

# ELECTRICAL NOTES AND SPECIFICATIONS

## GENERAL REQUIREMENTS FOR ELECTRICAL WORK

- GENERAL CONDITIONS**
  - The General Requirements of the Contract Documents, and the Supplementary Requirements for Electrical Work, shall form an integral part of this Specification.
  - The Electrical Contractor (herein referred to as "Contractor") shall review the project drawings (all disciplines) and plans prior to any construction, and shall report in writing potential conflicts that will obstruct or impede the construction to the Engineer of Record. Wherein indicated to "provide", contractor shall "furnish and install".
- SCOPE OF WORK**
  - Conform to the applicable provisions of the General conditions of the Contract.
  - This General Specification shall apply to and form a part of each of the sections covering Mechanical and Electrical trades work.
- EXAMINATION OF SITE AND INFORMATION**
  - Before tendering, Contractor shall examine the site, the Architectural, Structural, Mechanical, Electrical and any other relevant documents, and fully familiarize himself with the designer's intent, so that the tender price will include everything necessary for the proper completion of the work in accordance with the intent of the documents. Obtain the approval of the Engineer, Architect and Project Manager before any alterations to the work indicated.
  - It is the Contractor's responsibility to review the work site noting all existing conditions that may affect construction.
  - Contractor to ensure that all products and materials necessary for the execution of the contract can be brought into the spaces where they are to be located, either through specified openings or partially assembled equipment. Failure to verify space limitations will not absolve the Contractor from the responsibility to provide any additional cutting and restoration work as required.
- RELATIONSHIP TO OTHER TRADES**
  - Contractor shall confer with other trades working in the area, to ensure that his installation will be the result of co-operation between all parties. All devices must be accessible for service. The recommendations of the equipment suppliers shall govern.
  - Ensure that all work will be installed within the prescribed limits of the building, such as ceiling heights, and notify the General trade of any requirements for inserts, sleeves, openings, curbs and bases in sufficient time to have the items completed in the normal course of construction.
  - Confirm with the Mechanical trade, shop drawings and nameplate data that the intended electrical supply will match the required electrical equipment characteristics (i.e. Volts, overcurrent protection, phase, etc.) before finalizing orders. No compensation will be allowed to change any device due to the Contractor's failure to verify the supply with the characteristics.
  - Any cutting or patching required, for whatever reason, shall be done by qualified trades people in the required trade.
  - Structural members shall not be cut without the written consent of the structural engineers on the project.
  - All newly installed conduit, lighting, or wiring devices must have a minimum clearance of 3" from underside of roof decking.
- ADDITIONAL REQUIREMENTS**
  - Prior to the procurement of any new electrical equipment, the Contractor shall retain an independent Professional Engineer (P. Eng.) to complete a Fault Current and Coordination Study of all electrical equipment based on trip settings and cable lengths. Cable lengths shall be provided by the electrical contractor to the independent Engineer.
  - Contractor to provide a copy of the Fault Current and Coordination Study to the Engineer for review.
  - All new equipment provided by the contractor shall be fault-current rated higher than the minimum withstand ratings indicated on the drawings or as indicated by the Fault Current and Coordination Study whichever is greater.
- SUBMITTAL / SHOP DRAWINGS AND ALTERNATIVE EQUIPMENT**
  - This review is for general conformity only and does not relieve the supplier and/or subcontractor from providing the necessary product(s) to meet the design intent.
  - Provide to the Engineer electronic copies of submittals / shop drawings for each piece of equipment to be used in the construction for review. Verify that the submittals / shop drawings correctly identify the equipment that will be supplied, that the equipment will fit the space allotted, and perform the service intended.
  - Before submission, all submittals / shop drawings must be checked for accuracy and the inclusion of all necessary details such as: project identification, item labels (tags), clear indication of which item is being submitted (e.g. Model) and all associated accessories or features associated with the submission. Submittals / shop drawings without this information or that are confusing, unclear, or ambiguous will be rejected and returned as not approved.
  - Equipment described either generically or by brand name is to establish the minimum standard required for the installation. Alternative equipment may be suggested by the bidder, but the equivalence shall be determined by the Engineer. Bidders must tender on the basis of the specified equipment. If alternatives are proposed, they will be considered on their own merits, after the close of tenders. Any lowering of the price based on alternative suppliers will be permitted with the savings being passed to the Owner.
  - All Contractor supplied materials and equipment shall be approved and labeled specifically for use in Canada.
  - Review of submittal / shop drawings by the Engineer is not intended to be the final review. Contractor is still required thereafter to verify that the intended product is correct and that it satisfies the design intent.
- REQUIREMENTS OF INSPECTIONS**
  - All work shall comply with the governing codes and local requirements. Contractor to provide any items required to accomplish this, whether explicitly noted or not on the drawings.
  - Where the Inspecting person requests items not deemed to be included, the matter shall be immediately referred to the Engineer for a ruling. No extra will be considered if the work done by the Contractor to satisfy such a request, could have been avoided by discussion between the Inspector and the Engineer.
  - Provide notice to Inspectors as required for the progress of the project, and ensure that such inspections are carried out, before work is concealed.
  - Any changes or alterations required by inspectors shall be rectified at the Contractor's cost.
- CERTIFICATES, PERMITS AND FEES**
  - Obtain and pay all required permits and all inspections fees, except where specifically noted to the contrary.
  - Furnish to the Owner any certificates that may be necessary as evidence that the work as installed conforms to all the laws and regulations of those authorities having jurisdiction. Prior to issuing any final certificates, Contractor shall make all alterations required by the authority having jurisdiction, by the Engineer as a law, or by any regulation that should have been followed by the Contractor.
- GUARANTEE**
  - The Contractor shall provide a written 1-year guarantee covering all work from defects of workmanship and materials from the date of project substantial completion.
  - Any repairs within the warranty period, the Contractor will repair and replace in a timely manner (within 30 days after notice) without cost to the owner. The cost of repair of damage to any work, caused by the failure of either material or workmanship within the period covered by the guarantee noted in (a) shall be included in this warranty.
  - Where equipment is put into operation prior to completion of the work the period of guarantee covering such equipment shall still commence as noted in item (a) above. The putting into operation of any equipment prior to completion of the work shall only be with written approval of the Engineer and Owner. No equipment shall be started up without first ascertaining that all systems and services associated with its operation are functioning and that responsibilities for equipment maintenance have been arranged.
  - At the completion of the project and prior to final acceptance, the Contractor shall provide to the Engineer the results of the following electrical tests: (1) Electrical Wiring Continuity Testing, (2) Electrical Insulation Resistance Testing for feeders and service conductors, (3) Electrical Earth Continuity Path Testing for all feeders, (4) Electrical Performance Testing of newly installed equipment as per the manufacturer's instructions.
- DRAWINGS**
  - The drawings produced by the Engineer are generally schematic and diagrammatic in nature and are issued for the express purpose of obtaining tenders for the work and for the erection of the systems described in the scope of work to be done. Unless specifically shown, the responsibility for the installation and workability of the system(s) rests with the Contractor.
  - The design contained in the drawings is based on the 2021 Ontario Electrical Safety Code, 28th edition, and its associated bulletins.
  - Where necessary, the Contractor shall prepare interference drawings to ensure that the installation will be coordinated with all services to be installed in the area. The Engineer of Record or other Professionals may be required to approve these proposals.
  - The Contractor shall refer to the architectural edge of slab drawings for the exact location of equipment, fixtures and penetrations. Engineering drawings provide the general design intent and are therefore not dimensioned. Refer to architectural drawings for dimensions.
  - These drawings are not intended to describe every detail which may be necessary to complete the installation. Anything currently existing but not shown on the plans but is within the specified scope of work shall be removed and demolished.
  - Contractor shall be responsible to maintain a set of record drawings by using red lines on the construction drawings where any deviation from the drawings has occurred. The Contractor shall convert the record drawings to electronic AutoCAD (latest version) drawing format and provide electronic copies to the Engineer and Owner.
- RESPONSIBILITY AND LIABILITY**
  - This Contractor is responsible for the laying-out his work, and it shall be done in cooperation with all other trades working in the area. Prior to any electrical work performed by the Contractor, the work of other trades shall be protected from any possible damage and restitution made for any damage caused by the Contractor's work.

- Notify the Engineer of any discrepancies or inconsistencies and abide by the decision of the Engineer. Contractor is responsible to provide a fully working system whether or not details are explicitly on drawings.
  - The Contractor shall correct any deficiencies noted by the Owner or the Engineer of Record at the Contractor's cost.
- CLEAN-UP AND PROTECTION**
    - Maintain a clean working area to minimize danger to others on site, and protect all work in progress from damage due to construction work, weather, or from dirt entry.
    - The Contractor shall complete all work in a neat and tidy manner and shall maintain a well-kept site for the duration of construction.
    - Recyclables and waste shall legally be disposed of off-site at the Contractor's cost.
  - OPERATOR TRAINING AND INSTRUCTIONS**
    - Contractor to provide complete operating and Maintenance instructions for all equipment supplied, complete with parts lists and the names of the suppliers to Owner.
    - Touch up or repaint as necessary, all scratches or other finish defects, that have occurred on any devices supplied under this contract.
  - FIRE SEPARATIONS AND FIRE STOPPING**
    - Adjacent devices in fire separations shall not be closer than 300mm.
    - Fire stop shall be of a type to suit the use and purpose.
    - Fire stop all sleeves passing through fire separations with an approved fire stopping material, and make waterproof. Provide escutcheons for all exposed penetrations through walls, and floors as directed.
    - All components of the electrical system shall be installed to maintain fire separations and fire ratings. For fire ratings and fire separations refer to architectural drawings. All electrical devices require coordination and consideration, include but are not limited to, device boxes, junction boxes, switches, receptacles, luminaires, etc.
  - WORKMANSHIP**
    - Only first class workmanship will be accepted, not only with regards to safety, efficiency, durability, etc., but also with regards to the neatness of detail. All conduit work shall be lined up parallel, or at right angles to the building walls where possible. Equipment must be accurately set, plumb and level, and all hangers must be in true vertical alignment. In general, the entire work shall be first class and workman like and present a neat and clean appearance upon completion.
    - Contractor shall complete all cutting and patching as required to complete the electrical installation. See 4 (e).

