

ELECTRICAL SPECIFICATIONS:

1 GENERAL

1.1 SUMMARY

1. PROVIDE ALL WIRING, CONDUIT, MATERIALS, EQUIPMENT, TEST/COMMISSIONING ETC., SHOWN OR REQUIRED TO COMPLETE THE ELECTRICAL WORK UNLESS OTHERWISE SPECIFIED. ANY ITEM OR SYSTEM WHICH IS SHOWN, MENTIONED OR REASONABLY IMPLIED ON EITHER THE DRAWINGS OR IN THE SPECIFICATIONS SHALL BE CONSIDERED TO BE PROPERLY AND SUFFICIENTLY SPECIFIED AND SHOWN, AND MUST BE PROVIDED. INCLUDE ALL LABOUR, EQUIPMENT, TOOLS, ETC., REQUIRED TO COMPLETE ALL INSTALLATIONS AS INTENDED. INSTALL ALL EQUIPMENT ACCORDING TO THE METHOD INDICATED, MANUFACTURER'S INSTRUCTIONS OR ACCORDING TO STANDARD INDUSTRY PRACTICES IF NO INSTALLATION TECHNIQUE IS DEFINED.
2. REFER TO DOCUMENT 0, INSTRUCTIONS TO BIDDERS AND DIVISION 01, GENERAL REQUIREMENTS OF THE SPECIFICATIONS AND CONFORM WITH ALL REQUIREMENTS. THE CONSTRUCTION CONTRACT SHALL BE GOVERNED BY THE STIPULATED PRICE CONSTRUCTION DOCUMENT C002 – 2008.
3. REFER TO DIVISION 01 – GENERAL REQUIREMENTS FOR SPECIFIC INSTRUCTIONS REGARDING STAGING OF WORK AND REQUIREMENTS FOR WORK IN PARTIALLY OCCUPIED AREAS. ALL WORK PERFORMED IN AN AREA WHICH IS TO BE PARTIALLY OCCUPIED DURING CONSTRUCTION IS TO BE PROVIDED IN CO-ORDINATION WITH OTHER TRADES TO MINIMIZE DISTURBANCE OF THE OCCUPANTS AND IN ACCORDANCE WITH THE CONSTRUCTION MANAGER'S INSTRUCTIONS.

1.2 SCOPE OF WORK

1. DETERMINE THE FULL SCOPE OF WORK BY REFERRING TO ALL DRAWINGS AND SPECIFICATIONS.
2. IT IS THE INTENT OF THESE SPECIFICATIONS AND DRAWINGS, TO PROVIDE THE CONTRACTOR WITH SUFFICIENT INFORMATION AND DETAILS FOR CONSTRUCTION OF A COMPLETE AND OPERATIONAL ELECTRICAL INSTALLATION.
3. ANY ITEM OR SUBJECT WHICH IS SHOWN, MENTIONED OR REASONABLY IMPLIED ON EITHER DRAWINGS OR IN THE SPECIFICATIONS, SHALL BE CONSIDERED TO BE PROPERLY AND SUFFICIENTLY SPECIFIED AND SHOWN, AND MUST BE PROVIDED. PROVIDE ALL LABOUR EQUIPMENT TOOLS, ETC., REQUIRED TO COMPLETE ALL THE WORK OF THIS DIVISION.
4. FORWARD TO THE CONSTRUCTION MANAGER COPIES OF ALL CORRESPONDENCE AND INSTRUCTIONS FROM THE ELECTRICAL SAFETY AUTHORITY FOR CLARIFICATION AND ACTION.

1.3 QUALITY ASSURANCE

1. IT IS THE INTENTION OF THE OWNER TO ENTER INTO AN EQUITABLE CONTRACT WITH THE CONTRACTOR. HAVING DONE SO, IT IS THE EXPECTATION OF THE OWNER THAT THE WORK OF THIS DIVISION WILL BE CARRIED OUT WITH THE UTMOST PRECISION AND CARE. THE STANDARDS OF WORK QUALITY AND LAYOUT AND ORGANIZATION OF THE INSTALLATIONS AS LISTED HEREIN SHALL BE STRICTLY ADHERED TO. ANY WORK DEEMED UNACCEPTABLE BY THE CONSTRUCTION MANAGER SHALL BE REMOVED AND REPLACED AT NO ADDITIONAL COST TO THE OWNER.
2. CONFORM TO MINIMUM REQUIREMENTS OR BETTER OF PROVINCIAL AND LOCAL CODES, WHERE EXISTING, AND TO REQUIREMENTS OF LOCAL INSPECTION AUTHORITIES FOR EXECUTION OF WORK UNDER THIS DIVISION.
3. MATERIALS SUPPLIED TO CONFORM TO MINIMUM PUBLISHED REQUIREMENTS AND RECOMMENDATIONS, OR BETTER, OF APPLICABLE STANDARDS OF:

CSA – CANADIAN STANDARDS ASSOCIATION

EEMAC – ELECTRICAL AND ELECTRONIC MANUFACTURERS' ASSOCIATION OF CANADA

NEMA – NATIONAL ELECTRICAL MANUFACTURERS' ASSOCIATION

ULC – UNDERWRITERS LABORATORIES OF CANADA LTD.

OESC – ONTARIO ELECTRICAL SAFETY CODE

ESA – ELECTRICAL SAFETY AUTHORITY

OBC – ONTARIO BUILDING CODE

4. ARRANGE AND PAY FOR ALL PERMITS AND INSPECTIONS BY AUTHORITIES HAVING JURISDICTION, REQUIRED IN UNDERTAKING OF WORK UNDER THIS DIVISION. MODIFICATIONS REQUIRED BY THE ABOVE STATED AUTHORITIES SHALL BE MADE WITHOUT ANY ADDITIONAL CHARGE TO THE OWNER.

