



**ELECTRICAL SPECIFICATIONS**

**A. GENERAL:**

- SCOPE OF SERVICES**— WORK SHALL INCLUDE THE FURNISHING AND INSTALLING OF COMPLETE FUNCTIONING SYSTEMS AS INDICATED ON THE DRAWINGS AND THESE SPECIFICATIONS, ACCESSORIES NECESSARY WHETHER SPECIFICALLY STATED OR NOT TO MAKE THE REQUIRED ELECTRICAL SYSTEMS COMPLETE AND OPERATIONAL; INCLUDING EVERY ARTICLE, DEVICE OR ACCESSORY NECESSARY TO FACILITATE EACH SYSTEM FUNCTIONING AS INDICATED BY THE DESIGN AND THE EQUIPMENT SPECIFIED. CONTRACTOR SHALL BECOME FAMILIAR WITH THE SITE AND ALL EXISTING CONDITIONS PRIOR TO BIDDING.
  - MATERIAL AND WORKMANSHIP**— ALL EQUIPMENT PROVIDED SHALL BE NEW EXCEPT AS OTHERWISE STATED ON THE DRAWINGS. ALL EQUIPMENT PROVIDED SHALL BE UL LISTED WHEN SUCH STANDARDS EXIST FOR THE TYPE OF EQUIPMENT FURNISHED AND ACCEPTABLE FOR INSTALLATION OF THE LOCAL BUILDING AUTHORITY. ALL MATERIAL AND APPARATUS SHALL BE NEW AND IN FIRST CLASS CONDITION. ALL WORKMANSHIP SHALL BE OF THE FINEST POSSIBLE BY EXPERIENCED ELECTRICIANS OR JOURNEYMEN. ALL TOOLS, MACHINERY AND EQUIPMENT REQUIRED OF THE PERFORMANCE OF THE ELECTRICAL WORK SHALL BE FURNISHED BY THIS CONTRACTOR.
  - COORDINATION**— THE CONTRACTOR SHALL COORDINATE ALL WORK WITH OTHER CONTRACTORS AND SUBCONTRACTORS SO THAT VARIOUS COMPONENTS OF THE ELECTRICAL SYSTEMS WILL BE INSTALLED AT THE PROPER TIME, WILL FIT THE AVAILABLE SPACE, AND WILL ALLOW PROPER SERVICE ACCESS TO ALL EQUIPMENT. THE CONTRACTOR SHALL REFER TO ARCHITECTURAL, STRUCTURAL AND MECHANICAL DRAWINGS AND TO RELEVANT EQUIPMENT DRAWINGS TO DETERMINE THE EXTENT OF CLEAR SPACES.
  - ORDINANCES AND CODES**— CONTRACTOR'S PERFORMANCE, WORKMANSHIP AND MATERIALS SHALL COMPLY WITH NATIONAL FIRE PROTECTION ASSOCIATION CODES STATE AND LOCAL BUILDING CODES, AND/OR ALL OTHER APPLICABLE CODES AND ORDINANCES. ALL PERMITS, LICENSES AND FEES THAT ARE REQUIRED BY THE GOVERNING AUTHORITIES FOR THE PERFORMANCE OF THE ELECTRICAL WORK SHALL BE OBTAINED AND PAID FOR BY THE CONTRACTOR. FILLING OUT FORMS FOR APPLICATIONS BY THE ENGINEER WILL BE BILLED HOURLY TO THE CONTRACTOR.
- B. WORK:**
- GUARANTEE**— GUARANTEE AGAINST DEFECTIVE WORKMANSHIP AND MATERIAL FOR A PERIOD OF ONE YEAR FROM DATE OF FINAL PAYMENT. GUARANTEE SHALL INCLUDE MATERIAL TO BE REPLACED AND ALL LABOR REQUIRED.
  - TESTING, CHECK-OUT AND CLEANING**— REPLACE ALL BURNED-OUT LAMPS. THE CONTRACTOR SHALL CLEAN ALL MATERIAL AND EQUIPMENT INSTALLED UNDER THE ELECTRICAL CONTRACT. DIRT, DUST, PLASTER, STAINS AND FOREIGN MATTER SHALL BE REMOVED FROM ALL SURFACES. ALL EQUIPMENT SHALL HAVE FINISHED TOUCHED UP PRIOR TO INSPECTION.
  - CUTTING AND PATCHING**— THIS CONTRACTOR SHALL DO ALL CUTTING OF WALLS, FLOORS, CEILINGS, ETC. AS REQUIRED TO INSTALL WORK UNDER THIS SECTION. CONTRACTOR SHALL PATCH WALLS, FLOORS, ETC. TO MATCH THE ORIGINAL MATERIAL AND CONSTRUCTION.
  - DEMOLITION** — REMOVE ALL EXISTING WIRING, FIXTURES, EXPOSED CONDUITS AND OTHER ELECTRICAL INSTALLATIONS NOT REUSED.
  - UNDERGROUND CONDUIT**— SCHEDULE 40 PVC WITH RMC FOR ELBOWS AND ABOVE GRADE.