## GENERAL ELECTRICAL AND POWER

- INSTALLATION**
  - All electrical equipment shall be installed in accordance with any specific manufacturer's instructions in addition to the minimum Code requirements. OESC Rule 2-034
  - Provisions for Temporary Power during construction shall be the responsibility of the electrical contractor, including the associated application process.
  - Supply and install all electrical heaters. Refer to Mechanical Drawings for locations.
  - The contractor shall confirm the physical dimensions of all equipment prior to their release, including all clearances and work required for a complete installation, to ensure they can be physically accommodated within the space.
- EQUIPMENT PROTECTION**
  - Contractor shall protect existing equipment during construction.
  - Existing equipment to be reused shall be checked by the Contractor for proper operation.
  - All new electrical equipment shall be delivered to the site and shall be completely protected with a plastic covering. Additional on-site protection must be provided to keep the equipment protected from the elements and other trades. If there is any indication of rusting or corrosion or significant physical abuse on the equipment, the affected parts shall be replaced at no cost to the owner.
  - The Contractor shall ensure all products and equipment to be used is safely stored prior to installation. The Contractor shall be responsible for any theft of equipment prior to installation.
  - Floor mounted electrical equipment (switchgear, transformers, etc) shall be mounted on housekeeping pad (minimum 4") supplied by the Contractor. It is the responsibility of the Contractor to provide structural drawings.
  - Roof sleeves shall be complete with roof flashing and rain shields.
- EQUIPMENT IDENTIFICATION GENERAL**
  - Provide all nameplates for electrical equipment (such as but not limited to panels, disconnect switches, transformers, etc.) nameplates must indicate equipment name and electrical characteristics (ampacity, voltage, phases, number of conductors), i.e.: "Panel A", 200A, 120/208V, 3-Phase, 4-Wire.
  - Nameplates must be white with black lettering lamacoid 1.5mm thick minimum. Nameplate engraving shall be as follows:
    - Electrical Equipment Name: 0.5" (13mm) in height.
    - Electrical Equipment Characteristics: 0.25" (6mm) in height.
  - Provide typed directory cards in all new and revised distribution panels. Hand written directory cards are not acceptable.
  - All empty or spare conduit shall be identified with black permanent marker clearly indicating the source and the destination.
  - All junction boxes shall be identified with black permanent marker indicating the source panel, circuit number and system (i.e., lighting, receptacles, fire alarm, etc.).
  - Where applicable, Contractor to comply with but not limited to the following:
    - At each distribution point, circuit breakers, fuses and switches shall be marked, adjacent thereto, in a conspicuous and legible manner to indicate clearly which installation or portion of installation they protect or control and the maximum rating of overcurrent device that is permitted. Rule 2-100 3)
    - A warning sign shall be located beside the switches controlling circuits electrically protected by Class A ground fault circuit interrupters, advising that the circuits have this protection and that the equipment shall be tested regularly. Rule 68-068 5)
    - Permanent, legible signs shall be installed at the point of connection of the electric vehicle supply equipment to the branch circuit wiring, warning against operation of the equipment without sufficient ventilation as recommended by the manufacturer's installation instructions. Rule 86-200
    - All equipment must be labeled and approved by an accredited Certification Body, or accepted through field evaluation, or accepted by an Inspector under the provisions of Rule 2-024 of the current Ontario Electrical Safety Code. Rule 2-022, Rule 2-024, Bulletin 2-7-\*

## CONDUIT WIRE & CABLE

- All wiring and cables below grade and outside of building envelope must be installed in PVC Schedule 40 unless otherwise noted. All wiring and cables above grade or within building envelope must be installed in EMT conduit unless otherwise noted on drawings. Armored flexible cable may be used where not visible (within walls and ceilings that are not return air plenums).
- All empty conduit and raceway systems shall be installed complete with nylon pull string which shall be securely fastened at each end of the conduit.
- All conduits installed in accessible spaces (e.g. above dropped T-bar ceilings) or where exposed shall be run in straight lines parallel to building structure. Diagonal runs are not permitted.
- Conduit wire & cable shall not be run near the top of transformer enclosures due to higher ambient temperatures. No more than (3) 90° bends in a conduit run are allowed between pull boxes.
- If the conduit lengths/bends exceed that listed below, a pull box shall be installed.
  - 65' (20m) maximum - three 90° bends.
  - 100' (30m) maximum - two 90° bends.
  - 150' (45m) maximum - one 90° bend.
  - 200' (60m) maximum - no bends.

## ELECTRICAL HEATERS

- Supply and install all heaters as listed, in coordination with the Mechanical trade, at the rated size and voltage indicated on the drawings.
- Supply and install all controls and wiring as necessary to provide a complete and operating heating system.
- Supply and install all conduit for thermostat of unit heaters as required by Mechanical trade.

## DISTRIBUTION EQUIPMENT

- All distribution equipment must be rated for use within the space. All electrical equipment must be complete with drip shields at a minimum or otherwise listed as suitable for use in a sprinklered environment.
- PANELBOARDS**
    - Provide surface or recessed panels as indicated adhering to type, voltage, ampere capacity, number of poles/branch circuits, withstand fault current, etc. Breakers shall be bolt-on type (slash rated breakers are not acceptable).
    - Provide electrical panels with a steel door, flush mounted locks, and concealed hinges.
    - The Contractor must balance all panels to give as near as possible equal current on all phases under typical operating conditions (adjust to be within 15%).

## DISCONNECT SWITCHES

- The main service switch must meet the requirements of the local utility, including lockable, visible window type, etc.

- All disconnects must be lockable in off position by one lock. The switch must be mechanically interlocked with switch door, containing defeat to prevent opening when switch is in the closed position.
- FUSES & BREAKERS**
    - Fuses within the main service switch shall be Class J (600A and under). Fuse ratings shall be as noted or as required for proper protection, fuses shall be rated for 200KAC.
    - Fuses serving as over current protection on the primary side of a transformer feeding a panel board shall be RK5 (time delay).
    - Circuit breakers shall be rated for the voltage of the system to which they are connected.
  - WIRING DEVICES**
    - Devices must be white colour unless otherwise noted.
    - Devices for general purpose shall be of heavy duty specification grade.
    - All receptacle devices shall be Tamper-Resistant type as per OESC C2.1-18 rule 26-720.
    - Install switches with handle in the "up" position when the switch is in the "on" or closed position.
    - Remove plastic protective film on stainless steel plates only after painting and other work has been completed in that area.
    - Do not use cover plates designed for flush outlet boxes on surface mounted boxes.
    - Do not use outlet boxes designed for recessed mounting in surface mount applications.
    - All devices shall have permanent labels affixed clearly indicating the source circuit number and panel name. Text on the label shall be 1/4" (6mm) in height.
    - Contractors shall be of the voltage, ampacity and number of poles as indicated on the drawings. Contacts shall have mixed load ratings (lighting and motor) and a withstand rating of 100KA. Contacts shall be electrically held unless otherwise noted.
    - Where applicable, Contractor to comply with but not limited to the following:
      - Each 125V, single-phase receptacle installed in pits, hostways, elevator and enclosed vertical platform lift car tops, and escalator or moving walk wellways shall be of the Class A ground fault circuit interrupter type. Rule 38-085 1)
      - Where exposed to the weather, receptacles of configurations 5-15R, 5-20R, 5-20RA, 6-15R, 6-20R and 6-20RA shall be provided with cover plates suitable for wet locations whether or not a plug is inserted into the receptacle, and marked "Extra Duty". Rule 26-708 2)
      - Each branch circuit in a dwelling unit supplying 125V receptacles rated 20 amps or less shall be protected by a combination-type arc-fault circuit interrupter, except for receptacles installed in accordance with OESC Rule 26-656 1) a) and b), Bulletin 26-18-\*
      - A separate disconnecting means shall be provided for electric vehicle supply equipment. Rule 86-304 1)
      - Electric vehicle supply equipment shall be mechanically protected from damage either by location or other means. Rule 2-200
      - Where applicable and whether or not indicated on drawings, single dwellings of the detached, semi-detached, and row housing types shall have at least one outdoor receptacle at both front and rear of the house controlled by interior switch per Rule 26-726 a)
      - Where applicable and whether or not indicated on drawings, dwelling units with garage or carport shall have at least one receptacle and an additional receptacle within 1m of garage door opener apparatus. Rule 26-726

## DEVICE MOUNTING HEIGHTS AND INSTALLATION

- Mounting heights to center of device above finished floor (AFF), unless otherwise noted.
- Contractor shall coordinate device mounting heights with other disciplines prior to installation.
- The Contractor shall refer to the architectural for the exact location of devices and penetrations.
- The following mounting heights shall be adhered to unless otherwise noted:
  - Light Switches: To be mounted not less than 35.4" (900mm) and not more than 43.3" (1100mm) AFF.
  - Receptacle Heights: To be mounted 16" (400mm) AFF. When above a countertop, to be mounted 4" (100mm) above countertop (max 1200mm AFF). When provided for mechanical equipment, coordinate with final mechanical equipment location.
  - Roof Receptacles: Provide dedicated branch circuit to each roof receptacle required per OESC 26-710. Roof receptacles shall be 5-20R GFCI (Class A type) within 25' (7.5 m) of all rooftop equipment.
  - Kitchen Receptacles: Where residential dwellings are included in these plans Contractor shall ensure that the requirements of OESC 26-724 a) b) c) are met. Whether or not shown explicitly on these drawings, provide additional receptacles as needed so that no location along any kitchen counter space is more than 900mm from a kitchen counter receptacle. Counters longer than 300mm must have no less than one receptacle. Island counters or peninsulas larger than 600mm long and 300mm wide must have no less than one receptacle. No receptacles may be mounted in the back splash area of a sink.
  - Receptacles in Dwelling Areas: Where residential dwellings are included in these plans Contractor shall ensure that the requirements of OESC 26-724 a) b) c) are met. Whether or not shown explicitly on these drawings, provide duplex receptacles in all finished walls (greater than 900mm) of every room or area (including balcony or porch but not including washrooms, hallways, laundry rooms, utility rooms, or closets) so that no point along the floor line of any usable wall space is more than 1.8 m horizontally from a receptacle in that or an adjoining space.
  - Hallway Receptacles: Where residential dwellings are included in these plans Contractor shall ensure that the requirements of OESC 26-724 d) and 26-720 m) are met. Whether or not shown explicitly on these drawings, provide duplex receptacles in hallways of public corridors of residential occupancies such that at least one duplex receptacle is located in each 10 m of wall length or fraction thereof. Additionally within dwelling units, provide duplex receptacles in hallways along the floor line of any usable wall space such that there is no point along the wall that is further than 4.5 m from the nearest duplex receptacle within that hallway.
- Where a conflict of device mounting occurs, the Contractor shall contact the Engineer for clarification.
- Receptacles installed in a dwelling unit shall be tamper resistant as required in the OESC section 26, with exception of receptacles dedicated for stationary appliances such that the receptacle is rendered inaccessible.
- Branch circuits in dwellings rated for 125V and 20A or less shall be protected by a combination type arc-fault circuit interrupter, in accordance with OESC 26-656.
- Where receptacles are exposed to weather, provide in suitable receptacle housing designed for wet locations whether or not a plug is inserted into the receptacle, in accordance with OESC 26-708.

## TRANSFORMERS

- Unless otherwise noted on drawings, transformers shall be dry-type, 115 deg c temp rise, less than 4.5% regulation at unity power factor, less than 5% total losses at full load, 3.5% minimum impedance, aluminum or copper wound, the transformer must be of the voltage and kVA as shown on the drawings.
- Transformers specified must not be replaced with an alternative T-wound or auto-transformer unless directly reviewed and approved by the Engineer.
- Dry-type transformers shall have internal vibration absorbing pads and optional external molded neoprene and steel vibration isolators.
- When wye-wound step-up/down transformers are used, a wye winding shall not face a wye service winding.
- Transformers shall have four (4) 2.5% full capacity taps. Connections on HV and LV sides shall be flexible conduit or equivalent.
- Where transformers are mounted on combustible floors or above pedestrian traffic, Contractor shall provide protection plates, such that in the event of a failure there is no hazard of molten metal.

## GROUNDING & BONDING

- The Contractor shall include in his tender grounding and bonding as required by Electrical Safety Authority inspection department. Where applicable, Contractor to comply with but not limited to the following:
  - The grounded conductor of a solidly grounded separately derived ac system shall be connected to the equipment bonding terminal by a system bonding jumper, sized per Table 16, at the source, at the first switch controlling the system, or by the system bonding jumper that is connected to the bonding conductor included in the primary supply. Rule 10-212, Rule 10-614
  - Any metal (i.e. metal fences, bollards, protective barrier, etc) located within 2.4 m of the outdoor pad mounted equipment enclosure shall be bonded to the station ground electrode with No. 2/0 AWG copper conductors. Rule 36-308 and Bulletin 36-10-\*
  - Bonding conductors for pools shall be not smaller than No. 6 AWG for permanently installed pools and for all in-ground pools, or as required by Table 16 for all other pools. Rule 68-058 4)
  - Where conductors are installed in parallel in separate cables, raceways, or bus, a full size bonding conductor shall be installed within each individual run of parallel conductors as per Rule 10-602. This also applies to primary and the secondary conductors of main service feeders.

