Public Works and Government Services Canada | Travaux publics et Services gouvernementaux Canada

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**RETOURNER LES SOUMISSIONS À:**

**Bid Receiving Public Works & Government Services Canada/Réception des souissions Travaux publics et Services gouvernementaux Canada**
**1713 Bedford Row**
**Halifax, N.S./Halifax,(N.E.)**
**B3J 1T3**
**Halifax**
**Bid Fax: (902) 496-5016**

# SOLICITATION AMENDMENT
# MODIFICATION DE L'INVITATION

The referenced document is hereby revised; unless otherwise indicated, all other terms and conditions of the Solicitation remain the same.

Ce document est par la présente révisé; sauf indication contraire, les modalités de l'invitation demeurent les mêmes.

**Comments - Commentaires**

**Vendor/Firm Name and Address**
**Raison sociale et adresse du fournisseur/de l'entrepreneur**

**Issuing Office - Bureau de distribution**

Atlantic Region Acquisitions/Région de l'Atlantique Acquisitions
1713 Bedford Row
Halifax, N.S./Halifax, (N.E.)
B3J 3C9
Halifax
Nova Scot

| | |
|---|---|
| **Title - Sujet**<br>Holland West Cooling Extension | |
| **Solicitation No. - N° de l'invitation**<br>EB144-181387/A | **Amendment No. - N° modif.**<br>002 |
| **Client Reference No. - N° de référence du client**<br>EB144-18-1387 | **Date**<br>2017-10-31 |
| **GETS Reference No. - N° de référence de SEAG**<br>PW-$PWA-110-5661 | |
| **File No. - N° de dossier**<br>PWA-7-78081 (110) | **CCC No./N° CCC - FMS No./N° VME** |
| **Solicitation Closes - L'invitation prend fin at - à 02:00 PM on - le 2017-11-07** | **Time Zone**<br>**Fuseau horaire**<br>Atlantic Standard Time AST |
| **F.O.B. - F.A.B.**<br>**Plant-Usine:** ☐ **Destination:** ☑ **Other-Autre:** ☐ | |
| **Address Enquiries to: - Adresser toutes questions à:**<br>Collier (PWA), Susan | **Buyer Id - Id de l'acheteur**<br>pwa110 |
| **Telephone No. - N° de téléphone**<br>(902) 401-3352 (  ) | **FAX No. - N° de FAX**<br>(902) 496-5016 |
| **Destination - of Goods, Services, and Construction:**<br>**Destination - des biens, services et construction:** | |

**Instructions: See Herein**

**Instructions: Voir aux présentes**

| | |
|---|---|
| **Delivery Required - Livraison exigée** | **Delivery Offered - Livraison proposée** |
| **Vendor/Firm Name and Address**<br>**Raison sociale et adresse du fournisseur/de l'entrepreneur**<br><br>**Telephone No. - N° de téléphone**<br>**Facsimile No. - N° de télécopieur** | |
| **Name and title of person authorized to sign on behalf of Vendor/Firm (type or print)**<br>**Nom et titre de la personne autorisée à signer au nom du fournisseur/ de l'entrepreneur (taper ou écrire en caractères d'imprimerie)**<br><br>**Signature** | **Date** |

Canada

La modification 002 vise à insérer la spécification addenda et à répondre aux questions des soumissionnaires potentiels comme suit :

Insérer :
SPÉCIFICATION ADDENDA

Reference Section 01 10 10 General Instructions
Add 1.3: “Removal and reinstatement of suspended ceilings, forming of housekeeping pads and cutting/patching.”
Add1.4: “Electrical connections to new equipment and required new power distribution equipment/breakers.”
Add1.5: “Other works described herein the specification or as shown on drawing set.”

Reference Section 23 31 13.01 Metal Ducts – Low Pressure to 500 Pa
Add:
2.7 DUCT INSULATION

D-2 Mineral Fiber Blanket with ASJ Vapour Barrier 4° to 120° C
Application: on concealed cold or dual temperature ducting.
Outside air intake from louver to unit.
All relief air ducting and exhaust ducting (except kitchen range hood exhaust duct) to the motorized damper or for minimum of 3 meters (measured on centerline of duct), whichever is greater, from steel roof deck, from underside of wood trusses or exterior wall.
All air conditioned supply ducts
Where indicated.
Material
CAN/CGSB 51.11 Mineral Fiber Blanket.
CGSB 51-GP-52 Vapour Barrier Jacket and Facing Material.
Thickness:
One layer for air conditioned supply ducts.
Two layers of duct insulation for outside air intakes to air handling units and heat recovery ventilators.
One layer of duct insulation for exhaust air ducting

