

SECTION 02730
GENERAL ELECTRICAL WORK

02730.01 GENERAL

A. Description

General electrical work shall include, but not necessarily be limited to, furnishing, installing, and testing for all electrical items.

B. Related Work Included Elsewhere

1. Electrical cable; Section 02735.
2. Loop detectors; Section 02742.
3. Loop detector amplifiers; Section 02743.
4. Push buttons; Section 02745.
5. Luminaires; Section 02762.

C. Quality Assurance

1. Inspection

The Engineer will inspect all materials and work to ensure compliance with the Contract Documents.

2. Testing

a. General

The Contractor shall be responsible for furnishing all personnel and equipment required to successfully perform the following tests and shall furnish six certified copies of complete test reports to the Engineer.

Not less than 30 days prior to the commencement of each required test, the Contractor shall submit to the Engineer the types, styles, or catalog numbers of all testing equipment to be used for the tests. A written certification shall be included stating that the testing equipment was last calibrated by an approved testing agency not more than 60 days prior to the date when the tests are to be performed. All tests are to be performed in the presence of the Engineer. The Contractor shall provide 72 hours notice prior to testing.

b. Conductor's

The ground conductivity test shall use a megger ground tester of the hand crank type. The test method to be used shall be Fall of Potential Method. No corrected reading greater than 25 ohms will be accepted. The Contractor shall submit in writing to the Engineer a list of readings itemized and identified for all items for which grounding systems are required.

The Contractor shall test cable installed and shall demonstrate to the satisfaction of the Engineer that all conductors are continuous and free from short circuits and unspecified grounds and that all circuits are properly connected in accordance with the Plans.

Any defect found in the completed installation, in materials, specified equipment performance, and/or workmanship, as a result of these tests, shall be repaired and/or replaced promptly without any additional cost to the County.

c. Circuit Testing

A circuit test to determine the insulation resistance shall be made for each insulated cable, except pole and bracket cable, in all feeders and all distribution circuits, including duct cable used in distribution circuits. The test shall be performed on each cable of each circuit with all ballasts and transformers disconnected and all connections to earth grounds, including ground rods and grounding connections to light poles disconnected. Units of measurements for reporting shall be expressed in megohms. The cable insulation resistance shall exceed 10 megohms.

d. Performance Test

When specified or otherwise required, the Contractor shall furnish the services of the equipment manufacturer's factory-trained servicemen or technicians to start up and/or test the equipment.

A performance test shall be conducted prior to acceptance. The Contractor shall operate the lighting system, including automatic control equipment and other specified apparatus, or equipment for 30 consecutive days without interruption or failure. Street lighting systems shall be operated from sunset to sunup. If a lamp or the ballast should fail, it should be immediately replaced, however, this shall not require a restart of the test. The Contractor shall record each fault, the method and date of correction, and the beginning and ending of the 30 day test period. If more than 5% of any system components under test fail, then the 30 day test period shall commence again for the entire system.

If the performance test is conducted prior to all other tests, the Contractor shall energize and manually operate the entire system, including control equipment, for a minimum period of one hour to ensure that all connections were restored after testing.

e. Illumination Testing

An illumination test shall be conducted by the Contractor for all lighting systems to determine the ground-level illumination characteristics of the lighting installation by measuring footcandles at locations designated by the Engineer, in accordance with IES testing procedures.

Cost for power necessary to conduct tests will be borne by the Contractor.

D. Submittals

1. Shop Drawings

The Contractor shall submit to the Engineer for approval all necessary documents such as detail plans, drawings, photographs, photometric data, schematics, templates, make, model number and specifications of all apparatus and equipment he proposes to furnish. They shall show clearly the design, construction dimensions, quantities, and any other information as may be necessary or desirable for a proper understanding of the equipment offered. All material sheets, curves, etc. defining the above shall identify the specific project to which the material applies; and if more than one catalog number, style, or type is listed on one sheet, the item to be furnished shall be clearly marked.

The Contractor shall not order electrical material until written approval of the submission is received from the Engineer. Approval by the Engineer will not relieve the Contractor of responsibility for erroneous or inconsistent dimensions, notations, omissions, or other errors, or the proper functioning of the complete installation.

2. Certificates

The Contractor shall, upon completion of the work, deliver to the Engineer a final certificate of approval from the Anne Arundel County Inspections and Permits P.A.C.E., prior to final payment. The Contractor shall apply and pay for all permits, licenses, and inspection fees required. Four copies of certificates of compliance shall be delivered to the Engineer upon completion of the work.

02730.02 MATERIALS

A. Materials Furnished by the County

The County will not furnish any materials for general electrical work.

B. Contractor's Options

Not applicable.

C. Detailed Material Requirements

Materials shall comply when applicable to the Underwriters' Laboratories requirements and meet the applicable minimum standards.

The materials shall also comply with the National Electrical Code (NEC) and that of all applicable Anne Arundel County codes.

All materials and equipment installed as part of the permanent installation shall be new. Insofar as practical, all major items of electrical materials and equipment, such as lamps and luminaires, different parts of lighting standards, etc., shall be produced by the same manufacturer.

02730.03 EXECUTION**A. General**

All installations shall be in accordance with the National Electrical Code, the NECA Standards of Installation, the National Electrical Safety Code, and all applicable State and Anne Arundel County Codes governing the work, and to the rules and regulations of the electrical utility serving the facility.

B. Grounding System

1. Grounding shall be in accordance with the requirements of the National Electrical Code and as hereinafter specified and/or indicated on the Plans. Perforated grounding straps will not be acceptable.
2. The Contractor shall furnish ground for secondary service neutral and all raceways, devices and utilization equipment permanently and effectively in accordance with requirements of the National Electrical Code, and as hereinafter specified. Continuity of metal raceways shall be ensured by double locknuts. All grounded and bonding connections shall be solderless, except where indicated otherwise on the Plans.
3. The ground system shall be so constructed that the resistance between the equipment and the ground shall not exceed 5 ohms. Additional ground rods shall be driven if required to obtain this resistance value.
4. Cable connections to ground rods shall be stranded copper. All ground connections shall be the exothermic weld process or approved equal.
5. All wires used solely for grounding purposes shall have green color if insulated.

C. Operation of Equipment

1. The Contractor shall lubricate, clean, adjust, and test all equipment and systems in accordance with the manufacturer's instruction prior to initial operation. Equipment shall not be operated unless proper safety devices and controls are operational. The Contractor shall furnish all maintenance and service for equipment which is operated during construction and protect the equipment.
2. Where specified or otherwise required the Contractor shall furnish the services of the manufacturer's factory-trained servicemen or technicians to start up the equipment.
3. Upon completion of the work, the Contractor shall clean and restore all equipment to new conditions.

D. Damage to Other Work

1. Damage

All cutting or damage to existing structures, surfaces or installations shall be repaired at the expense of the Contractor. All such repairs or patching shall be done by mechanics of the appropriate trade and shall be neatly done and in such fashion as to leave no readily apparent joint or change in appearance, and to leave no structural or other weakness.

2. Waterproofed Surfaces

No electrical work shall pierce any waterproofed or dampproofed surface without the permission of the Engineer and where such condition occurs, the work shall be waterproofed or dampproofed to meet the standards of the original specifications to the satisfaction of the Engineer.

02730.04 METHOD OF MEASUREMENT

Measurement of the work described in this Section will not be made.

02730.05 BASIS OF PAYMENT

Payment for furnishing all materials, labor, equipment, and incidentals for required performance testing shall be incidental to and included in the prices bid for the respective items.