## ELEVATORS

- COORDINATION & POWER REQUIREMENTS**
  - Main power feeds and associated disconnects shall be provided by the electrical contractor as noted in the elevator shop drawings and the power single line diagram. All power shall be provided to the elevator as indicated on the elevator shop drawings. Provide feeder with equipment grounding conductors sized according to OESC requirements.
  - When a fire alarm system is not provided within the building, all devices required by CSA B44 shall be wired to an appropriately labelled "Dedicated Fire Function Panel" that will initiate elevator recall. When a fire alarm system is provided within the building, all devices required by CSA B44 shall be wired to the fire alarm system. Provide dual contact devices where required to allow for the elevator controller to initiate elevator recall.
  - When the building has a CAFR room (Central Alarm and Control Facilities) the electrical contractor shall provide wiring and conduit between the CAFR room and each elevator machine room as required by the elevator shop drawings.
  - When emergency power is available within the building, the elevator car lighting, pit lighting and machine room lighting shall be on a dedicated emergency power circuit.

- When emergency power is available within the building, one or more elevators may be on the emergency power system, coordination with all professionals, contractors and equipment providers is required
- PIT**
    - Whether or not explicitly indicated on drawings, elevator pit lighting shall be provided to achieve 200lux within the pit at the floor level. Provide conduit from light switch within the machine room.
    - Whether or not explicitly indicated on drawings, provide a GFCI-type receptacle on a dedicated 20A, 120VAC circuit within the elevator pit at 18" AFF when required (refer to elevator shop drawings elevator machine room layout).
  - ANCILLARY CONTROL DEVICES**
    - Provide devices in elevator lobbies to initiate elevator recall via the elevator controller (unless the elevating device is exempt from this requirement by design).
    - Provide a GFCI-type receptacle on a dedicated 20A, 120VAC circuit next to each control cabinet (refer to elevator shop drawings machine room layout).
  - MACHINE ROOM**
    - Provide lighting in elevator machine room to achieve 200lux within the machine room at the floor level, provided color and light switch within the machine room (the switch shall also control the elevator pit lighting).
    - Provide a general purpose GFCI-type receptacle on a dedicated 20A, 120VAC circuit within the elevator machine room (may also be required at the top of the hoistway, consult the elevator shop drawings).

## LIGHTING

- INSTALLATION**
  - Supply and install lighting fixtures with all accessories and lamps as shown in lighting fixture schedule, and as noted on drawings. This Contractor shall also obtain a copy of the latest Architectural and Interior Design plans for exact type and quantity of lighting fixtures. Any discrepancies between the plans are to be reported to Engineer at once.
  - The Contractor must endeavour to provide a mounting solution that is visually appealing to the Owner when not directly specified in this drawing package, at no additional cost to the Owner.
  - Alternative lighting fixtures may be suggested by the bidder; however, this contractor must provide photometric calculations/simulation to confirm adequate substitution.
  - The Contractor shall submit shop drawings containing a minimum of the following information:
    - fixture manufacturer (include address and telephone number)
    - image of the fixture
    - fixture model number
    - fixture colour
    - mounting details
    - photometric data
    - highlighted selectable options
- EXTERIOR LIGHTING TIME CONTROLS & SIGN CONTROL**
  - The Contractor must provide an electronic programmable timer with the minimum requirements of 7 day, 2 circuit, 1 to 70 on/off operations/week, 120V, 30A rated contacts.
  - The Contractor must program time clock for independent control of two exterior lighting zones on a seven day schedule as noted by the Owner and Engineer. Schedules and instruction sheets shall be provided to the Owner.
  - Lighting should be controlled by automatic switching devices such as timers or photocells. The outdoor lighting shall be reduced by 75% after normal hours of operation until dawn.

## LIFE SAFETY

- EXITS**
  - All new exit fixtures must be internally illuminated or a photoluminescence type as specified on drawings. Contractor to confirm type with client prior to purchase.
  - New exit signs shall be the green running man type.
  - Exit fixtures must be wall or ceiling mounted. Final exit fixture location and mounting arrangements must be coordinated on-site. Each exit fixture must be visible from the exit approach.
  - Wall mounted exits shall be mounted at 96" (2430mm) above finished floor or 12" (300mm) above doors.
  - Exit fixtures may be ceiling mounted if the ceiling height does not exceed 144" (3658mm).
- EMERGENCY LIGHTING (BATTERY SYSTEM)**
  - The emergency lighting must activate upon loss of power to the lighting circuit servicing the space. The battery must automatically recharge after normal power is restored.
  - The Contractor must supply and install an emergency lighting system consisting of 24VDC battery unit(s), lighting heads, conduit, wiring, etc.
  - The Contractor shall test the emergency lighting system and repair any non-conforming fixtures or deficiencies to ensure that minimum lighting levels are maintained.
  - Dedicated battery units must be wall mounted at 84" (2250mm), power feed for battery packs shall be mounted at 96" (2450mm) where possible.
  - Wall mounted remote heads shall be mounted at 96" (2450mm) AFF. Contractor to verify locations on site as required.
  - The Contractor shall confirm that the wire size and length of each emergency lighting circuit will allow at the most a voltage drop limit of five percent to the most remote fixtures.
  - All emergency lighting wiring shall be in dedicated conduits and not mixed with other wiring.

## COMMUNICATION AND DATA

- CONDUITS**
  - The Contractor shall supply and install all empty conduits and conduit components to allow for installation of data and phone cables as shown in the drawings.
  - All conduit for the purpose of communications within ceiling spaces, rooms or closets must stub into the space a minimum of 3" (75mm) without a bend.
- CABLES**
  - Supply and install Cat6 Cables, RJ45 Connectors required for Data and VOIP, RJ11 Connectors required for Phone.

## CIVIL WORKS

- GENERAL**
  - The Contractor shall coordinate all civil works with the General Contractor including but not limited to the excavation, backfill, compaction, restoration, etc.
  - The Contractor shall be responsible for obtaining all locates to ensure that the new installation will not interfere with existing services.
  - The Contractor shall be responsible for the restoration of grass area, sidewalks, roadways, landscaped areas, etc. to the original condition. Grass areas shall be re-sodded, not seeded.
  - The Contractor shall coordinate inspection of all underground installations by the local utility and Electrical Safety Authority prior to pouring concrete or backfilling.

CONDUIT/FEEDER SCHEDULE (BASED ON 30 DEG C AMBIENT, IN RACEWAY PER OESC TABLE 2)											
DESCRIPTION	CONDUIT			CABLES IN EA			BOND			NOTES	
	ID	AMPS	CNT	INCH	mm	TYPE	CNT	SIZE	TYPE		CNT
60S	60	1	1"	27	EMT	3	#6	RW90	1	#10	SINGLE PHASE
60	60	1	1"	27	EMT	4	#6	RW90	1	#10	
70	70	1	1.25"	35	EMT	4	#4	RW90	1	#8	
90	90	1	1.5"	41	EMT	4	#2	RW90	1	#8	
100S	100	1	1.25"	35	EMT	4	#2	RW90	1	#8	SINGLE PHASE
100	100	1	1.5"	41	EMT	4	#2	RW90	1	#8	
125S	125	1	1.25"	35	EMT	3	#1	RW90	1	#6	SINGLE PHASE
125	125	1	1.5"	41	EMT	4	#1	RW90	1	#6	
150S	150	1	1.5"	41	EMT	4	1/0	RW90	1	#6	SINGLE PHASE
150	150	1	2"	53	EMT	4	1/0	RW90	1	#6	
200S	200	1	2"	53	EMT	3	3/0	RW90	1	#6	SINGLE PHASE
200	200	1	2"	53	EMT	4	3/0	RW90	1	#6	
225	225	1	2.5"	63	EMT	4	4/0	RW90	1	#4	
300	300	1	3"	75	EMT	4	350KCMIL	RW190	1	#4	
400	400	1	0'-4"	75	EMT	4	600KCMIL	RW190	1	#3	
600	600	2	2.5"	63	EMT	4	350KCMIL	RW190	1	#1	EQUIPMENT BOND IN EACH
800	800	2	0'-4"	75	EMT	4	600KCMIL	RW190	1	1/0	EQUIPMENT BOND IN EACH
1200	1200	4	3"	75	PVC	4	350KCMIL	RW190	1	3/0	EQUIPMENT BOND IN EACH
1600	1600	5	3"	75	PVC	4	600KCMIL	RW190	1	4/0	EQUIPMENT BOND IN EACH

ALL CONDUCTORS TO BE COPPER (CU) UNLESS OTHERWISE NOTED.

### ELECTRICAL SYMBOLS

SYMBOL	DESCRIPTION
	125V-15A, 10-3W GROUNDED DUPLEX RECEPTACLE, WALL MOUNTED UNLESS NOTED
	125V-15A, 10-3W GFCI GROUNDED DUPLEX RECEPTACLE, WALL MOUNTED UNLESS NOTED
	125V-15A, 10-3W GROUNDED DUPLEX RECEPTACLE C/W 2 USB CONNECTION, WALL MOUNTED UNLESS NOTED
	125V-15A, 10-3W WEATHER PROOF GROUNDED DUPLEX RECEPTACLE, WALL MOUNTED UNLESS NOTED
	125V-15A, 10-3W GROUNDED DUPLEX RECEPTACLE, CEILING MOUNTED UNLESS NOTED
	125V-15A, 10-3W GROUNDED DUPLEX RECEPTACLE ON DED. CCT. WALL MOUNTED UNLESS NOTED
	125V-15A, 10-3W GROUNDED DUPLEX RECEPTACLE, MOUNTED ABOVE COUNTER FOR GENERAL POWER CONNECTION.
	125V-15A, 2P-3W GROUNDED SPLIT WIRED RECEPTACLE, WALL MOUNTED UNLESS NOTED
	125V-15A, 10-3W GROUNDED QUAD RECEPTACLE IN COMMON BOX, WALL MOUNTED UNLESS NOTED
	125V-15, 2P-3W DOUBLE DUPLEX SPLIT WIRE GROUNDED QUAD RECEPTACLE IN COMMON BOX, WALL MOUNTED UNLESS NOTED
	125V-15A, 10-3W GROUNDED DUPLEX RECEPTACLE MOUNTED IN FLUSH FLOOR BOX UNLESS NOTED
	120V-15A, 10-3W GROUNDED QUAD RECEPTACLE MOUNTED IN FLUSH FLOOR BOX UNLESS NOTED
	250V-20A, 2P-3W GROUNDED RECEPTACLE, WALL MOUNTED UNLESS NOTED
	250V-30A, 2P-3W GROUNDED RECEPTACLE, WALL MOUNTED UNLESS NOTED (RANGE OR DRYER RCPT IN RESIDENTIAL APPLICATIONS)
	250V-40A, 2P-3W GROUNDED RECEPTACLE, WALL MOUNTED UNLESS NOTED
	125V-15A, 10-3W GROUNDED DUPLEX RECEPTACLE C/W DATA/PHONE COMBO MOUNTED IN FLUSH FLOOR BOX UON
	DATA OUTLET C/W 3/4\"/>
	TELEPHONE WALL OUTLET C/W 3/4\"/>
	COMBINATION DATA & TELEPHONE OUTLET - WALL MOUNTED C/W 3/4\"/>
	HARDWIRED CONNECTION
	TV DATA OUTLET
	PUSH BUTTON
	CALL FOR HELP INDICATOR LIGHT
	CONTROL SWITCH, MOTOR RATED
	CONTROL SWITCH, MANUAL-OFF-AUTO
	POWER PANEL, FLUSH MOUNTED
	TELECOM PANEL, FLUSH MOUNTED
	POWER PANEL SURFACE MOUNTED
	DISTRIBUTION BOARD
	DISCONNECT, NON-FUSED
	DISCONNECT, FUSED
	SWITCH, NON-FUSED
	SWITCH, FUSED
	CIRCUIT BREAKER
	TRANSFORMER
	POWER METER
	MOTOR WITH HORSEPOWER INDICATED
	JUNCTION BOX
	CONDUIT RUN TO PANEL
	GROUNDING
	HEAT TRACE WITH GROUND FAULT PROTECTION APPLIED TO PIPING, VALVES, ETC
	CONDUIT RUN CONCEALED OR EXPOSED
	CONDUIT RUN UNDERGROUND OR UNDERFLOOR
	J-HOOKS INSTALLED AT 3' REGULAR INTERVALS (UON) ABOVE ACCESSIBLE CEILING SPACE ON WALL OR CEILING

