .5 Three horn volume settings.

2.14 End-of-line Devices

- .1 End-of-line devices to control supervisory current in alarm circuits and signalling circuits, sized to ensure correct supervisory current for each circuit. Open , short or ground fault in any circuit will alter supervisory current in that circuit, producing audible and visible alarm at main control panel and remotely as indicated.

2.15 Addressable Field Modules

- .1 Addressable modules shall monitor and supervise dry contact input devices. Installation shall include box and face plates.
- .2 Standard of acceptance: Notifier FMM-1.

2.16 Isolator Base

- .1 Isolator Base:

- .1 The isolator base shall support all detector types and have the following minimum requirements:
 - .1 The operation of the isolator base shall be controlled by its respective detector processor. Isolators which are not controlled by a detector processor shall not be accepted.
 - .2 The isolator shall operate within a minimum of 23 msec. of a short circuit condition on the communication line.
 - .3 Following a short circuit condition, each isolator/detector shall be capable of performing an internal self-test procedure to re-establish normal operation. Isolator/detectors not capable of performing independent self-tests shall not be acceptable.
- .2 Isolator bases to be provided when a loop is used between floors, between areas which have fire separations. Do not exceed 12 devices on a branch without an isolator.
- .3 Terminal connections shall be made on the room side of the base. Bases which must be removed to gain access to the terminals shall not be acceptable.
- .4 The Loop Controller shall support up to 96 isolator bases.

2.17 Modules

- .1 Single Input Module
 - .1 The intelligent Single Input Module shall be capable of a minimum of 4 personalities, each with a distinct operation.
 - .2 The personality of the module shall be programmable at site to suit conditions and may be changed at any time using a personality code downloaded from the Analog Loop Controller. Single function modules or modules requiring Eprom, ROM or PROM changes or DIP switch/jumper changes shall not be acceptable.
 - .3 The single input module shall support the following circuit types:
 - .1 Alarm Latching, Manual Station, Conventional Heat, Waterflow.
 - .2 Delayed Waterflow.
 - .3 Non-Latching Monitor.
 - .4 Supervisory.
 - .4 Input circuit wiring shall be supervised for open and ground faults.
 - .5 The input module shall have a minimum of 2 diagnostic LEDs mounted behind finished cover plate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The module shall be capable of storing up to 24 diagnostic codes.
 - .6 Terminal connections shall be accessible from the room side of the assembly. Devices which must be removed to gain access to the wiring terminals shall not be acceptable.

- .7 The single input module shall be suitable for mounting on North American 2 1/2" (64 mm) deep 1 gang, 1 1/2" (38 mm) deep 4" square box with 1 gang cover.
 - .8 The input module shall be suitable for operation in the following environment:
 - .1 Temperature: 32°F to 120°F (0°C to 49°C).
 - .2 Humidity: 0-93% RH, non-condensing.
 - .9 It shall be possible to address each module without the use of DIP or rotary switches. Devices using DIP switches for addressing shall not be acceptable.
- .2 Dual Input Module
- .1 The intelligent Dual Input Module shall provide two (2) supervised input circuits capable of a minimum of 4 personalities, each with a distinct operation.
 - .2 The personality of the module shall be programmable at site to suit conditions and may be changed at any time using a personality code downloaded from the Analog Loop Controller. Single function modules or modules requiring Eprom, ROM or PROM changes or DIP switch/jumper changes shall not be acceptable.
 - .3 The dual input module shall support the following circuit types:
 - .1 Alarm Latching, Manual Station, Conventional Heat, Waterflow.
 - .2 Delayed Waterflow.
 - .3 Non-Latching Monitor.
 - .4 Supervisory.
 - .4 Input circuit wiring shall be supervised for open and ground faults.
 - .5 The dual module shall have a minimum of 2 diagnostic LEDs mounted behind finished cover plate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The module shall be capable of storing up to 24 diagnostic codes.
 - .6 The dual input module shall be suitable for mounting on North American 2 1/2" (64 mm) deep 1 gang, 1 1/2" (38 mm) deep 4" square box with 1 gang cover.
 - .7 Terminal connections shall be accessible from the room side of the assembly. Devices which must be removed to gain access to the wiring terminals shall not be acceptable.
 - .8 The input module shall be suitable for operation in the following environment:
 - .1 Temperature: 32°F to 120°F (0°C to 49°C).
 - .2 Humidity: 0-93% RH, non-condensing.
 - .9 It shall be possible to address each module without the use of DIP or rotary switches. Devices using DIP switches for addressing shall not be acceptable.
- .3 Single Input Signal Module
- .1 The intelligent Single Input Riser/Signal Module shall provide one supervised output circuit. The output circuit shall be suitable for any of the following operations:
 - .1 24 vdc, polarized audible and visible signal appliances.

