BOWEN ISLAND
SPORTS FIELD LIGHTING

EQUIPMENT SUPPLY SPECIFICATIONS

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Division 16 - Equipment Supply

PART 1 - GENERAL

1.1 INTRODUCTION

.1 Refer to the General Conditions of the Contract together with Amendments and Supplements contained in the General Specification, which forms an integral part of this specification.

.2 **In order to meet the project schedule, the specified equipment shall be pre-ordered on behalf of the successful Electrical Contractor.**

Upon award of Sports Field Lighting Installation Contract, the successful Contractor shall accept responsibility for the purchase of the tendered equipment. This shall include delivery, payment, and all coordination associated with the equipment supply.

1.2 SUMMARY OF WORK

.1 Scope of Work

Scope of Work included in the Equipment Supply shall include:

- Supply of shop drawings and documentation outlined in Submittals Specification 16900.
- Supply of sports field lighting luminaires, ballasts, and fixture support assembly.
- Supply of sports field lighting poles.
- Supply of lighting control panel.
- Assisting Installation Contractor with procedures and requirements of pole and luminaire installation.
- Assisting Installation Contractor with Testing and Commissioning as outlined in Specification 16950.

1.3 SCHEDULE

.1 Time is of the essence for this Contract. The Equipment Supplier shall schedule and coordinate delivery of submittals and equipment with Installation Contractor to meet project schedule.

PART 2 - PRODUCTS

2.1 RESPONSIBILITY

.1 The Equipment Supplier shall be responsible for compliance with illumination performance as outlined in Specification 16400 - 1.5 Design Criteria.

PART 3 - EXECUTION

3.1 PROTECTION OF EQUIPMENT

.1 Provide maximum protection of major equipment such as luminaires and electronic equipment. Equipment shall be kept clean and dry at all times and caution shall be taken to ensure no mechanical damage is done to the equipment.

3.2 PAYMENT SCHEDULE

.1 The following payment schedule is proposed on behalf of the Purchaser (Installation Contractor):

- Receipt of approved Shop Drawings	10%
- Delivery of material to site	75%
- Completion of satisfactory site testing and commissioning	10%
- Receipt of O&M Manuals including all Test Reports and Warranty Certificates	5%
	100%

3.3 PRE-APPROVAL OF EQUIPMENT

.1 The Owner or Engineer will not assess the suitability of alternate equipment prior to tender opening.

.2 Alternatives to specified equipment will be assessed after the Tender Opening.

3.4 DELIVERY OF EQUIPMENT

.1 Time is of the essence for this project.

.2 Delivery period of the equipment shall be a factor in the award of this Contract.

.3 Delivery shall be to Bowen Island Elementary School (play field), Bowen Island.

3.5 CODES, PERMITS, AND INSPECTIONS

.1 The installation shall comply with all the by-laws applying to electrical installations in effect locally and with the BC Electrical Code Regulations, Municipal Regulatory Services, BC Department of Labour, and Worksafe BC, where such regulations do not conflict with those by-laws.

3.6 WARRANTY

.1 The entire electrical system shall be left in proper working order and without additional charges. Any work or materials which develop defects shall be replaced, except for ordinary wear and tear, within one year from the date of substantial completion referred to in the General Conditions.

END OF SECTION

PART 1 - GENERAL

1.1 DOCUMENTS

.1 This section of the specification forms part of the Contract documents and is to be read, interpreted, and coordinated with all other parts.

PART 2 - PRODUCTS

2.1 PANELBOARDS

.1 Panels shall have bolted breakers and tubs for flush or surface mounting as called for on the drawings. Panel tub shall be zinc coated, and surface mounted panels shall be finished with standard baked grey enamel. Panelboard mains shall be 225 amp unless otherwise noted.

.2 The manner in which the circuit breaker shall be connected to the busses and the numbering and ampere rating of these breakers shall be as indicated on the drawing. The breakers shall be thermo magnetically operated type and two and three pole breakers shall have common trip without tie bar handle. The mains for the panels shall be arranged as shown on the drawing. All ground wires shall terminate in ground terminal strip in panelboard.

.3 The circuit number arrangements as laid out on the drawings shall be adhered to a neatly typed list of these numbers and relevant room or locations together with room numbers shall be posted on the back of the door of the panelboard in an approved directory holder. Above the directory a lamicoid label with the name of the panel shall be installed.

.4 Ground Fault Circuit Interrupting Breakers
Where noted on the drawings, ground fault circuit interrupting breakers shall be installed on the amperage and poles shown. Breakers shall be Class A, Group 1 ground fault circuit interrupters with test and reset function in addition to normal trip.