1.4 RULES, REGULATIONS AND PERMITS

1. PROVIDE ALL WORK AND MATERIALS IN ACCORDANCE WITH THE LATEST EDITIONS OF THE ONTARIO ELECTRICAL SAFETY CODE, THE ONTARIO BUILDING CODE, APPLICABLE C.S.A. AND ULC STANDARDS, THE REQUIREMENTS OF THE ELECTRICAL SAFETY AUTHORITY AND ALL OTHER APPLICABLE MUNICIPAL AND PROVINCIAL CODES AND REGULATIONS. ANY MATERIALS, EQUIPMENT OR INSTALLATIONS NOT MEETING ALL REQUIREMENTS OF THE APPROPRIATE REGULATORY AGENCIES WILL NOT BE ACCEPTED. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THESE REQUIREMENTS ARE MET AND PROVIDE EVIDENCE OF SUCH AS REQUESTED.
2. OBTAIN AND PAY FOR ALL PERMITS REQUIRED FOR THE EXECUTION AND INSPECTION OF THE ELECTRICAL WORK. ALL WORK SHALL BE PROVIDED BY QUALIFIED JOURNEYMAN ELECTRICIANS OR APPRENTICES HOLDING VALID ONTARIO CERTIFICATES OF QUALIFICATION AND BE SUPERVISED BY A COMPETENT FOREMAN.
3. IN GENERAL, ALL NECESSARY CUTTING AND PATCHING FOR THE ELECTRICAL WORK SHALL BE PROVIDED BY THE APPROPRIATE TRADE AT THE EXPENSE OF THE CONTRACTOR UNLESS INDICATED OTHERWISE ON THE DRAWINGS. HOLES THROUGH EXTERIOR WALLS AND ROOF ARE TO BE PROPERLY FLASHED AND MADE WEATHERPROOF. REPAIR ANY DAMAGE CAUSED BY THE ELECTRICAL TRADE TO EXISTING BUILDINGS OR EQUIPMENT, ETC., TO THE CONSTRUCTION MANAGER SATISFACTION. IN GENERAL, PAINTING OF ELECTRICAL WORK AND PATCHES AS REQUIRED WILL BE PROVIDED BY THE ELECTRICAL TRADE.
4. UPON COMPLETION OF THE WORK, CLEAN ALL EQUIPMENT AND REMOVE FROM THE SITE ALL ELECTRICAL DEBRIS.
5. PROVIDE LEGIBLE SIGNS AND BARRIERS ON OR AROUND ALL LIVE PANELS AND EQUIPMENT DURING CONSTRUCTION TO PREVENT INJURY OR SHOCK.
6. TEST ALL EQUIPMENT AND WIRING AT ANY TIME REQUESTED BY THE CONSTRUCTION MANAGER AS PART OF THE CONTRACT. PROVIDE ALL METERS, MATERIALS AND LABOUR REQUIRED TO CARRY OUT THIS WORK. PRIOR TO CONNECTION OF ADDITIONAL LOADS TO EXISTING SOURCES, ENSURE THROUGH LOAD MEASUREMENT AND MONITORING THAT THE REQUIRED EXCESS CAPACITY IS AVAILABLE.
7. UPON COMPLETION OF THE ELECTRICAL INSTALLATIONS, TRIAL OPERATE ALL EQUIPMENT, SYSTEMS AND DEVICES TO ENSURE CORRECT FUNCTIONING. FOLLOWING SATISFACTORY TRIAL OPERATION, INSTRUCT THE OWNER'S REPRESENTATIVE REGARDING OPERATION AND MAINTENANCE OF THE SYSTEMS AND EQUIPMENT INSTALLED.
8. THE CONTRACTOR MUST CARRY PROPER AND ADEQUATE LIABILITY INSURANCE TO PROTECT BOTH HIMSELF AND THE OWNER FROM ALL CLAIMS RELATED TO HIS WORK FOR THIS PROJECT.
9. PERFORM ALL WORK IN SUCH A MANNER AS TO CAUSE AS LITTLE DISTURBANCE OR INCONVENIENCE AS POSSIBLE TO THE EXISTING OPERATIONS, WHERE DEEMED NECESSARY BY THE OWNER OR CONSTRUCTION MANAGER, PROVIDE TEMPORARY MEASURES AS REQUIRED TO MAINTAIN SPECIFIC SERVICES AND/OR PROVIDE WORK OUTSIDE REGULAR HOURS AT NO ADDITIONAL COST. DO NOT INTERRUPT ANY ELECTRICAL SERVICES WITHOUT PRIOR AUTHORIZATION.
10. PROVIDE ALL SLEEVES, INSERTS HANGERS AND CORE DRILLING OF SLAB REQUIRED FOR WORKING ALL SLEEVES AND PROVIDE PROPERLY ACQUAINTED WITH THE PROJECT SEPARATIONS FOR INSTALLATIONS OF THIS DIVISION SHALL BE TREATED BY THE PROJECT MANAGER TO MAINTAIN THE APPLICABLE RATING.
11. PROVIDE ALL ACCESS DOORS REQUIRED FOR THE ELECTRICAL INSTALLATIONS. ACCESS DOOR SIZE, TYPE AND FIRE RATING SHALL BE IN ACCORDANCE WITH THE ARCHITECTURAL SPECIFICATIONS AND CONDITIONS.
12. THE ELECTRICAL CONTRACTOR SHALL BE HELD RESPONSIBLE FOR THE SATISFACTORY COMPLETION OF ALL WORK BEARING UPON HIS TRADE. PLAN WORK WELL IN ADVANCE TO ELIMINATE DELIVERY AND INSTALLATION DIFFICULTIES. CO-ORDINATE WORK WITH OTHER TRADES TO PREVENT CONFLICTS ON SITE AND RESOLVE INTERFERENCES. PROVIDE WORK IN STAGES AND AT TIMES REQUIRED BY THE PROJECT SCHEDULE.
13. ALL ELECTRICAL WORK SHALL BE COMPLETED TO BUILDING OWNER REQUIREMENTS AND BUILDING STANDARDS IN ACCORDANCE WITH THE RELEVANT SECTIONS, ARTICLES AND DETAILS OF THE BASE BUILDING SPECIFICATIONS AND DRAWINGS. THESE DRAWINGS ARE AVAILABLE FOR REVIEWING AT THE OFFICE OF THE MANAGER OF TENANT CO-ORDINATION.

1.5 GROUNDING

1. PROVIDE ALL GROUNDING REQUIRED BY THE ONTARIO ELECTRICAL SAFETY CODE OR ANY

LOCAL AUTHORITIES REGARDLESS OF WHETHER IT HAS BEEN SHOWN. THIS INCLUDES EQUIPMENT GROUNDING AS WELL AS SYSTEM (SERVICE) AND DISTRIBUTION GROUNDING. PROVIDE ADDITIONAL SPECIFIC PROVISIONS AS INDICATED, INCLUDING GROUND CONNECTIONS FOR MAIN ELECTRICAL ROOM AND BUILDING STRUCTURE. PROVIDE THESE INSTALLATIONS ACCORDING TO ELECTRICAL SAFETY CODE REGULATIONS. COLLECT ALL GROUND CONNECTIONS AT A COMMON POINT IN THE MAIN ELECTRICAL ROOM, WHICH IN TURN IS CONNECTED TO THE MAIN SERVICE GROUND.

2. ALL GROUNDING FEEDERS AND BRANCH CIRCUITS SHALL BE PROVIDED WITH A SEPARATE GROUND CONDUCTOR SIZED ACCORDING TO THE ELECTRICAL SAFETY CODE REGULATIONS. THE CONDUIT SYSTEM SHALL NOT BE USED AS THE GROUND PATH, HOWEVER ALL CONDUITS SHALL BE SOLIDLY GROUND.
3. ARRANGE GROUNDS SUCH THAT UNDER NORMAL OPERATING CONDITIONS CURRENT FLOW IN ANY GROUNDING CONDUCTOR IS NOT OBJECTIONABLE AND WILL NOT HARM PERSONNEL OR EQUIPMENT. ARRANGE SERVICE GROUNDS AND DISTRIBUTION GROUNDS TO PROVIDE GROUND RESISTANCE READINGS WITHIN VALUES REQUIRED BY THE ONTARIO ELECTRICAL SAFETY CODE AND THE ELECTRICAL SAFETY AUTHORITY.

1.6 DRAWINGS

1. DRAWINGS WHICH ACCOMPANY THESE SPECIFICATIONS ARE DIAGRAMMATIC AND SHOW THE REQUIRED DISTRIBUTION, NUMBER AND LOCATIONS OF THE ELECTRICAL EQUIPMENT, FIXTURES AND OUTLETS, AND INDICATE SUGGESTED CIRCUITING. DO NOT SCALE DRAWINGS BUT USE ONLY DIMENSIONS WHICH ARE SHOWN. WHERE EXACT BUILDING DIMENSIONS AND DETAILS ARE REQUIRED, USE ONLY DIMENSIONS FROM THE ARCHITECTURAL DRAWINGS OR JOB SITE DIMENSIONS. ASSEMBLE COPIES OF REVIEWED SHOP DRAWINGS AND OPERATING AND MAINTENANCE INFORMATION INTO HARD COVERED BINDERS COMPLETE WITH TYPED DIRECTORY SHEETS AND SUBMIT TO THE CONSTRUCTION MANAGER FOLLOWING COMPLETION OF THE PROJECT. INDICATE IN RED INK ON AS-BUILT DRAWINGS ALL DEVIATIONS AND APPROVED CHANGES FROM THE CONTRACT DRAWINGS.

1.7 WARRANTY

1. ALL MATERIALS AND INSTALLATIONS OF THIS DIVISION SHALL BE GUARANTEED FOR A PERIOD OF ONE YEAR FROM THE DATE OF FINAL ACCEPTANCE OF THE WORK UNLESS OTHERWISE SPECIFIED, REGARDLESS OF THE EXTENT OF EQUIPMENT MANUFACTURER'S WARRANTIES. ARRANGE WITH EACH MANUFACTURER/SUPPLIER TO EXTEND WARRANTIES AS NECESSARY TO COINCIDE WITH WARRANTY PERIOD OR THOSE PERIODS SPECIFIED.
2. MAKE SUBMISSIONS NECESSARY TO REGISTER PRODUCT WARRANTIES TO THE BENEFIT OF THE OWNER.

