

PART 1 - GENERAL

- .1 This section supplements requirements of Division 01 - General Requirements.

1.2 CODES AND STANDARDS

- .1 Do complete installation in accordance with latest CSA C22.1-2015 except where specified otherwise.
- .2 Abbreviations for electrical terms: to latest version of CSA Z85.

1.3 VOLTAGE RATINGS

- .1 Operating voltages: to latest version of 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. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.4 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 Obtain an electrical work permit and pay associated fees for permit and for review of drawings.
- .3 The Departmental Representative will provide drawings and specification required by Electrical Inspection Department and Supply Authority at no cost.
- .4 Notify the Departmental Representative of changes required by Inspection Department prior to making changes.
- .5 Furnish Certificates of Acceptance from Electrical Inspection Department on completion of work to the Departmental Representative.
- .6 Within 30 days of award of contract, submit a list of suppliers and delivery dates for equipment.

### 1.5 DRAWINGS

- .1 Electrical drawings are not intended to show structural details or architectural features.
- .2 The electrical drawings are not to be scaled.
- .3 Except where dimensioned, drawings indicate general layouts only. Because of the small scale of drawings, it is not possible to show all offsets, fittings and accessories which may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings and accessories which are required to meet the conditions.

### 1.6 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

- .1 Submit shop drawings, product data and samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate details of construction, dimensions, capacities, weights and electrical performance characteristics of equipment or material.
- .3 Where applicable, include wiring, single line and schematic diagrams.
- .4 Include wiring diagrams or diagrams showing interconnection with work of other Sections.

### 1.7 AS-BUILT DRAWINGS

- .1 To be read in conjunction with Section 01 78 00 - Closeout Submittals.
- .2 Site records:
  - .1 Provide sets of white prints as required for each phase of the work. Mark thereon all changes as work progresses and as changes occur.
  - .2 On a weekly basis, transfer information to reproducibles, revising reproducibles to show all work as actually installed.
  - .3 Use different colour waterproof ink for each service.
  - .4 Make available for reference purposes and inspection at every job meeting.
- .3 As-built drawings:
  - .1 Prior to start of Testing, Adjusting and Balancing (TAB), finalize production of as-built drawings.

- .2 Identify each drawing in lower right hand corner in letters at least  $\frac{3}{4}$ " high as follows: "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW ELECTRICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (date).
  - .3 Submit to Departmental Representative for approval and make corrections as directed.
  - .4 TAB to be performed using as-built drawings.
  - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
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- .4 Submit copies of as-built drawings for inclusion in final TAB report.

#### 1.8 MATERIALS AND EQUIPMENT

- .1 Provide material and equipment in accordance with Division 01 - General Requirements.
- .2 Equipment & 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.

#### 1.9 ELECTRIC, MOTORS EQUIPMENT AND CONTROLS

- .1 Division 26, responsibilities are as follows:
  - .1 Control wiring and conduit is by Division 26 unless noted otherwise on Electrical Drawings.

#### 1.10 EQUIPMENT IDENTIFICATION

- .1 Switchboards, receptacles, panels, disconnect switches, transformers, magnetic starters, TOL's, etc. are to be provided with nameplates.
- .2 Nameplates:
  - .1 Lamacoid  $\frac{1}{8}$ " thick plastic engraving sheet, white face, black core, mechanically attached w/ pop rivets.

##### NAMEPLATE SIZES

Size 1	$\frac{7}{16}$ " x 2"	1 line	$\frac{1}{8}$ " high letters
Size 2	$\frac{1}{2}$ " x 2 $\frac{7}{8}$ "	1 line	$\frac{3}{16}$ " high letters
Size 3	$\frac{1}{2}$ " x 2 $\frac{7}{8}$ "	2 lines	$\frac{1}{8}$ " high letters
Size 4	$\frac{1}{2}$ " x 3 $\frac{1}{4}$ "	1 line	$\frac{3}{8}$ " high letters
Size 5	$\frac{1}{2}$ " x 3 $\frac{1}{2}$ "	2 lines	$\frac{3}{16}$ " high letters
Size 6	1" x 4"	1 line	$\frac{1}{2}$ " high letters
Size 7	1" x 4"	2 lines	$\frac{1}{2}$ " high letters