  - CONDUIT INSTALLATION** — ALL WIRING SHALL BE ROUTED IN CONDUIT. CONDUIT SHALL BE INSTALLED CONCEALED WHEREVER POSSIBLE. EXPOSED CONDUIT SHALL BE PAINTED TO MATCH SURROUNDINGS.
  - WIRE** — ALL WIRE SHALL HAVE COPPER CONDUCTORS, WITH U.L. LISTING. SERVICE ENTRANCE CABLE SHALL BE TYPE USE, THWN OR XHHW WITH STRANDED CONDUCTORS. ALL FEEDER AND BRANCH CIRCUIT WIRE #8 AWG AND LARGER SHALL BE TYPE THWN OR XHHW, BOTH WITH STRANDED CONDUCTORS. ALL WIRE #10 AWG SHALL BE TYPE THWN (WET OR DAMP LOCATIONS, OR IN CONDUIT BELOW GRADE OR SLAB) OR THHN (DRY LOCATIONS ONLY AND ABOVE GROUND). BOTH WITH SOLID CONDUCTORS. ALL BRANCH CIRCUIT WIRING SHALL BE NOT SMALLER THAN #10 AWG WIRE.
  - VOLTAGE DROP** — ALL BRANCH CIRCUITS SUPPLYING EQUIPMENT, LIGHTING, OR DEVICES SHALL BE SIZED NOT TO EXCEED 3% VOLTAGE DROP, AND NOT EXCEED 5% VOLTAGE DROP FROM SOURCE (E.G. TRANSFORMER, SERVICE, ETC) TO LOAD. DERATE CONDUCTORS PER NEC WHEN ROUTED IN RACEWAY CONTAINING MORE THAN THREE CURRENT CARRYING CONDUCTORS. PROVIDE BUCK-BOOST TRANSFORMERS MEETING THE REQUIREMENTS OF THE TRANSFORMER SECTION WHEN VOLTAGE DROP EXCEEDS 3% FROM OVERCURRENT DEVICE TO END DEVICE.
  - WIRING INSTALLATION** — ALL WIRING SHALL BE INSTALLED IN APPROVED RACEWAY AND ENCLOSURES. ALL SPLICES OR TAPS SHALL OCCUR IN APPROVED BOXES AND ENCLOSURES, AND SHALL BE MADE UP WITH APPROVED SOLDERLESS CONNECTORS. CONDUCTORS SHALL HAVE INSULATION OF THE PROPER COLOR TO MATCH NEC COLOR CODE SYSTEM. ALL BRANCH CIRCUITS SHALL HAVE AN EQUIPMENT GROUNDING CONDUCTOR INSTALLED IN THE RACEWAY, SIZED IN ACCORDANCE WITH NEC 250-122. COMPLY WITH VOLTAGE DROP EQUIPMENT IN THIS SPECIFICATION.
  - CONNECTION TO SERVING UTILITIES**— CONTRACTOR SHALL PROVIDE PROPER TERMINATION, METERING PROVISIONS, ETC. FOR ELECTRICAL AND TELEPHONE SERVICES FOR CONNECTION BY THE SERVING UTILITY, IN STRICT COMPLIANCE WITH THE REQUIREMENTS OF ALL CODES HAVING JURISDICTION AND OF THE SERVING UTILITY INVOLVED. UTILITY COSTS SHALL BE INCLUDED IN THE BID.
  - GROUNDING**— ALL CONDUCTORS, CONDUITS, MOTOR FRAMES, ETC. WHICH REQUIRE GROUNDING SHALL BE PERMANENTLY AND EFFECTIVELY GROUNDED BY THIS CONTRACTOR IN A THOROUGH AND EFFICIENT MANNER CONFORMING IN ALL PARTICULARS TO THE NATIONAL ELECTRICAL CODE. [[DELETE FOLLOWING IF NOT APPLICABLE]][[RUN A #6 COPPER WIRE TO THE TELEPHONE TERMINAL BOARD]] .
  - EXTRA MATERIAL** — PROVIDE MINIMUM 1 EACH TYPE AND 1 ADDITIONAL FOR EVERY 10 OF THE FOLLOWING: LAMPS, BALLASTS, AND GLOBES/DIFFUSERS. PROVIDE IN PROTECTIVE COVERING/PACKAGING WITH LABEL OF CONTENTS.
  - EQUIPMENT PADS** — UNLESS SPECIFIED ELSEWHERE IN CONTRACT DRAWINGS, PROVIDE MINIMUM 6" THICK CONCRETE PAD 28 DAY 3000 PSI WITH 6" REBAR AT 12" CENTER, EACH WAY FOR REINFORCING. PAD SHALL EXTEND MINIMUM 6" BEYOND EQUIPMENT FOOTPRINT ON ALL SIDES.
  - MOTORS** — CONTRACTOR SHALL FURNISH AND INSTALL ALL COMPONENTS FOR A COMPLETE AND FUNCTIONING SYSTEM INCLUDING BUT NOT LIMITED TO DISCONNECTS, STARTERS AND CONTROL WIRING. SIZE FEEDER TO ACCOUNT FOR VOLTAGE DROP PER THIS SPECIFICATION.