SYMBOL	DESCRIPTION
	MANUAL PULL STATION
	HEAT DETECTOR
	SMOKE DETECTOR
	SMOKE ALARM
	SMOKE / CO COMBINATION DETECTOR
	CARBON MONOXIDE DETECTOR
	DUCT - TYPE SMOKE DETECTOR
	REMOTE SAMPLING - TYPE SMOKE DETECTOR
	HORN & STROBE COMBINATION DEVICE - WALL MOUNTED
	STROBE ONLY DEVICE - WALL MOUNTED
	HORN & STROBE COMBINATION DEVICE - CEILING MOUNTED
	STROBE ONLY DEVICE - CEILING MOUNTED
	HORN ONLY DEVICE
	FIRE ALARM CONTROL PANEL
	FIRE ALARM ANNUNCIATOR PANEL C/W GRAPHIC
	CARD READER
	SIGNAL SILENCE
	FAULT ISOLATION MODULE
	END OF LINE DEVICE
	STAIRWELL SPEAKER
	SPEAKER
	FIREMAN'S PHONE
	FIRE ALARM RELAY
	ADDRESSABLE MODULE
	ADDRESSABLE MONITOR MODULE
	ADDRESSABLE CONTROL MODULE
	CONTROL RELAY
	WATER-FLOW SWITCH
	SPRINKLER PRESSURE SWITCH
	SUPERVISED VALVE
	EXHAUST DAMPER
	AUTOMATIC TRANSFER SWITCH
	JUNCTION BOX
	DATA COMMUNICATION LINK STYLE C
	BEAM SMOKE DETECTOR
	BELL

SYMBOL	DESCRIPTION
	ELECTRONIC STRIKE
	CARD READER
	DOOR CONTACT
	OVERHEAD DOOR CONTACT
	SECURITY KEYPAD
	EXIT/ENTRANCE BUTTON (COMBO PUSH/WAVE TO INITIATE)
	MAGNETIC LOCK
	DUAL TECHNOLOGY MOTION DETECTOR
	SECURITY CAMERA
	INTERCOM

SYMBOL	DESCRIPTION
	SINGLE POLE, SINGLE THROW TOGGLE SWITCH (3' DENOTES 3-WAY, 4' DENOTES 4-WAY, PL' DENOTES PILOT LIGHT, LV' DENOTES LOW VOLTAGE, K' DENOTES KEY OPERATED) 120 OR 347V AS APPLICABLE.
	GANGED SWITCHES
	TOGGLE SWITCH WITH OCCUPANCY SENSOR, WALL MOUNTED
	TOGGLE SWITCH WITH DIMMING
	TOGGLE SWITCH TIMER
	OCCUPANCY SENSOR CEILING MTD
	RECESSED ROUND FIXTURE
	WALL MOUNTED FIXTURE / WALLPACK
	LOW-BAY FIXTURE
	PENDANT CYLINDER FIXTURE
	SHOWER FIXTURE
	CORRIDOR SURFACE FIXTURE
	LINEAR SURFACE WALL FIXTURE
	1' x 4' RECESSED CEILING FIXTURE
	2' x 2' RECESSED CEILING FIXTURE
	2' x 4' RECESSED CEILING FIXTURE
	4' SURFACE LINEAR STRIP FIXTURE
	1' x 4' HIGH-BAY FIXTURE
	LINEAR TRACK LIGHTING FIXTURE
	SINGLE HEAD LIGHTING STANDARD
	DOUBLE HEAD LIGHTING STANDARD

NOTES:  
 1. SHADED FIXTURES ARE CONNECTED TO EMERGENCY CIRCUIT  
 2. REFER TO LIGHTING FIXTURES SCHEDULE & SPECIFICATIONS  
 3. SHADED FIXTURES WITH THE SUFFIX 'N' INDICATE FIXTURES CONNECTED TO UN-SWITCHED EMERGENCY CIRCUIT (NIGHT LIGHTS)  
 4. HALF SHADING INDICATES NL OR EM

SYMBOL	DESCRIPTION
	EMERGENCY LIGHTING BATTERY UNIT C/W UNIT MOUNTED QUARTZ HEADS
	EMERGENCY SURFACE MOUNTED DOUBLE HEAD LED REMOTE HEAD
	EMERGENCY SURFACE MOUNTED SINGLE HEAD LED REMOTE HEAD
	PICTOGRAM EXIT SIGN C/W TWO EMERGENCY BATTERY HEADS AND BATTERY UNIT
	SUSPENDED CEILING MOUNTED PICTOGRAM GREEN RUNNING MAN EXIT LIGHT, ARROW(S) INDICATE DIRECTION C/W BATTERY UNIT. PROVIDE REQUIRED CONDUIT LENGTH TO SUIT SITE CONDITIONS.
	WALL MOUNTED PICTOGRAM GREEN RUNNING MAN EXIT LIGHT, ARROW(S) INDICATE DIRECTION C/W BATTERY UNIT. PROVIDE REQUIRED CONDUIT LENGTH TO SUIT SITE CONDITIONS

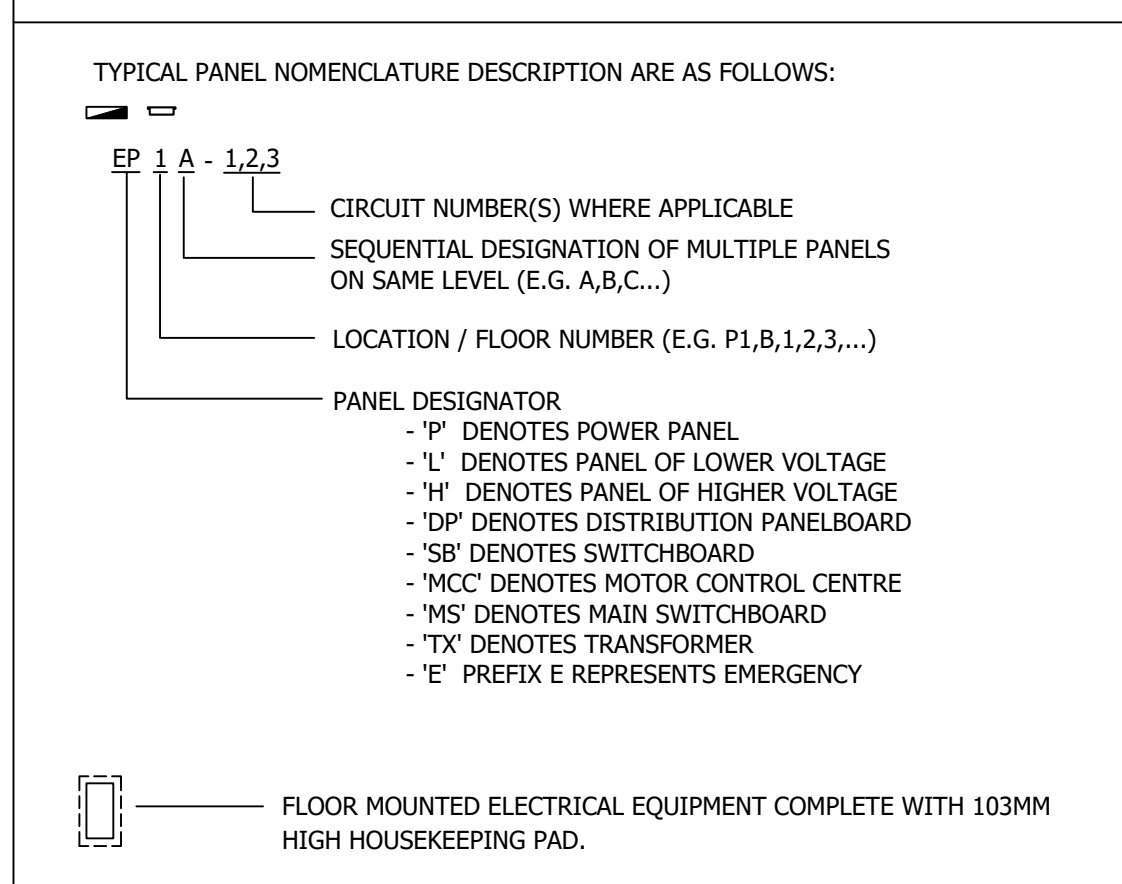
### LIFE SAFETY

SYMBOL	DESCRIPTION
	EMERGENCY LIGHTING BATTERY UNIT C/W UNIT MOUNTED QUARTZ HEADS
	EMERGENCY SURFACE MOUNTED DOUBLE HEAD LED REMOTE HEAD
	EMERGENCY SURFACE MOUNTED SINGLE HEAD LED REMOTE HEAD
	PICTOGRAM EXIT SIGN C/W TWO EMERGENCY BATTERY HEADS AND BATTERY UNIT
	SUSPENDED CEILING MOUNTED PICTOGRAM GREEN RUNNING MAN EXIT LIGHT, ARROW(S) INDICATE DIRECTION C/W BATTERY UNIT. PROVIDE REQUIRED CONDUIT LENGTH TO SUIT SITE CONDITIONS.
	WALL MOUNTED PICTOGRAM GREEN RUNNING MAN EXIT LIGHT, ARROW(S) INDICATE DIRECTION C/W BATTERY UNIT. PROVIDE REQUIRED CONDUIT LENGTH TO SUIT SITE CONDITIONS