D-4 Mineral Fiber Rigid with ASJ Vapour Barrier to 4° to 120° C
Application: on exposed cold or dual temperature ducting.
Outside air intakes from louver to unit.
All relief air ducting and exhaust ducting (except kitchen range hood exhaust duct) to the motorized damper or for minimum of 3 meters (measured on centerline of duct), whichever is greater, from steel roof deck, from underside of wood trusses or exterior wall.
Air conditioned supply duct within mechanical rooms.
Where indicated.
Material:
CAN/CGSB 51.11 Rigid Mineral Fiberboard.
CGSB 51-GP-52 Vapour Barrier, Jacket and Facing Material.
Thickness:
One 25 mm (1”) layer for air conditioned supply ducts.

One 51 mm (2”) layer of duct insulation for outside air intakes to air handling units and heat recovery ventilators.
2.8 Jackets

Canvas.
Plain weave, cotton fabric at 6.5 oz/yd² (220 g/m²).
ULC label every 600 mm (2 ft.)

Application:
Exposed insulated piping
Exposed insulated ductwork

FIN DE L’ADDENDA NO 1 MÉCANIQUE

QUESTIONS :

Question 1 :
Sur le dessin H-2 il y a de nouveaux conduits d’air sont installés dans les locaux à bureaux comme dissimulée? Habituellement nous isoler des conduits d’air qui a refroidi à l'air qui traverse le système. Il n’y a pas de spécifications pour cette nouvelle S/A, pouvez-vous préciser si l'isolant est nécessaire.

Réponse 1 :
Oui nouvel approvisionnement en air ductworks requis. Voir ci-dessus la spécification addenda pour de plus amples détails.

Question 2 :
Il n’y a pas de spécifications électriques inclus?

Réponse 2 :
Voir les spécifications électriques en pièce jointe.

Question 3 :
Instructions générales de la section 01 10 10 1,1 description de travail ne comprend pas, l’électricité, l’entretien ménager de béton AHU DAP, ou le retrait / au rétablissement des plafonds. Ces éléments à inclure dans l’appel d’offres, et si oui pouvez les plafonds demeurent ouvertes entre les quarts de travail?

Réponse 3 :
L’électricité, l’entretien ménager de béton AHU DAP, et le retrait / au rétablissement des plafonds sont inclus dans la portée des travaux. Voir le document ci-joint SPEC addenda ci-dessus pour la section 01 10 10. Voir aussi des précisions sur les heures de travail à la question 4.

Question 4 :
Dessin H-2 a une note que tous les travaux doivent être effectués lorsque les bureaux ne sont pas occupés; toutefois, la spécification 01 14 10 1.3.4 fait remarquer que le travail sur les planchers peut être effectué pendant les heures normales de travail. Les occupants devront être déplacés lorsque le travail est effectué à cet étage?

Réponse 4 :
Le travail sur chacun des étages doit être effectuée un étage à la fois pendant les heures normales de travail. Les carreaux de plafond peut être retirée pendant que les travaux sont exécutés et devrait être rétabli une fois terminé, avant que les utilisateurs sont déplacés dans l'espace. Plus envahissant ou perturbateurs du système travaux nécessitant des fermetures doit être effectuée le soir, la fin de semaine et les fermetures prévues. Tous les horaires de travail proposée doit être présentée et approuvée par le représentant du ministère.

TOUTES LES AUTRES MODALITÉS ET CONDITIONS DEMEURENT LES MÊMES.

## 1.1 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CSA C22.1-15 Canadian Electrical Code, Part 1 (21st Edition), Safety Standard for Electrical Installations.

## 1.2 DEFINITIONS

.1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

## 1.3 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

.3 Language operating requirements: provide identification nameplates and labels for control items in English.

## 1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data: submit WHMIS MSDS in accordance with Section 01 35 43 Environmental Procedures.

.3 Shop drawings:
- .1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Nova Scotia, Canada.
- .2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, and other items that must be shown to ensure co-ordinated installation.
- .3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
- .4 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.
- .5 Submit 4 copies of 600 x 600 mm minimum size drawings and product data to Departmental Representative.
- .6 If changes are required, notify Departmental Representative of these changes before they are made.

.4 Quality Control: in accordance with Section 01 45 00 – Testing and Quality Control.
- .1 Provide CSA certified equipment and material.
- .2 Submit test results of installed electrical systems and instrumentation.
- .3 Permits and fees: in accordance with General Conditions of contract.
- .4 Submit, upon completion of Work, load balance report.
- .5 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.

