

1.1 ELECTRICAL SPECIFICATIONS

1. THE CONTRACTOR SHALL BE RESPONSIBLE TO COORDINATE, SUBMIT AND FACILITATE ALL ITEMS RELATED TO MANITOBA HYDRO PROGRAM INCENTIVES.
2. REFER TO SPECIFICATIONS AND OTHER GENERAL CONDITIONS.
3. PROVIDE FOR A COMPLETE AND FULLY WORKING INSTALLATION AS HEREIN SPECIFIED AND AS SHOWN ON DRAWINGS.
4. THE ELECTRICAL INSTALLATION SHALL BE IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE, PROVINCIAL AND MUNICIPAL CODES AND REGULATIONS AS MANDATED BY THE AUTHORITY HAVING JURISDICTION (AHJ) AND BY-LAWS.
5. OBTAIN ALL PERMITS, APPROVALS AND PAY ALL RELATED FEES REQUIRED FOR A FULLY FUNCTIONAL INSTALLATION.
6. ALL EQUIPMENT SUPPLIED UNDER THIS CONTRACT SHALL BE NEW AND BE C.S.A. AND OR UL/C APPROVED.
7. COORDINATE ALL CONDUIT RUNS AS SPECIFIED OR AS PER CONTRACT ADMINISTRATOR BEFORE INSTALLATION BEGINS.
8. ARRANGE FOR, COORDINATE, ROUGH-IN AND FINAL INSPECTIONS WITH INSPECTION AUTHORITIES AND FORWARD INSPECTION RESULTS TO CONTRACT ADMINISTRATOR.
9. VISIT EXISTING SITE WHERE SUCH EQUIPMENT IS PRESENTLY INSTALLED, AND/OR OBTAIN OUTLETS, WIRING AND RECEPTACLE CONFIGURATIONS FROM EQUIPMENT MANUFACTURERS. EXACT CONFIGURATIONS MAY DIFFER FROM THOSE SHOWN ON THE DRAWINGS. INCLUDE ALL COSTS TO PROVIDE NECESSARY WIRING, OUTLETS, RECEPTACLES AND CERTIFICATIONS TO CSA OR UL/C.

1.2 EXAMINATION

1. EXAMINE IN-CONTRACT DOCUMENTS/DRAWINGS TO ENSURE WORK UNDER THIS CONTRACT CAN BE SATISFACTORILY CARRIED OUT. REPORT ANY DISCREPANCIES TO THE CONTRACT ADMINISTRATOR.
2. THE CONTRACTOR SHALL EXAMINE THE SITE, LOCAL CONDITIONS AND CONSIDER HOW THEY MAY AFFECT THE PROJECT.

1.3 SUPERVISION

1. SUPERVISE THE WORK AT ALL TIMES THROUGH A RESPONSIBLE AND COMPETENT JOURNEMEN ELECTRICIAN / SUPERVISOR.
2. FULL COOPERATION SHALL BE SHOWN WITH OTHER TRADES TO FACILITATE INSTALLATIONS AND TO AVOID DELAYS IN CARRYING OUT THE WORK.

1.4 ACCURACY OF DATA

1. DRAWINGS ARE SCHEMATIC; EXACT LOCATIONS, DISTANCES, LEVELS AND OTHER DIMENSIONS SHALL BE GOVERNED BY THE BUILDING AS CONSTRUCTED.
2. OUTLETS OR EQUIPMENT SHALL BE MOVED TO ANY POINT WITHIN A 10' RADIUS WHEN RELOCATION IS REQUESTED BY THE CONTRACT ADMINISTRATOR BEFORE THE WORK HAS BEEN SUBSTANTIALLY COMPLETED, WITHOUT ADDITIONAL COST.

3. BRANCH CIRCUIT WIRING SHALL BE INSTALLED WITH CIRCUITS ARRANGED EXACTLY AS SHOWN ON THE DRAWINGS. CONDUIT AND CABLE RUNS MAY BE MODIFIED TO SUIT THE INSTALLATION AND CODE.

1.5 APPROVAL OF MATERIAL

1. REQUEST FOR APPROVAL OF MATERIAL AS EQUALS OR ALTERNATES TO THAT SPECIFIED SHALL BE SUBMITTED TO THE CONTRACT ADMINISTRATOR IN ACCORDANCE WITH TENDER CONDITIONS.

1.6 SHOP DRAWINGS

1. PROVIDE SHOP DRAWINGS FOR REVIEW TO THE CONTRACT ADMINISTRATOR. THE SHOP DRAWINGS MUST BE ASSEMBLED AS COMPLETE WITH SPECIFICATION, DIMENSIONS AND DRAWINGS.
2. THE REVIEW OF THE SHOP DRAWINGS IS FOR THE SOLE PURPOSE OF ASCERTAINING CONFORMANCE WITH THE GENERAL DESIGN CONCEPT. THE REVIEW SHALL NOT MEAN APPROVAL OF THE DETAILED DESIGN INHERENT IN THE EQUIPMENT, THE RESPONSIBILITY FOR WHICH SHALL REMAIN WITH THE CONTRACTOR. THE REVIEW SHALL NOT RELIEVE THE CONTRACTOR OF THE RESPONSIBILITY TO MEET THE REQUIREMENTS OF THE CONTRACT DOCUMENTS. THE CONTRACTOR SHALL REMAIN RESPONSIBLE FOR CONFIRMING AND CORRELATING THE DIMENSIONS ON THE JOBSITE, AND FOR INFORMATION THAT PERTAINS TO THE FABRICATION PROCESS, CONSTRUCTION TECHNIQUES, AND INSTALLATION DETAILS, AND FOR COORDINATING ALL WORK OF THE RELATED SUB-TRADES.
3. FABRICATION OF EQUIPMENT SHALL NOT COMMENCE UNTIL SHOP DRAWINGS OF SUCH EQUIPMENT HAVE BEEN REVIEWED AND APPROVED THROUGH THE CONTRACT ADMINISTRATOR. WHERE REQUIRED, TWO SETS SHALL BE SUBMITTED WITH LOCAL INSPECTION DEPARTMENT APPROVAL.
4. THE ELECTRICAL SUB-CONTRACTOR SHALL REVIEW ALL APPLICABLE MECHANICAL SHOP DRAWINGS - REQUIRING ELECTRICAL CONNECTION- AND COORDINATE VOLTAGE AND SIZES WITH MECHANICAL SUB-CONTRACTOR AND CONTRACTOR.

