

INFORMAL CONTRACT

FOR

**NC Department of Transportation
Division 11 Equipment Shop Office Up-fit
302 Statesville Road
N. Wilkesboro, NC 28659
13-10023-01A**

SCOPE OF WORK

Conversion of existing conference room into new offices. See attached drawings for details.

NOTICE TO BIDDERS

A **mandatory pre-bid** conference will be held on **Thursday, October 31, 2013 at 11:00 AM** to review and verify existing conditions and discuss scope of work. The contractors are asked to meet at the NCDOT Division 11 Equipment Shop at 302 Statesville Road, N. Wilkesboro NC 28659. **Contractor should bring all necessary measuring tools and ladders for through inspection and measurement of existing conditions. NCDOT will not supply ladder or measuring devices.**

Sealed proposals for this work will be received by:

**Brad Ellington, CEM, PEM
NC Department of Transportation
302 Statesville Road
N. Wilkesboro, NC 28659
919-707-4554**

up to **3:00 PM**, on **Thursday, November 14th, 2013** and immediately thereafter publicly opened and read aloud. Complete plans and specification and contract documents can be obtained from

*NC Department of Transportation Facilities Design Section
1525 Mail Service Center
Raleigh NC 27699-1525
919-707-4554*

Contractors are hereby notified that they must have proper license under the State laws governing their respective trades and that North Carolina General Statute 87 will be observed in receiving and awarding contracts. General Contractors must have general license classification for Building Contractor.

A bid bond, performance bond, and payment bond are not required when the total amount of the construction contracts does not exceed \$500,000.

No bid may be withdrawn after the opening of bids for a period of 30 days. The Owner reserves the right to reject any or all bids and waive informalities. Proposals shall be made only on the form provided herein with all blank spaces for bids properly filled in and all signatures properly executed.

Please note on the envelope – **Bid Proposal: Attn:** Brad Ellington, CEM PEM

November 14, 2013

(Contractor)

(License Number)

GENERAL CONDITIONS

GENERAL

It is understood and agreed that by submitting a bid that the Contractor has examined these contract documents, drawings and specifications and has visited the site of the Work, and has satisfied himself relative to the Work to be performed.

MATERIALS, EQUIPMENT AND EMPLOYEES

The contractor shall, unless otherwise specified, supply and pay for all labor, transportation, materials, tools, apparatus, lights, power, fuel, sanitary facilities and incidentals necessary for the completion of his work, and shall install, maintain and remove all equipment of the construction, other utensils or things, and be responsible for the safe, proper and lawful construction, maintenance and use of same, and shall construct in the best and most workmanlike manner, a complete job and everything incidental thereto, as shown on the plans, stated in the specifications, or reasonably implied there from, all in accordance with the contract documents.

All materials shall be new and of quality specified, except where reclaimed material is authorized herein and approved for use. Workmanship shall at all times be of a grade accepted as the best practice of the particular trade involved, and as stipulated in written standards of recognized organizations or institutes of the respective trades except as exceeded or qualified by the specifications.

No changes shall be made in the Work except upon written approval and change order of the Designer/Owner. Change orders shall be subject to provisions in the current North Carolina Construction Manual.

Products are generally specified by ASTM or other reference standard and/or by manufacturer's name and model number or trade name. When specified only by reference standard, the Contractor may select any product meeting this standard, by any manufacturer. When several products or manufacturers are specified as being equally acceptable, the Contractor has the option of using any product and manufacturer combination listed.

However, the contractor shall be aware that the cited examples are used only to denote the quality standard of product desired and that they do not restrict bidders to a specific brand, make, manufacturer or specific name; that they are used only to set forth and convey to bidders the general style, type, character and quality of product desired; and that equivalent products will be acceptable. Substitution of materials, items or equipment of equal or equivalent design shall be submitted to the architect or engineer for approval or disapproval; such approval or disapproval shall be made by the architect or engineer prior to the opening of bids.

If at any time during the construction and completion of the work covered by these contract documents, the conduct of any workman of the various crafts be adjudged a nuisance to the Owner or if any workman be considered detrimental to the work, the Contractor shall order such parties removed immediately from the site.

The contractor shall designate a foreman/superintendent who shall direct the work.

CODES, PERMITS AND INSPECTIONS

The Contractor shall obtain the required permits, if required, give all notices, and comply with all laws, ordinances, codes, rules and regulations bearing on the conduct of the work under this contract. If the Contractor observes that the drawings and specifications are at variance therewith, he shall promptly notify the Designer in writing. If the Contractor performs any work knowing it to be contrary to such laws, ordinances, codes, rules and regulations, and without such notice to the Owner, he shall bear all cost arising there from.

All work under this contract shall conform to the current North Carolina Building Code and other state and national codes as are applicable

Projects constructed by the State of North Carolina or by any agency or institution of the State are not subject to county or municipal building codes and may* not be subject to inspection by county or municipal authorities. The Contractor shall, however, cooperate with the county or municipal authorities by obtaining building permits. Permits may be obtained by the contractor at no cost to the owner.

*Inspection and certification of compliance by local authorities is necessary if an architect or engineer was not employed on the project, or if the plans and specifications were not approved and the construction inspected by the State Construction Office.

SAFETY REQUIREMENTS

The Contractor shall be responsible for the entire site and the construction of the same and provide all the necessary protections as required by laws or ordinances governing such conditions and as required by the Owner or Designer. He shall be responsible for any damage to the Owner's property, or that of others on the job, by himself, his personnel or his subcontractors, and shall make good such damages. He shall be responsible for and pay for any claims against the Owner arising from such damages.

The Contractor shall adhere to the rules, regulations and interpretations of the North Carolina Department of Labor relating to Occupational Safety and Health Standards for the Construction Industry (Title 29, Code of Federal Regulations, Part 1926 published in Volume 39, Number 122, Part 11, June 24, 1974 Federal Register), and revisions thereto as adopted by General Statutes of North Carolina 95-126 through 155.

The Contractor shall provide all necessary safety measures for the protection of all persons on the work, including the requirements of the AGC Accident Prevention Manual in Construction as amended, and shall fully comply with all state laws or regulations and North Carolina Building Code requirements to prevent accident or injury to persons on or about the location of the work. He shall clearly mark or post signs warning of hazards existing, and shall barricade excavations and similar hazards. He shall protect against damage or injury resulting from falling materials and he shall maintain all protective devices and signs throughout the progress of the work.

TAXES

Federal Excise Taxes do not apply to materials entering into State work (Internal Revenue Code, Section 3442(3)).

Federal Transportation Taxes do not apply to materials entering into State work (Internal Revenue Code, Section 3475 (b) as amended).

North Carolina Sales Taxes and Use Tax do apply to materials entering into State Work (N.C. Sales and Use Tax Regulation No. 42, Paragraph A), and such costs shall be included in the bid proposal and contract sum.

Local Option Sales and Use Taxes do apply to materials entering into State work as applicable (Local Option Sales and Use Tax Act, Regulation No. 57), and such cost shall be included in the bid proposal and contract sum.

ACCOUNTING PROCEDURES FOR REFUND OF COUNTY SALES & USE TAX (THIS SECTION ONLY APPLIES TO STATE OWNED PROJECTS)

Contractors for State owned projects shall provide the owner a signed statement containing the information listed in G.S. 105-164.14(e) for all materials purchased for the project.

The Department of Revenue has agreed that in lieu of obtaining copies of sales receipts from contractors, an agency may obtain a certified statement from the contractor setting forth the date, the type of property and the cost of the property purchased from each vendor, the county in which the vendor made the sale and the amount of local sales and use taxes paid thereon. If the property was purchased out-of-state, the county in which the property was delivered should be listed. The contractor should also be notified that the certified statement may be subject to audit.

In the event the contractors make several purchases from the same vendor, such certified statement must indicate the invoice numbers, the inclusive dates of the invoices, the total amount of the invoices, the counties, and the county sales and use taxes paid thereon.

Name of taxing county: The position of a sale is the retailer's place of business located within a taxing county where the vendor becomes contractually obligated to make the sale. Therefore, it is important that the county tax be reported for the county of sale rather than the county of use.

When property is purchased from out-of-state vendors and the county tax is charged, the county should be identified where delivery is made when reporting the county tax.

Such statement must also include the cost of any tangible personal property withdrawn from the contractor's warehouse stock and the amount of county sales or use tax paid thereon by the contractor.

Similar certified statements by his subcontractors must be obtained by the general contractor and furnished to the claimant.

Contractors are not to include any tax paid on supplies, tools and equipment which they use to perform their contracts and should include only those building materials, supplies, fixtures and equipment which actually become a part of or annexed to the building or structure.