.5 Manufacturer's Field Reports: submit to Departmental Representative manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3.7 - FIELD QUALITY CONTROL.

## 1.5 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00 – Testing and Quality Control.

.2 Qualifications: electrical Work to be carried out by qualified, licensed electricians or apprentices in accordance with authorities having jurisdiction respecting manpower vocational training and qualification.

.1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.

.2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.

.3 Site Meetings:

.1 In accordance with Section 01 14 10 Scheduling and Management of Work.

.4 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29 - Health and Safety Requirements.

## 1.6 DELIVERY, STORAGE AND HANDLING

.1 Material Delivery Schedule: provide Departmental Representative with schedule within 2 weeks after award of Contract.

.2 Construction/Demolition Waste Management and Disposal in accordance with Section 01 74 22 - Construction/Demolition Waste Management and Removal.

## 1.7 SYSTEM STARTUP

.1 Instruct Departmental Representative in operation, care and maintenance of systems, system equipment and components.

.2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.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 will aspects of its care and operation.

## 1.8 OPERATING INSTRUCTIONS

.1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.

.2 Operating instructions to include following:

.1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.

.2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
.3 Safety precautions.
.4 Procedures to be followed in event of equipment failure.
.5 Other items of instruction as recommended by manufacturer of each system or item of equipment.

.3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.

.4 Post instructions where directed.

.5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.

.6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

## 2 Products

### 2.1 MATERIALS AND EQUIPMENT

.1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.

.2 Material and equipment to be CSA certified.

.3 Factory assembled control panels and component assemblies.

### 2.2 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

.1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.

.2 Control wiring and conduit is the responsibility of the electrical contractor, except for conduit, wiring and connections which are related to control systems specified in the mechanical contract documents and shown on mechanical drawings.

### 2.3 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of Departmental Representative

.2 Porcelain enamel signs, minimum size 175 x 250 mm.

### 2.4 WIRING TERMINATIONS

.1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

### 2.5 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates as follows:
.1 Nameplates: lamicoid 3 mm thick black face, white core, lettering accurately aligned and engraved into core mechanically attached with pop rivets.

.2 Sizes as follows:

**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 Departmental Representative prior to manufacture.

.4 Allow for minimum of twenty-five (25) letters per nameplate.

.5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.6 Identify equipment with Size 3 labels engraved "ASSET INVENTORY NO. _____ " as directed by Departmental Representative.

.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.

## 2.6 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

## 2.7 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits, boxes and metallic sheathed cables.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.

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

| Prime | Auxiliary |
|---|---|
| up to 250 V | Yellow |
| Above 250 V | Orange |
| Fire Alarm | Red |

**2.8 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.

.2 Paint indoor switchgear and distribution enclosures light gray to EEMAC 2Y-1.

**3 Execution**

**3.1 INSTALLATION**

.1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

.2 Do overhead and underground systems in accordance with CSA C22.3 No.1 except where specified otherwise.

**3.2 NAMEPLATES AND LABELS**

.1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

**3.3 CONDUIT AND CABLE INSTALLATION**

.1 Install conduit and sleeves prior to pouring of concrete.

.1 Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.

.2 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

**3.4 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.

**3.5 CO-ORDINATION OF PROTECTIVE DEVICES**

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

## 3.6 FIELD QUALITY CONTROL

.1 Load Balance:
- .1 Measure phase current to panelboards with normal loads 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 Provide upon completion of work, load balance report as directed in PART 1 - SUBMITTALS: phase and neutral currents on panelboards operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.

.2 Conduct following tests in accordance with Section 01 45 00 – Testing and Quality Control.
- .1 Power distribution system including phasing, voltage, grounding and load balancing.
- .2 Circuits originating from branch distribution panels.
- .3 Lighting and its control.
- .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
- .5 Systems: fire alarm system.
- .6 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.

.3 Carry out tests in presence of Departmental Representative.

.4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.5 Manufacturer's Field Services:
- .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
- .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
- .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

## 3.7 CLEANING

.1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

# 1 General

## 1.1 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CAN/CSA-C22.2 No.18-98, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.
- .2 CSA C22.2 No.65-93(R1999), Wire Connectors.

## 1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 22 - Construction/Demolition Waste Management and Disposal.

# 2 Products

## 2.1 MATERIALS

.1 Pressure type wire connectors: with current carrying parts of sized to fit conductors as required.

2 Fixture type splicing connectors: with current carrying parts 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 as required.
- .2 Stud clamp bolts as required.
- .3 Sized for conductors as required.

.3 Clamps or connectors for armoured cable, flexible conduit, as required.