.5 Lockout Devices
All panelboard breakers shall have provision for lockout.

.6 347/600 Volt Panelboard
Shall have, unless otherwise noted, 225 amp mains arranged for 3 phase, 4 wire, solid neutral, 347/600 volt distribution for single, 2 or 3 pole breakers.

Shall be equivalent to:
- Cutler Hammer Pow-R-Line 3a
- Square 'D' NF

.7 120/240 Volt Panelboard
Shall have, unless otherwise noted, 225 amp mains, 24 circuits, arranged for 1 phase, 3 wire solid neutral 120/240 volt distribution for single or 2 pole breakers. Panels shall be mounted as called for on the drawings with bolted breakers. Breakers shall have a minimum 10,000 amps symmetric interrupting capacity, unless otherwise noted.

Approved Manufacturers:
- Cutler Hammer Pow-R-Line 1a
- Square D NQOD

2.3 ENCLOSURES

.1 Enclosures for ground level distribution equipment shall be stainless steel, gasketted watertight construction to EEMAC 4X Standards.

2.4 LOCKS

.1 Panelboard and enclosure locks shall be flush mounted cylinder type lock equivalent to Corbin, Chicago, or Yale to Bowen Island Community Standards. If additional backing is required to mount lock it shall be placed behind the door to keep the door face clean. Panels shall have common keys.

.2 All locks providing access to electrical equipment shall be keyed to Bowen Island Community Standards AE-1 Key.

2.5 DISCONNECT SWITCHES

.1 The Contractor will supply and install outdoor weatherproof EEMAC 4X, H.P. rated heavy duty industrial disconnect switches where indicated on the drawing.

2.6 LIGHTING CONTACTORS

.1 Lighting Contactors shall be installed where called for on the drawings with the ampere rating and number of poles as called for on the drawings. Contactors shall be permanent magnet, mechanically held, rated for lighting loads equivalent to Allen Bradley #500L. At all terminals of contactor, wiring shall be labelled indicating circuit number. Unless otherwise noted, contactors shall have HOA selector switch.

.2 Where pilot lights are noted they shall be neon or LED type.

END OF SECTION

PART 1 - GENERAL

1.1 DOCUMENTS

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1.2 STANDARDS

.1 Illumination Engineering Society RP-6-01
'IES Recommended Practice for Sports and Recreational Area Lighting'

.2 Illumination Engineering Society RP-33-99
'IES Recommended Practice of Lighting for Exterior Environments'

.3 IES Technical Memoranda TM-11-00
'Technical Memorandum on Light Trespass: Research Results and Recommendations TM-11-00

.4 Canadian Electrical Code - Part I - Current Edition
CSA C22.1-06

1.3 DESIGN CRITERIA

.1 General

Selection of lighting criteria for the Bowen Island Sports Field has been based on the Illuminating Engineers Society' Recommendations for Sports and Recreational Area Lighting.'

Selection of criteria includes:
- Class of play and facilities
- Average illumination levels

The IES Recommendations also provide criteria for quality and standards of illumination:
- Coefficient of Variation
- Maximum to minimum ratios
- Uniformity

.2 Class of Play

Sports and recreation activities have been divided by the IES into four categories:

Class I	Facilities with spectator capacity over 5000
Class II	Facilities for spectators of 5000 or less
Class III	No special provision for spectators
Class IV	Social and recreational

For the Bowen Island Sport Field, the following 'class of play' has been selected:

Soccer Field	Class III

.3 Illumination Standards

IES recommended illumination levels for each outdoor sport and activity are:

Soccer	Class III	30 fc	avg illumination

Based on the above IES Recommendations, the illumination design criteria for Bowen Island Community Sports Field will be:

Soccer Field # 1

Average Illumination	30 fc - horizontal at ground level	
Uniformity	- Coefficient of variation	0.25 or less
	- Max : Min	3:1 or less
Field of Play	30 m. X 40 m.	
Lighted Area	36 m. x 46 m.	

.4 Lighting Cutoff

While maintaining quality illumination on the playing surface, it is essential to cut off light outside the playing surface as quickly as possible.

Illumination is required for both the playing boundary and adjacent areas where illumination levels must be maintained. The total illuminated area is called 'Primary Playing Area' (PPA). For each sport the area beyond the official field levels are:

Soccer	3 - 5 metres

Outside the primary playing area, the illumination levels shall be cutoff as quickly as possible.

Illumination cutoff shall comply with recommendations of IES Technical Memoranda TM-11-00 and IES Report RP-33-99.