**C. DISTRIBUTION:**

- MANUFACTURERS** — ALL COMPONENTS SHALL BE BY ONE OF THE FOLLOWING: CUTLER HAMMER (EATON), GENERAL ELECTRIC, SIEMENS, SQUARE D, MILBANK OR TESCO.
- PANELBOARDS** — FURNISH AND INSTALL PANELBOARDS AS SCHEDULED AND NOTED ON THE DRAWINGS. THE PANELBOARDS SHALL BE COMPLETE WITH THERMAL MAGNETIC PLASTIC CASE CIRCUIT BREAKERS OF THE BOLT-ON TYPE ASSEMBLED IN A FINISHED CABINET. ALL 2 AND 3 POLE BREAKERS MUST BE COMMON TRIP. EACH PANEL SHALL CONTAIN A TYPED PRINTED OR COMPUTER PRINTED CIRCUIT DIRECTORY.
- PEDESTALS** — FURNISH AND INSTALL MILBANK OR EQUIVALENT, AS SHOWN ON THE DRAWINGS. PANELBOARD INSIDE PEDESTAL SHALL MEET THE REQUIREMENTS OF THE "PANELBOARD" SECTION OF THE SPECIFICATION.
- SAFETY SWITCHES** — FURNISH AND INSTALL FUSED OR NON-FUSED (AS REQUIRED) HEAVY DUTY SAFETY SWITCHES WHERE NOT FURNISHED WITH THE EQUIPMENT, AND AT ALL OTHER POINTS REQUIRED BY CODE. CONSTRUCTION SHALL BE OF A NEMA DESIGN SUITABLE FOR THE ENVIRONMENT INSTALLED. ALL FUSES SHALL BE BUSSMAN, LITTELFUSE OR FERRAZ-SHAWMUT, SIZE AND TYPE AS REQUIRED OR INDICATED.