# 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. Installation shall meet secureness tests in accordance with CSA C22.2 No.65.
- .2 Install fixture type connectors and tighten. Replace insulating cap.
- .3 Install bushing stud connectors in accordance with EEMAC 1Y-2.

# 1 General

## 1.1 REFERENCES

.1 Section 26 05 00 - Common Work Results For Electrical.

## 1.2 PRODUCT DATA

.1 Provide product data in accordance with Section 01 33 00 - Submittal Procedures.

## 1.3 DELIVERY, STORAGE AND HANDLING

.1 Packaging Waste Management: remove for reuse packaging materials in accordance with Section 01 74 22 - Construction/Demolition Waste Management and Disposal.

# 2 Products

## 2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.

.2 Copper conductors: size as indicated, with 600 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE Non Jacketed.

## 2.2 ARMOURED CABLES

.1 Conductors: insulated, copper, size as indicated.

.2 Type: AC90 sheath over cable assembly and under armour.

.3 Armour: interlocking type fabricated from aluminum strip.

.4 Connectors: anti short connectors.

## 2.3 VARIABLE SPEED DRIVE CABLE

.1 Conductor: copper, size as indicated.

.2 Corrugated continuous aluminum sheath.

.3 Three (3) bonding conductors.

.4 Rated voltage: 1000 V.

.5 Drive rated cable connectors.

## 2.4 CONTROL CABLES

.1 Type: LVT: 2 soft annealed copper conductors, sized as indicated:
- .1 Insulation: thermoplastic.
- .2 Sheath: thermoplastic jacket.

.2 Type: low energy 300 V control cable: stranded annealed copper conductors sized as indicated LVT: 2 soft annealed copper conductors, sized as indicated:
.1 Insulation: PVC.

.3 Type: 600 V stranded annealed copper conductors, sizes as indicated:
.1 Insulation: cross-linked polyethylene type RW90 (x-link).

## 3 Execution

### 3.1 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Perform tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

### 3.2 GENERAL CABLE INSTALLATION

.1 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).

.2 Cable Colour Coding: to Section 26 05 00 Common Work Results for Electrical.

.3 Conductor length for parallel feeders to be identical.

.4 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

.5 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.

.6 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e. common neutrals not permitted.

.7 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

### 3.2 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:
.1 In conduit systems in accordance with Section 26 05 34 Conduits, Conduit Fastenings and Conduit Fittings.
.2 Feed VFDs with Variable Speed Drive cable.

### 3.3 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible on channels.

## 3.4 INSTALLATION OF CONTROL CABLES

.1 Install control cables in conduit.

.2 Ground control cable shield.

# 1 General

## 1.1 REFERENCES

.1 Canadian Standards Association, (CSA International)

## 1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 22 - Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.

.5 Fold up metal banding, flatten and place in designated area for recycling.

# 2 Products

## 2.1 EQUIPMENT

.1 Insulated grounding conductors: green, type RW90 XLPE.

.2 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 Bolted type conductor connectors.
- .4 Thermit welded type conductor connectors.
- .5 Bonding jumpers, straps.
- .6 Pressure wire connectors.

# 3 Exeuction

## 3.1 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including, conductors, connectors, accessories. Where EMT is used, run ground wire in 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. Avoid loop connections.

## 3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.

.2 Perform tests before energizing electrical system.

# 1 General

## 1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results - Electrical.

## 1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 22 - Construction/Demolition Waste Management And Disposal.

# 2 Products

## 2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41 mm, 2.5 mm thick, suspended.

# 3 Execution

## 3.1 INSTALLATION

.1 Secure equipment to hollow masonry, tile and plaster surfaces with lead anchors.

.2 Secure equipment to poured concrete with expandable inserts.

.3 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.

.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 steel 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 on centre 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 Departmental Representative.

.12 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

# 1 General

## 1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results - Electrical.

## 1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CSA C22.1-15, Canadian Electrical Code, Part 1, 21st Edition.

## 1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.

## 1.4 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:
- .1 Separate waste materials for in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

# 2 Products

## 2.1 SPLITTERS

.1 Construction: sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.

.2 Terminations: main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.

.3 Spare Terminals: minimum three spare terminals on each connection or lug block sized less than 400 A.

## 2.2 JUNCTION AND PULL BOXES

.1 Construction: welded steel enclosure.

.2 Covers Flush Mounted: 25 mm minimum extension all around.

.3 Covers Surface Mounted: screw-on flat covers.

## 2.3 CABINETS

.1 Construction: welded sheet steel, hinged door, handle, latch and catch

.2 Type E Empty: surface return flange mounting.