1.7 AS-BUILT DRAWINGS

1. KEEP A RECORD SET OF DRAWINGS ON-SITE AT ALL TIMES RECORDING ANY CHANGES THAT MAY OCCUR. SUBMIT THESE DRAWINGS TO THE CONTRACT ADMINISTRATOR UPON COMPLETION OF PROJECT. AS-BUILTS SHALL INCLUDE TAGGING EXISTING AND NEW CIRCUITS AND EQUIPMENT IN AREA OF WORK.
2. SUBMIT A CERTIFICATE OF INSPECTION FROM THE LOCAL INSPECTION AUTHORITY UPON COMPLETION OF WORK.

3. THE CONTRACT ADMINISTRATOR RESERVES THE RIGHT TO RECOMMEND A PORTION OF THE CONTRACT FUNDS BE WITHHELD PENDING SUBMISSION (PDF VERSION AND (3) SET HARD COPIES) OF ACCEPTABLE ON-SITE REDLINE DRAWINGS, AS-BUILT DRAWINGS, CONTROLS DIAGRAMS, OPERATING AND MAINTENANCE MANUALS.

1.8 TESTING

1. THE ELECTRICAL INSTALLATION SHALL BE COMPLETELY TESTED DEMONSTRATING THE EQUIPMENT AND SYSTEMS INSTALLED PERFORM IN THE MANNER INTENDED.

1.9 GUARANTEE

1. THE SATISFACTORY OPERATION OF ALL WORK SHALL BE GUARANTEED FOR A PERIOD OF 12 CALENDAR MONTHS AFTER FINAL ACCEPTANCE.

1.10 REQUEST FOR CHANGE

1. ALL QUOTATIONS IN RESPONSE TO REQUEST FOR CHANGE SHALL BE SUBMITTED COMPLETE WITH AN ITEMIZED COST BREAKDOWN OF ALL MATERIALS AND LABOUR REQUIRED IN THE CHANGE.

1.11 GROUNDING AND BONDING

1. THE ENTIRE INSTALLATION SHALL BE GROUNDED AND BONDED IN ACCORDANCE WITH THE EDITION OF CANADIAN ELECTRICAL CODE MANDATED BY AHJ AND BY-LAWS.

1.12 WORKMANSHIP

1. INSTALL EQUIPMENT, CONDUIT AND CABLES IN A WORKMANLIKE MANNER TO PRESENT A NEAT APPEARANCE TO THE SATISFACTION OF THE CONTRACT ADMINISTRATOR. INSTALL CONDUITS AND CABLE TO RUN PARALLEL AND/OR PERPENDICULAR TO BUILDING GRID LINES, COLUMNS, IN CEILING SPACES, CHASES & BEHIND FLOORING. IN AREAS WHERE SYSTEMS ARE TO BE EXPOSED, INSTALL NEATLY AND GROUP TO PRESENT A TIDY APPEARANCE.
2. AS REQUIRED BY CODE, INSTALLED EQUIPMENT AND APPARATUSES REQUIRING MAINTENANCE, ADJUSTMENT OR EVENTUAL REPLACEMENT TO HAVE ADEQUATE CLEARANCES AND ACCESSIBILITY WITH ACCESS DOOR/HATCHES AT NO-COST.
3. INCLUDE IN WORK ALL REQUIREMENTS SHOWN ON THE SHOP DRAWINGS OR MANUFACTURERS' INSTALLATION INSTRUCTIONS.
4. WORK UNSATISFACTORY TO THE CONTRACT ADMINISTRATOR SHALL BE REWORKED WITHOUT EXTRA COST.
5. USE OF CLIPS FOR SECURING AC80 TO CEILING SYSTEM IS PROHIBITED.

6. ALL CONDUITS MUST BE CLIPPED TO STRUCTURAL CONCRETE BY MEANS OF SUITABLE ANCHORS OR SUPPORTED BY UNISTRUT HANGERS AS CLOSE TO UPSIDE AS POSSIBLE. THE WRAPS FOR WIRE HANGING AND FASTENING IS NOT ACCEPTABLE. PERFORATED STRAPPING IS ALSO UNACCEPTABLE. ALL ELECTRICAL COMPONENTS MUST BE SUPPORTED INDEPENDENTLY AND MEET CODE.

7. ALL ELECTRICAL SUPPORTS AND HANGER SHALL CONFORM TO EDITION OF CANADIAN ELECTRICAL CODE MANDATED BY AHJ AND BYLAWS INCLUDING MANUFACTURERS' INSTALLATION INSTRUCTIONS.

2.0 MATERIALS AND INSTALLATION

2.1 OUTLET BOXES

1. OUTLET, JUNCTION AND SWITCH BOXES SHALL BE GALVANIZED PRESSED STEEL OF SIZE AND TYPE TO SUIT EACH INDIVIDUAL APPLICATION.
2. COMMERCIAL DUTY DUPLEX RECEPTACLES, DATA FACEPLATES SHALL BE "DECORA" STYLE, WHITE & CSA APPROVED, ON STAINLESS STEEL FACE PLATES MOUNTED 18" ABOVE FINISHED FLOOR OR OTHERWISE NOTED.
3. LIGHT SWITCHES SHALL BE MOUNTED 42" ABOVE FINISHED FLOOR OR OTHERWISE NOTED.
4. OUTLETS SHALL NOT BE LOCATED ANYWHERE ON THE EXTERIOR CURTAIN WALL. OUTLETS SHOWN SHALL BE MOUNTED ON THE NEAREST DIVIDING WALL 2" FROM OUTSIDE WALL, OR NEAREST FURRED OUT COLUMN.
5. PROVIDE ALL REQUIRED ACCESS PANELS WITH SUITABLE FIRE RATINGS FOR THE WALL OR CEILING THEY ARE BEING INSTALLED IN.
6. DO NOT INSTALL OUTLETS BACK-TO-BACK IN WALL. RECEPTACLES & DATA DEVICE BOXES ON SAME SIDE OF WALL SHALL BE ON CENTER.