EQUAL OPPORTUNITY

The non-discrimination clause contained in Section 202 (Federal) Executive Order 11246, as amended by Executive Order 11375, relative to Equal Employment Opportunity for all persons without regard to race, color, religion, sex or national origin, and the implementing rules and regulations prescribed by the Secretary of Labor, are incorporated herein.

The Contractors agree not to discriminate against any employees or applicant for employment because of physical or mental handicap in regard to any position for which the employees or applicant is qualified. The Contractor agrees to take affirmative action to employ, advance in employment and otherwise treat qualified handicapped individuals without discrimination based upon their physical or mental handicap in all employment practices.

INSURANCE

The Contractor shall not commence work until he has obtained all insurance required, and the Owner has approved such insurance, nor shall the Contractor allow any subcontractor to commence work on his subcontract until all similar insurance required of the subcontractor has been obtained.

The Contractor shall provide and maintain during the life of this contract Workmen's Compensation Insurance for all employees employed at the site of the project under his contract.

The Contractor shall provide and maintain during the life of this contract such Public Liability and Property Damage Insurance as shall protect him and any subcontractor performing work covered by this contract, from claims for damage for personal injury, including accidental death, as well as from claims for property damages which may arise from operations under this contract, whether such operation be by the Contractor himself or by any subcontractor, or by anyone directly or indirectly employed by either of them and the amounts of such insurance shall be as follows:

Public Liability Insurance in an amount not less than \$300,000 for injuries, including accidental death, to any one person and subject to the same limit for each person, in amount not less than \$500,000 on account of one accident; and Property Damage Insurance in an amount not less than \$100,000/\$300,000.

The Contractor shall furnish such additional insurance as may be required by General Statutes of North Carolina, including motor vehicle insurance in amounts not less than statutory limits.

Each Certificate of Insurance shall bear the provision that the policy cannot be canceled, reduced in amount or coverage eliminated in less than fifteen (15) days after mailing written notice to the insured and/or the Owner of such alteration or cancellation, sent by registered mail.

The Contractor shall furnish the Owner with satisfactory proof of carriage of the insurance required before written approval is granted by the Owner.

INVOICES FOR PAYMENT

No partial payment will be made unless agreed to in advance. Final payment will be made lump sum within forty-five (45) consecutive days after acceptance of the work and the submission both of notarized contractor's affidavit and four copies of invoices which are to include the contract, account and job order numbers.

The contractor's affidavit shall state: "This is to certify that all costs of materials, equipment, labor, and all else entering into the accomplishment of this contract, including payrolls, have been paid in full."

Executed contract documents, insurance certifications and, upon completion and acceptance of the work, invoices and other information requested are to be sent to:

Brad Ellington C.E.M., P.E.M.
Energy Management Engineer
Facilities Management Division
North Carolina Department of Transportation
1525 Mail Service Center

Raleigh, NC 27699-1525
(P) 919-707-4554 (F) 919-715-0399

It is imperative that contract documents, invoices, etc., be sent only to the above address in order to assure proper and timely delivery and handling.

CLEANING UP

The Contractor shall keep the sites and surrounding area reasonably free from rubbish at all times and shall remove debris from the site from time to time or when directed to do so by the Owner. Before final inspection and acceptance of the project, the Contractor shall thoroughly clean the sites, and completely prepare the project and site for use by the Owner.

GUARANTEE

The contractor shall unconditionally guarantee materials and workmanship against patent defects arising from faulty materials, faulty workmanship or negligence for a period of twelve (12) months following the final acceptance of the work and shall replace such defective materials or workmanship without cost to the owner.

Where items of equipment or material carry a manufacturer's warranty for any period in excess of twelve (12) months, then the manufacturer's warranty shall apply for that particular piece of equipment or material. The contractor shall replace such defective equipment or materials, without cost to the owner, within the manufacturer's warranty period.

Additionally, the owner may bring an action for latent defects caused by the negligence of the contractor, which is hidden or not readily apparent to the owner at the time of beneficial occupancy or final acceptance, whichever occurred first, in accordance with applicable law.

Guarantees for roofing workmanship and materials shall be stipulated in the specifications sections governing such roof, equipment, materials, or supplies.

CONTRACTOR-SUBCONTRACTOR RELATIONSHIPS

The Contractor agrees that the terms of these contract documents shall apply equally to a subcontractor as to the Contractor, and that the subcontractor is bound by those terms as an employee of the Contractor.

SUPPLEMENTARY GENERAL CONDITIONS

TIME OF COMPLETION

The Contractor shall commence work to be performed under this Contract on a date to be specified in written order from the Designer and shall fully complete all work hereunder within (30) consecutive calendar days from the Notice to Proceed for base bid contract. For each day in excess of the above number of days, the Contractor shall pay the Owner the amount of One Hundred Dollars (\$ 100) as liquidated damages reasonably estimated in advance to cover the losses to be incurred by the Owner should the Contractor fail to complete the Work within the time specified.

If the Contractor is delayed at anytime in the progress of his work by any act or negligence of the Owner, his employees or his separate contractor, by changes ordered in the work; by abnormal weather conditions; by any causes beyond the Contractor's control or by other causes deemed justifiable by Owner, then the contract time may be reasonably extended in a written order from the Owner upon written request from the contractor within ten days following the cause for delay.

UTILITIES

Utilities will be provided by NCDOT. Contractor will provide necessary extension cords and connection devises for utilization of utilities.

Use of NCDOT restroom facilities will be contingent upon contractor's ability to respect NCDOT staff and facility cleanliness.

USE OF SITE

Work hours will be limited to normal working hours, 7:30am – 4:30pm, Monday through Friday. Special permission must be obtained for weekend or afterhours work.

Dumpster location to be coordinated between NCDOT staff and contractor.

Storage of material onsite to be coordinated with NCDOT staff.

Technical Specifications

See attached **Division 26 Electrical specifications and Construction Drawings.**

PROPOSAL AND CONTRACT

for

Division 11 Equipment Shop Office Up-fit
302 Statesville Road
N. Wilkesboro, NC 28659
13-10023-01A

Conference room conversion

The undersigned, as bidder, proposes and agrees if this proposal is accepted to contract with the **State of North Carolina** through the **Department of Transportation** for the furnishing of all materials, equipment, and labor necessary to complete the construction of the work described in these documents in full and complete accordance with plans, specifications, and contract documents, and to the full and entire satisfaction of the **State of North Carolina** and the **Department of Transportation** for the sum of:

BASE BID: _____ **Dollars \$** _____

Respectively submitted this _____ day of _____ 20____

(Contractor

Federal ID#: _____

By: _____

Witness: _____

Title: _____

(Owner, partner, corp. Pres. Or Vice President)

(Proprietorship or Partnership)

Address: _____

Attest: *(corporation)*

Email Address: _____

(Corporate Seal)

By: _____ License #: _____

Title: _____
(Corporation.Secretary./Ass't Secretary.)

ACCEPTED by the STATE OF NORTH CAROLINA
through the

(Agency/Institution)

BY: _____ TITLE: _____

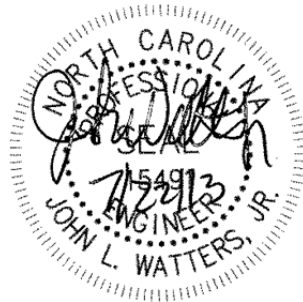
DATE: _____ 20____

**N. WILKESBORO
OFFICE UPFIT**

**HIGHWAY DIVISION 11, NCDOT
WILKES COUNTY, NORTH CAROLINA**

DIVISION 26

ELECTRICAL



GENERAL REQUIREMENTS

PART 1 – GENERAL

- 1.1 This section is intended to supplement or modify the conditions and requirements defined in the General or Project Requirements given in the General Requirements of this specification. The General Requirements and this Section shall apply to all electrical work as described in Electrical Specification Sections 26 00 00 through 26 09 99.
- 1.2 **WORK COVERED BY CONTRACT DOCUMENTS:**
- A. All work, materials, etc., shall be furnished and installed, whether or not specifically shown on the drawings and/or called for in the specifications, which may be necessary to comply with all of the requirements, due to the exigencies of the work, to complete the work and the contract in a satisfactory and approved manner.
 - B. The work to be done under this contract shall consist of furnishing all equipment, labor, materials required for the items listed in the proposal, and/or as shown on the contract drawings, together with all devices, connectors, splices and appurtenances, required for a safe, clean, complete and ready for service, reliable, substantial and rugged working installation, to the satisfaction of the Engineer and to execute the intent of this contract and these specifications.
 - C. The Contractor shall be responsible for determining the proper connection points for all power, control, and signal wiring installed under this contract, regardless of whether the connection points are in equipment furnished under this contract, existing equipment, or equipment furnished by others. The Contractor shall include in his bid prices any field surveys, wire tracing or other work required to ascertain the proper connection points for all wiring.
 - D. It is the intent of these specifications that the Contractor shall furnish equipment and material which is suitable for the purpose and for installation in the location as specified, and which is adequate and satisfactory for the service intended.
 - E. It is also the intent of the specification that the equipment, materials and accessories, as furnished, shall be complete in all respect and ready to operate.
 - F. The specifications cover the general design, construction arrangement, and certain particular features, but do not purport to cover all details entering into the design of the equipment and accessories.
 - G. Minor revisions in construction details will be made to accommodate equipment proposed and approved on the drawings thereof, submitted by the Contractor. Major revisions shall not be made nor shall equipment be submitted for approval which cannot be installed in structures of the approximate dimensions and character specified herein.
 - H. Further, it is also the intent of these specifications to provide a complete contract including items which may be omitted or not shown but which are considered normal and accepted engineering practice for this type of contract at no additional cost to the Owner.