### ABBREVIATIONS

SYMBOL	DESCRIPTION	ER	EXISTING TO REMAIN	KVA	KILOVOLT AMPERE	ODS	OVERHEAD DISTRIBUTION SYSTEM	T	TRANSFORMER
A	AMPERE	ES	ENERGY SAVER	KVAR	KILOVOLT AMPERE REACTIVE	OH	OVERHEAD	TB	TERMINAL BLOCK
AAF	ABOVE ACCESS FLOOR	ESA	ELECTRICAL SAFETY AUTHORITY	KW	KILOWATT	OHD	OVERHEAD DOOR	TC	TIME CLOCK
AF	AMPS FUSED	EST	ESTIMATED	KWH	KILOWATT-HOUR	OL	OVERLOAD	TCC	TEMPERATURE CONTROL CONTACTOR
AS	AMPS SWITCH	EP	ELECTRIC PANEL	LED	LIGHT EMITTING DIODE	P	POLE	TD	TIME DELAY
AFB	ABOVE FINISHED FLOOR	EPO	EMERGENCY POWER OFF	LF	LINEAR FOOT	PB	PUSH BUTTON	TFF	TOP OF FINISHED FLOOR
AFG	ABOVE FINISHED GRADE	EWC	ELECTRIC WATER COOLER	LLD	LAMP LUMEN DEPRECIATION	PC	PHOTOCELL	THD	TOTAL HARMONIC DISTORTION
AIC	AMP INTERRUPTING CAPACITY	EWH	ELECTRIC WATER HEATER	LM	LUMEN	PD	PROTECTIVE DEVICE	TL	TWIST LOCK
ALT	ALTERNATE	EXP	EXPOSED	LO	LOCKOUT	PDO	POWER DOOR OPERATOR	TR	TAMPER RESISTANT
AL	AMPERE TRIP	EXR	EXISTING TO REMAIN	LP	LIGHTING PANEL	PH / Ø	PHASE	TS	TRIGGER START
ATS	AUTOMATIC TRANSFER SWITCH	EXRL	EXISTING TO BE RELOCATED	LT	LIQUID TIGHT	PIV	POST INDICATOR VALVE	TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSOR
AWG	AMERICAN WIRE GAUGE	EXT	EXTERIOR	LV	LOW VOLTAGE	PKG	PACKAGE	TYP	TYPICAL
BAT	BATTERY	EX	EXISTING	MA	MILLIAMPERE	PL	PILOT LIGHT	UC	UNDER COUNTER
BD	BOARD	FA	FIRE ALARM	MAG STR	MAGNETIC STARTER	PM	PEDESTAL MOUNTED	UHF	ULTRA HIGH FREQUENCY
BR	BRANCH	F	FLOOR MOUNTED	MCA	MINIMUM CIRCUIT AMPS	PNL	PANEL	UNFIN	UNFINISHED
BRKR	BREAKER	FAAP	FIRE ALARM ANNUNCIATOR PANEL	MCB	MINIMUM CIRCUIT BREAKER	PSI	POUNDS PER SQUARE INCH	UTIL	UTILITY
C/C	CENTER TO CENTER	FACP	FIRE ALARM CONTROL PANEL	MCB	MOLDED CASE CIRCUIT BREAKER	PT	POTENTIAL TRANSFORMER	UTP	UNSHIELDED TWISTED PAIR
CAB	CABINET	FD	FUSED DISCONNECT	MCC	MOTOR CONTROL CENTER	PWR	POWER	UON	UNLESS OTHERWISE NOTED
CAP	CAPACITY	FDR	FEEDER	MCCB	MOLDED CASE CIRCUIT BREAKER	PVC	POLYVINYL CHLORIDE	V	VOLT
CB	CIRCUIT BREAKER	FIXT	FIXTURE	MCM	THOUSAND CIRCULAR MILS	QC	QUALITY CONTROL	VA	VOLT AMPERES
CCTV	CLOSED CIRCUIT TELEVISION	FLA	FULL LOAD AMPS	MCP	MOTOR CIRCUIT PROTECTOR	QTY	QUANTITY	VAR	VOLT-AMPERES REACTIVE
CF	CUBIC FEET	FLUOR	FLUORESCENT	MCS	MOTOR CIRCUIT SWITCH	R	RESISTANCE	VAV	VARIABLE AIR VOLUME
CKT	CIRCUIT	FM	FREQUENCY MODULATION	MDF	MAIN DISTRIBUTION FRAME	RCPT	RECEPTACLE	VFD	VARIABLE FREQUENCY DRIVE
CLG	CEILING	FFM	FEET PER MINUTE	MDP	MAIN DISTRIBUTION PANELBOARD	RCS	RELAY CONTROL STATION	VHF	VERY HIGH FREQUENCY
CP	CONTROL PANEL	FR	FIRE RATING	MH	MOUNTING HEIGHT	RECIRC	RECIRCULATING	VHO	VERY HIGH OUTPUT
CT	CURRENT TRANSFORMER	FVNR	FULL VOLTAGE NON-REVERSING	MHZ	MEGAHERTZ	REQD	REQUIRED	VP	VAPOUR PROOF
CU	COPPER	GA	GAUGE	MOCP	MAXIMUM OVERCURRENT PROTECTION	RE	EXISTING IN RELOCATED	VT	VAPOURTIGHT
CU FT	CUBIC FOOT	GAL	GALLON	MTD	MOUNTED	RLA	RUNNING LOAD AMPS	W	WATT
DB	DOOR BELL	GEN	GENERATOR	MTS	MANUAL TRANSFER SWITCH	RP	RAINPROOF	WAP	WIRELESS ACCESS POINT
DC	DIRECT CURRENT	GFCI	GROUND FAULT CIRCUIT INTERRUPTER	MVA	MEGAVOLT AMPERES	RPM	REVOLUTIONS PER MINUTE	WG	WIRE GUARD
DDC	DIRECT DIGITAL CONTROL	GFI	GROUND FAULT INTERRUPTER	MVAR	MEGAVOLT AMPERES REACTIVE	RPVC	RIGID PVC	WG	WIRE GUARD
DISC	DISCONNECT	GFP	GROUND FAULT PROTECTOR	MW	MEGAWATT	RR	RESTROOM	WM	"WIRE MOLD" (SURFACE RACEWAY)
DP	DUSTPROOF	G	GROUND	N/A	NOT APPLICABLE	R&P	REMOVE & REPLACE	WO	WELDER OUTLET
DPDT	DOUBLE POLE, DOUBLE THROW	HSKPG	HOUSEKEEPING	NA	NON-AUTOMATIC	RT	RAINTIGHT	WP	WEATHERPROOF
DPST	DOUBLE POLE, SINGLE THROW	HIC	HIGH INTERRUPTING CAPACITY	NC	NORMALLY CLOSED	SCHED	SCHEDULE	WT	WEATHER TIGHT
DX	DIRECT EXPANSION	HOA	HAND-OFF-AUTOMATIC	NFD	NON-FUSED DISCONNECT	SCR	SHORT CIRCUIT RATING	XHD	EXTRA HEAVY DUTY
EBBR	ELECTRIC BASEBOARD RADIATION	HT	HEAT TRACE	NIC	NOT IN CONTRACT	SD	SERVICE DROP	XFER	TRANSFER
EC	EMPTY CONDUIT	HV	HIGH VOLTAGE	NEMA	NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION	SE	SERVICE ENTRANCE		
ED	EXISTING TO BE DEMOLISHED	HZ	HERTZ	NFSD	NON-FUSED	SP	SINGLE POLE		
EGC	EQUIPMENT GROUNDING CONDUCTOR	IAF	IN ACCESS FLOOR	NFD	NON-FUSED DISCONNECT	SPD	SURGE PROTECTIVE DEVICE		
EIPS	EXTERIOR INSULATION FINISH SYSTEM	IC	INTERRUPTING CAPACITY	NIC	NOT IN CONTRACT	SPDT	SINGLE POLE, DOUBLE THROW		
ELEV	ELEVATOR	IG	ISOLATED GROUND	NL	UNSWITCHED LIGHT (NIGHT LIGHT)	SPKR	SPEAKER		
EM	EMERGENCY	JB	JUNCTION BOX	NO	NORMALLY OPEN	SPST	SINGLE POLE, SINGLE THROW		
EMS	ENERGY MANAGEMENT SYSTEM	KCMIL	THOUSAND CIRCULAR MILS	NTS	NOT TO SCALE	SQ FT	SQUARE FOOT		
EMT	ELECTRICAL METALLIC TUBING	KHZ	KILOHERTZ	OD	OUTSIDE DIAMETER	SQ IN	SQUARE INCH		
ENCL	ENCLOSURE	KP	KEYPAD			SR	SURFACE RACEWAY		
EOR	ENGINEER ON RECORD	KV	KILOVOLT			STR	STARTER		
EPRF	EXPLOSION PROOF					SV	SOLENOID VALVE		
EQUIP	EQUIPMENT					SW	SWITCH		
						SWBRD	SWITCHBOARD		
						SYN	SYNTHETIC		

### PANEL AND CIRCUIT ABBREVIATION DESIGNATION



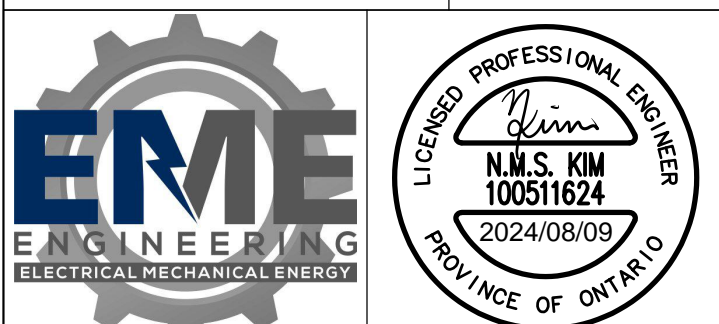
**NOTE**  
 SOME SYMBOLS AND ABBREVIATIONS SHOWN ON THIS SHEET MAY NOT BE APPLICABLE TO THIS PROJECT

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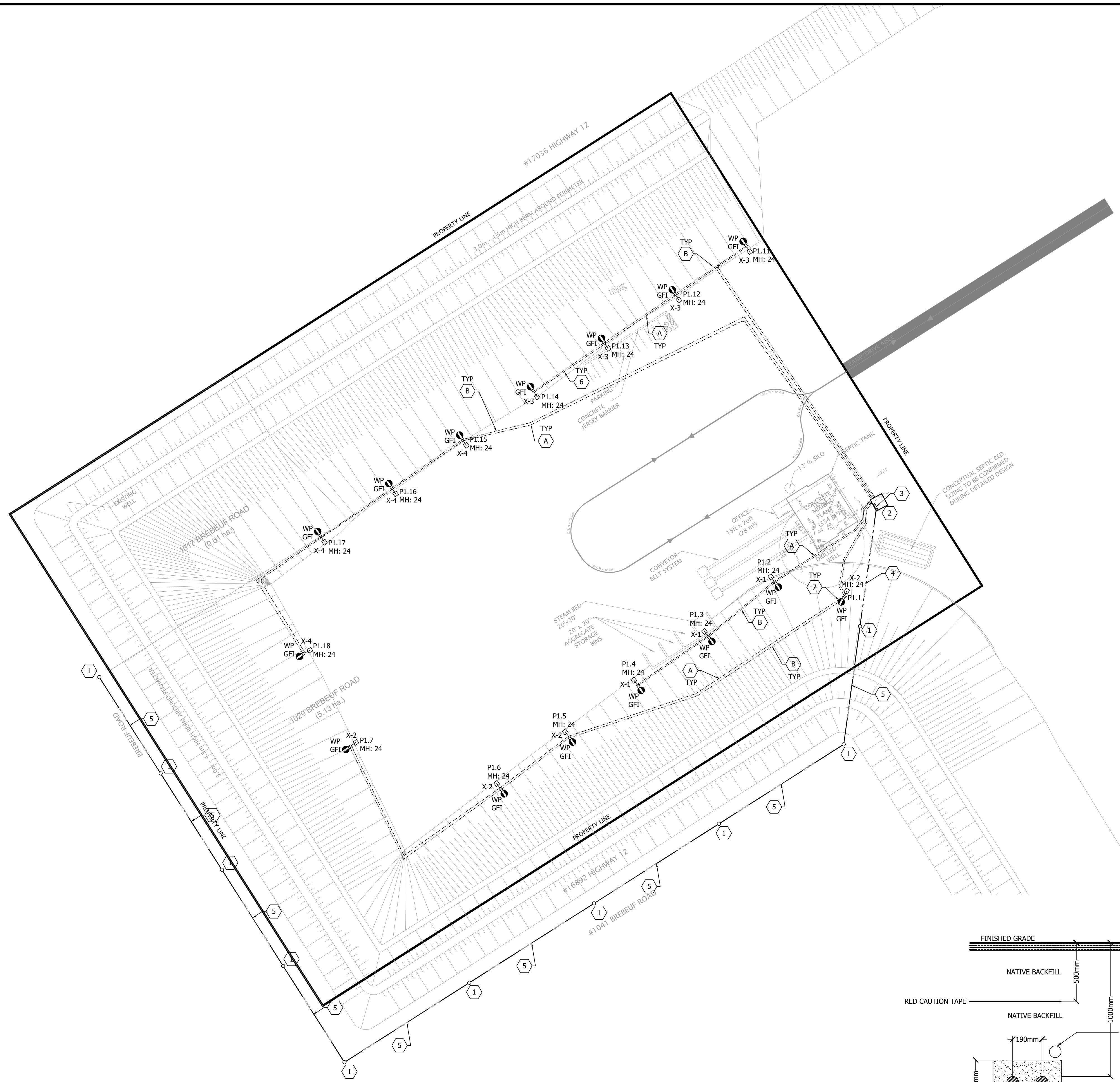
### REVISIONS

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 DRAWINGS ARE PREPARED FOR PRINTING ON ARCH D PAPER (24"X36"). DRAWINGS ARE NOT TO BE SCALED.