2.2 WIRING METHODS & SUPPORTS

1. EXISTING WIRING INCLUDING INSULATION THAT IS FRAYED, CRACKED OR DEEM NOT TO CODE SHALL BE REPLACED TO MEET CODE.
2. UNLESS OTHERWISE SHOWN ON THE DRAWINGS, ALL WIRE SHALL BE COPPER, MINIMUM #12 AWG WITH 90 DEGREES CELSIUS X-LINK INSULATION IN STEEL ELECTRICAL METALLIC TUBING (EMT) CONDUIT (INCLUDING WIRING ON ROOF DECK FLUTES WHERE APPROVED).
3. WIRING IN CONCRETE OR MASONRY CONSTRUCTION SHALL BE INSTALLED IN EMT. PROVIDE A SEPARATE GROUNDING CONDUCTOR IN EMT EMBEDDED IN CONCRETE SLABS. CONDUITS INSTALLED IN AREAS EXPOSED TO MOISTURE OR OUTSIDE SHALL HAVE WATERTIGHT FITTINGS.
4. ALL WIRING IN FINISHED AREAS SHALL BE CONCEALED. ALL CONDUCTORS AND CONDUITS SHALL BE RUN PERPENDICULAR OR PARALLEL TO THE BUILDING CORE WALLS.
5. CONDUIT AND WIRING SHALL BE GROUPED WHERE POSSIBLE AND CLIPPED IN A NEAT AND WORKMANLIKE MANNER.
6. HOME RUNS SHALL BE IN CONDUIT.
7. EACH CIRCUIT FOR COMPUTER EQUIPMENT, PRINTERS AND COPIERS SHALL HAVE A SEPARATE NEUTRAL CONDUCTOR.
8. PROVIDE ONE ISOLATED GROUND CONDUCTOR PER THREE 2 WIRE ISOLATED GROUND CIRCUITS.
9. CONDUIT RUNS SHALL BE INSTALLED AND INSPECTED BEFORE AC-90 RUNS ARE INSTALLED.
10. THREE WIRE AC-90 SHALL NOT BE USED FOR ISOLATED GROUND WIRING, UNLESS IT INCLUDES A GREEN INSULATED CONDUCTOR FOR THIS PURPOSE.
11. ALL AC90 USED FOR DROPS SHALL BE RUN TIGHT TO DECK AND FOLLOW LINES OF BEAMS AND BUILDING.
12. ALL WIRING IN SERVICE AREAS CAN BE SURFACE MOUNTED EMT. DO NOT RUN CONDUITS HORIZONTALLY ON WALLS. VERTICAL DROPS ONLY.
13. ALL BRANCH CIRCUIT WIRING AND CONDUITS SHALL BE INSTALLED TO MINIMIZE VOLTAGE DROP. INSTALL ADDITIONAL CONDUIT RUNS AS REQUIRED TO TAKE THE MOST DIRECT, SHORTEST ROUTE TO OUTLETS, LIGHT FIXTURES, ETC. AND MEET THE METHODS ABOVE.

14. INSTALLATION IN RACEWAYS

1. ENSURE CONDUITS ARE DRY AND FREE OF DEBRIS BEFORE PULLING CABLES.
2. CONDUITS AND BOX COVERS COLOUR CODING AND IDENTIFICATION AS PER CEC AND EXISTING SYSTEM IDENTIFICATION.
3. WIRES IN OUTLETS, JUNCTIONS AND SWITCH BOXES, NOT HAVING A CONNECTION WITHIN BOX SHALL NOT BE SPLICED, BUT SHALL CONTINUE UNBROKEN THROUGH THE BOX.
4. BRANCH CIRCUITS (15A-1P) EXCEEDING 88 FEET SHALL BE #10 AWG, BRANCH CIRCUITS (15A-1P) EXCEEDING 115 FEET SHALL BE #8 AWG OR UNLESS OTHERWISE NOTED.
15. INSTALLATION OF SINGLE CONDUCTOR CABLES
1. SINGLE CONDUCTOR CABLES SHALL BE INSTALLED ONE CABLE DIAMETER APART ON SUSPENDED CABLE TRAY OR CHANNEL SUPPORTS AND SHALL BE CLAMPED WITH CODE COMPLIANT CABLE CLAMPS. CABLES SHALL BE TERMINATED USING NON-MAGNETIC CONNECTOR COVERS. CABLE ARMOUR SHALL BE GROUNDED VIA A PLATE AT THE SUPPLY END AND ISOLATED VIA AN INSULATING PLATE, AT THE LOAD END OF THE CABLE. A #10 AWG BARE STRANDED (UNLESS OTHERWISE NOTED) COPPER GROUND WIRE SHALL BE INSTALLED WITH EACH FEEDER. CABLE BENDING RADIUS SHALL BE AT LEAST TWELVE TIMES THE OVERALL CABLE DIAMETER AND BENDS SHALL NOT DAMAGE OR DISTORT THE OUTER SHEATH.
2. PLENUM RATED PVC JACKETED CABLES SHALL BE USED IN APL PLENUMS. NON-PLENUM RATED CABLES ALLOWABLE IN EMT.
3. SINGLE CONDUCTOR CABLES INSTALLED UNDERGROUND SHALL BE IN THE INSTALLATION CONFIGURATION OUTLINED IN THE CANADIAN ELECTRICAL CODE TO PROVIDE THE ALLOWABLE IMPACT REQUIRED FOR THE FEEDER.

16. INSTALLATION OF FLEXIBLE ARMoured CABLE

1. TYPE AC90 ARMoured CABLE (BX) SHALL BE USED FOR CONNECTIONS FROM CONDUIT SYSTEMS TO EQUIPMENT OR RECESSED LUMINAIRES IN ACCESSIBLE CEILINGS. CABLE TO BE OF SUFFICIENT LENGTH TO ALLOW THE LIGHTING FIXTURE TO BE RELOCATED TO ANY LOCATION WITHIN A 6' RADIUS. CABLE SHALL BE CLAMPED BEFORE ENTERING THE LIGHTING FIXTURE AND SHALL BE CLIPPED BEFORE ENTERING THE CONDUIT SYSTEM JUNCTION BOX.
17. INSTALLATION IN EQUIPMENT
1. GROUP AND LACE-IN NEATLY WIRE AND CABLE INSTALLED IN SWITCHBOARDS, PANELBOARDS, CABINETS, WIRE WAYS AND OTHER SUCH ENCLOSURES.
2. TERMINATIONS
3. TERMINATE WIRES AND CABLES WITH APPROPRIATE CONNECTORS IN AN APPROVED MANNER.