- .2 The personality of the module shall be programmable at site to suit conditions and may be changed at any time using a personality code downloaded from the Analog Loop Controller. Single function modules or modules requiring Eprom, ROM or PROM changes or DIP switch/jumper changes shall not be acceptable.
 - .3 Input circuit wiring shall be supervised for open and ground faults.
 - .4 The signal module shall have a minimum of 2 diagnostic LEDs mounted behind finished cover plate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The module shall be capable of storing up to 24 diagnostic codes.
 - .5 The signal module shall be suitable for mounting on North American 2 1/2" (64 mm) deep 1 gang, 1 1/2" (38 mm) deep 4" square boxes.
 - .6 Terminal connections shall be accessible from the room side of the assembly. Devices which must be removed to gain access to the wiring terminals shall not be acceptable.
 - .7 The signal module shall be suitable for operation in the following environment:
 - .1 Temperature: 32°F to 120°F (0°C to 49°C).
 - .2 Humidity: 0-93% RH, non-condensing.
 - .8 It shall be possible to address each module without the use of DIP or rotary switches. Devices using DIP switches for addressing shall not be acceptable.
- .4 Control Relay Module
- .1 The intelligent micro-processor based Control Relay Module shall provide one form "C" dry relay contact rated at 2 amps at 24 Vdc to control external appliances or equipment shutdown. The control relay shall be rated for pilot duty and releasing systems.
 - .2 The position of the relay contact shall be confirmed by the system firmware.
 - .3 The control relay module shall have a minimum of 2 diagnostic LEDs mounted behind finished cover plate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The module shall be capable of storing up to 24 diagnostic codes.
 - .4 The control relay module shall be suitable for mounting on North American 2 1/2" (64 mm) deep 1 gang, 1 1/2" (38 mm) deep 4" square box with 1 gang cover.
 - .5 The module shall be suitable for operation in the following environment:
 - .1 Temperature: 32°F to 120°F (0°C to 49°C).
 - .2 Humidity: 0-93% RH, non-condensing.
 - .6 Terminal connections shall be accessible from the room side of the assembly. Devices which must be removed to gain access to the wiring terminals shall not be acceptable.

- .7 It shall be possible to address each module without the use of DIP switches. Devices using DIP switches for addressing shall not be acceptable.

.5 Universal Class A/B Module

- .1 The intelligent Universal Class A/B Module shall be capable of a minimum of 15 distinct operations.
- .2 The personality of the module shall be programmable at site to suit conditions and may be changed at any time using a personality code downloaded from the Analog Loop Controller. Single function modules or modules requiring Eprom, ROM or PROM changes or DIP switch/jumper changes shall not be acceptable.
- .3 The Universal Class A/B module shall support the following circuit types:
 - .1 Two Class B or one Class A Initiating Device Circuits (IDC) capable of delayed waterflow alarm operation.
 - .2 One Class A or B Indicating Device (Signal) Appliance Circuit (IAC).
 - .3 One Class A or B Circuit for 2 wire Smoke Detectors (Verified or non-verified).
 - .4 One Form "C" (NO/NC) Dry Output Contact Relay.
- .4 Input/Output circuit wiring shall be supervised for open and ground faults.
- .5 The universal Class A/B module shall have a minimum of 2 diagnostic LEDs mounted behind finished cover plate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The module shall be capable of storing up to 24 diagnostic codes.
- .6 The control relay module shall be suitable for mounting on North American 2 1/2" (64 mm) deep 1 gang, 1 1/2" (38 mm) deep 4" square boxes.
- .7 Terminal connections shall be accessible from the room side of the assembly. Devices which must be removed to gain access to the wiring terminals shall not be acceptable.
- .8 The universal Class A/B module shall be suitable for operation in the following environment:
 - .1 Temperature: 32°F to 120°F (0°C to 49°C).
 - .2 Humidity: 0-93% RH, non-condensing.
- .9 It shall be possible to address each module without the use of DIP or rotary switches. Devices using DIP switches for addressing shall not be acceptable.