**EME Engineering Inc.**  
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 67 HIGH STREET BARRIE, ON L4N 1W5  
 info@EMEeng.com

PROJECT:  
**1017 & 1029 BREBEUF ROAD**  
 1017 & 1019 BREBEUF ROAD  
 MIDLAND, ON  
 L4R 4K4



**TRENCH DETAILS**

(A) FEEDERS FROM NEW PANEL TO LIGHTING AS FOLLOWS:  
1 X 2" PVC (ONE 20A CIRCUIT FOR LIGHTING.)  
SEE TRENCH DETAIL 1/E-301. CONDUITS BURIED AT 1000mm DEEP.

(B) FEEDERS FROM NEW PANEL TO BLOCK HEATERS AS FOLLOWS:  
1 X 2" PVC (ONE 20A CIRCUIT FOR BLOCK HEATERS)  
SEE TRENCH DETAIL 1/E-301. CONDUITS BURIED AT 1000MM DEEP.  
REFER TO FEEDER SCHEDULE ON THIS PAGE.

**TRENCHING DETAILS - GENERAL NOTES**

ADDITIONAL NOTES:  
- CONTRACTOR SHALL ENSURE THAT ALL WORK MEETS WITH ESA APPROVAL AND SHALL CALL FOR ESA AND EME ENGINEER'S REVIEW PRIOR TO COVERING OF TRENCH.  
- CONDUCTOR SIZES IN TABLE ABOVE TAKE INTO CONSIDERATION VOLTAGE DROP AND ALSO MULTIPLE CIRCUITS IN SINGLE CONDUIT.  
- LIGHTING WILL BE ADDED FROM EAST TO WEST AS THE LOT ENVELOPE IS EXCAVATED. COORDINATE WITH CLIENT FOR LIGHTS TO BE INSTALLED NOW AND LIGHTS TO BE INSTALLED IN FUTURE. PROVIDE EMPTY CONDUITS AND PROVISIONS FOR FUTURE LIGHTS AS REQUIRED.

**FEEDER SCHEDULE FOR POLE RECEPTACLES**

POLE	TOT LEN	BRKR	VOLTS	LOAD	WIRE	VD
P1.1	121 FT	20A	120	12.5A	8 AWG	1.82%
P1.2	153 FT	20A	120	12.5A	8 AWG	2.30%
P1.3	253 FT	20A	120	12.5A	6 AWG	2.45%
P1.4	353 FT	20A	120	12.5A	4 AWG	2.19%
P1.5	484 FT	20A	120	12.5A	3 AWG	2.43%
P1.6	585 FT	20A	120	12.5A	2 AWG	2.37%
P1.7	864 FT	20A	120	12.5A	1 AWG	2.86%
P1.11	366 FT	20A	120	12.5A	4 AWG	2.27%
P1.12	466 FT	20A	120	12.5A	4 AWG	2.89%
P1.13	566 FT	20A	120	12.5A	3 AWG	2.84%
P1.14	666 FT	20A	120	12.5A	2 AWG	2.69%
P1.15	611 FT	20A	120	12.5A	2 AWG	2.47%
P1.16	711 FT	20A	120	12.5A	2 AWG	2.88%
P1.17	811 FT	20A	120	12.5A	1 AWG	2.68%
P1.18	998 FT	20A	120	12.5A	1/0 AWG	2.68%

**LIGHTING FEEDER SCHEDULE**

CIRCUIT	TOT LEN	BRKR	VOLTS	LOAD	WIRE	VD
X-1	354 FT	20A	120	10A	6 AWG	2.74%
X-2	864 FT	20A	120	10A	2 AWG	2.80%
X-3	627 FT	20A	120	10A	3 AWG	2.52%
X-4	998 FT	20A	120	10A	1 AWG	2.64%

**DRAWING KEYNOTES**

- PROPOSED HYDRO POLE. EXACT QUANTITIES AND LOCATIONS WILL BE PROVIDED BY NEWMARKET-TAY POWER DISTRIBUTION
- POWER SHACK. LOCATION OF ELECTRICAL DISTRIBUTION EQUIPMENT.
- SWITCHGEAR WITH METERING AND DISTRIBUTION COMPARTMENTS.
- UNDERGROUND SECONDARY SERVICE FEEDER TO POWER SHACK. SEE DETAIL 3/E-101.
- OVERHEAD CONDUCTOR SIZE, CONDUIT SIZE, CONDUIT CONFIGURATION TO BE CONFIRMED BY UTILITY.
- UNDERGROUND LV FEEDER FOR LIGHT STANDARDS AND POWER. SEE DETAIL 2/E-101.
- PROVIDE RECEPTACLE FOR POLE MOUNTED BLOCK HEATERS. CONFIRM SPECIFICATION AND MOUNTING HEIGHT OF RECEPTACLE WITH CLIENT.

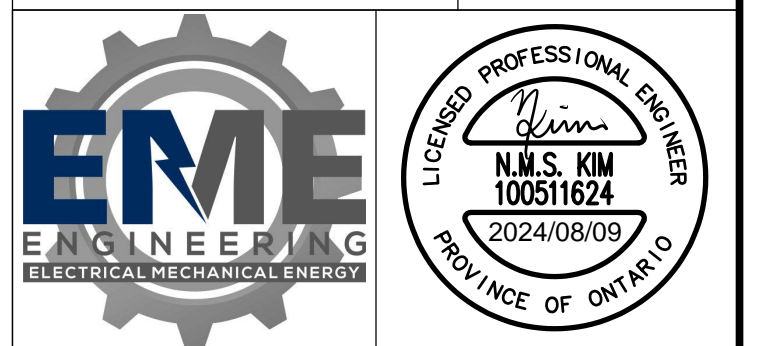
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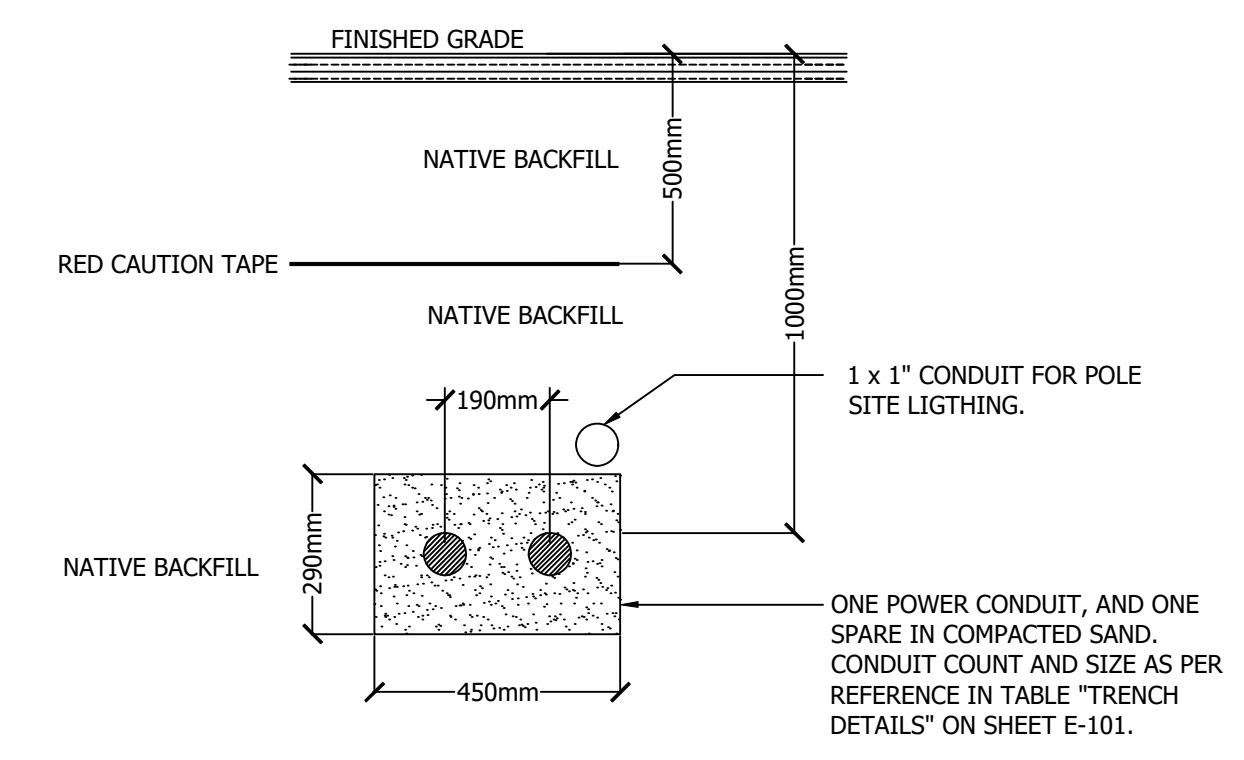
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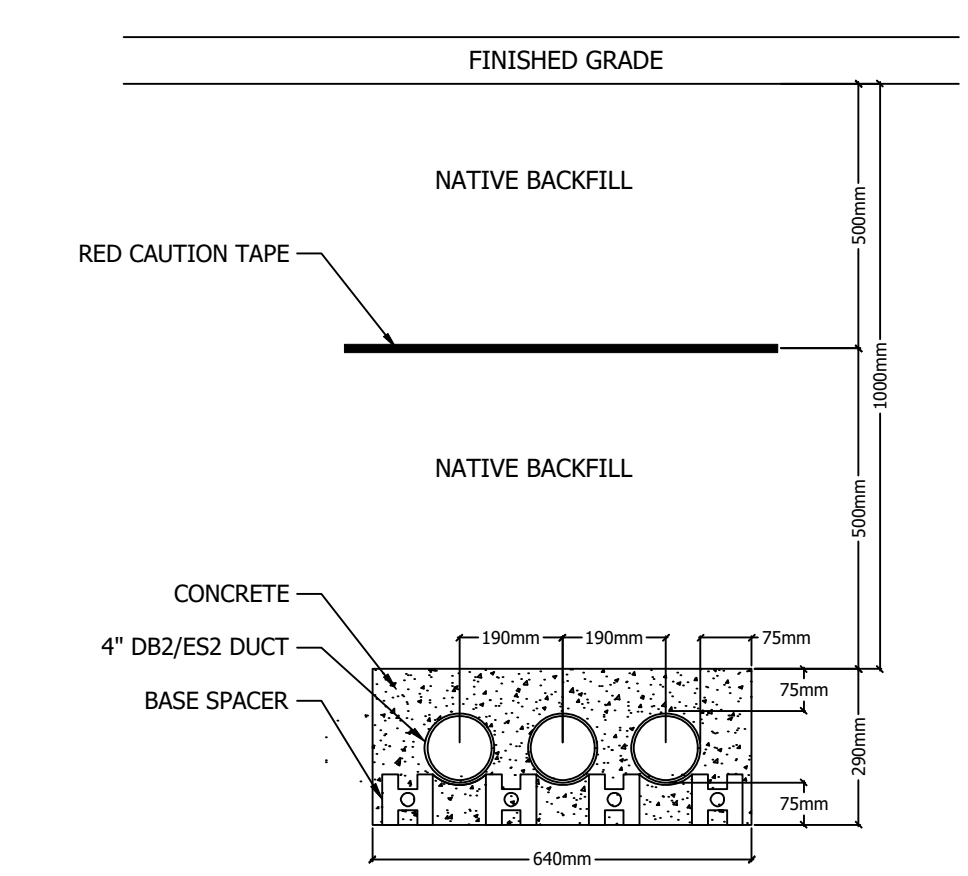
**SITE SERVICING PLAN**