.3 Type T Terminal: flush overlapping sides, mounting as indicated containing 19 mm G1S fir plywood backboard.

# 3 Execution

## 3.1 SPLITTER INSTALLATION

.1 Mount plumb, true and square to building lines.

.2 Extend splitters full length of equipment arrangement except where indicated otherwise.

## 3.2 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Mount cabinets with top not higher than 2 m above finished floor except where indicated otherwise.

.3 Install terminal block as indicated in Type T cabinets.

.4 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

## 3.3 IDENTIFICATION

.1 Equipment Identification: to Section 26 05 00 - Common Work Results for Electrical.

.2 Identification Labels: size 2 indicating voltage and phase, or as indicated.

# 1 General

## 1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results - Electrical.

## 1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
  .1 CSA C22.1-15, Canadian Electrical Code, Part 1, 21st Edition.

## 1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

## 1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Waste Management and Disposal:
  .1 Separate waste materials for in accordance with Section 01 74 22 - Construction/Demolition Waste Management and Disposal.

# 2 Products

## 2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1.

.2 102 mm square or larger outlet boxes as required.

.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 GALVANIZED STEEL OUTLET BOXES

.1 One-piece electro-galvanized construction.

.2 Single and multi-gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and tile rings as required.

## 2.3 CONDUIT BOXES

.1 Cast FS or FD aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of devices.

## 2.4 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 35mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

# 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. Do not install reducing washers.

.5 Vacuum clean interior of outlet boxes before installation of wiring devices.

.6 Identify systems for outlet boxes as required.

# 1 General

## 1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results - Electrical.

## 1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CAN/CSA C22.2 No. 18-98(R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
- .2 CSA C22.2 No. 45-M1981(R2003), Rigid Metal Conduit.
- .3 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .4 CSA C22.2 No. 83-M1985(R2003), Electrical Metallic Tubing.

## 1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product data: submit manufacturer's printed product literature, specifications and datasheets.

.3 Quality assurance submittals:
- .1 Test reports: submit certified test reports.
- .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .3 Instructions: submit manufacturer's installation instructions.

## 1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials in accordance with Section 01 74 22 - Construction/Demolition Waste Management and Disposal.

# 2 Products

## 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 Flexible metal conduit: to CSA C22.2 No. 56, steel liquid-tight flexible metal.

## 2.2 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits 50 mm and smaller.
- .1 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 on centre.

.4 Threaded rods, 6 mm diameter, to support suspended channels.

**2.3 CONDUIT FITTINGS**

.1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.

.2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.

.3 Watertight connectors and couplings for EMT.
- .1 Set-screws are not acceptable.

**2.4 FISH CORD**

.1 Polypropylene.

**3 Execution**

**3.1 MANUFACTURER'S INSTRUCTIONS**

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

**3.2 INSTALLATION**

.1 The minimum acceptable conduit size used is 21 mm.

.2 Unless noted otherwise, conduits are to be installed as high as possible to conserve headroom, to reduce interference with other trades and cause minimum interference in spaces through which they pass.

.3 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.

.4 Use rigid galvanized steel threaded conduit where subject to injury.

.5 Use electrical metallic tubing (EMT) for all wiring on this project.
- .1 EMT shall be installed as a complete system and shall be securely fastened in place within 300 mm of each outlet box, junction box, cabinet, couplings, fittings and changes in direction and the spacing between supports as follows:
  - .1 Not greater than 1500 mm for 21 mm EMT
  - .2 Not greater than 1800 mm for 27 mm and 35 mm EMT
  - .3 Not greater than 3050 mm for 41 mm EMT or larger.

.6 All conduit runs shall be a maximum of 30 meters in length with a maximum of four (4) 90 degree bends between pull points. A pull box shall be placed in conduit runs where the sum of the bends exceeds 360 degrees, where the overall run exceeds 30 meters or there is a reverse bend in the run.

.7 Pull boxes shall be placed in straight sections of conduit run and shall not be used in lieu of a bend. Conduit fittings shall not be used in place of pull boxes or bends. The use of C, LB, LL, LR and T type fittings are prohibited on this project unless written permission is provided by the Departmental Representative.

.8 The use of corner pulling ELLs or corner pulling elbows is not permitted.

.9 Conduits shall be installed in a neat and ordered manner. When installed in a group, conduits shall be parallel and evenly spaced apart.

.10 Liquid tight metal flexible conduit is not to be used as a general purpose raceway. Use liquid tight flexible metal conduit (maximum length permitted to be 1.5 M) and liquid tight conduit fittings for:
.1 Connection to vibrating equipment.

.11 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.12 Mechanically bend steel conduit over 19-mm diameter.