18. IDENTIFICATION

1. WIRE IN CONDUIT #2 AWG AND SMALLER SHALL HAVE SOLID COLOURED INSULATION, COLOUR CODED AS PER CANADIAN ELECTRICAL CODE.
2. WIRE IN CONDUIT 10 AWG AND LARGER AND SINGLE CONDUCTOR CABLES FOR NORMAL POWER FEEDERS SHALL BE IDENTIFIED AT EACH OUTLET BOX AND TERMINATION WITH A 6" BAND OF COLOURED VINYL TAPE OF THE APPROPRIATE COLOUR. EMERGENCY POWER FEEDERS SHALL BE PROVIDED WITH AN ADDITIONAL 3-1/2" BAND OF RED VINYL TAPE INSTALLED ADJACENT TO THE 6" BAND OF THE COLOURED PHASE IDENTIFICATION TAPE. AS LISTED BELOW. NEUTRAL AND GROUND CONDUCTORS SHALL BE IDENTIFIED. PAINT OR OTHER MEANS OF COLOURING THE INSULATION SHALL NOT BE USED.
3. IDENTIFY CONTROL CONDUCTORS IN MOTOR CONTROL EQUIPMENT, CONTACTORS, ETC. WITH MYLAR/CLOTH WIRE MECHANICAL MARKERS. HAND WRITING NOT PERMITTED.

19. SUPPORT PRODUCT

1. SUPPORT CHANNELS (GALVANIZED STEEL)
2. U-SHAPE, SIZE 1-1/2" x 1-1/2" x 3/32" (MINIMUM) THICK, SURFACE MOUNTED, SUSPENDED OR SET IN POURED CONCRETE WALLS AND CEILINGS OR AS REQUIRED.
3. MANUFACTURERS: B-LINE, BURNOY, ELECTROVOLT, UNISTRUT, PILGRIM, PULSLEY.

20. SUPPORT EXECUTION

1. INSTALLATION
2. SECURE EQUIPMENT TO STRUCTURALLY SOUND MEMBERS WITH APPROVED ANCHORS.
3. SECURE EQUIPMENT TO POURED CONCRETE WITH CAST-IN OR EXPANDABLE INSERTS.
4. SECURE EQUIPMENT TO HOLLOW MASONRY WALLS WITH TOGGLE BOLTS.
5. SUPPORT EQUIPMENT, CONDUIT OR CABLES USING CLIPS. SPRING LOADED BOLTS, CABLE CLAMPS DESIGNED AS ACCESSORIES TO BASIC CHANNEL MEMBERS.
6. FASTEN EXPOSED CONDUIT OR CABLES TO BUILDING CONSTRUCTION OR SUPPORT SYSTEM USING STRAPS.
7. ONE-HOLE MALLEABLE IRON STRAPS TO SECURE SURFACE CONDUITS AND CABLES FOR 2" AND SMALLER.
8. TWO-HOLE STEEL STRAPS FOR CONDUITS AND CABLES LARGER THAN 2".
9. BEAM CLAMPS TO SECURE CONDUIT TO EXPOSED STEEL WORK.
10. SUSPENDED SUPPORT SYSTEMS.
11. SUPPORT INDIVIDUAL CABLE OR CONDUIT RUNS WITH 1/4" (MINIMUM) DIAMETER THREADED RODS AND SPRING CLIPS.
12. SUPPORT (2) OR MORE CABLES OR CONDUITS ON CHANNELS SUPPORTED BY 1/4" (MINIMUM) DIAMETER THREADED ROD HANGERS WHERE DIRECT FASTENING TO BUILDING CONSTRUCTION IS IMPRACTICAL.
13. FOR SURFACE MOUNTING OF TWO OR MORE CONDUITS USE CHANNELS AT 60" O/C SPACING.
14. PROVIDE METAL BRACKETS, FRAMES, HANGERS, CLAMPS AND RELATED TYPES OF SUPPORT STRUCTURES WHERE INDICATED OR AS REQUIRED TO SUPPORT CONDUIT AND CABLE RUNS.
15. ENSURE ADEQUATE SUPPORT FOR RACEWAYS AND CABLES DROPPED VERTICALLY TO EQUIPMENT WHERE THERE IS NO WALL SUPPORT.
16. DO NOT USE WIRE LASHING OR PERFORATED STRAP TO SUPPORT OR SECURE RACEWAYS OR CABLES.
17. DO NOT USE SUPPORTS OR EQUIPMENT INSTALLED FOR OTHER TRADES FOR CONDUIT OR CABLE SUPPORT EXCEPT WITH PERMISSION OF OTHER TRADES AND APPROVAL OF CONTRACT ADMINISTRATOR.
18. INSTALL FASTENINGS AND SUPPORTS AS REQUIRED FOR EACH TYPE OF EQUIPMENT CABLES AND CONDUITS, AND IN ACCORDANCE WITH MANUFACTURERS' INSTALLATION RECOMMENDATIONS.
19. THREADED ROD TO BE MINIMUM 1/4" DIAMETER GALVANIZED OR NICKEL PLATED. BLACK STEEL ROD IS NOT ACCEPTABLE.