1.4 APPROVED MANUFACTURERS

.1 The following manufacturers are approved subject to compliance with the Illumination Design Criteria and Specifications.

- Cooper Lumark
- General Electric
- Hubbell
- Keene
- Musco
- Qualite

Other manufacturers may be approved subject to submitting product literature for approval.

1.5 SHOP DRAWINGS

.1 Shop drawings shall be submitted detailing all elements of the field lighting system, including:

- Luminaire
- Shielding
- Ballast and ballast enclosures
- Lamp
- Pole
- Pole terminal box
- Field lighting control panel

.2 In addition to the luminaire and pole material shop drawings, a field plan shall be provided showing anticipated lighting performance. Area of field shall include:

- All of playing surface
- All areas three metres beyond playing surface
- Areas surrounding field showing light cut off five, ten, and fifteen metres from edge of field.

.3 Lighting plan of field shall show:

- Horizontal footcandles at field surface.
- Uniformity rates
- Maximum to minimum lighting levels

PART 2 - PRODUCTS

2.1 LUMINAIRES

.1 347 volt, 1000 watt, pulse or standard start, metal halide, high quality floodlight luminaire with remote ballast, capable of providing illumination to the standards outlined in the Design Criteria, Specification 16400 - 1.3.

Fixture components shall include:

- Cast aluminium housing with gasketted cover
- Aluminum reflector
- Tempered glass lens
- Extended lamp ignitor to accommodate remote pulse start ballast up to 50 feet
- Internal glare control optics
- External shielding visor
- Vertical and horizontal adjustment with aiming protractor and locking assembly

.2 Quantity of luminaires per pole shall be determined by manufacturer necessary to provide illumination in compliance with, or better than, the Design Criteria outlined for each field.

2.2 BALLASTS

.1 Ballasts shall be remotely mounted from the luminaire and mounted in a weatherproof EEMAC 4x ballast enclosure at 12 feet from base of pole.

.2 Ballasts shall be:

- 1000 watt metal halide - either standard or pulse start ballasts are acceptable.
- 347 volt input
- One ballast per luminaire

Each ballast shall be individually fused.

.3 Ballast enclosures shall house:

- Ballasts with mounting brackets
- Fusing
- Wiring harness
- Labelling

Ballast enclosure shall be aluminum or stainless steel weatherproof EEMAC 4X cabinet with hinged, gasketted door, door latch, and securing hardware.

Secure ballast enclosure to pole with bottom of enclosure at 12 feet.

2.3 LAMPS

.1 Lamps shall be 1000 watt, clear standard or pulse start metal halide.

Type BT 37 Bulb

- Minimal Initial Lumens	110,000V
- Minimal Mean Lumens	96,000H
- Average Rated Life	12,000V

Approved Manufacturers:
- General Electric
- Osram
- Philips
- Sylvania

2.4 POLES

.1 Poles shall be galvanized tapered steel suitable to support selected quantity of luminaires, mounting and aiming hardware, and ballast enclosures to specified minimal wind loads.

.2 Pole base shall be bolt style suitable to anchor to concrete pole base with anchor bolts.

.3 Pole heights specified are maximum height, but may be reduced assuming illumination design criteria is still met.

.4 All vertical wiring shall be internal within the pole.

Pole features shall include:

- Hand hole
- Ground lug
- Mounting brackets for ballast enclosures
- Harnesses for wiring

Supply pole with anchor bolts, nuts, and nut covers.

.5 Pole design shall have structural capability to handle loads produced by:

- ½" ICE load
- 100 mph constant wind load with
- 1.3 gust factor

Structural loading shall be for final projected areas of pole, luminaires, and support brackets.

2.5 POLE BASES

.1 Pole bases shall be cast-in-place concrete constructed to meet forces of pole under maximum wind loading conditions.

.2 Pole base shall have anchor bolts installed to match spacing and dimensions of pole, as defined by pole manufacturer.

.3 Pole base design and construction shall be approved and certified by a Structural Engineer registered in the province of BC.

2.6 JUNCTION BOX

.1 Each field lighting pole shall have an in-ground junction box mounted adjacent to the pole, flush with grade.

.2 Junction box shall be 585 mm x 865 mm outside dimensions, AE Concrete #T466 box, with two vertical sections, (273 mm each) and galvanize checker steel plate with bolt down assembly. Identify cover with welded 'ELEC' marking.

2.7 POLE PANEL

.1 Each pole shall have a pole mounted panel to house:

- Pole disconnect breakers
- Ballast fusing
- Terminal strips
- Wiring harness

Pole panel shall be mounted on pole above 12 feet.