.13 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.14 Install fish cord in empty conduits.

.15 Where conduits become blocked, remove and replace blocked section.

.16 Dry conduits out before installing wire.

.17 The installation of conduits above the structure, directly below roof insulation is strictly prohibited.

.18 All conduits to be complete with minimum #12 green insulated bond conductor.

.19 Ensure all metal raceways are bonded to ground, including those used for communication systems, fire alarm systems. Where a separate bonding conductor is run to a bonding bushing on an open end of a metal raceway. a #6 green RW90 shall be used.

## 3.3 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Run conduits in flanged portion of structural steel.

.3 Group conduits wherever possible on suspended channels.

.4 Do not pass conduits through structural members except as indicated.

.5 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

## 3.4 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.

.4 Protect conduits from damage where they stub out of concrete.

.5 Install sleeves where conduits pass through slab or wall.

.6 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed.

.1 Use cold mastic between sleeve and conduit.

.7 Encase conduits completely in concrete with minimum 25 mm concrete cover.

.8 Organize conduits in slab to minimize cross-overs.

## 3.5 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

# 1 General

## 1.1 RELATED REQUIREMENT

.1 Section 26 05 00 - Common Work Results - Electrical.

## 1.2 REFERENCES

.1 Canadian Standards Association (CSA International).
  .1 CSA-C22.2 No. 5-02 (R2007), Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).

## 1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.

## 1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 22 - Construction/Demolition Waste Management And Disposal.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.

.5 Fold up metal banding, flatten and place in designated area for recycling.

# 2 Products

## 2.1 BREAKERS GENERAL

.1 Moulded-case circuit breakers and Ground-fault circuit-interrupters,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 degrees 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.
  .1 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.

.5 Circuit breakers to match symmetrical RMS interrupting capacity rating of circuit breakers in existing panel, unless otherwise noted.

## 2.2 THERMAL MAGNETIC BREAKERS DESIGN A

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

# 3 Execution

## 3.1 INSTALLATION

.1 Install circuit breakers as indicated.

# 1 General

## 1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results - Electrical.

## 1.2 REFERENCES

.1 Canadian Standards Association (CSA International).
- .1 CAN/CSA C22.2 No.4-M89 (R2000), Enclosed Switches.
- .2 CSA C22.2 No.39-[M89 (R2003), Fuseholder Assemblies.

## 1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.

## 1.4 HEALTH AND SAFETY

.1 Do construction occupational health and safety in accordance with Section 01 35 28 - Health and Safety Requirements.

## 1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

# 2 Products

## 2.1 DISCONNECT SWITCHES

.1 Non-fusible, horsepower rated disconnect switch in CSA Enclosure, size as indicated.

.2 Provision for padlocking in on-off switch position by three locks.

.3 Mechanically interlocked door to prevent opening when handle in ON position.

.4 Quick-make, quick-break action.

.5 ON-OFF switch position indication on switch enclosure cover.

## 2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - Electrical.

.2 Indicate name of load controlled on size 4 nameplate.

# 3 Execution

## 3.1 INSTALLATION

.1 Install disconnect switches complete with fuses if applicable.

# 1 General

## 1.1 REFERENCES

.1 Canadian Standards Association, (CSA International)

## 1.2 REFERENCES

.1 International Electrotechnical Commission (IEC)
- .1 IEC 947-4-1-2002, Part 4: Electromechanical contactors and motor-starters.

## 1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .1 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Provide shop drawings for each type of starter to indicate:
    - .1 Mounting method and dimensions.
    - .2 Starter size and type.
    - .3 Layout and components.
    - .4 Enclosure types.
    - .5 Wiring diagram.
    - .6 Interconnection diagrams.

## 1.4 CLOSEOUT SUBMITTALS

.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Submit operation and maintenance data for each type and style of motor starter for incorporation into maintenance manual.

.3 Extra Materials:
- .1 Provide listed spare parts for each different size and type of starter.
  - .1 3 contacts, stationary.
  - .2 3 contacts, movable.
  - .3 1 contacts, auxiliary.
  - .4 1 control transformer[s].
  - .5 1 operating coil.
  - .6 2 fuses.
  - .7 10% indicating lamp bulbs used.

## 1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.

.2 Deliver materials to site in original factory packaging, labeled with manufacturer's name, address.

.3 Packaging Waste Management: in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## 2 Products

### 2.1 MATERIALS

.1 Starters: to IEC 947-4 with AC4 utilization category.