- I. All work shall be done in a thorough and workmanlike manner and shall conform to the best modern practice in the manufacture and installation of high-grade equipment and materials. Wherever possible, all parts shall be made according to standard gauge to facilitate replacement and repair.
- J. All materials furnished under these items shall be the best of their respective kinds and shall be free from defects in design and workmanship.
- K. All materials or equipment not meeting the specified requirements shall be rejected, and shall be replaced at once by the Contractor with materials or equipment of the specified type and quality, at no cost to the Owner.
- L. All materials for which no detailed specifications are given herein shall be of the quality and character best adapted and suitable for the purpose for which they are to be used and shall be subject to the approval of the Engineer.
- M. Where any material or article or the maker or distributor thereof is specified by name, this is done for the purpose of more clearly describing the type or quality desired. Any material or article of equal quality, merit and performance, in the opinion of the Engineer, will be acceptable, if approval is given in writing.
- N. All materials furnished and work done by the Contractor shall be subject to the inspection of the Engineer. Defective materials shall be removed from the site of the work and defective work repaired or replaced as directed. Facilities for handling and inspection of materials and equipment and for access to the work in progress, shall at all times be furnished by the Contractor.
- O. Where any delay is encountered in carrying out work due to unfavorable operating conditions, the Contractor shall not be entitled to additional compensation therefore, but the time allowed equivalent to the period of actual delay.

1.3 DESCRIPTION OF WORK

- A. Work includes all labor, equipment, wiring, termination, testing and documentation to satisfy the design intend described in the contract documents for all electrical, tele/data and lighting systems in the building to the satisfaction of the Engineer.
- B. Unless specifically dimensioned, the work shown on the drawings is diagrammatic, and is intended only to show general arrangement.
- C. Include in the work, all accessories and devices necessary for the intended operation or perfection of any system, whether or not specifically shown or specified.
- D. The term "Furnish" shall mean to obtain and supply to the job site. The term "Install" shall generally mean to fix in position and connect for use. Where language indicates that one party or trade is to "install" and another is to "connect", the term "install" shall mean only to fix in position, and "connect" shall mean to make electrical connections to. The term "Provide" shall mean to furnish and install.
- E. Testing & Start-Up:
 - 1. Start-up & test each component of all building systems covered by the contract documents.

1.4 STANDARD OF QUALITY

- A. The specifications establish the standards of quality required, either by description or by references, to brand name, name of manufacturers or manufacturer's model number. All materials shall be new unless noted otherwise.
- B. Where one product only is specifically identified by name or manufacturer's model number, the Contractor shall base his bid on the use of the named product. Where multiple names are used, the Contractor shall base his bid on the use of any of those products named.
- C. The Contractor may submit, with his bid, the names of products which are proposed as substitutions for products named in the specifications. Each proposed substitution shall be accompanied by a written sum of money to be added or deducted from his bid. The Owner reserves the sole right to accept or reject said substitutions with or without cause.
- D. When equipment and/or materials are proposed to be purchased from a manufacturer other than those specified, the Contractor shall provide complete data adequate for the Engineer's evaluation of the proposed substitution.
- E. When the equipment other than that specified is used, the Contractor shall be responsible for any extra cost of required revisions such as structural steel, concrete, electrical, piping, etc. Such additional costs shall be identified at the time such substitutions are proposed.

1.5 SUBMITTALS

- A. Engineers review of shop drawings is solely for the benefit of the Owner and in no way relieves the contractor from his obligations to furnish materials which satisfy the requirements of his contract and the design intent.
- B. Shop drawings, product data and samples shall be submitted as required by the General Conditions or Project Requirements and as supplemented by this section.
- C. When a specific specification section identifies that no submittal is required, the contractor shall provide the specified materials without submittals.
- D. Provide to the Engineer, a schedule of shop drawing submissions identifying submittal target dates.
- E. The Contractor shall review, approve and submit shop drawings, with promptness so as to cause no delay in his work or in that of others. No submissions will be accepted by the Engineer without the signed review and approval of the Contractor.
- F. The Contractor shall check and verify pertinent field measurements, and quantities of equipment and materials required.
- G. Submittals shall be identified by reference to the drawing(s), section(s) of specifications, or equipment symbols to which they relate.
- H. Shop drawings, when required, shall include:

1. Verification of information given in Contract Documents such as performance, dimensions, weight, materials, construction, types, models, manufacturer, etc.
 2. Equipment layouts drawn to scale as may be required.
 3. Wiring diagrams and schematics for equipment.
 4. Any special construction conditions.
 5. Other information/data as may be requested.
- I. All submittals shall identify the specific details of the product or assembly. All optional features being provided or proposed shall be so noted or the submittal will be rejected.
- J. The Engineer will return submittals with one of the following notations stamped thereon; REVIEWED, REVIEWED AS NOTED, REVISE AND RESUBMIT, REJECTED or SUBMIT SPECIFIED ITEM AND THE FOLLOWING:
1. Review is only for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Any action shown is subject to the requirements of the plans and specifications. Contractor is responsible for: dimensions which shall be confirmed and correlated at the job site; fabrication processes and techniques of construction; coordination of his work with that of all other trades; and the satisfactory performance of his work.
 2. The work involved may proceed when submittals are marked REVIEWED or NO EXCEPTIONS TAKEN with no further submission required.
 3. The work involved may proceed when submittals are marked REVIEWED AS NOTED providing corrections are made and submittals are resubmitted for record. Review does not authorize changes to Contract Sum unless stated in a separate letter or Change Order. In the event that any notes placed on the submittals by the Engineer are believed to result in a change in the Contract Sum, the Engineer shall be notified immediately and fabrication may not be undertaken until written authorization to proceed is issued by the Owner.
 4. The work involved may not proceed when submittals are marked REVISE AND RESUBMIT. Submittals must be corrected and resubmitted for review.
 5. Submittals marked REJECTED OR SUBMIT SPECIFIED ITEM are not in accordance with the Contract Documents and require a new submittal for review.
- K. For items being resubmitted, clearly identify changes made from the initial submittal requested by the Engineer. The Engineer will review only those changes requested and identified by the Contractor.
- 1.6 PROTECTION OF WORK
- A. Each Contractor is responsible for the protection of his materials, equipment, and completed work as defined in the General or Project Requirements and as supplemented herein.
 - B. All openings into any part of the conduit systems, all fixtures and equipment must be securely covered or otherwise protected to prevent damage due to dropped tools or materials, work by others or intrusion of grit, dirt, water, snow, ice or other foreign matter. Remove burrs, dirt, paint spots and debris. The Contractor shall be held responsible for all damage done to unprotected work or materials.
 - C. All equipment on site, whether stored or installed, shall be protected with weather tight covers.
- 1.7 STEEL AND CONCRETE WORK FOR ELECTRICAL EQUIPMENT

A. Steel

1. Provide all miscellaneous steel supports and anchors required for equipment and materials installed under this Specification. Manual of Construction by American Institute of Steel Construction latest edition shall be followed in design and construction except that the second sentence of paragraph 4.2.1., Section 4 of Division 5, page 5-177 will not apply. Structural steel members shall conform to ASTM A36, and shall have a shop applied coat of rust inhibiting paint.
2. Welding of steel shall conform to American Welding Society, Standard Code for Arc and Gas Welding in Building Construction.
3. Bolts, nuts and washers for structural steel framing and concrete embedment shall be high tensile type minimum 3/4" diameter conforming to ASTM A325.

B. Slotted-steel channel supports shall have flange edges turned toward web, and 9/16 inch diameter slotted holes at a maximum 2 inches o.c., in webs. Channel depth: 2-1/2 inches minimum. Channel thickness: selected to suit structural loading. Fittings and Accessories: Products of the same channel manufacturer. Channel supports and fittings shall be hot dip galvanized steel.

C. Concrete work and anchors

1. Refer to Section 260050 and Division 03 for concrete work and anchors.

1.8 COUNTERFLASHING

A. Where conduits or other items pass through any roof, wall or other exterior component, provide counter flashing as required.