1.8 EXAMINATIONS

1. CAREFULLY EXAMINE THE SITE AND TENDER DOCUMENTS FOR THE WORK IN ACCORDANCE WITH THE INSTRUCTIONS TO BIDDERS. VISIT THE EXISTING BUILDING AND BECOME FAMILIAR WITH EXISTING ARCHITECTURAL AND STRUCTURAL CONDITIONS. THE LOCATION OF EXISTING ELECTRICAL EQUIPMENT AND INSTALLATIONS AND OTHER FACTORS RELATED TO THE WORK TO BE DONE, NO EXTRA CHARGES WILL BE CONSIDERED FOR ANYTHING WHICH COULD HAVE BEEN REVEALED IN THE COURSE OF SUCH EXAMINATIONS.

1.9 SHOP DRAWINGS

1. SUBMIT FOR REVIEW A SINGLE (1) SET OF SHOP DRAWINGS AND DATA SHEETS IN EITHER .PDF OR HARD COPY FORMAT COVERING ALL ITEMS OR EQUIPMENT TO BE INSTALLED UNDER THE CONTRACT. SHOP DRAWINGS SHALL SHOW ALL RELEVANT PERFORMANCE AND INSTALLATION INFORMATION. THE DRAWINGS AND DATA REQUIRED SHALL GENERALLY BE AS OUTLINED UNDER EACH SECTION OF THE SPECIFICATION, BUT SHALL NOT BE RESTRICTED TO THE ITEMS LISTED. SUBMIT COPIES OF REVIEWED SHOP DRAWINGS TO OTHER TRADES AS REQUIRED FOR COMPLETION OF THEIR RELATED WORK.
2. EQUIPMENT WILL NOT BE ACCEPTED ON SITE UNTIL REVIEW OF SHOP DRAWINGS IS COMPLETE.

1.10 MAINTENANCE AND INSTRUCTION MANUAL

1. PROVIDE THREE (3) COPIES OF BOTH ELECTRONIC (CD) AND HARD COPIES, BOUND 'MAINTENANCE AND INSTRUCTION MANUALS' AT THE COMPLETION OF THE PROJECT COMPLETE WITH TYPED DIRECTORY AND INFORMATION SHEETS, AND SUBDIVIDED INTO APPROPRIATE AND IDENTIFIED SECTIONS. EACH MANUAL SHALL CONTAIN, BUT NOT BE RESTRICTED TO, THE FOLLOWING INFORMATION:
1. 1 COPY OF EACH SHOP DRAWING (REVISED AS PER THE REVIEWED DRAWINGS).
2. 1 COPY OF EQUIPMENT PARTS LIST.
3. 1 COPY OF RECOMMENDED LIST OF SPARE PARTS.
4. 1 COPY OF OPERATING AND MAINTENANCE INSTRUCTIONS.
5. 1 COPY OF EQUIPMENT INSTALLATION DETAILS, CONSTRUCTION AND PERFORMANCE DATA.
6. 1 LIST OF ALL MANUFACTURING AND EQUIPMENT SERVICE DEPOTS INCLUDING TELEPHONE NUMBERS.
7. 1 COPY OF THE ELECTRICAL SAFETY AUTHORITY FINAL INSPECTION CERTIFICATE.
8. 1 COPY OF THE EMERGENCY LIGHTING TEST RESULTS
9. 1 COPY OF ANY OTHER CERTIFICATES, APPROVAL LETTERS, ETC.

2. QUALIFIED TECHNICIANS SHALL INSTRUCT THE OWNER'S REPRESENTATIVES IN THE OPERATION AND MAINTENANCE OF THE SYSTEMS AND EQUIPMENT INCLUDED IN THIS DIVISION.

1.11 RECORD DRAWINGS

1. KEEP A COMPLETE AND SEPARATE SET OF PRINTS ON SITE AT ALL TIMES AND NOTE THEREON CLEARLY, NEATLY, ACCURATELY AND PROMPTLY ALL ARCHITECTURAL, STRUCTURAL, MECHANICAL AND ELECTRICAL CHANGES, REVISIONS AND ADDITIONS TO THE WORK AND DEVIATIONS FROM THE CONTRACT DOCUMENTS. ACCURATE LOCATIONS, DEPTH, SIZE AND TYPE OF UNDERGROUND UTILITIES SHALL BE INCLUDED IN THESE RECORD DRAWINGS.
2. INDICATE ALSO ON THE RECORD DRAWINGS THE LOCATION OF ACCESS PANELS OR REMOVABLE CEILING TILES WHICH COVER EQUIPMENT OR JUNCTION BOXES WHICH MAY REQUIRE FUTURE ACCESS OR WHERE CONDUIT OR WIRING FOR FUTURE USE IS LOCATED.
3. THE FINAL RECORD DRAWINGS SHALL BE PREPARED BY A QUALIFIED DRAFTSPERSON IN AUTOCAD AT THIS TRADE'S EXPENSE AS AN ELECTRONIC COPY AND ONE HARD COPY TO BE SUBMITTED TO THE CONSTRUCTION MANAGER AT THE COMPLETION OF THE PROJECT WITH AN APPLICATION FOR A CERTIFICATE OF TOTAL PERFORMANCE.

2 PRODUCTS

2.1 BASIC EQUIPMENT, MATERIALS AND METHODS

1. ALL ITEMS INSTALLED MUST BE APPROVED BY A CERTIFICATION ORGANIZATION ACCREDITED BY THE STANDARDS COUNCIL OF CANADA (CSA, ULC, ETC.) OR FIELD APPROVED FOR THE PARTICULAR APPLICATION BY THE ELECTRICAL SAFETY AUTHORITY OR AN ACCREDITED CERTIFICATION ORGANIZATION. ALL WORK AND INSTALLATIONS MUST BE ACCEPTABLE TO THE EQUIPMENT MANUFACTURER OR SYSTEM SUPPLIER AND BE APPROVED BY THE ELECTRICAL SAFETY AUTHORITY. ALL MATERIALS SPECIFIED WITH MANUFACTURER'S NAME, TYPE, BULLETIN NUMBER, ETC., ARE TO ESTABLISH TYPE AND QUALITY OF MATERIALS REQUIRED AND FIRST CHOICE OF MANUFACTURER. EQUIVALENT MATERIALS BY OTHER MANUFACTURERS MAY BE USED, BUT ONLY AFTER OBTAINING APPROVAL FROM THE CONSTRUCTION MANAGER. REFER TO THE APPROVED MANUFACTURER'S LIST, AND INSTRUCTIONS TO BIDDERS FOR FURTHER REQUIREMENTS. UNLESS OTHERWISE INDICATED, ALL EQUIPMENT AND MATERIALS SHALL BE NEW.
2. GENERALLY, MOUNT EQUIPMENT AS CLOSE AS PRACTICAL TO THE LOCATION SHOWN ON THE DRAWINGS TAKING INTO CONSIDERATION SITE CONDITIONS. ENSURE ALL EQUIPMENT IS LOCATED IN A MANNER ALLOWING EASY ACCESS FOR MAINTENANCE, REPAIR OR ADJUSTMENT. CONFIRM ALL ARCHITECTURAL CONDITIONS SUCH AS GLAZING, DOOR SWINGS, FURNITURE AND EQUIPMENT TYPES AND LAYOUTS, ETC., ON SITE PRIOR TO INSTALLING ANY RELATED ITEM OR WIRING.
3. THE CONSTRUCTION MANAGER RESERVES THE RIGHT TO RELOCATE ANY FIXTURE, OUTLET, DEVICE, EQUIPMENT, ETC., UP TO 3 M (10') PRIOR TO INSTALLATION WITHOUT INCURRING ANY EXTRA COST. CONFIRM LOCATIONS, MOUNTING HEIGHT AND ARRANGEMENT OF ALL OUTLETS ON SITE PRIOR TO INSTALLATION.
4. PROVIDE OUTLET BOXES OF ADEQUATE SIZE OF TYPE APPROVED FOR THE PARTICULAR APPLICATION AS REQUIRED FOR ALL WIRING DEVICES, LIGHT FIXTURES, ETC., OR AS SHOWN. PROVIDE JUNCTION BOXES, COMPLETE WITH BLANK COVERS AS REQUIRED OR SHOWN FOR ALL WIRING SYSTEMS. INSTALL ALL BOXES TO BE ACCESSIBLE, IF NECESSARY PROVIDE ACCESS PANELS. SECURE ALL BOXES INDEPENDENT OF THE CONDUIT/WIRING SYSTEM.