### 2.2 MANUAL MOTOR STARTERS

.1 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: heavy duty, oil tight labelled as indicated.
- .2 Indicating light: LED type and colour as indicated.
- .3 Locking tab to permit padlocking in "ON" or "OFF" position.

### 2.3 FULL VOLTAGE MAGNETIC STARTERS

.1 Combination magnetic starters of size, type, rating and enclosure type as indicated with components as follows:
- .1 Contactor solenoid operated, rapid action type.
- .2 Motor overload protective device in each phase, manually reset from outside enclosure.
- .3 Wiring and schematic diagram inside starter enclosure in visible location.
- .4 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.

.2 Combination type starters to include motor circuit interrupter with operating lever on outside of enclosure to disconnect motor circuit interrupter and provision for:
- .1 Locking in "OFF" position with up to 3 padlocks.
- .2 Independent locking of enclosure door.
- .3 Provision for preventing switching to "ON" position while enclosure door open.

.3 Accessories:
- .1 Selector switches: labeled as indicated.
- .2 Indicating lights: LED type and colour as indicated.
- .3 1-N/O and 1-N/C spare auxiliary contacts unless otherwise indicated.
- .4 Manual overload reset button on enclosure exterior.
- .5 Control transformer, minimum 150 VA.
- .6 Provide solid core AC current sensors in each and every starter enclosure. Wire all connections to a factory installed terminal strip.

.7 Provide mechanical relays and relay base in each and every starter enclosure. Unit to have 8-12 VDC coil and 120 VAC contacts to switch motor control circuit. Wire all connections to a factory installed terminal strip.

.8 All components and entire assembly to be CSA approved.

**2.4 CONTROL TRANSFORMER**

.1 Single phase, dry type, control transformer with primary voltage as indicated and 120 V secondary, complete with secondary fuse, installed in with starter as indicated.

.2 Size control transformer for control circuit load plus 20% spare capacity.

**2.5 FINISHES**

.1 Apply finishes to enclosure in accordance with Section 26 05 00 - Common Work Results for Electrical.

**2.6 EQUIPMENT IDENTIFICATION**

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Manual starter designation label, white plate, black letters, size 1, engraved as indicated.

.3 Magnetic starter designation label, white plate, black letters, engraved as indicated.

**3 Execution**

**3.1 INSTALLATION**

.1 Install starters and control devices in accordance with manufacturer's instructions.

.2 Install and wire starters and controls as indicated.

.3 Ensure correct fuses installed.

.4 Confirm motor nameplate and adjust overload device to suit.

**3.2 FIELD QUALITY CONTROL**

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical and manufacturer's instructions.

.2 Operate switches and 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.

## 3.3 CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.
  .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

# 1 General

## 1.1 REFERENCES

.1 Government of Canada
- .1 NBC-1995, National Building Code of Canada.

.2 Underwriter's Laboratories of Canada (ULC)
- .1 CAN/ULC-S524-1991, Installation of Fire Alarm Systems.
- .2 ULC-S525-1978, Audible Signal Appliances for Fire Alarm.
- .3 CAN/ULC-S526-1987(R1995), Visual Signal Appliances, Fire Alarm.
- .4 CAN/ULC-S527-1987(R1995), Control Units.
- .5 CAN/ULC-S528-1991, Manual Pull Stations.
- .6 CAN/ULC-S529-1987(R1995), Smoke Detectors.
- .7 CAN/ULC-S530-1991, Heat Actuated Fire Detectors.
- .8 CAN/ULC-S531-1987(R1995), Smoke Alarms.
- .9 CAN/ULC-S536-1997, Inspection and Testing of Fire Alarm Systems.
- .10 CAN/ULC-S537-1997, Verification of Fire Alarm Systems.

## 1.2 DESCRIPTION

.1 Fully supervised, microprocessor-based, fire alarm system, utilizing digital techniques for data control and digital, 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; remotely annunciating to existing Edwards Fire Alarm Control Panel.

.3 Zoned, non-coded, single stage.

.4 Modular in design to allow for future expansion.

## 1.3 REGULATORY REQUIREMENTS

.1 System:
- .1 To Fire Commissioner of Canada (FC) approval.

.2 System components: listed by ULC and comply with applicable provisions of National Building Code and meet requirements of local authority having jurisdiction.

## 1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Include:
- .1 Detail assembly and internal wiring diagrams for control unit.
- .2 Overall system riser wiring diagram identifying control equipment, initiating zones, 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.

## 1.5 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance data for fire alarm system for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

.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 List of recommended spare parts for system.

## 1.6 EXTRA MATERIALS

.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

## 1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 22 - Construction/Demolition Waste Management and Disposal, and with the Waste Reduction Workplan.