1.9 EQUIPMENT BY OTHERS

A. Section - Summary of Work, together with other technical sections in the Project Manual, describe equipment that will be furnished by the Owner or from other sources.

B. The responsibility for setting, installation and protection of such equipment will be defined in other sections of the Project Manual.

C. Provide services rough-in for and make final connections to this equipment as shown and specified.

D. Provide coordination to assure clearances required for moving equipment to final location.

1.10 MOVING AND INSTALLATION OF RACEWAYS, DEVICES AND EQUIPMENT

A. Verify that electrical equipment will pass through all restricting openings, and when equipment or sections of equipment are larger than these openings, install this equipment prior to construction of enclosing walls, floors or roofs.

B. Use planking or cribbing as required to protect adjoining construction from damage.

C. Provide rigging and scaffolding with expert rigging / scaffolding personnel as required for equipment installation in difficult locations. Rigging & scaffolding shall include any necessary structural investigation and temporary structural support.

1.11 CUTTING AND PATCHING

- A. Provide all openings through walls, floors and ceilings, etc. required for the installation of work defined on the drawings and specifications.
- B. Following installation and testing, restore floors, walls and ceilings with materials equal to the original construction and finish to match existing surfaces.
- C. Cutting and patching shall be performed only by tradesmen familiar with the construction involved.

1.12 IDENTIFICATION

A. Nameplates

- 1. Provide each new normal power load break switch, automatic transfer switch, starter, circuit breaker, panel, remote start-stop station, pilot light or safety switch with an engraved laminated black and white phenolic nameplate, white letters on black background. Provide similar emergency and normal/emergency equipment with an engraved laminated red and white phenolic nameplate, white letters on red background.
- 2. Compose the legend so as to clearly indicate the function of the equipment. Letters and numbers to be at least 3/16 inch high.
- 3. Locate the nameplate in a position so as to be clearly visible and secure with screws. Rivets and adhesives are not acceptable.
- 4. Submit proposed nameplate legend for review.
- 5. Provide a nameplate on the main switchgear indicating names of the electrical contractor and the engineer and project year.

B. Stenciling

- 1. Paint bright red, all exposed pull/splice boxes, conduits, duct banks and raceways containing high voltage conductors over 600 volts.
- 2. Provide 1 inch high stenciling, white letters on red background as follows: "HIGH VOLTAGE **** VOLTS"
- 3. The stenciling shall occur 10 feet on center on each side of the raceway and on the front face of pull/splice box.

1.13 FINAL ACCEPTANCE

- A. The Contractor shall perform and complete work in accordance with the Contract Documents without fault or defect of any kind. In the absence of more specific directives, the work shall:
 - 1. Be completed in a first class manner.
 - 2. Be placed in a thoroughly clean and unmarred condition.
 - 3. Be checked out in a step-by-step manner to ascertain that fastenings, controls, parts, safety devices, operating devices and other required appurtenances have been provided in accordance with the Contract Documents.
 - 4. Be free of previously condemned or rejected parts and be properly restored to an acceptable condition.
 - 5. Be adjusted for proper operation wherever adjustments or calibrations exist in the work.
 - 6. All systems shall be operated to demonstrate that the requirements of the Contract have been met and that the systems have been adjusted and will operate in accordance therewith.

1.14 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Furnish for review, three hard bound copies of complete written instructions for the operation, care and maintenance of each piece of equipment and/or system. Include recommended frequency of inspection, cleaning, oiling, greasing, and adjustment and other action as may be required in accordance with manufacturer's recommendations. Material shall include manufacturer's brochures, catalog cuts, parts lists, wiring diagrams, service organizations, etc.

1.15 PERMITS, FEES AND CERTIFICATES OF APPROVAL

- A. Contractor shall acquire all permits and certificates. Submit a final inspection certificate from NFPA affiliated agency with request for final payment.
- B. Contractor shall provide all power, labor and instruments required for tests and cleaning of systems.
- C. Whenever tests are required, three (3) copies of the test reports shall be submitted to the Engineer.
- D. Tests may be observed by the Engineer or his representative. Notify the Engineer a minimum of three weeks in advance of test dates.

1.16 COMPLIANCE WITH CODES, STANDARDS AND REGULATIONS

- A. In the absence of specific instruction in the technical specifications, equipment and installation shall conform to the following applicable codes, standards and regulations, latest editions:
 - 1. American Society for Testing and Materials (ASTM)
 - 2. American National Standard Institute (ANSI)
 - 3. Underwriter's Laboratories, Inc. (UL)
 - 4. American Welding Society Code (AWSC)
 - 5. NFPA 70, "National Electrical Code", latest edition
 - 6. National Electrical Manufacturer's Association (NEMA).
 - 7. Occupational Safety and Health Act (OSHA).
 - 8. National Fire Protection Association (NFPA).
 - 9. National Electrical Safety Code (NESC)
 - 10. North Carolina State Building Code. (NCIBC)
 - 11. Institute of Electrical and Electronics Engineers (IEEE)
 - 12. Illuminating Engineering Society of North American (IESNA)
 - 13. State and Local Building, Electric, and Fire Codes and Regulations.
 - 14. NC Department of Administration State Construction Office Electrical Guidelines and Policies

1.17 PAINTING

- A. Cabinet trims and similar prefabricated equipment shall be factory primed and finish painted with baked enamel in color selected. This equipment shall not be painted in the field unless the factory finishes have been marred or as otherwise directed. Do not paint over UL or similar labels or mechanical/electrical nameplates.

1.18 COORDINATION OF WORK

- A. Coordinate installation of conduit runs and equipment with other trades and conditions in the building and participate in all coordinated shop drawings. Variance from work shown on drawings will be subject to approval. Where interference occurs and electrical work is directed to be relocated, provide such relocation without additional cost.

1.19 LOCATION OF OUTLETS

- A. Examine all architectural and vendor drawings before locating outlets. Place outlets as required to harmonize with moldings, panels, cabinets, mirrors, etc. Do not scale dimensions on electrical drawings, but use measurements from architectural drawings.
- B. If an outlet is installed in such a location as to be out of proper relation to beams, walls, or other details of the building, relocate the outlet as directed. A relocation allowance of 10 ft. shall be understood by the Contractor with no extra cost to the Owner.
- C. Unless otherwise indicated, outlet boxes in walls shall be located with center line at the following elevation above the Finish floor line. Verify with Contractor for General Construction, all heights prior to actual layout of work.
 - 1. Switch Outlets 3 feet - 10 inches
 - 2. Bracket Outlets (Stairs) 7 feet - 0 inches
 - 3. Bracket Outlets (Other) 6 feet - 6 inches
 - 4. Telephone Outlets (Wall) 4 feet - 1 inch
 - 5. Telephone and Data Outlets (Other) 1 foot - 6 inches. Unless otherwise noted
 - 6. Receptacle Outlets, noted. 1 foot - 6 inches. Unless otherwise noted.
 - 7. Receptacle Outlets, 3 feet - 0 inches in Mechanical Rooms
 - 10. Motor Starters and Safety Switches required 4 feet - 0 inches to 6 feet - 0 inches as required
 - 11. Panel Boards (top) 6 feet - 0 inches

1.20 ACCESS PANELS

- A. Furnish access panels where required, to concealed pull boxes, junction boxes, or similar equipment located above dry wall board ceiling or behind walls. Installation of access panels shall be by mechanics of the pertinent trade under General Construction.
- B. Access panels shall be 18" x 18" minimum, 16 gage wall or ceiling frame and a 14 gage panel door with not less than 1/8" fire proofing secured to the inside of the door. The door shall be provided with concealed hinges and cylinder lock, and prime-coated steel prepared for painting. Each door shall be capable of opening 180 degrees. Doors for wall panels shall be secured with suitable clips and counter sunk tamperproof screws.
- C. Access panels shall have "label" fire rating equal to the ceiling or wall surface.

1.21 WARRANTY

- A. The contractor and equipment manufacturers shall jointly guarantee all wiring and equipment to be free of defects in workmanship and material for a period of one year from the date of final acceptance, unless otherwise noted.