.2 Pole panel may be combined or integrated with ballast housings.

PART 3 - EXECUTION

3.1 TESTING & COMMISSIONING

.1 Prior to acceptance of sports field lighting, the Contractor and Lighting Equipment Supplier shall commission the system. Commissioning shall include:

- Installation of internal reflector
- Installation of fixture shielding
- Aiming each fixture
- Site measurements of final illumination levels on playing surface
- Recording final aiming angles
- Site measurements of field perimeter lighting cut off
- Testing of all switching and controls

END OF SECTION

PART 1 - GENERAL

1.1 DOCUMENTS

.1 This section of the specification forms part of the contract documents and is to be read, interpreted, and coordinated with all other parts.

1.2 SCOPE - SPORTS FIELD LIGHTING

.1 Sports field shall have individual lighting control. All control equipment shall be housed in a pad mounted weatherproof enclosure.

.2 Field lighting control for Soccer Field shall consist of:

- Manual ON-OFF, key operated - 50% illumination level
- Manual ON-OFF, key operated - 100% illumination level
- Time clock override

1.3 SHOP DRAWINGS

.1 Submit shop drawings of lighting control panel.

PART 2 - PRODUCTS

2.1 SPORTS FIELD LIGHTING CONTROL

.1 <u>General</u>

Field lighting control panel shall be provided for one illuminated field.

.2 <u>Operations</u>

Operation of sports field lighting shall be:

<u>Soccer Field</u>
- Manual ‘ON’ with keyed switches - 50% illumination or 100% illumination
- Manual ‘OFF’ with keyed switches
- Photocell override for ‘ON’ position so lights only come on in dusk or dark conditions
- Time clock override for ‘OFF’ position so lights go off at preset time. Set override time to 10:30 pm (to be confirmed).
- Control and override devices shall have HOA selector switches located inside control panel.

.3 <u>Enclosure</u>

Field lighting control panel shall be pad mounted weatherproof stainless steel enclosure with gasketted hinged door, constructed to EEMAC 4X Standards.

Enclosure shall house all equipment associated with field lighting control:
- 347/600 volt 3 phase, 4 wire panelboard
- Lighting contactors
- Time clock
- Selector switches
- Control switch
- Wiring terminal blocks

- 120/240 volt, single phase, 3 wire panelboard
- Strip heater
- Ground pad
- Wiring
- Labelling

Access to control panel shall have cylindrical lock keyed to Community Standards.

.4 347/600 Volt 3 Phase 4 Wire Panelboard

Shall be 42 circuit, 347/600 volt 3 phase, 4 wire panelboard with main breaker as detailed on drawings and in Specification 16100 - 2.2.6.

.5 Lighting Contactors

Lighting contactors shall be 3 pole, 600 volt, permanent magnet, mechanically held contactor rated for lighting loads of the ampere rating noted on the drawings.

Contactor shall have 120 volt coil with electric 'ON' and 'OFF' signal.

.6 Time Clock

Time switch shall be 24 hour equivalent to Paragon #4213-OS, two pole, 40 ampere, 120 volt with reserve power feature.

.7 Selector Switch

Selector switches shall be provided for hand-off operation to permit manual bypass of each automatic control device.

Selector switches shall be oil-tight with features as noted on drawing equivalent to Allen-Bradley #800T.

.8 Control Switch

Each field lighting control panel shall have two keyed 'ON-OFF' switches flush mounted in control panel door. Switches shall have weatherproof cover.

Switch #1 shall control illumination levels to 50%.

Switch #2 shall control the remaining fixtures to provide illumination levels to 100%.

Keyed switch shall be oil-tight, equivalent to Allen-Bradley #800T.

Provide rain shield canopy above switches.

.9 Wiring Terminal Blocks

All wiring entering and leaving control panel and control wiring within the panel shall be terminated in wiring terminal blocks.

.10 600/120 Volt Distribution Transformer

600 to 120/240 volt, single phase, epoxy potted, air cooled transformer shall be installed in control panel as shown on drawings. Transformers shall be designed, manufactured, tested, and completed with standard accessories in accordance with latest CSA Standard C9.

Transformer shall be dry type:
- 9 kVA
- Epoxy potted
- Copper windings
- 150˚C Class H temp rise
- 2% high voltage taps, two above (FCAN), two below (FCBN)
- Supplied with Cu/Al clamp type terminal lugs

.11 120/240 Volt Single Phase Panelboard

Shall be 24 circuit, 120/240 volt, 1 phase, 3 wire panelboard with main breaker as detailed on drawings and in Specification 16100-2.2.7.