DRAWN BY:	CHECKED BY:	SCALE:
JK	CL	1:750
DATE:	PROJECT NUMBER:	DRAWING NUMBER:
JUL/2024	24-6476	E-101

**1 SITE SERVICING PLAN**  
SCALE: 1:750



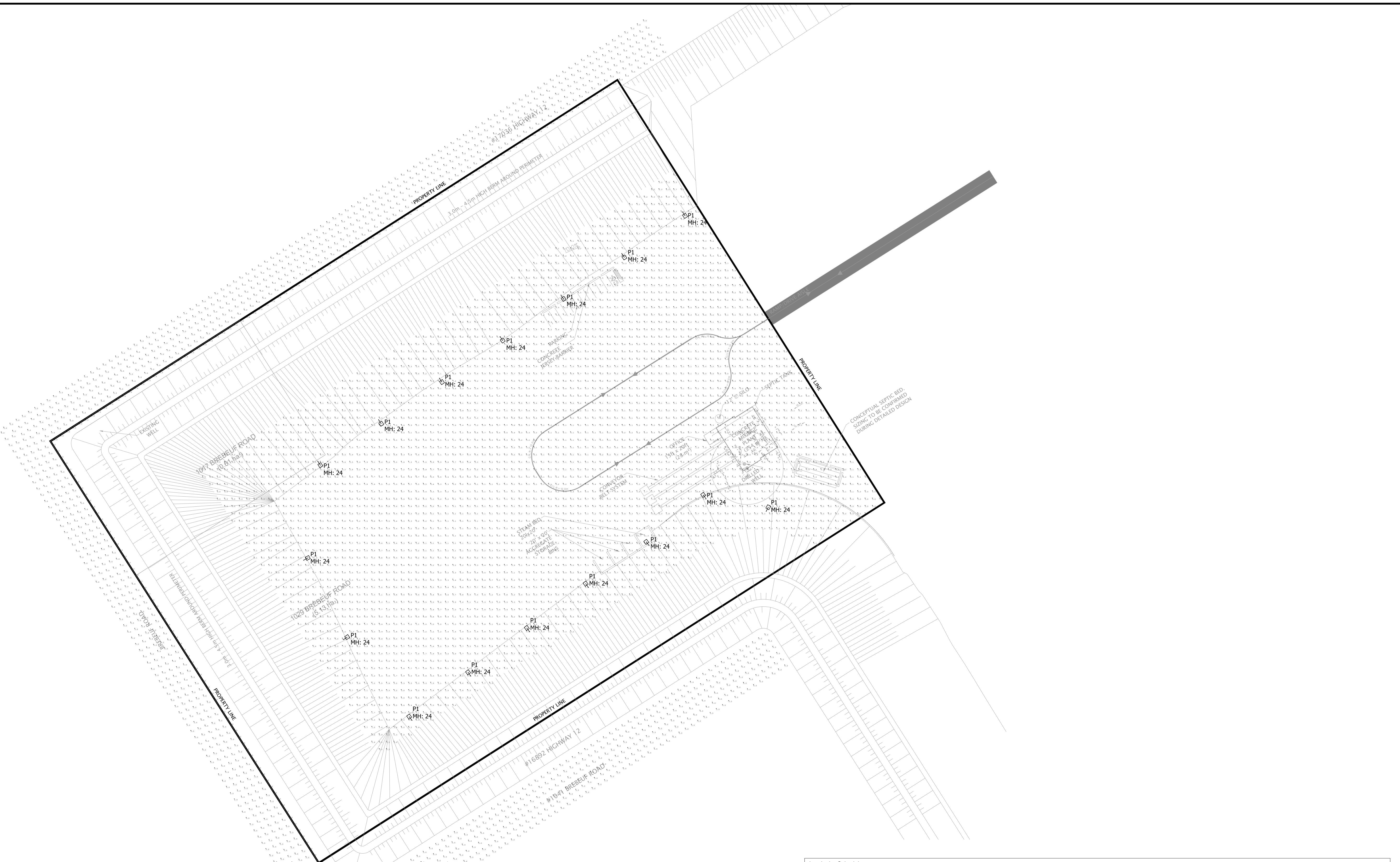
**2 TRENCH DUCT DETAIL**  
SCALE: NTS



**3 PRIMARY TRENCH DUCT DETAIL**  
Scale: NTS

**Drawing Notes**

ALL PHOTOMETRIC VALUES MEASURED IN FC  
 FIXTURE TYPE AND MOUNTING HEIGHT SHOWN ADJACENT FIXTURE  
 ALL FIXTURES ARE DARK SKY COMPLIANT



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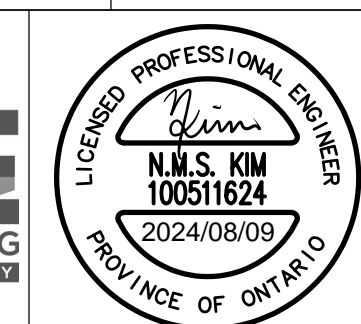
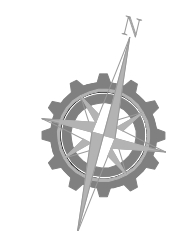
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**EME Engineering Inc.**

90 WINGES ROAD, SUITE 201 VAUGHAN, ON L4L 6A9  
 67 HIGH STREET BARRIE, ON L4N 1W5  
 info@EMEeng.com

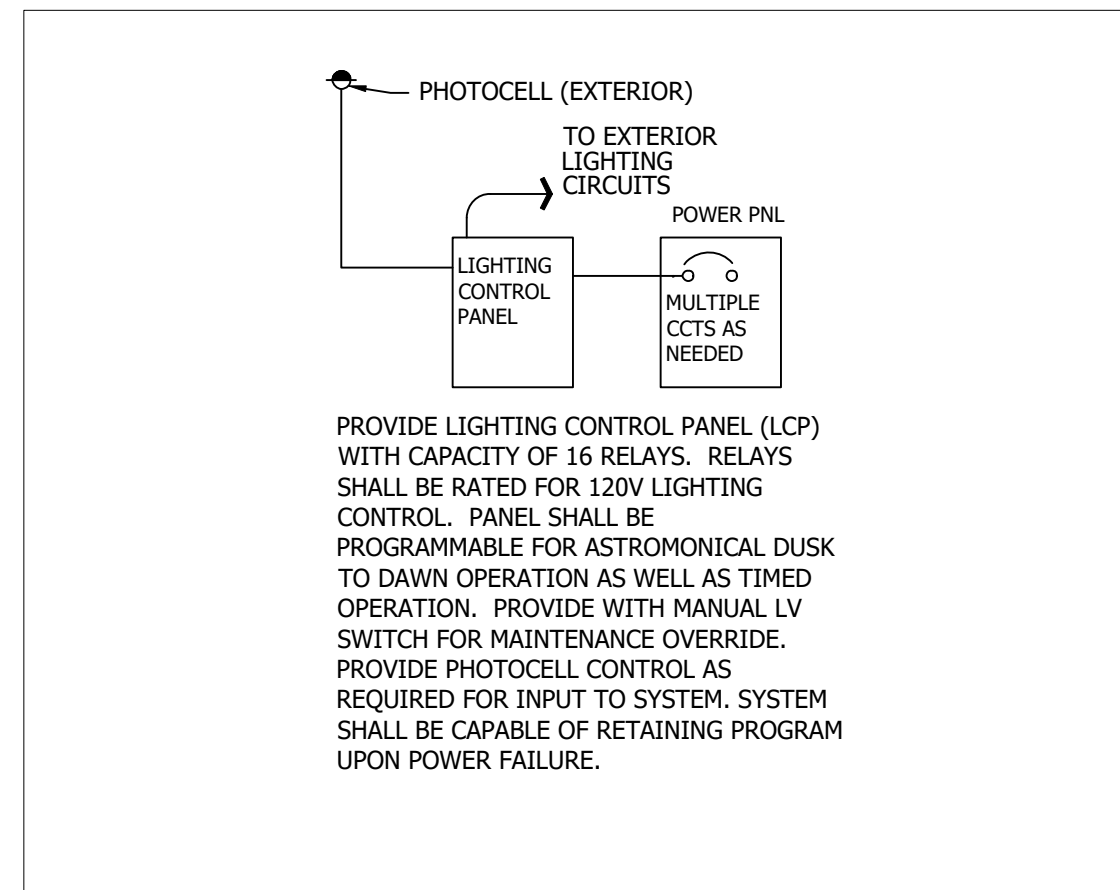
PROJECT:  
**1017 & 1029 BREBEUF ROAD**  
 1017 & 1019 BREBEUF ROAD  
 MIDLAND, ON  
 L4R 4K4