2.3 IDENTIFICATION OF EQUIPMENT AND WARNING SIGNS

1. ALL NEW EQUIPMENT SHALL BE IDENTIFIED WITH 3/4" HIGH LETTERS/NUMBERS ON 1" HIGH ENGRAVED LAMACOID NAMEPLATES. PROVIDE ADDITIONAL NEW 1/4" HIGH LETTERS/NUMBERS ON 1/2" HIGH ENGRAVED LAMACOID BENEATH TO INDICATE PANEL-CIRCUIT OF NEW EQUIPMENT. LAMACOIDS SHALL BE EITHER SCREWED OR RIVETED IN PLACE.
2. RECEPTACLES AND LIGHTING SWITCHES CAN BE SELF ADHESIVE TYPE WITH 1/4" HIGH LETTERS/NUMBERS ON 1/2" HIGH TAPE.
3. NORMAL POWER AND COMMUNICATION DEVICES; MECHANICAL PRODUCED WHITE LETTERING ON BLACK FACE.
4. EMERGENCY POWER CIRCUITS, LAMACOIDS/TAPES SHALL BE MECHANICAL PRODUCED RED LETTERING ON WHITE FACE.
5. FIRE ALARM DEVICES, LAMACOID/TAPES SHALL BE MECHANICAL PRODUCED WHITE LETTERING ON RED FACE.
6. PROVIDE MINIMUM 2" HIGH ENGRAVED LAMACOIDS FOR EACH NEW MD, COP & PANELBOARDS, INDICATING PANEL ID, "V-PH-7W", "FED FROM PANEL", "LOCATED IN RM." ON PANELBOARDS UNUSED CIRCUITS, LABEL "SPARE" OR "SPACE" ON PANEL LIST.
7. MANUFACTURERS NAMEPLATES, CERTIFICATION LABELS AND CSA LABELS SHALL BE VISIBLE AND LEGIBLE AT EQUIPMENT INSTALLED LOCATIONS.

8. PROVIDE WARNING SIGNS ON EQUIPMENT, AS REQUIRED, TO MEET THE REQUIREMENTS OF THE INSPECTION AUTHORITIES, INCLUDING INDICATION OF MULTIPLE POWER SOURCES, ARC FLASH LABELLING.

2.4 LUMINAIRES

1. SUPPLY AND INSTALL LUMINAIRES AND ASSOCIATE COMPONENTS, AS PER LUMINAIRE SCHEDULE TO OPERATE AS INTENDED WITH MANUFACTURES INSTRUCTIONS.
2. ALL LUMINAIRES SHALL BE 4000 K, UNLESS NOTED OTHERWISE.
3. ALL SWITCHING SHALL BE RUN IN CONDUIT.

2.5 CUTTING AND PATCHING

1. ARRANGE AND PAY FOR ALL CUTTING AND PATCHING AS REQUIRED FOR THE ELECTRICAL INSTALLATION.
2. PROVIDE & INSTALL APPROPRIATE FIRE STOP AT ALL FIRE WALL & OR FLOOR PENETRATIONS. ACCEPTABLE MANUFACTURERS: HILT, DOW CORNING, FIRE-STOP SYSTEMS (ELASTA-SEAL) OR G.E. SILCOKE.
3. REFER TO MANUFACTURERS' SPECIFICATIONS FOR PRODUCT AND INSTALLATION DETAILS.

2.6 DEVICES

1. COLORS OF RECEPTACLES, SWITCHES, AND OUTLETS SHALL MATCH EXISTING SYSTEMS, UNLESS NOTED OTHERWISE.
2. SWITCHES SHALL BE COMMERCIAL QUALITY "DECORA" STYLE, HUBBELL, ARROW HART, BRYANT, LEVITON, WOODHEAD, PASS & SEYMOUR. MOUNT SWITCHES 42" ABOVE FINISH FLOOR. UNLESS OTHERWISE NOTED.
3. ACCEPTABLE MANUFACTURERS FOR "DECORA" STYLE RECEPTACLES SHALL BE HUBBELL, ARROW HART, BRYANT, LEVITON, WOODHEAD, PASS & SEYMOUR. MOUNT RECEPTACLES 18" ABOVE FINISH FLOOR, UNLESS OTHERWISE NOTED.
4. PROVIDE STAINLESS STEEL FACEPLATES FOR DEVICES.