2.18 As-Built Floor Plans

- .1 Fire alarm system floor plans complete with address and device names and exits: in glazed frame minimum size 600 x 600 mm at main floor entrance.

2.19 Ancillary Devices

- .1 Remote relay unit to initiate fan shutdown: Notifier FRM-1, or equal.

2.20 Conduit

- .1 Red EMT as manufactured by ALLIED TUBE shall be used for fire alarm system.

Part 3 Execution

3.1 Installation

- .1 Install systems in accordance with CAN/ULC-S524-M91.
- .2 Install central control unit and connect to ac power supply, dc standby power.
- .3 Install manual alarm stations and connect to alarm circuit wiring.
- .4 Locate and install detectors and connect to alarm circuit wiring. Do not mount detectors within 3 feet of air outlets. Maintain at least 2 feet radius clear space on ceiling, below and around detectors. Locate duct type detectors in straight portions of ducts. Relocate existing detector bases to avoid grille locations, etc.
- .5 Connect alarm circuits to main control panel.
- .6 Supply and install framed 11 x 17 copies of floor plans at each floor means of exit with appropriate "You Are Here" arrows at locations.
- .7 Connect signalling circuits to main control panel.
- .8 Install end-of-line devices at end of alarm and signalling circuits as required.
- .9 Install addressable modules for air conditioning duct smoke detector and connect to new fire alarm control panel.
- .10 Install remote annunciator as indicated on drawings and connect to main control panel.
- .11 Splices are not permitted.
- .12 Provide new raceways, where required, cable and wiring to make interconnections to annunciator equipment and CCU, as required by equipment manufacturer.
- .13 Ensure that wiring is free of opens, shorts or grounds, before system testing and handing over.
- .14 Identify circuits and other related wiring at central control unit, annunciators, and terminal boxes.
- .15 Supply and install visible address number labels on all detector and pull station bases.

- .16 Device location/description wording as they will appear on main control panel and annunciator shall be reviewed by Engineer at shop drawing stage.
- .17 Cut, patch and paint walls, ceilings and floors as required to carry out work. Utilize qualified trades to perform this work. Restore to original condition.

3.2 Field Quality Control

- .1 Perform tests in accordance with Section 16010 - Electrical General Requirements and CAN/ULC-S537-M97.
- .2 Fire alarm system:
 - .1 Test each device and alarm circuit to ensure manual stations, thermal and smoke detectors transmit alarm to control panel and actuate general alarm and ancillary devices.
 - .2 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of systems.
 - .3 Addressable circuits system style DCLB:
 - .1 Test each conductor on all DCLB addressable links for capability of providing 3 or more subsequent alarm signals on line side of single open-circuit fault condition imposed near electrically most remote device on each link. Operate Acknowledge/Silence switch after reception of each of the 3 signals. Correct imposed fault after completion of each series of tests.
 - .2 Test each conductor on all DCLB addressable links for capability of providing 3 or more subsequent alarm signals during ground-fault condition imposed near electrically most remote device on each link. Operate Acknowledge/Silence switch after reception of each of the 3 signals. Correct imposed fault after completion of each series of tests.
- .3 Provide final PROM program re-burn for system incorporating program changes made during construction at no charge to Owner.
- .4 The manufacturer or his authorized representative must perform tests in accordance with CAN/ULC-S537-M97.
- .5 Provide a complete verification report on CFAA forms. The verifying technician must bear approval from CFAA (Canadian Fire Alarm Association).
- .6 Manufacturer or his authorized representative to provide complete system verification.

END OF SECTION