DRAWING TITLE:  
**SITE PHOTOMETRIC PLAN**

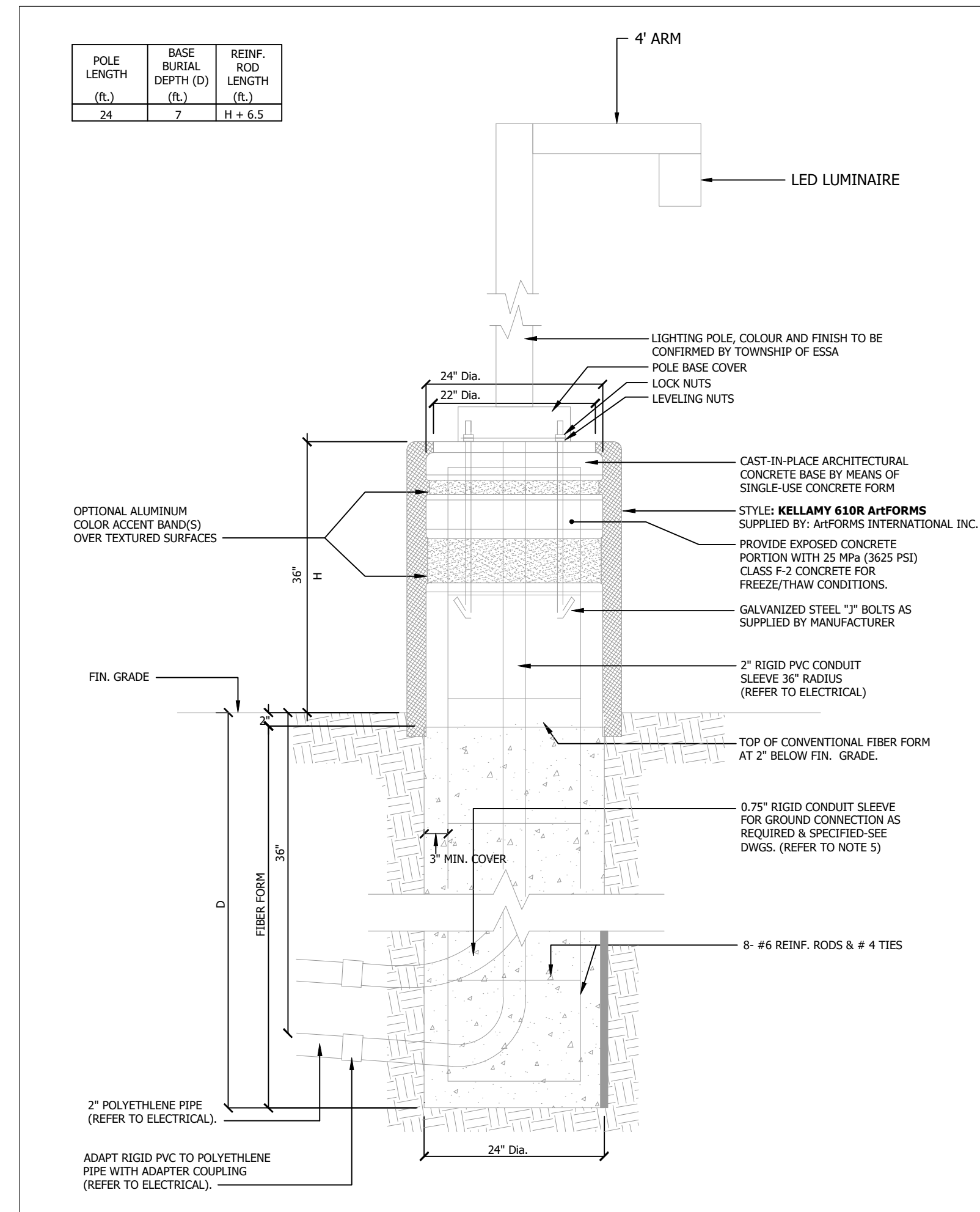
DRAWN BY:	CHECKED BY:	SCALE:
JK	CL	1:750
DATE:	PROJECT NUMBER:	DRAWING NUMBER:
JUL/2024	24-6476	E-201

Symbol	Label	Arrangement	Lum. Lumens	Lum. Watts	LLF	Description	[MANUFAC]	Mounting Height
☐	P1	Single	37843	300	0.900	PFAS-92L-1A-NW-G2-4	SIGNIFY GARDCO	24'

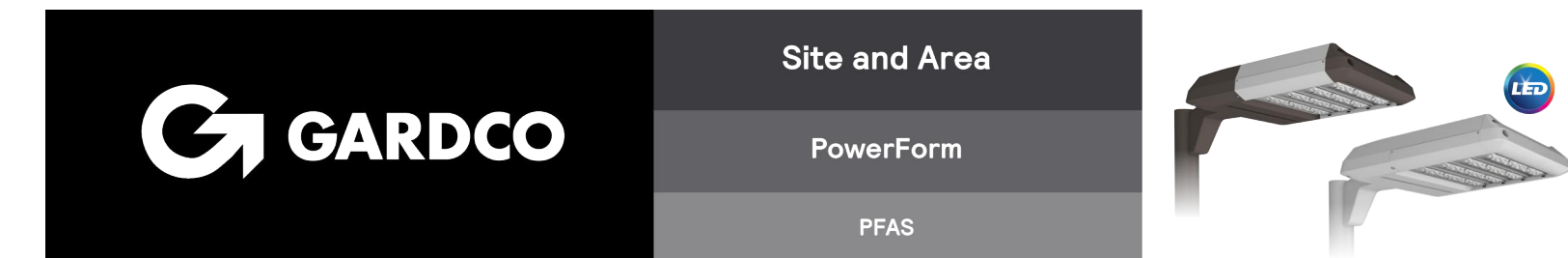
Label	CalcType	Units	Avg	Max	Min	Avg/Min	Max/Min
Area	Illuminance	Fc	1.45	12.0	0.0	N.A.	N.A.
Spill Light	Illuminance	Fc	0.00	0.0	0.0	N.A.	N.A.



1 LIGHTING CONTROL PANEL DETAIL  
SCALE: N.T.S.



2 POLE BASE DETAIL  
SCALE: N.T.S.



Gardco PowerForm LED area luminaires provide up to 1,000W HID replacement while significantly reducing energy and maintenance costs. PowerForm features an architecturally styled, modular housing design available in five different sizes for a range of commercial, retail, industrial, and other large area outdoor applications. PowerForm is available with multiple lumen packages delivering approximately 33,400 to 109,200 lumens.

Project: \_\_\_\_\_  
Location: \_\_\_\_\_  
Cat. No: \_\_\_\_\_  
Type: \_\_\_\_\_  
Lamps: \_\_\_\_\_ Qty: \_\_\_\_\_  
Notes: \_\_\_\_\_

Ordering guide example: PFAS-184L-1A-NW-G2-AR-5W-120-PCB-120-BZ

Prefix	Number of LEDs	Drive Current	Color Temperature	Mounting	Distribution	Voltage
PFAS	92L 92 LEDs (2 modules)	900 900mA 1A 1amp	NW-G2 Warm White 3000K, 70 CRI Generation 2	AR Arm Mount Slip Fitter Mount (fits to 2-3/8" O.D. term)	2 Type 2 3 Type 3 4 Type 4 5 Type 5W	120 120V 208 208V 240 240V 277 277V
138L	138 LEDs (3 modules)	700 700mA 900 900mA 1A 1amp	NW-G2 Neutral White 4000K, 70 CRI Generation 2		AFR Auto Front Row AFR-90 Auto Front Row, Rotated 90°	347 347V 480 480V UNV 120-277V 347-480V
184L	184 LEDs (4 modules)	900 900mA 1A 1amp				
230L	230 LEDs (5 modules)	900 900mA 1A 1amp				
276L	276 LEDs (6 modules)	900 900mA				

Options	Dimming Controls	Motion sensing lens	Photo-sensing	Electrical	Luminaire	Finish
None <sup>1</sup> leave blank	IMR3 <sup>4</sup> Integral with #3 lens (up to 20' MH)	FCB <sup>10,11</sup> Photocentral Button	TP <sup>12</sup> Terminal Block Feeding	SP1 <sup>16</sup> Square Pole Adapter	BK Black	
DDC <sup>2</sup> Dual Circuit Control	IMR7 <sup>4</sup> Integral with #7 lens (up to 40' MH)	TLR3 <sup>10,11</sup> Twist Lock Receptacle 5-pin	F1 <sup>13</sup> Single (120, 277, 347VAC)	HS <sup>17</sup> Internal Housing Side Shield	WN White	
FAWS <sup>14</sup> Field Adjustable Wattage Selector		TLR7 <sup>10,11</sup> Twist Lock Receptacle 7-pin	F2 <sup>13</sup> Double (208, 240, 480VAC)	MSZ Medium Gray	BZ Dark Gray	
BL <sup>15</sup>		TLR9 <sup>10,11</sup> Twist Lock Receptacle 9-pin	F3 <sup>13</sup> Canadian Double Pole (208, 240, 480VAC)	SLK <sup>18</sup> Side Shield	CC Custom Color (must supply color chip, requires factory quote)	
DynDimmer: Automatic Profile Dimming		TLR13 <sup>10,11</sup> Twist Lock Receptacle with 3-pin photocell	Pole Mount Feeding FP1 <sup>13</sup> Single (120, 277, 347VAC) FP2 <sup>13</sup> Double (208, 240, 480VAC) FP3 <sup>13</sup> Canadian Double Pole (208, 240, 480VAC)	standard anodized, no finish Painted Side Panel, painted same finish to match luminaire finish	RAL Optional Color (specify optional color or RAL)	
CS50 <sup>1</sup> Safety 50% Dimming, 8 hours			Surge Protection (100kA standard) SP2 Increased 20kA			
CS80 <sup>1</sup> Median 50% Dimming, 8 hours			BAC <sup>16</sup> Meets the requirements of the Buy American Act of 1933 (BAA)			

- Dual Circuit Control (DCC), Terminal Block (TB) and Square Pole Adapter (SPA) options not available with Slip Fitter Mount (SF)
- Product comes equipped with dimming drivers as standard. Only include DD if dimming leads need to be accessed external to the product.
- Not available with other dimming control options.
- Not available with motion sensor.
- IMR3/7 option not available with 230L-1A or 276L-900 due to wattage restriction. Not available with DD, DCC, and FAWS dimming control options.
- Must specify a motion sensing lens.
- Available in 120-277 (UNV) only.
- Must specify specific input voltage.
- Max. aiming angle 45°. Works with 3 pin NEMA photocell.
- Dimming pins will not work if ordered with DD, FAWS, BL, or CS/CM50.
- Not available in 480V or HVU.
- Uses a 5-pin receptacle. Dimming pins will not work if ordered with DD, FAWS, BL, or CS/CM50.
- Not available with Dual Circuit Control (DCC).
- HS option not available with SW, AFR-90 and AFR-270 (see AFR25 accessory).
- Extended lead times apply. Contact factory for details.
- Failure to properly select the "BAC" suffix could result in you receiving product that is not BAA compliant. Product with no recourse for an RMA or refund. The BAC designation hereunder does not address (i) the applicability of, or availability of a waiver under, the Trade Agreements Act, or (ii) the "Buy American" domestic content requirements imposed on states, localities, and other non-federal entities as a condition of receiving funds administered by the Department of Transportation or other federal agencies.

PFAS\_PowerForm\_area 04/24 page 1 of 7

3 FIXTURE TYPE P1  
SCALE: N.T.S.

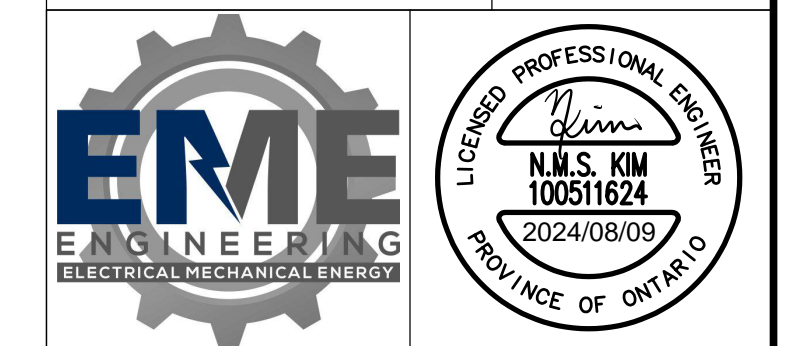
DATE	NO.	DESCRIPTION	BY
AUG 09/2024	-	RE-ISSUED FOR SPA	JK
JUL 11/2024	-	ISSUED FOR SPA	JK

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MIDLAND, ON  
L4R 4K4

SITE DETAILS

DRAWN BY:	CHECKED BY:	SCALE:
JK	CL	NTS
DATE:	PROJECT NUMBER:	DRAWING NUMBER:
JUL 2024	24-6476	E-301