- LIGHTING CONTACTORS** — MANUFACTURERS: CUTLER-HAMMER; EATON CORPORATION, GE INDUSTRIAL SYSTEMS; TOTAL LIGHTING CONTROL OR SQUARE D. CONTACTOR SHALL BE ELECTRICALLY OPERATED AND MECHANICALLY HELD, COMPLYING WITH NEMA ICS 2 AND UL 508. CURRENT RATING FOR SWITCHING SHALL BE LISTED OR RATED CONSISTENT WITH TYPE OF LOAD SERVED, INCLUDING TUNGSTEN FILAMENT, INDUCTIVE, AND HIGH INRUSH BALLAST (BALLAST WITH 20 PERCENT OR LESS TOTAL HARMONIC DISTORTION OF NORMAL LOAD CURRENT). CONTROL COIL VOLTAGE SHALL MATCH CONTROL POWER SOURCE.

**D. LIGHTING:**

- GENERAL** — THE LOCATIONS, NUMBERS, SIZES AND TYPES OF LIGHTING FIXTURES SHALL BE AS SHOWN ON THE CONTRACT DOCUMENTS. ALL LIGHTING FIXTURES FURNISHED UNDER THIS CONTRACT TO HAVE UL LABELS ATTACHED TO EACH FIXTURE OR AN INTEGRAL PART OF THE DEVICES FOR 120V AND 277V SOLID-STATE EQUIPMENT. FOR DEVICES WITHOUT INTEGRAL LINE VOLTAGE SURGE PROTECTION, FIELD MOUNTING SURGE PROTECTION SHALL COMPLY WITH IEEE C62.41, WITH UL 1449. METAL PARTS SHALL BE FREE FROM BURRS, SHARP CORNERS AND EDGES. DOORS, FRAMES AND OTHER INTERNAL ACCESSSES SHALL BE SMOOTH OPERATING, FREE FROM LIGHT LEAKAGE UNDER OPERATING CONDITIONS, AND ARRANGED TO PERMIT RELAMPING WITHOUT USE OF TOOLS. ARRANGE DOORS, FRAMES, LENSES, DIFFUSERS AND OTHER PIECES TO PREVENT ACCIDENTAL FALLING DURING RELAMPING AND WHEN SECURED IN OPERATING POSITION; LENSES, DIFFUSERS, COVERS AND GLOBES SHALL BE 100 PERCENT VIRGIN ACRYLIC PLASTIC OR ANNEALED CRYSTAL GLASS, UNLESS OTHERWISE INDICATED. PLASTIC SHALL BE HIGH RESISTANCE TO YELLOWING AND OTHER CHANGES DUE TO AGING, EXPOSURE TO HEAT AND ULTRAVIOLET RADIATION.
- BALLASTS** — MANUFACTURERS SHALL BE ADVANCE, UNIVERSAL, OR AS SHOWN ON THE CONTRACT DRAWINGS.
  - GENERAL** — BALLASTS SHALL BE DESIGNED FOR THE TYPE AND NUMBER OF LAMP(S) AND OPERATING VOLTAGE AS SHOWN ON THE CONTRACT DOCUMENTS. BALLASTS SHALL HAVE A POWER FACTOR OF NOT LESS THAN 0.90. BALLASTS SHALL BE UL LISTED AND PROVIDED WITH THERMAL PROTECTION AS REQUIRED BY UL 1029; SHALL BE SOUND RATED "A". BALLASTS RATED FOR 0 DEG F STARTING TEMPERATURE SHALL BE USED IN TEMPERATURES FROM 0 DEG F AND ABOVE. BALLASTS DESIGNED FOR USE WITH HIGH OUTPUT LAMPS SHALL BE USED IN TEMPERATURES MINUS 20 DEG F AND ABOVE. BALLASTS SHALL BE DESIGNED TO BE OPERATED IN THE TYPE FIXTURE AS SHOWN ON THE CONTRACT DRAWINGS. BALLASTS SHALL BE AS SPECIFIED ON THE CONTRACT DRAWINGS. IF NOT SPECIFIED ON DRAWINGS, IT SHALL BE AS SPECIFIED IN THIS SPECIFICATION.
  - EFFICIENCIES** — ELECTRONIC BALLASTS SHALL HAVE A POWER FACTOR OF NOT LESS THAN 0.95.
- LAMPS** — THE LAMPS SHALL BE AS MANUFACTURED BY: GENERAL ELECTRIC COMPANY, PHILIPS, SYLVANIA, VENTURE, OR AS MARKED ON THE CONTRACT DRAWINGS. METAL HALIDE LAMPS SHALL BE CLEAR UNLESS SHOWN OR SCHEDULED OTHERWISE.
- POLES** — POLES SHALL BE OF THE TYPES AND SIZES AS SHOWN ON THE CONTRACT DRAWINGS. THE POLE SHALL BE STEEL, UNLESS SPECIFICALLY SHOWN AS OTHER MATERIAL ON THE CONTRACT DRAWINGS. WHERE APPLICABLE, THE POLE SHOULD BE PROVIDED WITH A HANDHOLE AND A GROUND LUG, AND LOCAL FUSES. THE POLE SHALL BE INSTALLED AS SHOWN ON THE CONTRACT DRAWINGS.