5. ENSURE ALL OUTLET BOXES WHICH PIERCE A BUILDING VAPOUR BARRIER ARE INSTALLED WITH VAPOUR BARRIER PROTECTION INTEGRAL WITH SPECIFIC WALL OR CEILING CONSTRUCTION. VERIFY EXACT REQUIREMENTS ON SITE WITH THE CONSTRUCTION MANAGER PRIOR TO PROCEEDING WITH INSTALLATIONS.

6. IN ALL CASES USE ONLY CONDUIT AND RACEWAYS APPROVED FOR THE PARTICULAR APPLICATION AND OF ADEQUATE SIZE TO SUIT TYPE AND NUMBER OF CONDUCTORS BEING CARRIED. PROVIDE A SEPARATE GROUND CONDUCTOR IN ALL CONDUITS. THE CONDUIT SYSTEM SHALL NOT BE USED AS THE GROUND PATH, WHERE INDICATED, USE CONDUIT AS SPECIFIED. EVERY CONDUIT OR SECTION OF ARMoured CABLE SHALL BE ADEQUATELY SECURED USING APPROVED SUPPORTS, CLAMPS AND FASTENERS TO ENSURE A SAFE AND SOUND INSTALLATION. ALL CONDUIT OR ARMoured CABLE RUN IN FINISHED AREAS SHALL BE CONCEALED IN WALLS, CEILINGS OR FURRING UNLESS OTHERWISE INDICATED OR APPROVED BY THE CONSTRUCTION MANAGER. ARMoured CABLE SHALL NOT BE USED WHERE EXPOSED UNLESS OTHERWISE NOTED.

7. RIGID METAL CONDUIT SHALL BE USED WHERE INSTALLED AS AN EXTERIOR BRANCH CIRCUIT ABOVE FINISHED GRADES. ALL FITTINGS MUST BE THREADED TYPE. ALL CONDUIT TERMINATIONS SHALL HAVE BUSHINGS WITH INSULATED EVERY PLASTIC LINING. RIGID METAL EXPANSION JOINT – CROUSE HINDS "XJ" SERIES WITH BONDING STRAP OR EQUIVALENT.

8. IN AREAS WITH SOLID CEILINGS, ELECTRICAL AND SYSTEMS JUNCTION BOXES ALONG WITH ASSOCIATED WIRE AND CONDUIT SHALL BE RELOCATED TO AREAS WHERE CEILING ACCESS IS POSSIBLE, OR ACCESS PANELS MAY BE PROVIDED WITH THE APPROVAL OF THE DESIGN CONSULTANT.

9. IN GENERAL, ALL WIRING SHALL BE TYPE RW90 XLPE INSTALLED IN CONDUIT OR RACEWAYS UNLESS OTHERWISE SPECIFIED. USE ONLY COPPER CONDUCTORS. MINIMUM SIZE NO. 12, SIZED AND COLOUR CODED ACCORDING TO THE ELECTRICAL SAFETY CODE WHERE NOT INDICATED. 190 NYLON MAY BE USED IN LIEU OF RW90 FOR INTERIOR INSTALLATIONS UP TO SIZE #10, HOWEVER, CONDUIT FILL SHALL BE BASED ON RW90 RATING. THE USE OF FLEXIBLE CABLE (TYPE AC90 ONLY) IS TO BE RESTRICTED TO INTERIOR PARTITION WALLS, ACCESSIBLE CEILING SPACES AND FINAL CONNECTIONS TO LIGHT FIXTURES. THE FLEXIBLE CABLE SHALL BE RESTRICTED TO 3600 MM (12') IN LENGTH AND BE SUITABLY CLIPPED AND SUPPORTED EVERY 900 MM (3'). ALL BRANCH CIRCUIT WIRE FEEDING A 20 AMP PROTECTED LIGHTING CIRCUIT SHALL BE MINIMUM NO. 10 AWG WIRE. ALL BRANCH CIRCUIT WIRING FEEDING A 15A PROTECTED CIRCUIT WHICH IS OVER 150' IN LENGTH SHALL BE MINIMUM NO. 10 AWG WIRE. ALL 120 V (SINGLE PHASE) BRANCH CIRCUITS SHALL BE PROVIDED WITH A SEPARATE NEUTRAL CONDUCTOR FOR EACH CIRCUIT. PIGTAIL CONNECT NEUTRAL CONDUCTORS AT ALL DEVICES. JOIN ALL CONDUCTORS USING APPROVED SOLDERLESS WING NUT PRESSURE CONNECTORS. ALL WIRING SHALL BE INSTALLED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS, ALL REGULATORY REQUIREMENTS AND SHALL SATISFY ALL APPLICABLE CODES. IT IS THE CONTRACTOR'S RESPONSIBILITY TO CHECK AND REPLACE AS REQUIRED ANY EXISTING WIRING BEING RE-USED. FEEDERS AND BRANCH CIRCUITS RATED 100 AMPERES OR GREATER SHALL BE CHECKED WITH A 1000 V MEGGER FOR 15 SECONDS BEFORE ENERGIZATION.

10. SIZE ALL WIRE FOR A MAXIMUM 2% VOLTAGE DROP

11. PROVIDE DISCONNECT SWITCHES WITH VISIBLE BLADES IN THE OFF POSITION, QUICK-MAKE, QUICK-BREAK OPERATING MECHANISM, LOCK-OFF PROVISION AND DOOR/HANDLE INTERLOCK WITH OVERRIDE AS SHOWN OR REQUIRED. SWITCHES SHALL HAVE AMPLE GUTTER SPACE FOR TOP OR BOTTOM WIRING AND BE HORSEPOWER AND ELECTRIC HEAT RATED. SWITCH ENCLOSURES SHALL BE PROVIDED TO SUIT THE SPECIFIC APPLICATION.

12. PROVIDE MANUAL AND MAGNETIC MOTOR STARTERS FOR MOTORS AND EQUIPMENT AS INDICATED. STARTERS SHALL INCLUDE MANUAL RESET, ADJUSTABLE THERMAL OVERLOAD UNITS WITH INTEGRAL SINGLE PHASE PROTECTION AND BE COMPLETE WITH INTERLOCKS, AUXILIARY RELAYS, CONTROL TRANSFORMERS, TERMINALS, ETC., REQUIRED FOR PROPER OPERATION. REFER TO THE DRAWINGS FOR FURTHER DETAILS OF MECHANICAL EQUIPMENT CONTROL AND WIRING REQUIREMENTS.

13. PROVIDE AC CONTROL RELAYS AND CONTACTORS WITH REQUIRED COIL AND CONTACT RATING AND PILOT LIGHT FOR CONTROL OF EXISTING AND MISCELLANEOUS LOADS AS SHOWN. PROVIDE AUXILIARY COMPONENTS, CONTROL TRANSFORMERS, TERMINALS, SWITCHES, ETC., REQUIRED FOR CONTROL AND CONNECTION.

14. ALL SWITCHES AND OUTLET LOCATION SHALL BE COORDINATED WITH FURRING, PIPE CHASES, ETC. PRIOR TO ROUGH-IN TO ENSURE ADEQUATE SPACE IS AVAILABLE FOR DEVICE MOUNTING.

15. PROVIDE SPECIFICATION GRADE WHITE WIRING DEVICES AS SHOWN ON THE DRAWINGS. DEVICES SHALL BE AS MANUFACTURED BY HUBBELL AND NOTED BELOW:

- 15 AMP., 120 V TOGGLE SWITCH – 1201
15 AMP., 120 V DUPLEX RECEPTACLE – 5252
20 AMP. DUPLEX RECEPTACLE (T-SLOT) – 5352
15 AMP. GROUND FAULT DUPLEX RECEPTACLE – GF5252
20 AMP. GROUND FAULT DUPLEX RECEPTACLE – GF5352
WEATHERPROOF IN-USE RECEPTACLE COVER – WP826

16. PROVIDE VERTICALLY BRUSHED STAINLESS STEEL COVERPLATES, COLOURED TO MATCH DEVICE, FOR FLUSH MOUNTED DEVICES OR GALVANIZED STEEL TYPE COVERPLATES WITH ROUNDED CORNERS FOR SURFACE MOUNTED DEVICES AS APPROPRIATE FOR ALL OUTLETS, GANGED TYPE FOR ALL GROUPED OUTLETS. PROVIDE SPECIAL RECEPTACLES AND OUTLET TYPES AS IDENTIFIED ON THE DRAWINGS.