2.7 SERVICE ENTRANCE/TRANSFER DISTRIBUTION

1. GENERAL
1. SCOPE
- FURNISH AND INSTALL PANELS WITH ARRANGEMENT AS SHOWN ON DRAWINGS. THE DISTRIBUTION SHALL BE INDOOR WITH THE FOLLOWING MAJOR COMPONENTS:
- 1 MD
- 2 COP
- 3 PANELBOARDS
- 4 MAIN BREAKERS
- 5 TRANSFORMERS
2. CODES AND STANDARDS
- THE COMPONENTS AND ACCESSORIES SHALL CONFORM TO THE REQUIREMENTS OF:
1. CSA C22.1 - CANADIAN ELECTRICAL CODE
2. CANADIAN CODE - EMERGENCY ELECTRICAL POWER SUPPLY FOR BUILDINGS
3. NFPA 710 - EMERGENCY AND STANDBY POWER SYSTEMS
4. IEEE STANDARD 446 - IEEE RECOMMENDED PRACTICE FOR EMERGENCY AND STANDBY POWER SYSTEMS FOR COMMERCIAL AND INDUSTRIAL APPLICATIONS
5. CSA C22.2 NO. 29 ENCLOSED PANELS
3. PRODUCTS
- 3.1 MAIN BREAKER
1. THE MAIN BREAKER SHALL BE RATED AS PER CODE.
2. THE BREAKER SHALL BE SUITABLE FOR CONNECTION WITHOUT INVERTING THE BREAKER.
- 3.2 (MD-1)
1. RATED 800A, 120/208V, 3-PHASE, 4-WIRE
2. COPPER BUS
3. MINIMUM 8 CIRCUITS
4. THE MD SHALL BE INSTALLED AS AN INTEGRAL PART OF THE SERVICE ENTRANCE.
- 3.3 (COP-EPI)
1. RATED 800A, 120/208V, 3-PHASE, 4-WIRE
2. COPPER BUS
3. MINIMUM 14 CIRCUITS
- 3.4 ACCEPTABLE MANUFACTURERS
1. EATON, SCHNEIDER, CGE, CUTLER-HAMMER, SIEMENS OR JRS.
2. ANY REQUESTS FOR ALTERNATES SHALL BE SUBMITTED TO THE CONTRACT ADMINISTRATOR AS PER TENDER. EACH ALTERNATE REQUEST MUST LIST DETAILS OF ALL COMPARABLE FEATURES AND ANY DEVIATIONS FROM THIS SPECIFICATION.
- 3.5 PANELBOARDS
1. SUBMIT SHOP DRAWINGS
2. DRAWINGS SHALL INCLUDE ELECTRICAL DETAIL OF PANEL, BRANCH BREAKER TYPE, QUANTITY, AMPACITY AND ENCLOSURE DIMENSION.
3. INSTALL CIRCUIT BREAKERS IN PANELBOARDS BEFORE SHIPMENT.
4. PANELBOARDS SHALL BE PRODUCT OF ONE MANUFACTURER THROUGHOUT PROJECT.
5. EACH BREAKER SHALL BE IDENTIFIED BY PERMANENT NUMBER IDENTIFICATION AS TO CIRCUIT NUMBER.
6. PANELBOARDS, MAINS, NUMBER OF CIRCUITS, AND NUMBER AND SIZE OF BRANCH CIRCUIT BREAKERS AS INDICATED.
7. TWO KEYS FOR EACH PANELBOARD AND KEY PANELBOARDS ALIKE.
8. COPPER BUS WITH FULL SIZE NEUTRAL.
9. FLUSH OR SURFACE-MOUNTED TUBS AS SHOWN.
10. FINISH TRIM AND DOOR BAKED GREY ENAMEL.
- 3.6 BREAKERS
1. BREAKERS WITH THERMAL MAGNETIC TRIPPING IN PANELBOARDS, UNLESS OTHERWISE NOTED.
2. MAIN BREAKER: MOUNTED ON TOP OR BOTTOM OF PANEL TO SUIT CABLE ENTRY.
- 3.7 TRANSFORMER
1. TYPE: DRY TYPE, STEP-UP, CERTIFIED FOR WALL MOUNTING WITH 2" MINIMUM WALL CLEARANCE.
- 1.1. COPPER CONDUCTORS, 458BA (AVG. SOUND LEVEL), 98% MIN EFFICIENCY @ 35% LOAD 75°C (CSA CR22), GROUND LVS, NEOPRENE ANTI-VIBRATION PADS BETWEEN CORE, CSA CERTIFIED, UL LISTED
2. RATING: 30kVA
3. TEMPERATURE RISE: 150°C
4. PHASES: 3
5. FREQUENCY: 60Hz
6. VOLTAGE: PRIMARY: 208, SECONDARY: 800
7. ACCEPTABLE UNIT: REX POWER MAGNETICS MODEL BC308-JU2, MUST BE CERTIFIED FOR 2" MINIMUM WALL CLEARANCE.
- 3.8 GENERATOR, WINTERIZED SOUND ENCLOSURE, FUEL TANK, ATS AND CONTROLLER
1. REFER TO BID OPPORTUNITY PART "E" SPECIFICATIONS.
- 3.9 SURGE PROTECTION DEVICE (SPD)
1. AC SERVICE TYPE, 3PH, WYE
2. AC LINE VOLTAGE: 120/208
3. FREQUENCY RANGE: 50/60 Hz
4. SINGLE ELEMENT PROTECTION MODES: L-N/L-L&G
5. VPR RATING (UL 1449 @ 20kA, 1k, 700/1000)
6. MAX SINGLE ELEMENT SURGE CURRENT PER MODE/PER PHASE: 80/350
7. TOTAL SURGE CAPACITY: 1000 kA @ 8/20 microsecond PULSE
8. MAX. CONTINUOUS OPERATING VOLTAGE (MCOV): 150/200
9. ACCEPTABLE UNIT: SURGE PURE MODEL, MACH 5 SPD SYSTEM MODEL MS-1208-4, SCHNEIDER ELECTRIC
- 3.10 LOAD BANK CONNECTION TAP BOX (TAP BOX)
1. RATING: 800A, 3PH, 4 POLE, 5 WIRE, 208/120 VAC
2. ENCLOSURE: WALL MOUNTED, MILD STEEL FINISH SHALL BE POWDER COATED RAL 1015, NEMA 3R OUTDOOR RATED
3. AGENCY APPROVED: AS LISTED (INNER PANEL), AS LISTED 1775 (OUTER PANEL)
4. FEATURES: COLOUR CODED CABLE LOCKS (NEMA 3R RATED), PLATED COPPER BUS BAR, TRAPPED GENERATOR CABLES, GFCI 20A RECEPTACLE, START/STOP TERMINALS, 3-PHASE ROTATION MONITOR, REM KEY INTERLOCKING DOOR KIT, BOTTOM CONDUIT ACCESS.
5. ACCEPTABLE UNITS: POWERTRON CORP. STANDARD SERIES, EMERGENCY ENERGY PRODUCTS (EEP) MODEL E701

4. INSTALLATION

1. LOCATE PANELBOARDS AS INDICATED AND MOUNT SECURELY, PLUMB, TRUE AND SQUARE, TO ADJOINING SURFACES.
2. INSTALL SURFACE-MOUNTED PANELBOARDS ON U-CHANNELS, WHERE PRACTICAL, GROUP PANELBOARDS ON COMMON LENGTH OF U-CHANNEL.
3. MOUNT PANELBOARDS TO HEIGHT INDICATED IN THIS SPECIFICATION, UNLESS OTHERWISE NOTED.
4. CONNECT RE-CIRCUIT LOADS TO CIRCUITS AS INDICATED.
5. INSTALL SPARE CONDUITS FROM RECESSED PANELBOARDS IN ACCORDANCE WITH CEC.
6. CONNECT ISOLATED GROUND BUS IN PANELBOARDS TO MAIN BUILDING GROUNDS SOURCE OR DISTRIBUTION SECONDARY NEUTRAL WITH #20 AWG, GREEN INSULATED GROUND WIRE, IN CONDUIT.
7. MOUNT PANELBOARDS SUCH THAT THE TOP IS 6" FROM FINISHED FLOOR, UNLESS OTHERWISE NOTED.
5. CIRCUIT BREAKERS
1. SUBMIT PRODUCT DATA IN ACCORDANCE WITH THIS SPECIFICATION.
2. INCLUDE WITH REQUESTS FOR EQUAL TIME-CURRENT CHARACTERISTICS CURVES FOR BREAKERS WITH AMPACITY AND WITH INTERRUPTING CAPACITY OF 18,000 SYMMETRICAL RMS AND OVER AT SYSTEM VOLTAGE.
6. BREAKERS - GENERAL
1. BOLT-ON MOLDED CASE CIRCUIT BREAKER, QUICK-MAKE, QUICK-BREAK TYPE, FOR MANUAL AND AUTOMATIC OPERATION WITH TEMPERATURE COMPENSATION FOR 40°C (104°F) AMBIENT.
2. COMMON-TRIP BREAKERS WITH SINGLE HANDLE FOR MULTI-POLE APPLICATIONS.
3. MAGNETIC INSTANTANEOUS TRIP ELEMENTS IN CIRCUIT BREAKERS, TO OPERATE ONLY WHEN THE VALUE OF CURRENT REACHES SETTING. TRIP SETTINGS ON BREAKERS WITH ADJUSTABLE TRIPS TO RANGE FROM 3-10 TIMES CURRENT RATINGS.