**E. CONTROLS:**

- OUTDOOR PHOTOELECTRIC SWITCHES** — MANUFACTURERS: INTERMATIC, INC., , TORK AND WATT STOPPER (THE). SOLID STATE, WITH SPST DRY CONTACTS RATED FOR 1800VA TO OPERATE CONNECTED LOAD, RELAY OR CONTACTOR COILS; AND COMPLYING WITH UL 773. LIGHT LEVEL MONITORING RANGE TO BE 1.5 TO 10 FC WITH AN ADJUSTMENT FOR TURN ON AND TURN OFF LEVELS WITHIN THAT RANGE. TIME DELAY SHALL BE 15 SECOND MINIMUM TO PREVENT FALSE OPERATION. LIGHTNING ARRESTER SHALL BE AIR GAP TYPE. MOUNTING SHALL BE TWIST LOCK COMPLYING WITH IEEE C136.10 WITH BASE. PROVIDE WITH STEM MOUNTING OR STEM AND SWIVEL MOUNTING ACCESSORIES AS REQUIRED TO DIRECT SENSOR TO THE NORTH SKY EXPOSURE.
- OUTDOOR MOTION SENSORS (PIR)** — MANUFACTURERS: HUBBELL LIGHTING INC., PARAGON ELECTRIC CO., TORK AND WATT STOPPER. SENSOR SHALL BE SUITABLE FOR OPERATION IN AMBIENT TEMPERATURES RANGING FROM MINUS 40 DEG F TO 130 DEG F, UL 773A RATED AS RAIN TIGHT. TURN LIGHTS ON WHEN SENSING INFRARED ENERGY CHANGES BETWEEN BACKGROUND AND MOVING BODY IN AREA OF COVERAGE; WITH A TIME DELAY FOR TURNING LIGHTS OFF, ADJUSTABLE OVER A MINIMUM RANGE OF 1 TO 15 MINUTES. SENSOR OUTPUT SHALL BE SUITABLE FOR SWITCHING 300 W OF TUNGSTEN LOAD AT 120V OR 277V AC. INDICATOR SHALL BE A LED TO SHOW WHEN MOTION IS BEING DETECTED DURING TESTING AND NORMAL OPERATION OF THE SENSOR. THE BYPASS SWITCH — OVERRIDE THE ON FUNCTION IN CASE OF SENSOR FAILURE. AUTOMATIC LIGHT LEVEL SENSOR SHALL BE ADJUSTABLE FROM 1 TO 20 FC; KEEPS LIGHTING OFF DURING DAYLIGHT HOURS.
  - DETECTOR SENSITIVITY** — DETECT OCCURRENCES OF 6 INCH MINIMUM MOVEMENT OF ANY PORTION OF A HUMAN BODY THAT PRESENTS A TARGET OF AT LEAST 36 SQ. IN. COVERAGE SHALL BE A MINIMUM OF 35 FEET, WITH A FIELD OF VIEW OF 180 DEGREES.