17. UNLESS OTHERWISE INDICATED, MOUNT LIGHT SWITCHES AND CONTROL DEVICES AT 1100 MM (43") TO THE CENTRE OF THE OUTLET BOX. MOUNT WALL OUTLETS AND RECEPTACLES AT 460 MM (18") OR 150 MM (6") ABOVE COUNTERTOP OR BACK SPLASH AS APPLICABLE

18. IN BARRIER-FREE SPACES AND SUITES, MOUNT THERMOSTAT OR A MANUAL PULL STATION AT 1150 MM (46") ABOVE FINISHED FLOOR, AND 1100 MM (43") ABOVE THE FINISHED FLOOR FOR ALL OTHER CONTROLS UNLESS OTHERWISE NOTED ON DRAWINGS.

19. PROVIDE TIME SWITCHES FOR CONTROL OF MECHANICAL AND ELECTRICAL LOADS AND SYSTEMS AS DESCRIBED BELOW AND IDENTIFIED ON THE DRAWINGS.

2.2 LIGHT FIXTURES

1. PROVIDE ALL LIGHT FIXTURES AS SPECIFIED ON THE DRAWINGS COMPLETE WITH BALLASTS, DRIVERS, LENSES, LED BOARDS, AUXILIARY COMPONENTS, MOUNTING HARDWARE, ETC., REQUIRED FOR A COMPLETE INSTALLATION. VERIFY ALL CATALOG NUMBERS WITH DESCRIPTIONS GIVEN. CHECK ALL LIGHTING FIXTURES PRIOR TO THEIR INSTALLATION TO ENSURE THAT THEY ARE THE SPECIFIED FIXTURES FOR THE PROJECT.

2. ALL FLAT LIGHT FIXTURE LENSES SHALL BE A MINIMUM 3 MM (1/8") THICK ACRYLIC TYPE.

3. LED MONOCHROME LIGHTING FIXTURES SHALL HAVE LIGHTING THAT SHALL HAVE A MINIMUM OF 85 LUMENS PER SQUARE FOOT. MINIMUM OF 75 LUMENS PER SQUARE FOOT FOR INTERIOR SPACES. THE FIXTURE SHALL HAVE A MINIMUM L70 OF 50,000 HOURS. ALL LIGHTING SHALL HAVE IESNA LM-79 AND LM-80 TESTING REPORTS AND LIFE CALCULATIONS BASED ON TM-21. INTERIOR AREA LIGHTING SHALL HAVE A MINIMUM EFFICIENCY OF 80 LUMENS PER WATT.

4. LED DRIVERS SHALL HAVE MINIMUM LIFESPAN EQUAL OR BETTER THAN THE LIFESPAN OF THE L70 LIFESPAN OF THE LED LAMPS IT SERVES. DRIVERS SHALL BE INTEGRATED INTO THE FIXTURE IF SERVING ONLY THAT FIXTURE OR REMOTE IF THE DRIVER SERVES MORE THAN ONE FIXTURE. LED DRIVERS SHALL BE DIMMABLE TO 0-10V DIMMING TECHNOLOGY UNLESS NOTED OTHERWISE. LED DRIVERS SHALL HAVE HIGH POWER FACTOR. ALL LED LIGHTING AND DRIVERS USED IN EXTERIOR OR UNEHEATED APPLICATIONS SHALL PROVIDE START-UP AND OPERATION IN TEMPERATURES FROM -30 °C TO +50 °C.

5. THE CONTRACTOR SHALL ENSURE THAT ALL LIGHT FIXTURES ARE ADEQUATELY SUPPORTED. FIXTURES MUST BE SUPPORTED DIRECTLY FROM THE BUILDING STRUCTURAL MEMBERS. CO-ORDINATE THE REQUIREMENTS OF THE LIGHT FIXTURE SUPPORTS WITH THE OTHER CONSTRUCTION MANAGER (WHERE APPLICABLE) PRIOR TO FIXTURE INSTALLATION. FIXTURE SAFETY CHAINS OR WIRES SHALL ALSO BE PROVIDED AS REQUIRED BY REGULATORY AGENCIES.

6. THE METHOD OF ATTACHING SUSPENSION WIRES AND SAFETY CHAINS TO FIXTURES AND BUILDING ELEMENTS, SHALL BE DISCUSSED WITH AND APPROVED BY THE CONSTRUCTION MANAGER PRIOR TO INSTALLATION.

7. REPLACE ALL DEFECTIVE LED BOARDS AT TIME OF OWNER OCCUPANCY OF THE BUILDING.

8. SHOP DRAWINGS FOR LUMINAIRES INDICATING LIGHTING PERFORMANCE DETAILS, FIXTURE CONSTRUCTION DETAILS, AIR CONTROL AND DUCTWORK CONNECTION DETAILS, ETC., AND PICTURES OF EACH TYPE OF LIGHTING FIXTURE SHALL BE SUBMITTED FOR REVIEW.

9. SHOP DRAWINGS SHALL BE SUBMITTED FOR LED DRIVERS, BALLASTS, AND BULBS FOR ALL FIXTURES TO BE INSTALLED. THESE SHALL BE SUBMITTED SEPARATELY FROM THE LIGHTING FIXTURES BEING INSTALLED AND SHOULD INDICATE EACH FIXTURE THE PRODUCT IS INSTALLED.

10. FIXTURES SHALL NOT BE RELEASED PRIOR TO REVIEW OF THE SHOP DRAWINGS. CANCELLATION CHARGES WILL NOT BE PAID FOR CHANGES TO FIXTURES MADE BEFORE THE FIXTURE CUTS HAVE BEEN REVIEWED.

2.3 EMERGENCY LIGHTING

1. PROVIDE COMPLETE 12V DC BATTERY POWERED EMERGENCY LIGHTING SYSTEMS FOR THE BUILDING AREAS INDICATED. SYSTEMS SHALL CONSIST OF FULLY AUTOMATIC BATTERY UNITS (360 WATTS FOR 1/2 HOUR) WITH MOUNTING BRACKET AND REMOTE LAMP HEADS AS SHOWN ON DRAWINGS. EMERGENCY BATTERY UNITS SHALL BE C/W BATTERY DISCONNECT SWITCH (70% OF NORMAL VOLTAGE) AND AUTOTEST AND AUTOMATED SELF-DIAGNOSTIC CIRCUITRY COMPLYING WITH C.S.A. AND N.B.C. REQUIREMENTS.

2. THE EMERGENCY BATTERIES SHALL BE LONG LIFE LEAD-ACID, CALCIUM ALLOY TYPE IN SEALED PLASTIC CONTAINERS AND BE TOTALLY MAINTENANCE FREE WITH A MINIMUM LIFE EXPECTANCY OF 10 YEARS.

3. THE BATTERY CAPACITY SHALL BE SIZED TO SUPPLY THE NUMBER OF FIXTURES INDICATED ON THE DRAWINGS, PLUS HAVE AN ADDITIONAL 50 WATTS SPARE CAPACITY FOR FUTURE HEDS. THE BATTERIES SHALL BE CAPABLE OF PROVIDING POWER TO THE FIXTURES FOR THIRTY MINUTES WITHOUT DROPPING BELOW NINETY-ONE (91) PERCENT OF THE RATED BATTERY VOLTAGE.

4. PROVIDE GREY COLOURED CONDUCTORS IN A SEPARATE CONDUIT SYSTEM, FOR THE D.C. WIRING. WIRE SYSTEM IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS TO MAINTAIN VOLTAGE DROP TO LESS THAN 5% TO FURTHEST FIXTURE. CONNECT REMOTE LAMP HEADS AND EXIT SIGN EMERGENCY SOCKETS TO BATTERY UNIT INDICATED. INSTALL A SINGLE RECEPTACLE ADJACENT TO BATTERY UNIT FOR CONNECTION TO BATTERY SUPPLY FROM A LOCAL LIGHTING CIRCUIT. MOUNTING PLATFORMS AND ACCESSORIES SHALL BE PROVIDED FOR A PERMANENT AND SAFE INSTALLATION OF THE BATTERY UNITS.