- .3 Wording on nameplates to be approved by the Departmental Representative prior to manufacture. Nameplates are to clearly indicate input source and output destination (name of equipment being fed), amperage, voltage, phasing and other information deemed necessary (such as rating of the fuses if different from the switch rating).
- .4 Allow for average of fifty (50) letters per nameplate.
- .5 Identification to be English and French.
- .6 Nameplates for terminal cabinets and junction boxes to indicate system and voltage characteristics.
- .7 Disconnects, starters and contactors: indicate equipment being controlled and voltage. For fusible switches, the nameplate shall indicate the maximum fuse size intended where the wire rating is less than the maximum rating of the switch.
- .8 On switchboard and distribution panels provide a nameplate for each branch breaker. It shall indicate the name and/or number of the equipment being fed.

#### 1.11 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. Identification shall be extended to outlet boxes of all power consuming devices. Use Panduit Nos. PLD-1 and PLD-2, write on self laminating labels. These labels shall be installed in such a manner as to present a white area with information in "flagged" position. Wrap the label around the conductor in "U" fashion and have it adhere to itself.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour code: to latest edition of CSA C22.1
- .4 Use colour coded wires in communication cables, matched throughout system.

#### 1.12 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 50' intervals and at least one (1) shall appear in every room.
- .3 All junction and/or pull boxes complete with their covers shall be colour coded. Boxes shall be coloured both inside and outside. Apply two (2) colours diagonally to each half of coverplates where required. Where only one (1) colour is required, the complete plate shall be painted.
- .4 Colours: 1" wide prime colour and ¾" wide auxiliary colour.

<u>Prime</u>	<u>Auxiliary</u>
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251V to 600V	Orange	
51 V to 250 V	Yellow	
0 V to 50 V	Violet	
Voice	Black	
Public Address	Blue	
Fire alarm	Red	
Emergency lighting and exit signs (AC)	Orange	White
Emergency lighting and exit signs (DC)	Brown	White
Ground or Bond	Green	
Security	Brown	

#### 1.13 WIRING TERMINATIONS

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

#### 1.14 MANUFACTURERS AND CSA LABELS

- .1 Visible and legible after equipment is installed.

#### 1.15 WARNING SIGNS

- .1 As specified and to meet requirements of Electrical Inspection Department and the Departmental Representative.
- .2 Porcelain enamel signs, minimum size 8" x 10".

#### 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.

#### 1.17 PROTECTION

- .1 Protect exposed live equipment during construction for personnel safety.
- .2 Shield and mark all live parts "LIVE 120 VOLTS", or with appropriate voltage in English.
- .3 Arrange for installation of temporary doors for rooms containing electrical distribution equipment. Keep those doors locked except when under direct supervision of electrician.

#### 1.18 CONDUIT AND CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pour of concrete. Sleeves through concrete: schedule 40 steel pipe sized for free passage of conduit, and protruding 2".
- .2 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 Test all wiring to ensure that no short or grounds are present on phase conductors for feeders and branch circuits and that insulation values are as required by the Canadian Electrical Code. Insulation resistance testing:
  - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
  - .2 Check resistance to ground before energizing.
  - .3 Perform megger tests to ground before energizing.
  - .4 Replace conductors if the reading is 500 MEGOHMS or less.
- .2 Submit test results to the Departmental Representative for review.
- .3 The Departmental Representative reserves the right to use any piece of electrical equipment, device or material installed under this Contract for such reasonable lengths of time and at such times as he may require to make a complete and thorough test of the same, before the final completion and acceptance of the work.

- .4 Such tests shall not be construed as evidence of acceptance of any of the work and no claim for damage will be accepted for any inquiry or breakage to any parts of the above, due to the aforementioned tests, where caused by weakness or workmanship of any kind whatsoever.

#### 1.20 FIREPROOFING

- .1 Fire seal any penetrations for conduits or cables running between rooms or floors. Fire ratings of walls/floors are to be maintained utilizing a proper firestop system. Firestop systems are to be tested to ASTM E-814 criteria.
- .2 Acceptable Manufacturers:
  - .1 3M
  - .2 Hilti
  - .3 Nelson
- .3 Caulking shall not be used as a firestopping method for PVC conduits.
- .4 Firestopping material shop drawings to be submitted for review by the Departmental Representative during Shop Drawing submittal stage.

