



.1 Drawings

- .1 Consultants are to prepare drawings in AutoCAD format for all projects and submit a record set of drawings in AutoCAD and PDF formats at project completion.
- .2 Drawings shall be sufficiently detailed to provide complete electrical systems and shall indicate the following as a minimum:
 - .1 Legend of symbols
 - .2 Site plan with site services
 - .3 Site services details
 - .4 Power distribution details and layouts
 - .5 Communications risers and layouts
 - .6 Power distribution riser and bumpless transfer system details
 - .7 Emergency power distribution
 - .8 Exit and emergency lighting
 - .9 Fire alarm system riser and layout
 - .10 Cable tray system layout and details
 - .11 Major conduit runs for site services, AV equipment in lecture theatres, AV equipment in teaching spaces, assistive listening systems, and communications
 - .12 Mechanical and owner's equipment schedules
 - .13 Generator system layout, including standby and emergency auto-transfer switches.

.2 Codes and Standards

- .1 Codes and standards applicable to electrical installations for the University of Victoria Campus are as follows:
 - .1 British Columbia Building Code (BCBC) latest adopted edition
 - .2 Local Municipal Codes and Standards
 - .3 National Model Energy Code for Buildings (MNECB)
 - .4 Provincial Fire Marshall Regulations
 - .5 Workers' Compensation Board (WCB) Regulations
 - .6 Fire Marshall Act
 - .7 Applicable NFPA Regulations
 - .8 Canadian Electrical Code (CEC) latest adopted edition
 - .9 CSA Standards
 - .10 ULC Standards
 - .11 University of Victoria Communications Systems Guidelines
 - .12 Laboratory Bio Safety Guidelines
 - .13 IES (Illuminating Engineering Society) Standards

.3 Electric Motors, Equipment and Controls

- .1 Variable frequency drives for HVAC equipment are typically provided by mechanical contractors, however, electrical contractors are responsible for obtaining a copy of shop drawings for drives and insert them in electrical operating and maintenance manuals.



.4 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.
- .5 Group neutral with associated conductors in junction boxes.

.5 Conduit, Junction Box and Cable Identification

- .1 Junction box covers are to be colour coded as follows
 - .1 Fire Alarm – red
 - .2 Communications – Green
 - .3 Mechanical Controls – Blue
 - .4 Emergency Power – Yellow
 - .5 Audio-Visual and Intercom - Orange
 - .6 Security System - White
- .2 Colour coding for cables/wire shall be as follows: 25 mm wide prime colour and 20 mm wide auxiliary colour.

	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red
Communications Category 5E	Yellow	
Communications Category 6 or 6A	White	
Other Communication Systems	Green	Blue
Emergency Voice	Red	Blue
Other Security Systems	Red	Yellow

.6 Single Line Electrical Diagrams

- .1 Single line diagrams shall be provided on all new building projects, as follows:
 - .1 Provide laminated single line electrical diagram in main electrical room.
 - .2 Provide laminated fire alarm riser diagram, plan and zoning of building at fire alarm control panel and at remote annunciator.
 - .3 Where an indoor passive graphic is indicated on plans, provide graphic printed on photographic archival paper in a plexi-glass frame.
 - .4 Where an outdoor passive graphic is indicated on plans, provide aluminum sublimation graphic with an aluminum frame.
 - .5 Drawings: 600 x 600 mm minimum size.

.7 Mounting Heights

- .1 Mounting heights for electrical devices shall be as follows where possible. Where these heights cannot be achieved, obtain written instructions from the University of Victoria for alternate mounting heights.
- .2 In offices and laboratories, mounting heights for receptacles and communications outlets are generally 150mm above counter height, unless not physically possible.



- .3 Install electrical equipment at following heights unless indicated otherwise.
 - .1 Local switches: 1400 mm.
 - .2 Wall receptacles:
 - .1 General: 300 mm.
 - .2 Above top of continuous baseboard heater: 200 mm.
 - .3 Above top of counters or counter splash backs: 150 mm.
 - .4 In mechanical rooms: 1400 mm.
 - .3 Panelboards: as required by Code or as indicated.
 - .4 Communications outlets: 300 mm.
 - .5 Wall mounted telephone and intercom outlets: 1500 mm.
 - .6 Fire alarm stations: 1200 mm.
 - .7 Fire alarm bells: 2100 mm (or if in conflict with ceiling, 300mm below ceiling).
 - .8 Television outlets: 300 mm.
 - .9 Wall mounted speakers: 2100 mm.
 - .10 Clocks: 2100 mm.
 - .11 Thermostats: 1525mm
 - .12 Door bell pushbuttons: 1500 mm.
 - .13 Where possible, wall mounted devices such as lighting switched and thermostats shall be aligned vertically.

.8 Operating and Maintenance Manuals

- .1 Submit a copy of operating and maintenance manuals for review, two weeks prior to substantial completion. This will be reviewed and returned within one week.
- .2 Submit two hard copy sets and one digital copy set on CD of final operating and maintenance manuals for equipment or as requested by the general section of the contract two (2) weeks prior to substantial completion of the project. Include descriptive and technical data, all shop drawings, operating procedures, routine and preventative maintenance, wiring diagrams, spare parts lists, warranties, service companies, suppliers for replacement parts, test results, fire alarm certificate of verification, electrical inspection authority certificate and contract guarantee.
- .3 Hard copy manuals shall be inserted in “**RED**” coloured heavy duty three ring binders, with lettering on the spine identified as “OPERATING AND MAINTENANCE MANUAL”, project title and system names.
- .4 Obtain and include a copy of all variable frequency drive shop drawings provided by the mechanical contractor on the project in manuals.
- .5 Include in maintenance data:
 - .1 Details of design elements, construction features, component function and maintenance requirements, to permit effective start-up, operation, maintenance, repair, modification, extension and expansion of any portion or feature of installation.
 - .2 Technical data, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items, and parts list. Advertising, sales or generic literature is not acceptable. All operations and maintenance data must pertain to the specific products used.
 - .3 Wiring and schematic diagrams and performance curves.
 - .4 Names and addresses of local suppliers for items included in maintenance manuals.
 - .5 Copy of reviewed shop drawings
 - .6 Guaranties and Warranties information



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- .7 Test reports and systems demonstration: Include copies of all applicable test reports and manufacturer's letters verifying test completion.
 - .8 Certificates; Include a copy of final certificates from electrical inspection authority, fire chief, and other authorities having jurisdiction over the work.
 - .9 Schedules: All schedules included in the technical specifications (motor schedules, lighting fixture schedules, panel schedules, security zone schedules, fire alarm schedules, low voltage relay schedules, dimmer schedules, etc.) shall be updated to reflect all changes made during tender and construction period.