.12 Strip Heater

Provide strip heater in control panel to prevent moisture, condensation, and corrosion within panel.

.13 Ground Pad

Provide ground pad in control panel to terminate all ground connections.

.14 Wiring

All control wiring shall be copper, stranded conductors. Wiring shall be neatly laid out and secure with wiring harnesses.

.15 Labelling

All devices shall be labelled. All wiring shall be identified and labelled at each termination.

.16 Remote Photo Cell

Photocell control shall be remotely mounted in nearest pole.

2.2 PHOTOCELL

.1 Photocell shall be pole mounted on light pole closest to the lighting control panel.

.2 Photocell control shall have HOA selector switch to permit photocell bypass.

.3 Wiring to photocell shall be 3#14 installed in conduit.

.4 Pathway photocell shall be flush mounted ‘button’ style.

.5 Field lighting photocell shall be flush pole mounted equal to Tork #3010.

PART 3 - EXECUTION

3.1 LAYOUT

.1 Prior to installation, lighting control panels shall be staked and approved by Engineer.

3.2 CONCRETE PAD

.1 Lighting control panels shall be mounted on a concrete pad (by others) as detailed on drawings.

END OF SECTION

PART 1 - GENERAL

1.1 ADMINISTRATIVE

.1 Provide to Engineer for review all submittals specified and in an orderly sequence so as to not cause delay in the Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

.2 Prepare and submit project schedule with dates for submission and return of shop drawings, product data or samples. Allow 10 working days for Engineer's review.

.3 Work affected by the submittals shall not proceed until review is complete.

.4 Review submittals prior to submission to the Engineer. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with the requirements of the Work and the Contract Documents.

1.2 APPROVALS

.1 All tender submissions shall be bid according to specifications. There shall be no substitutions during the tender period.

.2 Alternates to specifications may be submitted for review after award of contract.

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 The term 'shop drawings' means drawings, diagrams, illustrations, schedule, performance charts, brochures and other data which are to be provided by the Contractor to illustrate details of a portion of the Work

.2 Allow 10 working days for Engineer review of shop drawings.

.3 Prepare to an AutoCAD standard equivalent to the Contract drawings.

.4 Shop Drawings shall be submitted for:
- All major electrical equipment
- Panelboards
- Seismic Restraints
- Lighting Fixtures
- Poles and assembly
- Control Panels

.5 Indicate materials, methods of construction, and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinate, regardless of the Section under which the adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.6 Make such changes in shop drawings as the Engineer may require, consistent with Contract Documents. When resubmitting, notify the Engineer in writing of any revisions other than those requested.

.7 Submit 8 prints of shop drawings for each requirement requested in Specification Sections and as the Engineer may reasonably request.

.8 Submit 8 copies of product data sheets or brochures for requirements requested in specification Sections and as the Engineer may reasonably request where shop drawings will not be prepared due to standardized manufacture of product.

.9 If upon review by the Engineer, no errors or omissions are discovered or if only minor corrections are made, 6 copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through the same procedure indicated above, shall be performed before fabrication and installation of Work may proceed.

.10 Manufacturers shop drawings shall be reviewed by the Contractor, Consultant and University for the sole purpose of ascertaining conformance with the general design concept. This review shall not mean that the Reviewer approves the detail design inherent in the shop drawings, responsibility for which shall remain with the Contractor submitting same, and such review shall not relieve the Contractor of his responsibility for errors or omissions in the shop drawings or of his responsibility for meeting all requirements of the Contract Documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job-site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for coordination of the work of all sub-trades.

.11 Shop drawings for major electrical equipment shall include mounting and fastening details necessary to comply with British Columbia Building Code Seismic Requirements.

Details shall show locations and forces of required supports. All drawings to be stamped by a Professional Engineer registered in the Province of British Columbia.

.12 Shop drawings shall include all information necessary for the Consultant to clearly identify and understand the system being provided.

This shall include:
- Data information sheets of all equipment and devices.
- Block or schematic diagram of system interconnections.
- Detailed wiring diagram of the complete system as it relates to this particular project.
- Operational instructions of system set-up, modifications and operations.
- Maintenance and repair data sheets.

.13 All Shop Drawings shall be in AutoCAD computer format. Hand drawn sketches are not acceptable.

.14 An AutoCAD computer disc of the shop drawings shall be included with the final shop drawing submittal.

END OF SECTION

PART 1 - GENERAL

1.1 COMMISSIONING

.1 Sports Field Lighting

Sports field lighting performance and controls shall be as specified in Sports Field Lighting - 16400 - 3.3.

END OF SECTION