2.4 EMPTY CONDUIT SYSTEMS

1. PROVIDE EMPTY CONDUIT/OUTLET BOX SYSTEM TO ALLOW INSTALLATION OF COMMUNICATIONS AND SPECIAL SYSTEMS (TELEPHONE, SECURITY, PAGING AND COMPUTER) EQUIPMENT AND WIRING AS DETAILED BELOW AND INDICATED ON THE DRAWINGS. INSTALL PULL CORDS IN ALL EMPTY CONDUITS.

2. IN GENERAL, PROVIDE 38 MM (1½") EMPTY ZONE CONDUITS FROM THE SYSTEM EQUIPMENT MOUNTING BACKBOARD TO SUITABLE AREAS OF ACCESSIBLE CEILING SPACES AS SHOWN. TO ALLOW INSTALLATION OF TELEPHONE AND COMPUTER SYSTEMS DISTRIBUTION WIRING, TERMINATE CONDUITS WITH AN APPROPRIATE INSULATED BUSHING. FOR EACH GENERAL WALL OUTLET INDICATED PROVIDE A 20 MM (3/4") EMPTY CONDUIT FROM A STANDARD SINGLE GANG BOX WITH BLANK COVERPLATE TO AN ACCESSIBLE CEILING SPACE WITHIN 3 M (10') OF A ZONE CONDUIT.

3. TO ALLOW INSTALLATION AND CONNECTION OF PAGING SYSTEM EQUIPMENT SPEAKERS AND WIRING BY THE OWNER, PROVIDE 20 MM (3/4") EMPTY CONDUITS FROM TELEPHONE BACKBOARD TO ACCESSIBLE CEILING SPACES AS SHOWN.

4. IN GENERAL, COMPUTER AND TELEVISION SYSTEMS EMPTY CONDUIT PROVISIONS SHALL BE SIMILAR TO TELEPHONE SYSTEM PROVISIONS. REFER TO DRAWINGS FOR VARIATIONS.

5. REFER TO CONDUIT SYSTEM RISER DIAGRAMS (WHERE PROVIDED) FOR DETAILS OF DISTRIBUTION CONDUIT AND COMPONENT DETAILS AND TO FLOOR PLANS FOR COMPONENT AND OUTLET LOCATIONS. CONTACT OWNER'S SYSTEMS INSTALLATION CONTRACTORS TO VERIFY ALL CONDUIT SIZES, OUTLET LOCATIONS AND INSTALLATION DETAILS PRIOR TO PROCEEDING WITH INSTALLATIONS.

6. PROVIDE EMPTY CONDUIT/OUTLET BOX SYSTEM AS REQUIRED TO ALLOW THE INSTALLATION OF THE MECHANICAL CONTRACTOR'S THERMOSTATS. COORDINATE INSTALLATION WITH THE MECHANICAL CONTRACTOR AND MECHANICAL DRAWINGS PRIOR TO ROUGH-IN. INSTALL PULL CORDS IN ALL EMPTY CONDUITS.

2.5 POWER DISTRIBUTION

1. PROVIDE ALL LABOUR AND MATERIALS REQUIRED TO ALTER AND EXTEND THE EXISTING ELECTRICAL DISTRIBUTION SYSTEM AS SHOWN ON THE DRAWINGS TO MEET THE REQUIREMENTS OF THE PROJECT. PROVIDE ALL NEW DISTRIBUTION EQUIPMENT AND WIRING INDICATED. REFER TO THE POWER DISTRIBUTION SCHEMATIC AND ASSOCIATED SCHEMATICS FOR FURTHER DETAILS.

2. MODIFY/UPGRADE EXISTING INSTALLATIONS AFFECTED BY WORK OF THIS PROJECT IN ACCORDANCE WITH THE ELECTRICAL SAFETY AUTHORITY REQUIREMENTS. NEW DEVICES INSTALLED IN EXISTING EQUIPMENT SHALL MATCH TYPE AND QUALITY OF EXISTING DEVICES AND BE FULLY COMPATIBLE WITH AND BE APPROVED FOR USE IN THE EXISTING EQUIPMENT. PROVIDE ALL APPROPRIATE MODIFICATIONS TO EXISTING PANELS TO ALLOW INSTALLATION OF ADDITIONAL DISTRIBUTION BREAKERS OR FUSIBLE SWITCH UNITS IN A MANNER ACCEPTABLE TO THE ELECTRICAL SAFETY AUTHORITY.

3. UPDATE EXISTING PANEL OR BREAKER SCHEDULES TO REFLECT CHANGES AND ADDITIONS. PROVIDE LABELS FOR ALL NEW EQUIPMENT.

4. PROVIDE ALL LABOUR AND MATERIALS REQUIRED FOR A COMPLETE ELECTRICAL DISTRIBUTION SYSTEM INSTALLED AS SHOWN ON THE DRAWINGS TO MEET THE REQUIREMENTS OF THE PROJECT. DISTRIBUTION EQUIPMENT WILL GENERALLY REFER TO SUCH ITEMS AS SWITCHBOARDS, DISCONNECT SWITCHES, BREAKERS, SPLITTERS, STARTERS, ETC.

5. SURFACE WALL MOUNT ELECTRICAL DISTRIBUTION EQUIPMENT SHALL BE MOUNTED ON 20 MM (3/4") PLYWOOD BACKBOARDS. BACKBOARDS SHALL BE A MINIMUM OF 1220 MM (4') HIGH AND BE PAINTED WITH TWO COATS OF LIGHT GREY FIRE RETARDANT PAINT BEFORE THE EQUIPMENT IS INSTALLED.

6. PANELS SHALL BE OF THE TYPE WITH VOLTAGE AND CURRENT RATING AS SHOWN ON THE DRAWINGS, SIZED TO ACCOMMODATE BRANCH CIRCUIT BREAKERS AND SPACES AS INDICATED. BUS BRACING SHALL BE PROVIDED TO SUIT THE SHORT CIRCUIT CAPACITY RATING INDICATED ON THE DRAWINGS OR MINIMUM 10 KA AT 208 V, 3 PHASE OR 25 KA AT 600 V, 3 PHASE AS APPLICABLE. RESTRICTIVE DIMENSIONS SHALL BE AS SHOWN. PROVIDE LOCKING DOORS FOR ALL PANELS. ALL PANEL DOORS, TRIM AND SURFACE MOUNT TUBS SHALL BE FINISHED IN LIGHT GRAY ENAMEL PAINT. TUBS FOR FLUSH MOUNT PANELS SHALL BE GALVANIZED.

7. UNLESS OTHERWISE NOTED ALL BREAKERS SHALL BE RATED MINIMUM 25 KA SYMMETRICAL INTERRUPTING CAPACITY AT 600 VOLTS, 3 PHASE OR 10 KA ASYMMETRICAL INTERRUPTING CAPACITY AT 208 VOLTS, 3 PHASE AS APPROPRIATE AND NOT LESS THAN THE SHORT CIRCUIT CAPACITY AS SHOWN ON SINGLE LINE DIAGRAM DRAWINGS.

8. STEP DOWN TRANSFORMERS SHALL BE INDOOR, VENTILATED, ANN DRY TYPE FOR SYSTEM VOLTAGES AND OF RATINGS INDICATED ON THE DRAWINGS COMPLETE WITH CLASS 220 (150 DEG. C. RISE) INSULATION, 4 2½% FULL CAPACITY TAPS, GROUNDING TERMINALS AND FUSIBLE LINKS. PROVIDE A SECONDARY CIRCUIT BREAKER FOR EACH INDICATED. PROVIDE SUITABLE WALL MOUNTING PLATFORM OR 100 MM (4") CONCRETE HOUSEKEEPING PAD AS APPLICABLE AND EXTERNAL NEOPRENE VIBRATION ISOLATORS FOR ALL TRANSFORMERS.

9. FUSIBLE SWITCH UNITS INSTALLED IN EXISTING SWITCHBOARD EXTENSION SHALL HAVE QUICK MAKE-QUICK BREAK MECHANISM WITH PROVISIONS FOR LOCKING IN THE OPEN OR CLOSED POSITION AND DOOR/SWITCH INTERLOCK WITH OVERRIDE. ALL FUSIBLE UNITS SHALL BE MODULAR TYPE EQUIPPED FOR CLASS "J" HRC-1 FUSES AND INCLUDE AUXILIARY CONTACTS OR OTHER SPECIAL FEATURES AS NOTED ON THE DRAWINGS.