1.22 PROJECT RECORD DOCUMENTS

- A. Maintain at job site, one copy of record documents and samples as required under the General Conditions of the Contract, including Drawings, Specifications, Addenda And Bulletins, Change Orders, Shop Drawings, Product Data and Samples, Field Orders, Field Test Records and Maintenance and Operating Manuals.
- B. Provide files and racks for storage of documents. Maintain documents in a clean, dry legible condition and in good order. Do not use record documents for construction purposes. Make record documents and samples available during normal working hours for inspection.
- C. Recording:
 - 1. Label each document "Project Record" in neat large letters and provide final completion date.
 - 2. Record information concurrently with construction progress.
 - 3. Do not conceal any work until required information is recorded.
- D. Record Drawings - legibly mark to record actual construction as follows:
 - 1. A print set (blue-line or black-line) of contract drawing or shop drawing mark-ups of actual installations which vary substantially from the work as originally shown. Mark whichever drawing is most capable of showing "field" condition fully and accurately; however, where shop drawing are used for mark-up, record a cross reference at corresponding location on working drawings. Mark with red erasable pencil and, where feasible, use other colors to distinguish between variation in separate categories or work. Mark-up new information which is recognized to be of importance to Owner, but was for some reason not shown on either contract drawings or shop drawings. Give particular attention to concealed work which would be difficult to measure and record at a later date. Note related change order numbers where applicable.
- E. Record Specifications and Addenda, Bulletins, Requests for Information (RFI's) and Construction Clarification Sketches (CSK's) - legibly mark each Section to record:
 - 1. Any variations in actual work in comparison with text of specifications and modifications as issued. Give particular attention to substitutions, selection of options, and similar information work where it is concealed or cannot otherwise be readily discerned at a later date by direct observations. Note related record drawing information and product data, where applicable.
 - 2. Changes made by Field Order or by Change Order.
- F. Product Data: Maintain one copy of each product data submittal, and mark-up significant variation in actual work in comparison with submitted information.
 - 1. Include both variations in product as delivered to site, and variations from manufacturer's instruction and recommendations for installation.
 - 2. Give particular attention to concealed products and portions of the work which cannot otherwise be readily discerned at a later date by direct observations. Note related change orders and mark-up of record drawings and specifications.
- G. Record Drawings Submittal at Project Completion: Organize record drawing sheets into manageable sets, bind with durable paper cover sheets and print suitable titles, dates and other identification on cover of each set. Transfer marking required by previous paragraphs to set of

reproducible transparencies. Submit complete set of transparencies to the Design Professional and two sets of blue-line prints.

- H. Product Data Submittal at Project Completion: Submit three sets of marked-up product data submittals for record purposes that include resolution of all review notes and field revisions.
- I. Record Sample Submittals: Immediately prior to date of substantial completion Design Professional (and including Owner's personnel where desired) will meet with Contractor at site, and will determine which if any of submitted samples maintained by Contractor during progress of work are to be transmitted to Owner for record purposes. Comply with Design Professionals instruction for packaging, identification marking, and delivery to Owner's sample storage space.
- J. Miscellaneous Record Submittals: Refer to other sections of these specification for requirements of miscellaneous record-keeping and submittals in connection with actual performance of the work. Immediately prior to date(s) of substantial completion, complete miscellaneous records and place in good order properly identified and bound or filed, ready for continued use and reference. Submit to Architect/Engineer for Owner's records.
- K. Maintenance Manuals: Organize maintenance-and-operating manual information into three suitable sets of manageable size, and bind into individual binders properly identified and indexed (thumb-tabbed). Include: emergency instructions; spare parts listing; warranties; wiring diagrams; recommended "turn-around" cycles; inspection and cleaning procedures; recommended frequency of testing, adjustment and any other maintenance requirements; shop drawings; product data; and similarly applicable information. Bind each manual of each set in heavy duty 2-inch, vinyl-covered ring binder, and include pocket folders for folded sheet information. Mark identification on both front and spine for each binder.

END OF SECTION 26 00 00

GENERAL PROVISIONS

PART 1 - GENERAL

1.1 Scope

- A. This Contractor shall provide all materials, equipment and labor necessary to install and set into operation the electrical equipment as shown on the Engineering Drawings and as contained herein.

1.2 Quality Assurance

- A. See the General and Supplementary General Conditions and Division 1.
- B. Work shall be in accordance with the 2012 edition of the North Carolina State Building Code, which includes the 2008 edition of the National Electrical Code (NFPA 70).
- C. The Contractor shall be responsible for notifying the State Electrical Inspectors in the Construction Administration Section of the State Construction Office to schedule required inspections as work progresses.
- D. Wherever the words "Approved", "Approval", and "Approved Equal" appear, it is intended that items other than the model numbers specified shall be subject to the approval of the Engineer.
- E. "Provide" as used herein shall mean that the Contractor responsible shall furnish and install said item or equipment. "Furnish" as used herein shall mean that the contractor responsible shall acquire and make available said item or equipment and that installation shall be by others. "Install" as used herein shall mean that the Contractor responsible shall make installation of items or equipment furnished by others.
- F. All material and equipment that the Contractor proposes to substitute in lieu of those specified, shall be submitted to the Engineer ten (10) days prior to the bid date for evaluation. The submittal shall include a full description of the material or equipment and all pertinent engineering data required to substantiate the equality of the proposed item to that specified. Items that are submitted for approval after this date will not be accepted. Substitute material and equipment will not be deemed to be approved until notification is given in a written addendum prior to the bid date.
- G. All materials and equipment shall be NEMA Type 1 indoor, and NEMA Type 3R outdoors.

1.3 Submittals

- A. See General and Supplementary General Conditions & Division 1.
- B. Within twenty (20) days after notification of the award of the contract and written notice to begin work, the Contractor shall submit for approval to the Architect/Engineer a detailed list of equipment and materials, which he proposes to use. Items requiring submittal data for approval will be noted at this time. Six (6) sets of submittal data shall be provided for approval.
- C. Each submittal shall bear the approval of the contractor indicating that he has reviewed the data and found it to meet the requirements of the drawings and specifications as well as space limitations and

other project conditions, before submittal to the Engineer for review. The submittals shall be clearly identified showing project name, manufacturer's catalog number and all necessary performance and fabrication data. All requirements, parameters, information, details and other information noted about submitted equipment in the specifications and on the drawings shall be specifically addressed in the submittal. Submittals that do not contain this information will be returned to the contractor for resubmittal. The same detailed submittal data shall be provided when items are to be considered as substitution for specified items. Acceptance for approval shall be in writing from the Engineer.

- D. Upon completion of the project, the Contractor shall submit to the Engineer a set of accurately marked-up plans indicating all changes encountered during the construction. These drawings shall remain on the project for its duration and shall be updated at the time changes are made. Final payment will be contingent on receipt of these "Record Drawings."
- E. The Contractor shall furnish four (4) bound sets of maintenance and operating instructions, parts lists, electrical circuit wiring diagrams, all submittal data, and sufficient manufacturer's literature to operate and maintain all equipment.
- F. The Contractor shall submit to the Engineer a duplicate set of final electrical inspection certificates prior to final payment.

1.4 Product Delivery, Storage and Handling

- A. All material and equipment shall be delivered and unloaded by the Contractor within the project site as noted herein or as directed by the Owner.
- B. The Contractor shall protect all material and equipment from breakage, theft or weather damage. No material or equipment shall be stored on the ground. Any broken, damaged or weather damaged material or equipment shall be removed from the project site and replaced at the contractor's expense before installation.
- C. The material and equipment shall remain the property of the Contractor until the project has been completed and turned over to the Owner.

1.5 Work Conditions and Coordination

- A. Safety switches built in to equipment shall be furnished by the contractor furnishing the equipment. The electrical contractor shall furnish safety switches not built in to equipment. The electrical contractor shall review the plans and specifications of other trades to verify whether safety switches are furnished with equipment.
- B. All starters shall be furnished by the contractor furnishing the equipment.
- C. The electrical contractor shall provide power wiring to, a termination point consisting of a junction box, trough or gutter, starter or safety switch. The electrical contractor shall also furnish junction boxes, troughs and gutters. Final connections of the raceways and wire from those termination points to the equipment, except for food service equipment, shall be by the contractor furnishing the equipment. Final connections to food service equipment shall be by the electrical contractor.
- D. Pipe, conduit and duct chases required for installation of work shall be provided by the General Contractor unless otherwise noted. This Contractor shall be responsible for coordinating the location of all required chases.

- E. All work shall be coordinated with other trades. Cutting of new work, due to this contractor's negligence, and subsequent patching shall be approved by the Architect/Engineer and shall be at this contractor's expense with no extra cost to the Owner.

1.6 Guarantee

- A. See the General and Supplementary General Conditions.
- B. Where extended warranties or guarantees are available from the manufacturer, the Contractor shall prepare the necessary contract documents to validate these warranties as required by the manufacturer and present them to the Owner.

1.7 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by third party agencies accredited by the NCBCC to label electrical and mechanical equipment as suitable for purpose specified and shown, where such listing exists.

PART 2 - PRODUCT

- 2.1 Materials and equipment shall be new, unless noted otherwise, of the highest grade and quality and free from defects or other imperfections. Materials and equipment found defective shall be removed and replaced at the Contractor's expense.