**F. CONSTRUCTION:**

- SUBMITTALS**— SUBMIT FOR REVIEW SIX SETS OF MANUFACTURERS CUT SHEETS AND/OR SHOP DRAWINGS OF LIGHT FIXTURES WITH LAMPS AND LIGHT FIXTURE BASE, POWER PEDESTAL, AND ALL ITEMS IN THIS SPECIFICATION OTHER THAN WIRE AND CONDUIT. ALSO SUBMIT ITEMS REQUIRING COORDINATION BETWEEN CONTRACTORS. BEFORE SENDING SUBMITTALS, THE CONTRACTOR SHALL VERIFY THAT ALL EQUIPMENT SUBMITTED IS MUTUALLY COMPATIBLE AND SUITABLE FOR THE INTENDED USE, AND SHALL FIT THE AVAILABLE SPACE AND ALLOW AMPLE ROOM FOR MAINTENANCE. THE ENGINEER'S REVIEW AND COMMENT ON SUCH SUBMITTALS SHALL NOT RELIEVE THE CONTRACTOR FROM RESPONSIBILITY FOR ERRORS IN DIMENSIONS, DETAILS, SIZE OF MEMBERS, OR QUANTITIES; OR OMISSIONS OF COMPONENTS OR FITTINGS; OR FOR COORDINATING ITEMS WITH ACTUAL PROJECT CONDITIONS.
- SUBSTITUTIONS:** MATERIAL ALTERNATES SHALL BE SUBMITTED IN COMPLETE DETAIL TO THE ENGINEER NO LATER THAN 10 CALENDAR DAYS PRIOR TO BID DATE. DECISION ON ACCEPTANCE OF A SUBSTITUTION IS SOLELY UP TO THE ENGINEER.

**ELECTRICAL CONTACTS**

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**SYMBOL LIST**

| SYMBOL | DESCRIPTION                      | MOUNTING OR AS INDICATED |
|--------|----------------------------------|--------------------------|
|        | PULL BOX                         | GRADE                    |
|        | UNDERGROUND ELECTRICAL           | BELOW GRADE              |
|        | UTILITY TRANSFORMER              | GRADE                    |
|        | SITE LIGHT POLE AND FIXTURE HEAD | POLE                     |
|        | CONDUIT MARKER                   | GRADE                    |

**SYMBOLS LIST NOTES:**  
1. SOME MAY NOT BE USED IN THIS SET OF PLANS.  
2. ABBREVIATIONS MAY BE WITH OR WITHOUT PERIODS.  
3. ALL MOUNTINGS APPLY UNLESS OTHERWISE NOTED.

LANDSCAPE, LIGHTING, & IRRIGATION  
BERKELEY SQUARE FIRST ADDITION  
HOME BANK & TRUST ADDITION

**ELECTRICAL COVER SHEET**

SHEET TITLE  
**472-85039**  
PROJECT NUMBER

MKEC / JJW / BWB  
DESIGNED DRAWN CHECKED

ISSUED  
**FEBRUARY 2012**

REVISED

SHEET NO.