7. THERMAL MAGNETIC BREAKERS

1. MOLDED CASE CIRCUIT BREAKER SHALL OPERATE AUTOMATICALLY BY MEANS OF THERMAL AND MAGNETIC TRIPPING DEVICES TO PROVIDE INVERSE TIME CURRENT TRIPPING UNDER OVERLOAD CONDITIONS AND INSTANTANEOUS MAGNETIC TRIPPING FOR SHORT CIRCUIT PROTECTION.
8. GROUND FAULT CIRCUIT INTERRUPTERS
1. MOLDED CASE CIRCUIT BREAKERS AS ABOVE WITH INTEGRAL CLASS A GROUP 1 GROUND FAULT INTERRUPTER. INSTALLATION
1. INSTALL CIRCUIT BREAKERS AS INDICATED.

2.8 MOTOR AND CIRCUIT DISCONNECTS

- 1.1 SUBMIT PRODUCT DATA IN ACCORDANCE WITH THIS SPECIFICATION.

1.2 EQUIPMENT

1. FUSIBLE AND NON-FUSIBLE DISCONNECT SWITCHES IN EEMAC "I" ENCLOSURE FOR INTERIOR APPLICATIONS, AND EEMAC "3" ENCLOSURE FOR EXTERIOR APPLICATIONS, UNLESS OTHERWISE NOTED.
2. PROVISION FOR PADLOCKING IN "ON-OFF" POSITION.
3. MECHANICALLY INTERLOCKED DOOR TO PREVENT OPENING WHEN HANDLE IN "ON" POSITION.
4. FUSE HOLDERS IN EACH SWITCH SUITABLE WITHOUT ADAPTORS, FOR TYPE OF FUSE, AS INDICATED.
5. QUICK-MAKE, QUICK-BREAK ACTION.
6. "ON-OFF" SWITCH POSITION INDICATION ON SWITCH ENCLOSURE COVER.
7. SINGLE-PHASE MOTOR DISCONNECT SWITCHES SHALL BE ONE OR TWO-POLE TOGGLE-TYPE, 20 AMP, 120/227V AC, BLACK HANDLE WITH SIDE AND BACK WIRING COMPLETE WITH PILOT LIGHT.

1.3 EQUIPMENT IDENTIFICATION

1. INDICATE NAME OF LOAD CONTROLLED ON SIZE 4 NAMEPLATE.

1.4 MANUFACTURERS

1. ACCEPTABLE MANUFACTURERS: EATON, CGE, CUTLER-HAMMER, SQUARE D, SIEMENS.

1.5 INSTALLATION

1. INSTALL MOTOR DISCONNECT SWITCHES WHERE INDICATED.
2. INSTALL FUSED CIRCUIT DISCONNECT SWITCHES WHERE INDICATED OR WHERE REQUIRED BY THE INSPECTION AUTHORITIES AND/OR FOR EQUIPMENT SUPPLIED BY OTHER TRADES.

2.9 ELECTRICAL MODIFICATIONS

- ELECTRICAL DISTRIBUTION UPGRADE TO 1000A, 120/208V, 3PH, 4W FROM EXISTING ELECTRICAL SERVICE (400A, 120/208V, 3PH, 4W):
- 1.1. PROVIDE NEW 1000A-3P (100% RATED) MAIN BREAKER WITH RECOMMENDED LSI SETTINGS & ANY REQUIRE MODIFICATIONS.
2. ENSURE ALL EQUIPMENT DESIGNATE AS "EXISTING TO REMAIN" OR "EXISTING TO BE RELOCATED" IS SUITABLE FOR ITS INTENDED RE-USE, INCLUDING WIRING AND CIRCUITS. REPORT ANY DISCREPANCIES TO THE CONTRACT ADMINISTRATOR BEFORE CLOSE OF BID OPPORTUNITY.

3.0 SHORT CIRCUIT AND PROTECTIVE DEVICE COORDINATION STUDY

- 1.1. PROVIDE A SHORT CIRCUIT AND PROTECTIVE DEVICE COORDINATION STUDY. ALSO PROVIDE LSI SETTINGS FOR PROTECTIVE DEVICES.
- 1.2. STUDY SHALL BE PROVIDED BY RECOGNIZED FIRM WITH A REGISTERED PROFESSIONAL ENGINEER. STUDY TO INCLUDE BUT NOT LIMITED TO:
1. EACH BREAKER OPERATING TIME CYCLE/STRIPPING TIMES.
2. FINAL SELECTION OF TRIPPING DEVICES (FUSES SIZES, RELAYS, CT RATIOS) BASED ON STUDY RESULTS.
3. SYMMETRICAL & ASYMMETRICAL FAULT CURRENT CALCULATIONS FOR VERIFICATION OF SYSTEM PROTECTIVE ELEMENTS
4. SINGLE LINE DIAGRAM OF RESULTANT SHORT CIRCUIT VALUES, INDICATING DEVICE NUMBERS & EQUIPMENT RATINGS.
5. INSTALL ARC FLASH WARNING LABELS FROM STUDY RESULTS ON ALL ELECTRICAL DISTRIBUTION EQUIPMENT AND DOORS PER CODE.
6. RECOMMENDATIONS & SETTINGS OF DEVICES FOR REVIEW.