PART 3 - EXECUTION

3.1 Inspection

- A. If any part of this Contractor's work is dependent for its proper execution or for its subsequent efficiency or appearance on the character or conditions of contiguous work not executed by him, the Contractor shall examine and measure such contiguous work and report to the Architect/Engineer in writing any imperfection therein, or conditions that render it unsuitable for the reception of this work. Should the Contractor proceed without making such written report, he shall be held to have accepted such work and the existing conditions and he shall be responsible for any defects in this work consequent thereon and will not be relieved of the obligation of any guarantee because of any such imperfection or condition.

3.2 Installation

- A. All work shall be performed in a manner indicating proficiency in the trade.
- B. All conduit, pipes, ducts, etc., shall be either parallel to building walls or plumb where installed in a vertical position and shall be concealed when located in architecturally finished areas.
- C. Any cutting or patching required for installation of this Contractor's work shall be kept to a minimum. The Architect/Engineer shall require written approval if cutting of primary structure is involved.

- D. All patching shall be done in such a manner as to restore the areas or surfaces to match existing finishes.
- E. The Contractor shall lay out and install his work in advance of pouring concrete floors or walls. He shall furnish and install all sleeves or openings through poured masonry floors or walls above grade required for passage of all conduits, pipes or duct installed by him. The Contractor shall furnish and install all inserts and hangers required to support equipment.
- F. Grounding:
 - 1. All grounding shall be in accordance with the requirements of the NEC.
 - 2. The main service shall be grounded with driven rods, to building steel (where available) and to the domestic metal water main where it enters the building.
 - 3. The secondary neutral of each dry type transformer shall be bonded to the conduit system, building steel (where available), the domestic metal water line and to transformer case.
 - 4. A grounding conductor sized per the latest edition of the NEC shall be installed in all raceways containing power conductors.

3.3 Performance

- A. The Contractor shall perform all excavation and backfill operations necessary for installation of his work.

3.4 Erection

- A. All support steel, angles, channels, pipes or structural steel stands and anchoring devices that may be required to rigidly support or this Contractor shall provide anchor material and equipment.

3.5 Adjust and Clean

- A. All equipment and installed materials shall be thoroughly clean and free of all dirt, oil, grit, grease, etc.
- B. Factory painted equipment shall not be repaired unless damaged areas exist. The manufacturer shall touch up these areas with a material suitable for the intended service so that the finish is equal to that provided. In no event shall nameplates be painted.
- C. At a scheduled meeting, the Contractor shall instruct the Owner or the Owner's representative in the operation and maintenance of all equipment installed under his contract, (in the presence of the Engineer).

END OF SECTION 26 00 10

ELECTRICAL TESTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Electrical Testing

1.2 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specifications and other Division 260 Specification Section, apply to this Section.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIALS

- A. Equipment for electrical testing.
 - 1. For feeder insulation testing provide a 500-volt megger.
 - 2. For ground resistance testing, provide a ground resistance tester capable of accurately reading 0 to greater than 25 ohms.
 - 3. For ground fault testing of receptacles and circuit breakers provide equipment that will accurately produce and read a ground fault of 1mA through 20mA in 1mA increments at full line voltage.
 - 4. At the final inspection, the contractor shall furnish a megger and demonstrate to the Engineer that panel feeders comply with the requirements stated in the above paragraphs. The contractor shall also furnish a True RMS clamp-on ammeter and voltmeter to take readings as requested by the Engineer.
- B. Provide any miscellaneous material such as wire or cable, extension cords, insulating tape or materials, clamps, etc., to implement all testing procedures noted in this specification.

PART 3 - EXECUTION

3.1 FEEDER INSULATION RESISTANCE TESTING

- A. Test all current carrying phase conductors and neutrals as installed, and before connections are made, for insulation resistance and accidental grounds. This shall be done with a 500-volt megger. The testing procedures listed below shall be followed:
 - 1. Minimum readings shall be one million (1,000,000) or more ohms for #6 AWG and smaller wire and 250,000 ohms or more for #4 AWG or larger wire, between phase and

neutral conductors, and between phase and neutral conductors and the grounding conductor.

2. Demonstrate and measure isolation of the Grounding and Neutral conductors in the building after removal of the main bonding jumper.
3. After all fixtures, devices and equipment are installed and all connections are completed to each panel, the contractor shall disconnect the neutral feeder conductor from the neutral bar and take a megger reading between the neutral bar and the grounded enclosure. If this reading is less than 250,000 ohms, the contractor shall disconnect the branch circuit neutral conductors from this neutral bar. He shall then test each one separately to the panel until the low readings are found.
4. The contractor shall correct the problems, reconnect and retest the wires until at least 250,000 ohms from the neutral bar to the grounded panel can be achieved with only the neutral feeder disconnected.
5. The contractor shall send a letter to the Engineer certifying that the above test has been done, and tabulating the megger readings for each panel. This shall be done at least four (4) days prior to final inspection.

3.2 GROUND SYSTEM TESTING

- A. Upon completion of installation the electrical grounding and bonding systems, test the ground resistance with a ground resistance tester. Where tests show resistance to ground is over 25 ohms, drive additional ground rods as necessary to reduce the ground resistance to 25 ohms or less. Retest to demonstrate that the resistance is less than or equal to 25 ohms.

3.3 CIRCUIT BREAKER TESTS

- A. For services 1000 amperes and larger, perform the following tests on the service and distribution circuit breakers. A qualified factory technician at the job site shall perform testing. All readings shall be tabulated:
 1. Phase tripping tolerance. Adjust or replace circuit breakers until the settings are within 20% of UL tolerances.
 2. Trip time (per phase) in seconds.
 3. Instantaneous trip (in amperes) per phase.
 4. Insulation resistance (in Megohms) at 100 volts (phase-to-phase and line-to-line).

3.4 DOCUMENTATION

- A. All tests specified shall be completely documented indicating time of day, date, temperature and all pertinent test information.
- B. All required documentation of readings indicated above shall be submitted to the Engineer prior to, and as one prerequisite for, the final acceptance of the project.

END OF SECTION 26 00 35

ELECTRICAL DEMOLITION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Electrical demolition.

1.2 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specifications and other Division 260 Specification Section, apply to this Section.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work: As specified in individual Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify field measurements and circuiting arrangements are as shown on Drawings.
- B. Verify that abandoned wiring and equipment serve only abandoned facilities.
- C. Demolition Notes are based on casual field observation and existing record documents. Report discrepancies to Owner and Engineer before disturbing existing installation.
- D. Beginning of demolition means installer accepts existing conditions.

3.2 PREPARATION

- A. Coordinate utility service outages with the Owner.
- B. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits use personnel experienced in such operations.

- C. Existing Electrical Service: Maintain existing system in service until new system is as complete as possible without shutting down the existing system. Disable system only to make switchovers and connections. Obtain permission from Owner and Engineer at least 24 hours before partially or completely disabling system. Minimize outage duration.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Remove, relocate, and extend existing installations to accommodate new construction.
- B. Remove abandoned wiring completely to source of supply.
- C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- D. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- E. Repair adjacent construction and finishes damaged during demolition and extension work.
- F. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.
- G. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

3.4 CLEANING AND REPAIR

- A. Clean and repair existing materials and equipment that remain or are to be reused.
- B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

3.5 INSTALLATION

- A. Install relocated materials and equipment.

END OF SECTION 26 00 60

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Metal conduit.
- B. Flexible metal conduit.
- C. Liquid tight flexible metal conduit.
- D. Electrical metallic tubing.
- E. Nonmetallic conduit.
- F. Fittings and conduit bodies.
- G. Electrical nonmetallic tubing.

1.2 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specifications and other Division 260 Specification Section, apply to this Section.

1.3 REFERENCES

- A. ANSI C80.1 Rigid Steel Conduit, Zinc Coated.
- B. ANSI C80.3 Electrical Metallic Tubing, Zinc Coated.
- C. ANSI/NEMA FB 1 Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
- D. ANSI/NFPA 70 National Electrical Code.
- E. NECA "Standard of Installation."
- F. NEMA TC 3 PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.4 DESIGN REQUIREMENTS

- A. Conduit Size: ANSI/NFPA 70.

1.5 SUBMITTALS

- A. Submit under provisions of Section 260010.
- B. Product Data: Provide for metallic conduit, flexible metal conduit, liquid tight flexible metal conduit, metallic tubing, nonmetallic conduit, nonmetallic tubing, fittings and conduit bodies.

1.6 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 260010.
- B. Accurately record actual routing of conduits larger than 1½” inch.

1.7 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by third party agencies accredited by the NCBCC to label electrical and mechanical equipment as suitable for purpose specified and shown, where such listing exists.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Accept conduit on site. Inspect for damage.
- B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- C. Protect PVC conduit from sunlight.