10. DISCONNECT SWITCHES SHALL BE HEAVY DUTY TYPE WITH VISIBLE BLADES IN THE OFF POSITION, QUICK- MAKE QUICK-BREAK OPERATING MECHANISM, LOCK-OFF PROVISION, DOOR/HANDLE INTERLOCK WITH OVERRIDE AND SHALL BE HORSEPOWER AND ELECTRIC HEAT RATED. SWITCH FUSE HOLDERS SHALL HAVE REINFORCED CLIPS. FUSES SHALL BE EASILY REMOVABLE WHEN THE SWITCH IS IN THE OFF POSITION. ALL SWITCHES SHALL HAVE AMPLE GUTTER SPACE FOR TOP OR BOTTOM WIRING AND BE PROVIDED WITH ENCLOSURES TO SUIT THE SPECIFIC APPLICATION.



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date	revision	no.
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customer
DURHAM COLLEGE

WHITBY ONTARIO 1610 Champlain Ave

project
**DURHAM COLLEGE
CIVIL LAB RENOVATION
WHITBY ONTARIO**

title
**ELECTRICAL SPECIFICATIONS
PHASE 2**

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

The contractor shall check and verify all dimensions and report any errors or omissions to the consultant before commencing or proceeding with any work. Do not scale this drawing.

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scale: NTS	sheet no.:
date: 2018.10.17	E1-1a
job no.: 2018-0647-10	
CAD file: E1 2018-0647-10	
drawn by: SR	
checked by:	


$$1/4'' = 1' - 0'$$

- ① ELECTRICAL CONTRACTOR TO PROVIDE HUBBELL CORD REEL MODEL #GCA12325-SR. MOUNT TO UNDERSIDE OF STEEL JOIST. PROVIDE UNISTRUT AND NECESSARY MOUNTING HARDWARE AS REQUIRED.

ELECTRICAL LEGEND	
LIGHTING	
	2'X4' LIGHT FIXTURE (LETTER DENOTES TYPE)
	WALL MOUNTED LIGHT FIXTURE (LETTER DENOTES TYPE)
	EXIT LIGHT WALL MOUNTED C/W INTEGRAL EMERGENCY LIGHTING HEADS
	OCCUPANCY SENSOR
	DIMMING WALL SWITCH
POWER AND SYSTEMS	
	DUPLEX RECEPTACLE
	DUPLEX RECEPTACLE - HIGH LEVEL
	DUPLEX RECEPTACLE - GFCI. WP INDICATES DEVICE TO BE WEATHER PROOF
	DIRECT CONNECTION
	SURFACE MOUNT PANELBOARD
	WIRELESS ACCESS POINT
	PANEL DESIGNATION
MECHANICAL	
	MECHANICAL EQUIPMENT REFERENCE SYMBOL
FIRE ALARM	
	MANUAL PULL STATION
	FIRE ALARM BELL
RENOVATION	
	EXISTING DEVICE TO REMAIN AS PRESENTLY INSTALLED
	EXISTING SURFACE MOUNT PANELBOARD

E2-1a

\\BEL1\pubs_files\2018\0647-10\06-NWGS\ELC\PHASE 2\E3 2018-0647-10; E3-1a; 1:10028; ANSI full bleed D (22.00 x 34.00 inches); DWG To PDF.pc3; Sheet Name: 2019-03-08 12:11:08 PM

WIRING FOR MECHANICAL EQUIPMENT SCHEDULE																																						
EQUIPMENT			MOTOR			STARTERS														REMOTE CONTROL ITEM												REMARKS						
TAG No.	NAME AND LOCATION	ROOM NUMBER	VOLTAGE	LOAD	PHASE	MANUAL	CONTACTOR	MAGNETIC	COMBINATION	REDUCED VOLTAGE STARTER	SOLID STATE STARTER	VARIABLE FREQUENCY DRIVE	HI-LO SELECTOR	H-O-A	ON-OFF SELECTION SW.	STOP-START PUSH BUTTON	PILOT LIGHT(S)	CONTROL VOLTAGE	M.C.C.	INTEGRATED STARTER	ISOLATION SWITCH	BREAKER OR FUSED SWITCH	WIRED BY	THERMOSTAT AND VOLTAGE PUSHBUTTON STATION	ON/OFF SELECTOR	TIME CLOCK	CONTROL RELAY	WIRING BY		BAS/DCS/PLC	THERMOSTAT AND VOLTAGE	FIRESTAT	CONTROL PNL	WIRING BY	F/A SHUTDOWN	INTERLOCK WITH	INTERLOCK BY	EQUIPMENT SUPPLIED OR CONNECTED BY: E= ELECTRICAL CONTRACTOR M= MECHANICAL CONTRACTOR MC= MECHANICAL CONTROLS CONTRACTOR EC= ELECTRICAL CONTROLS CONTRACTOR KC= KITCHEN CONTRACTOR
RTU 1	ROOF TOP UNIT		208	-	3																E	E	E															-
EF 1	EXHAUST FAN		208	-	3																E	E	E												RTU 1	TBD		
DHW 1	HOT WATER TANK		120	-	1																E	E	E															

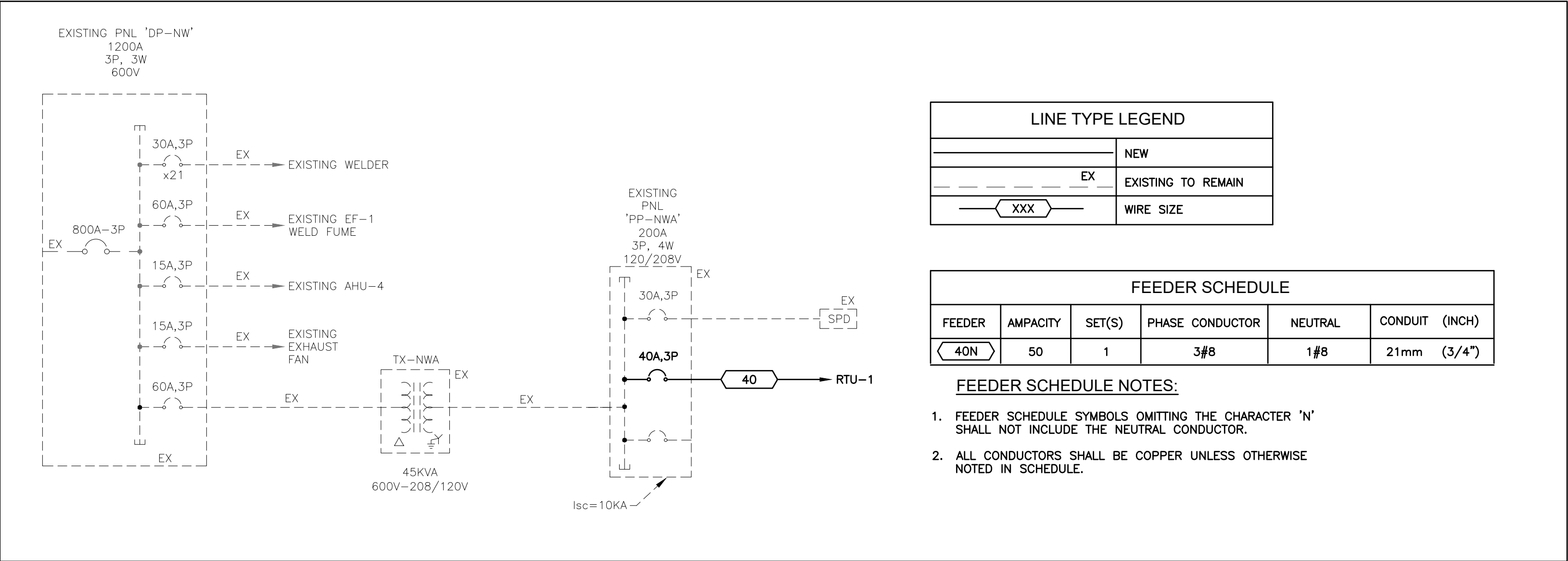
WIRING FOR MECHANICAL EQUIPMENT SCHEDULE NOTES:

- ALL CONTROLS VOLTAGE SHALL BE PROVIDED FROM A PROPER FUSED CONTROL CIRCUIT TRANSFORMER MOUNTED INTEGRALLY WITH THE CORRESPONDING DEVICE/STARTER.
- PROVIDE 'SPRING RETURN' TO OFF (O) FROM HAND (H) POSITION FOR SUPERVISED TEST PURPOSES ONLY.
- ON/OFF CONTROL SWITCH SHALL BE MOTOR RATED FOR LOAD.
- ALL STATUS CONTACTS FOR ALARM AND DEVICE STATE, ETC...SHALL BE INTEGRAL WITH CONTROL DEVICE ENCLOSURE UNLESS NOTED OTHERWISE.
- VARIABLE FREQUENCY DRIVE SHALL BE COMPLETE WITH THE FOLLOWING OPTIONS, START/STOP PUSHBUTTON, H.O.A. CONTROL SWITCH, DOOR MOUNTED DISPLAY (H.I.M.) MODULE, DOOR MOUNTED DISCONNECT SWITCH, MANUALLY OPERATED VFD BYPASS, AUTOMATIC DRIVE BYPASS (FULL SPEED), LINE AND LOAD REACTORS AND GROUND FAULT SENSING ALARM/TRIP. REFER TO SPECIFICATION FOR ADDITIONAL DETAILS AND REQUIREMENTS.
- ALL MECHANICAL EQUIPMENT FEEDERS SHALL BE RATED TO MATCH THE OVERCURRENT PROTECTION DEVICE SPECIFIED.
- PROVIDE POWER SUPPLY TO BAS PANEL AND WIRE AS DIRECTED BY MECHANICAL CONTROLS CONTRACTOR. (DUPLEX RECEPTACLE PROVIDED AND WIRED BY MECHANICAL CONTROLS CONTRACTOR INSIDE PANEL)
- DIV.16 CONTRACTOR TO TERMINATE WIRING FOR I/O (AS NOTED) AT THE LOCAL BAS PANEL COMPLETE WITH SLACK CABLE FOR CONNECTION BY MECHANICAL CONTROLS CONTRACTOR.
- PROVIDE SUITABLE NORMALLY CLOSED (ENERGIZED) RELAY IN A NEMA RATED ENCLOSURE TO OPEN ON FIRE ALARM SIGNAL, MOUNT IN EQUIPMENT HOUSING AS DIRECTED BY DIV.15 CONTRACTOR.
- RVSS SHALL BE COMPLETE WITH THE FOLLOWING OPTIONS, START/STOP PUSHBUTTON, DOOR MOUNTED, (H.I.M.) MODULE, DOOR MOUNTED DISCONNECT SWITCH, STARTER BYPASS CONTACTOR (INTEGRAL AUTO OPERATION) AND GROUND FAULT SENSING ALARM/TRIP. REFER TO SPECIFICATION FOR ADDITIONAL DETAILS AND REQUIREMENTS.
- PROVIDE PILOT LIGHTS AT OPERATOR CONTROL IN FACE OF ENCLOSURE AS FOLLOWS:
 - GREEN-RUNNING
 - RED-FAILED
 - AMBER-MANUAL

LIGHTING FIXTURE SCHEDULE							
TYPE	MANUFACTURER /MODEL	CATALOGUE NUMBER	VOLTAGE /LOAD	LUMENS/ COLOUR TEMP	MOUNTING SD=SUSPENDED S=SURFACE W=WALL MOUNTED R=RECESSED	MOUNTING HEIGHT	REMARKS
A	DELVIRO ENERGY	WPT-30-4K-U-TBLK-PC	120V, 30W	3,300 LUMENS 4000K	W	9' AFF	

LIGHTING FIXTURE SCHEDULE NOTES:

- UNLESS SPECIFICALLY INDICATED OTHERWISE, THE FOLLOWING NOTATIONS APPLY TO ALL FIXTURES IN SCHEDULE AND ON DRAWINGS REGARDLESS IF INFORMATION IS SPECIFICALLY NOTED IN CATALOG NUMBER OR NOT.
- STANDARD COLOUR FINISH FOR ALL FIXTURE ENCLOSURES, BODIES AND TRIMS SHALL BE AS FOLLOWS:
 - INTERIOR - WHITE
 - EXTERIOR - BRONZE
 - ALL FINISHES SHALL BE ELECTROSTATICALLY APPLIED.
- CONTRACTOR TO PROVIDE CLIENT'S STANDARD FIXTURES AS SPECIFIED. NO SUBSTITUTIONS OR ALTERNATES WILL BE ACCEPTED.



1 SINGLE LINE DIAGRAM
E3-1a NTS

Panel ID: PP-NWA	<div>EXISTING</div>		Voltage: 120/208V, 3PH							
Location: Civil Lab			Service: 3 PHASE, 4 WIRE							
Mounting: <div>SURFACE</div>	Bus Type: Copper		Mains: 200A MLO							
Neutral: SOLID			AIC: 10,000							
Load Description	KVA	Brk	P	Ckt #	Phase	Ckt #	P	Brk	KVA	Load Description
Highbay Light Fixtures	15	1	1		A	2	1	20		Benchtop Scales (BTS-1)
Asphalt Binder Pot (ABP-1)	20	1	3		B	4	1	20		Concrete Mixer (CMX-1)
Soil Oven (SO-1)	20	1	5		C	6	1	20		Compression Machine (CM-1)
Hot Plate (HP-1)	20	1	7	A		8	1	20		Universal Material Testing Unit (UMT)
Rotary Sifter (RS-1)	20	1	9		B	10	1	20		Beam Deflection Unit 1 (BDU-1)
Marshall Load Fram (MLF-1)	20	1	11		C	12	1	20		Beam Deflection Unit 2 (BDU-2)
Gravity Bench 1 (SGB-1)	20	1	13	A		14	1	20		Torsion Testing Unit (TTU-1)
Gravity Bench 2 (SGB-2)	20	1	15		B	16	1	20		Strut Buckling Unit (SBU-1)
Projector Receptacle	15	1	17		C	18	1	20		Water Immersion Bath (WIB-1)
SPD	30	3	19	A		20	1	15		SPARE
-	-	-	21		B	22	1	15		SPARE
Roof Top Service Receptacle ■	15	1	23		C	24	1	15		SPARE
Overhead Door Operator ■	15	1	25	A		26	1	20		20A Receptacle
DHW-1 ■	20	1	27		B	28	1	20		■ Cord Reel #1
SPACE			29		C	30	1	20		■ Cord Reel #2
RTU-1 ■	40	3	31	A		32	1	20		■ Cord Reel #3
-	-	-	33		B	34	1	20		■ Cord Reel #4
-	-	-	35		C	36	1	20		■ Cord Reel #5
EF-1 ■	15	3	37	A		38				SPACE
-	-	-	39		B	40				SPACE
-	-	-	41		C	42				SPACE
Notes: Unless noted otherwise, all breakers are EXISTING to be used as indicated. ■ Provide new circuit breaker with Ampere Interrupting Capacity (AIC) rating to match existing. ● Circuit Breaker made available from Demolition. ▲ Provide new GFCI circuit breaker with AIC rating to match existing										
Load Summary										
Additional Options:										
<input type="checkbox"/> Sub-Feed Lugs										
<input type="checkbox"/> NEMA 3R Enclosure										
<input type="checkbox"/> Sprinkler proof - Gasketted										
<input type="checkbox"/> Isolated Ground										
<input type="checkbox"/> Service Entrance Rated										
<input type="checkbox"/> Surge Protection Device										
<input checked="" type="checkbox"/> Drip-Proof										
<input checked="" type="checkbox"/> Lockable Panel										
Total Connected Load		0.0 KVA								
Diversity		80.0%								
Panel Demand Load:		0 KVA								
		0.0 AMP								



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WHITBY ONTARIO 1610 Champlain Ave

project
DURHAM COLLEGE
CIVIL LAB RENOVATION
WHITBY ONTARIO

title
ELECTRICAL SCHEDULES
AND SINGLE LINE DIAGRAM
PAHSE 2

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date: 2018.10.17	
job no.: 2018-0647-10	
CAD file: E3 2018-0647-10	
drawn by: SR	
checked by:	

E3-1a