DATA CABLING SPECIFICATIONS

CONTRACTOR QUALIFICATIONS
THE CONTRACTOR PERFORMING THE DATA CABLING INSTALLATION SHALL HAVE A STRUCTURED CABLING INDUSTRY AFFILIATION SUCH AS BOCA BUILDING INDUSTRY CONSULTANTS INTERNATIONAL MEMBERSHIP, PCID (REGISTERED COMMUNICATIONS DISTRIBUTOR/DESIGNER) AND/OR A STRUCTURED CABLING VENDOR CERTIFICATION.

ALL DATA CABLING INSTALLERS SHALL BE LICENSED AND INSURED.

THE DATA CABLING CONTRACTOR SHALL PROVIDE REFERENCES OF SIMILAR PROJECTS.

HORIZONTAL CABLING

- 1.1. CATEGORY 6 CABLING SHALL BE CERTIFIED AND TESTED TO A MINIMUM OF 250 MHZ. THE CATEGORY 6 HORIZONTAL CABLING SHALL MEET THE MINIMUM TECHNICAL SPECIFICATIONS IN (TELECOMMUNICATIONS INDUSTRY ASSOCIATION) TIA 568A. COLOUR TO BE BLUE AND PLENUM-RATED (FTB) OR (FT4) IN EMT.
- 1.2. ALL DATA TELECOMMUNICATIONS JACKS AND CONNECTORS SHALL BE TIA 568A CERTIFIED. JACK AND CONNECTOR COLOUR TO BE BLUE.
- 1.3. NO INSTALLED CABLING MAY BE EXPOSED TO VIEW OUTSIDE OF THE WIRING ROOM. IT SHALL BE WITHIN A RACEWAY, CONDUIT, POWER POLE OR BEHIND SUSPENDED CEILING.
- 1.4. ALL HORIZONTAL CABLING RUNS SHALL RUN FROM EACH WORK AREA IN A STAR TOPOLOGY TO A WIRING ROOM OR AS SHOWN. INSTALL CONDUITS AND CABLE RUNS PARALLEL AND/OR PERPENDICULAR TO BUILDING GRID LINES & COLUMNS IN CEILING SPACES, CHASES & BEHIND FLOORING. THERE SHALL BE NO CONNECTION IN THE CABLE RUN BETWEEN THE OUTLET IN THE WORK AREA AND THE WIRING ROOM. EXCEPT FOR DATA ZONE BOXES. ALL CABLES SHALL SUPPORTED BY HOOKS OR SUPPORTED BY EXISTING WIRE TRAY. ALL EXPOSED CATEGORY 6 CABLING SHALL BE PLENUM-RATED (FTB).
- 1.5. NO CABLES RUN MAY EXCEED A LENGTH OF 300 FEET.
- 1.6. UNLESS OTHERWISE SPECIFIED, ALL CATEGORY CABLING SHALL BE TERMINATED IN THE WIRING ROOM. EXISTING RACK MOUNT PATCH PANELS (MAXIMUM OF 48 JACKS PER PANEL), SUPPLY PATCH PANELS, COMPONENTS, WIRE MANAGEMENT, IF THERE IS INSUFFICIENT DATA PORTS IN EXISTING PATCH PANEL.
- 1.7. ALL CATEGORY CABLING IN THE RACKS SHALL BE INSTALLED WITH SUFFICIENT AND APPROPRIATE MOUNTING CLIPS, BRACKETS, AND CABLE MANAGEMENT TO PROVIDE A SECURE AND MAINTAINABLE SYSTEM. CARE SHALL BE TAKEN TO NOT CAUSE THE CABLES TO BE OVERLY CRIMPED.
- 1.8. THE UTP CATEGORY CABLE TAIL SHALL BE TERMINATED WITH A MINIMUM OF 14" OF SLACK BUT NOT TO EXCEED 18".
- 1.9. AFTER DRESSING CABLE TO THE FINAL LOCATION, THE SHEATH SHALL BE REMOVED TO A POINT THAT ALLOWS THE CONDUCTORS TO BE SPAYED AND TERMINATED IN A NEAT AND UNIFORM FASHION. EVERY EFFORT MUST BE MADE TO MAINTAIN SHEATH INTEGRITY BY REMOVING ONLY AS MUCH AS IS PRACTICAL TO ACCOMPLISH TERMINATION. CABLE PAIR TWISTS SHALL BE MAINTAINED UP TO THE POINT OF TERMINATION. AS INSTALLED IN TIA-568A, THE Pairs IN A CABLE SHOULD NEVER BE UNTWISTED MORE THAN 0.5 INCH FROM THE POINT OF TERMINATION. UNDER NO CIRCUMSTANCES SHALL CABLE Pairs BE UNTWISTED OR OTHERWISE ALTERED PRIOR TO TERMINATION.
- 1.10. ANY UNUSED HORIZONTAL CABLING SHALL BE LABELED AND LOOSELY COILED.
- 1.11. CONTRACTOR SHALL SPECIFY CABLES PROPOSED FOR USE AND SUBMIT DOCUMENTATION PROVING THE PROPOSED CABLES MEET THESE SPECIFICATIONS.

LABELLING

- 2.1. ALL CABLES (NEW & RELOCATED) SHALL BE LABELED WITH TAG WRAPS OR SOME OTHER PERMANENT MARKER CAPABLE OF WITHSTANDING MULTIPLE PULLING OF CABLE THROUGH RACEWAYS. LABELS SHALL BE LOCATED 18 INCHES FROM THE WORK AREA END.
- 2.2. ALL TERMINATIONS SHALL BE CLEARLY IDENTIFIED ON PATCH PANELS IN WIRING ROOM. ALL JACKS IN THE PATCH PANEL MUST BE IN SEQUENTIAL ORDER.
- 2.3. AT EACH WORK AREA, FACEPLATE OUTLET SHALL BE PROFESSIONALLY PRINTED WITH JACK NUMBERS CLEARLY VISIBLE WITHOUT REMOVING OUTLET FACEPLATE. THE LABELING SHALL BE METAL OR VINYL ADHESIVE TAPE WITH EMBOSSED OR INDELIBLE PRINTING FOR EACH OUTLET.

FIELD TEST QUALITY

- 3.1. THE CONTRACTOR SHALL VISUALLY INSPECT ALL