1.9 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Verify routing and termination locations of conduit prior to roughin.
- C. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required completing wiring system.

PART 2 - PRODUCTS

2.1 CONDUIT REQUIREMENTS

- A. Minimum Size: ½” trade size unless otherwise noted.

2.2 METAL CONDUIT

- A. Rigid Steel Conduit: ANSI C80.1.

- B. Intermediate Metal Conduit (IMC): Rigid steel.
- C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; all steel, plated, hexagonal, compression type fittings. Pot metal, setscrew or indenter type fittings will not be accepted.
- D. IMC and rigid conduit shall terminate with either a double locknut/bushing set, or in a threaded hub.

2.3 FLEXIBLE METAL CONDUIT

- A. Description: Interlocked steel or aluminum construction.
- B. Fittings: ANSI/NEMA FB 1.
- C. Sizes: ½” and larger are acceptable for motor, appliance and fixture connections provided a green grounding conductor is installed. The grounding conductor and the flexible conduit size shall meet NEC requirements.

2.4 LIQUID TIGHT FLEXIBLE METAL CONDUIT

- A. Description: Interlocked steel construction with PVC jacket with integral copper grounding conductor.
- B. Fittings: ANSI/NEMA FB 1.
- C. Sizes: ½” and larger are acceptable for motor, appliance and fixture connections provided a green grounding conductor is installed. The grounding conductor and the flexible conduit size shall meet NEC requirements.

2.5 ELECTRICAL METALLIC TUBING (EMT)

- A. Description: ANSI C80.3; galvanized tubing.
- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; all steel, hexagonal compression, insulated throat type. Pot metal, setscrew or indenter type fittings shall not be used. Provide rain tight fittings in damp locations.
- C. Do not install in locations where EMT or fittings will be in contact with earth or underground (in or below slab on grade or in earth); any location where the tubing would be exposed to the elements; or where exposed to severe corrosive influence and/or severe physical damage.

2.6 NONMETALLIC CONDUIT

- A. Description: NEMA TC 2; Schedule 40 or 80 PVC.
- B. Fittings and Conduit Bodies: NEMA TC 3.

2.7 ELECTRICAL NONMETALLIC TUBING

- A. Description: NEMA TC 2.

- B. Fittings and conduit bodies: NEMA TC 3.

PART 3 - EXECUTION

3.1 CONDUIT USES

A. Underground Installations:

1. Outside of Foundation Wall (with the exception of branch circuit raceways): Use a type approved by the NEC as “suitable for concrete encasement”, with a minimum of three (3) inches of concrete on all sides, and a minimum cover of eighteen (18) inches, except for circuits with voltages above 600 volts, which shall have a minimum cover of thirty (30) inches.

- B. Branch circuits run underground external to building foundation walls shall be run in raceways installed in accordance with the NEC, and shall be of a type approved by the NEC as “suitable for direct burial.” Minimum raceway size shall be 3/4 inch.

- C. Raceways run underground internal to building foundation walls shall be of a type and installed in a method approved by the NEC.

- D. Where underground raceways are required to turn up into cabinets, equipment, etc., and on to poles, the elbow required and the stubup out of the slab or earth shall be of schedule 80 PVC conduit oversized for same or greater inner diameter as the lateral run. Provide all required transition fittings.

- E. Outdoor Locations, Above Grade: Use rigid steel or intermediate metal conduit.

- F. Wet and Damp Locations: Use rigid steel or intermediate metal conduit.

- G. Underground raceways shall be identified by underground line marking tape located directly above the raceway at 6 to 8 inches below finished grade. Tape shall be permanent, bright-colored, continuous printed, plastic tape compounded for direct burial not less than 6 inches wide and 4 mils thick. Printed legend shall be indicative of general type of underground line below.

H. Dry Locations:

1. Concealed: Use rigid steel or intermediate metal conduit, or electrical metallic tubing.
2. Exposed below 8'0” AFF or subject to severe physical damage: Use rigid steel or intermediate metal conduit.
3. Exposed above 8'0” AFF and not exposed to severe physical damage: Use rigid steel or intermediate metal conduit, or electrical metallic tubing.

3.2 INSTALLATION

- A. Install conduit in accordance with NECA “Standard of Installation.”

- B. Install nonmetallic conduit in accordance with manufacturer's instructions.

- C. Arrange supports to prevent misalignment during wiring installation.

- D. Support conduit using coated steel or malleable iron straps, layin adjustable hangers, clevis hangers, and split hangers.
- E. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.
- F. Fasten conduit supports to building structure and surfaces under provisions of Section 260190.
- G. Do not support conduit with wire or perforated pipe straps. Remove temporary supports.
- H. Do not attach conduit to ceiling support wires.
- I. Arrange conduit to maintain headroom and present neat appearance.
- J. Route exposed and concealed conduit parallel and perpendicular to beams, walls and floors.
- K. Route conduit installed above accessible ceilings parallel and perpendicular to walls.
- L. Route conduit in and under slab from point-to-point.
- M. Maintain adequate clearance between conduit and piping.
- N. Maintain 12-inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.
- O. Cut conduit square using saw or pipe cutter; deburr cut ends.
- P. Bring conduit to shoulder of fittings; fasten securely.
- Q. Join nonmetallic conduit using cement as recommended by manufacturer. Prepare areas to be joined with appropriate cleaner before applying cement. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
- R. Use conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
- S. Install no more than equivalent of three 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams.
- T. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
- U. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic, control and expansion joints.
- V. Provide suitable pull string, minimum 200 pound breaking strength, in each empty conduit except sleeves and nipples.
- W. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
- X. Ground and bond conduit under provisions of Section 260170.
- Y. Identify conduit under provisions of Section 260195.

- Z. Where raceways pass through a “below grade” wall from a conditioned interior building space, said raceways shall be sealed utilizing fittings similar and equal to OZ/GEDNEY type “FSK” throughwall fitting with “FSKA” membrane clamp adapter, if required.
- AA. Terminate IMC or rigid conduit with a double locknut/bushing set or in a threaded hub.
- BB. Where concentric, eccentric or oversize knockouts are encountered while terminating conduit of any type, a bonding bushing shall be installed.
- CC. Limit the use of “LBs” to locations only absolutely necessary. Where “LBs” are used, install mogul units above 2 inch.
- DD. Supports for conduit systems shall conform to NEC minimum support requirements.
- EE. Provide a NEC sized green grounding conductor in all conduits.
- FF. Preferred method of installation in finished areas is concealed installation. Cutting and patching of existing surfaces for concealed installation is included. Where permitted by and coordinated with Architect, surface metal raceway may be installed.

3.3 INTERFACE WITH OTHER PRODUCTS

- A. Install conduit to preserve fire resistance rating of partitions and other elements.

END OF SECTION 26 01 11

SURFACE RACEWAYS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Surface metal raceways.
- B. Wireways.

1.2 SCOPE

- A. Surface mounted raceways are not acceptable unless specifically permitted by the Architect after all other options for a concealed installation have been thoroughly explored.

1.3 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specifications and other Division 260 Specification Section, apply to this Section.

1.4 REFERENCES

- A. NECA (National Electrical Contractor's Association) Standard of Installation.
- B. NEMA WD 6 - Wiring Device Configurations.

1.5 SUBMITTALS

- A. Submit under provisions of Section 260010.
- B. Product Data: Provide dimensions, knockout sizes and locations, materials, fabrication details, finishes, and accessories.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with NECA Standard of Installation.
- B. Maintain one copy of document on site.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum three years of documented experience.

1.8 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by third party agencies accredited by the NCBCC to label electrical and mechanical equipment, as suitable for purpose specified and shown, where such listing exists.

PART 2 - PRODUCTS

2.1 SURFACE METAL RACEWAY

- A. Description: Sheet metal channel with fitted cover, suitable for use as surface metal raceway.
- B. Size: As shown on Drawings.
- C. Finish: Gray or Buff enamel.
- D. Fittings, Boxes, and Extension Rings: Furnish manufacturer's standard accessories.

2.2 WIREWAY

- A. Description: General-purpose type wireway or as indicated on the drawings.
- B. Knockouts: None.
- C. Size: As indicated on Drawings.
- D. Cover: Hinged cover.
- E. Connector: Flanged.
- F. Fittings: Lay-in type with removable top, bottom, and side; captive screws.
- G. Finish: Rust inhibiting primer coating with gray enamel finish.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install Products in accordance with manufacturer's instructions.
- B. Use flat-head screws, clips, and straps to fasten raceway channel to surfaces. Mount plumb and level.
- C. Use suitable insulating bushings and inserts at connections to outlets and corner fittings.

- D. Wireway Supports: Provide steel channel as specified in Section 260190.
- E. Close ends of wireway and unused conduit openings.
- F. Ground and bond raceway and wireway under provisions of Section 260170.