# 2 Products

## 2.1 MATERIALS

.1 Equipment and devices: ULC listed and labeled and supplied by single manufacturer.

## 2.2 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 and data gathering panel/transponder.
- .2 Indicate zone of alarm at central control unit.
- .3 Cause audible signaling devices to sound continuously throughout building and at central control unit.
- .4 Transmit signal to fire alarm control panel.
- .5 Cause air conditioning and ventilation fans to shut down or to function to provide required control of smoke movement.
- .6 Cause fire doors and smoke control doors, if normally held open, to close automatically.

.2 Acknowledging alarm: indicated at central control unit.

.3 Possible to silence signals by "alarm silence" switch at control unit, after 60s 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 and data gathering panel/transponder.
- .2 Indicate respective supervisory zone at central control unit and at remote annunciator.
- .3 Cause audible signal at central control unit to sound.
- .4 Activate common supervisory sequence.

.6 Resetting alarm 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.

.8 Trouble on system: suppressed during course of alarm.

.9 Trouble condition on any circuit in system not to initiate alarm conditions.

**2.3 CONTROL PANEL**

.1 Central control unit (CCU) exists. (Edwards).

**2.4 POWER SUPPLIES**

.1 120 V, 60 Hz as primary source of power for system.

.2 Voltage regulated, current limited distributed system power.

.3 Primary power failure or power loss (less than 102 V) will activate common trouble sequence.

.4 Interface with battery charger and battery to provide uninterruptible transfer of power to standby source during primary power failure or loss.

.5 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.

.6 Standby batteries: sealed, maintenance free.

.7 Continuous supervision of wiring for external initiating and alarm circuits to be maintained during power failure.

**2.5 INITIATING/ INPUT CIRCUITS**

.1 Receiving circuits for alarm initiating devices wired in DCLA configuration to Line Isolation Module.

.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 DCLA configuration to Line Isolation Module.

.5 Actuation of supervisory initiating device: cause system to operate as specified in "System Operation".

**2.6 AUXILIARY CIRCUITS**

.1 Auxiliary contacts for control functions.

.2 Actual status indication (positive feedback) from controlled device.

.3 Alarm and or supervisory on system to cause operation of programmed auxiliary output circuits.

.4 Upon resetting system, auxiliary contacts to return to normal or to operate as pre-programmed.

.5 Auxiliary circuits: rated at 2 A, 24 Vdc or 120 Vac, fuse-protected.

**2.7 WIRING**

.1 Twisted copper conductors: rated 300 V.

.2 To initiating circuits: 18 AWG minimum, and in accordance with manufacturer's requirements.

.3 To signal circuits: 16 AWG minimum, and in accordance with manufacturer's requirements.

.4 To control circuits: 14 AWG minimum, and in accordance with manufacturer's requirements.

**2.8 ANCILLARY DEVICES**

.1 Remote relay unit to initiate combi-oven shut down.

**2.9 STANDARD OF ACCEPTANCE**

.1 Edwards, to match existing equipment.

**3 Execution**

**3.1 INSTALLATION**

.1 Install systems in accordance with CAN/ULC-S524.

.2 Remove and reinstall devices as indicated.

.3 Splices are not permitted.

.4 Provide necessary raceways, cable and wiring to make interconnections to terminal boxes, annunciator equipment and CCU, as required by equipment manufacturer.

.5 Ensure that wiring is free of opens, shorts or grounds, before system testing and handing over.

.6 Identify circuits and other related wiring at central control unit, annunciators, and terminal boxes.

## 3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical and CAN/ULC-S537.

.2 Fire alarm system:

- .1 Test such device and alarm circuit to ensure devices transmit alarm to control panel and actuate general alarm.
- .2 Check annunciator panels to ensure zones are shown correctly.
- .3 Simulate grounds and breaks on alarm and signaling circuits to ensure proper operation of systems.
- .4 Addressable circuits system style DCLA:
  - .1 Test each conductor on all DCLA addressable links for capability of providing 3 or more subsequent alarm signals on each side of single open-circuit fault condition imposed near midmost point of each link. Operate Acknowledge/Silence switch after reception of each of the three (3) signals. Correct imposed fault after completion of each series of tests.
  - .2 Test each conductor on all DCLA addressable links for capability of providing 3 or more subsequent alarm signals during ground-fault condition imposed near midmost point of 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 DEPARTMENTAL Representative incorporating program changes made during construction.

## 3.3 DEMONSTRATION AND TRAINING

.1 Provide on-site lectures and demonstration by fire alarm equipment manufacturer to train operational personnel in use and maintenance of fire alarm system.