#### 1.21 CLEANING

- .1 Do final cleaning in accordance with Division 01 - General Requirements.

#### 1.22 JUNCTION AND/OR PULL BOXES

- .1 Boxes and coverplates shall be colour coded as specified to match various systems' colour coding.
- .2 Junction and/or pull boxes installed above suspended ceilings are to be no greater than 30" above finished ceiling lines.

#### 1.23 CO-ORDINATION

- .1 Co-operate and investigate with other trades to make maximum use of spaces. Avoid conflict with pipes, ducts, etc. Prepare shop drawings indicating the route of main conduits, ducts and trays for submission to the Departmental Representative for approval.

- .2 Co-operate with other trades on the site and carry out the work, in such a way, as not to hinder or hold up the work of other trades.
- .3 Consult with other trades where their respective installations conflict and re-route conduits, ducts, outlets, equipment, etc. as required, subject to the approval of the Departmental Representative.
- .4 Obtain from the mechanical and other trades complete detailed wiring diagrams of equipment requiring connections and be responsible for pointing out any discrepancies or the reason why they cannot be adhered to.

#### 1.24 WASTE AND DISPOSAL MANAGEMENT

- .1 Collect, separate and recycle all site generated waste materials in accordance with Section 01 74 22 Construction/Demolition Waste Management and Disposal.
- .2 Coordinate all work related to Section 01 74 22 - Construction/Demolition Waste Management and Disposal with General Contractor.
- .3 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .4 Collect and separate for disposal, all packaging material in appropriate on-site bins for recycling in accordance with Section 01 74 22 - Construction/Demolition Waste Management and Disposal.
- .5 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.

END OF SECTION



## Part 1 - GENERAL

### 1.1 DESCRIPTION OF WORK

- .1 In general, work of this Section consists of removal/alternations of all existing fixtures, power and communication outlets in areas of renovation and any necessary materials, except those designated for re-use.
- .2 Contractor shall maintain circuit continuity to all equipment in areas not renovated, and to equipment to remain.
- .3 Contractor shall maintain and protect all electrical equipment passing through the renovated area to other areas and/or floors.

### 1.2 RELATED SECTIONS

- .1 General Provisions: Section 26 05 00 -Common Work Results - Electrical.

### 1.3 REFERENCE STANDARDS

- .1 All removal or modification work of electrical construction to be done in accordance with the safety standards outlined in the Canadian Electrical Code.

### 1.4 PROTECTION

- .1 Be responsible for any damages to existing structure as a result of the work.

### 1.5 SALVAGE MATERIAL

- .1 Materials and equipment identified on the drawing as being reused are to be taken down, stored, reinstalled, etc., as required to allow for new construction.
- .2 Contractor must identify any damaged equipment or materials intended for reuse prior to demolition and point out deficiencies to the Departmental Representative at the time.

### 1.6 DISPOSAL

- .1 All materials and equipment removed under work of this Section becomes the property of the Contractor unless indicated otherwise.

## 1.7 SCHEDULE

- .1 Overtime work and work outside normal work hours as deemed necessary to accomplish this scheduling are the responsibility of the Contractor and must meet the requirements of the Department of Labour. All costs resulting from such overtime must be included in the Contractor's Estimated Total Tender Price.
- .2 Fire Protection Services: i.e., fire alarm, emergency, exit lighting, and security systems are considered essential services and must be maintained in operation at all times.
- .3 All power shutdowns shall be coordinated with the Project Manager.

## PART 2 - EXECUTION

### 2.1 GENERAL REMOVALS

- .1 Remove all existing electrical service including exposed wire in the areas of renovation, except those designated for reuse.
- .2 Coordinate work of this Section with other trades.
- .3 Schedule all removal work with Project Manager. Do not disrupt operations except as permitted by the Schedule.

### 2.2 CLEANING

- .1 Reused existing equipment to be cleaned in accordance with Section 26 05 00 - Common Work Results Electrical.

END OF SECTION