3.2 ROUTING

- A. All routing of surface metal raceway shall be marked in chalk prior to installation and coordinated with the Architect. Chalk marks shall be removed after coordination meeting.
- B. Routing Guide Lines
 - 1. All horizontal runs shall be at the top of the wall and feeds to wall-mounted devices shall be in vertical runs unless otherwise noted.
 - 2. Feeds to ceiling mounted devices shall follow the architectural lines of the building.

END OF SECTION 26 01 12

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Building wire and cable.
- B. Wiring connectors and connections.

1.2 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specifications and other Division 260 Specification Section, apply to this Section.

1.3 REFERENCES

- A. ANSI/NFPA 70 National Electrical Code.

1.4 SUBMITTALS

- A. Submit under provisions of Section 260010.
- B. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years documented experience.

1.6 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by third party agencies accredited by the NCBCC to label electrical and mechanical equipment, as suitable for purpose specified and shown, where such listing exists.

1.7 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.

- B. Conductors shall be copper.
- C. Wire routing shown on Drawings is approximate unless dimensioned. Route wire as required meeting Project Conditions.
- D. Where wire routing is not shown, and destination only is indicated, determine exact routing and lengths required.

1.8 COORDINATION

- A. Coordinate Work under provisions of Section 260010.

PART 2 - PRODUCTS

2.1 BUILDING WIRE

- A. Description: Single conductor insulated wire.
- B. Insulation Voltage Rating: 600 volts.
- C. Insulation: ANSI/NFPA 70; Type XHHW or THWN/THHN insulation for feeders and branch circuits.

D. Color Coding:

Phase	208Y/120V	277/480V
A	Black	Brown
B	Red	Orange
C	Blue	Yellow
Neutral	White	Natural Gray
Ground	Green	Green

- E. Wire types and sizes required in other specification sections shall supersede this section.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that mechanical work likely to damage wire has been completed.

3.2 PREPARATION

- A. Completely and thoroughly swab raceway before installing wire.

3.3 WIRING METHODS

- A. All wiring shall be in raceway.
- B. Install a code-gauge green insulated grounding conductor in all raceways.

3.4 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Use solid conductors for feeders and branch circuits #10 AWG and smaller. Use Class B stranded conductors #8 AWG and larger.
- C. Use stranded conductors for control circuits.
- D. Use conductors not smaller than 12 AWG for power circuits.
- E. Use conductors not smaller than 14 AWG for control circuits.
- F. Use conductors not larger than 500 kCMIL.
- G. Use 10 AWG conductors to the first outlet for 20 ampere, 120-volt branch circuits longer than 50 feet.
- H. Use 10 AWG conductors to the first outlet for 20 ampere, 277-volt branch circuits longer than 125 feet.
- I. Pull all conductors into raceway at same time.
- J. Use suitable wire pulling lubricant for building wire 4 AWG and larger.
- K. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- L. Clean conductor surfaces before installing lugs and connectors.
- M. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
- N. Joints in solid conductors shall be made using Ideal "Wirenuts, 3M Company "Scotchlocks", T&B "Piggy" or other approved insulated spring, with plastic cap, twist-on connector.
- O. Joints in stranded conductors shall be made using approved mechanical connectors and gum rubber or friction tape with an outer covering of two layers of plastic tape equal to Scotch "33+". Solderless mechanical connectors for splices and taps, provided with UL approved insulating covers, may be used in place of mechanical connectors and tape.
- P. "StaKon" or other permanent type crimp connectors shall not be used for branch circuit connections.
- Q. Voltage Drop
 - 1. Where the conductor length from the panel to the first outlet on a 277 volt circuit exceeds 125 feet, the branch circuit conductors from the panel to the first outlet shall not be smaller than #10 AWG.

2. Where the conductor length from the panel to the first outlet on a 120 volt circuit exceeds 50 feet, the branch circuit conductors from the panel to the first outlet shall not be smaller than #10 AWG.

3.5 INTERFACE WITH OTHER PRODUCTS

- A. Identify wire under provisions of Section 260195.
- B. Identify each conductor with its circuit number or other designation indicated on Drawings.

3.6 FIELD QUALITY CONTROL

- A. Inspect wire for physical damage and proper connection.
- B. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.

3.7 TESTING

- A. Feeder Insulation Resistance Testing
 1. Test all current carrying phase conductors and neutrals as installed, and before connections are made, for insulation resistance and accidental grounds. This shall be done with a 500-volt megger. The testing procedures listed below shall be followed:
- B. Minimum readings shall be one million (1,000,000) or more ohms for #6 AWG and smaller wire and 250,000 ohms or more for #4 AWG or larger wire, between phase and neutral conductors, and between phase and neutral conductors and the grounding conductor.
- C. After all devices and equipment are installed and all connections are completed to each panel, the contractor shall disconnect the neutral feeder conductor from the neutral bar and take a megger reading between the neutral bar and the grounded enclosure. If this reading is less than 250,000 ohms, the contractor shall disconnect the branch circuit neutral conductors from this neutral bar. He shall then test each one separately to the panel until the low readings are found. The contractor shall correct the problems, reconnect and retest the wires until at least 250,000 ohms from the neutral bar to the grounded panel can be achieved with only the neutral feeder disconnected.
- D. The contractor shall send a letter to the Engineer and to the State Construction Office (SCO) certifying that the above test has been done, and tabulating the megger readings for each panel. This shall be done at least four (4) days prior to final inspection.
- E. Ground System Testing
 1. Upon completion of installation the electrical grounding and bonding systems, test the ground resistance with a ground resistance tester. Where tests show resistance to ground is over 25 ohms, drive additional ground rods as necessary to reduce the ground resistance to 25 ohms or less. Retest to demonstrate that the resistance is less than or equal to 25 ohms.
- F. Documentation

1. All tests specified shall be completely documented indicating time of day, date, temperature and all pertinent test information.
2. At the final inspection, the contractor shall furnish a megger and show the Engineer and State Inspector (SCO) that the panels comply with the above requirements. He will also furnish a clamp-on type ammeter and a voltmeter and take current and voltage readings as directed by the Engineer and State Inspector (SCO).
3. All required documentation of readings indicated above shall be submitted to the Engineer prior to, and as one prerequisite for, the final acceptance of the project.

END OF SECTION 26 01 23

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Wall and ceiling outlet boxes.
- B. Pull and junction boxes.

1.2 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specifications and other Division 260 Specification Section, apply to this Section.

1.3 REFERENCES

- A. NECA Standard of Installation.
- B. NEMA FB 1 Fitting and Supports for Conduit and Cable Assemblies.
- C. NEMA OS 1 Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
- D. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum).
- E. NFPA 70 National Electrical Code.

1.4 SUBMITTALS FOR CLOSEOUT

- A. Record actual locations and mounting heights of outlet, pull, and junction boxes on project record documents.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Provide Products listed and classified by third party agencies accredited by the NCBCC to label electrical and mechanical equipment, as suitable for the purpose specified and indicated, where such listing exists.

PART 2 - PRODUCTS

2.1 OUTLET BOXES

- A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
 - 1. Equipment Supporting Boxes: Rated for weight of equipment supported; include ½” male fixture studs where required.
- B. Nonmetallic Outlet Boxes: NEMA OS 2.
- C. Cast Boxes: NEMA FS, Type FD, cast ferrous alloy. Provide gasketed cover by box manufacturer. Provide threaded hubs.
- D. Wall Plates for Finished Areas: As specified in Section 260141.

2.2 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
- B. Surface Mounted Cast Metal Box: NEMA 250, Type 4 or 6; flatflanged, surface mounted junction box:
 - 1. Material: Galvanized cast iron or cast aluminum.
 - 2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify locations of floor boxes and outlets prior to roughin.

3.2 INSTALLATION

- A. Install boxes in accordance with NECA “Standard of Installation.”
- B. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
- C. Set wall mounted boxes at elevations to accommodate mounting heights as indicated or as specified in section for outlet device.
- D. Electrical boxes are shown on Drawings in approximate locations unless dimensioned. Adjust box location up to 10 feet if required to accommodate intended purpose.
- E. Orient boxes to accommodate wiring devices oriented as specified in Section 260141.
- F. Maintain headroom and present neat mechanical appearance.
- G. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- H. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

- I. Install boxes to preserve fire resistance rating of partitions and other elements, using specified materials and methods.
- J. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.
- K. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.
- L. Use flush mounting outlet box in finished areas.
- M. Do not install flush mounting box back-to-back in walls; provide minimum 24 inches separation.
- N. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- O. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- P. Do not fasten boxes to ceiling support wires.
- Q. Support boxes independently of conduit.
- R. Use cast outlet box in exterior locations exposed to the weather and wet locations.
- S. Large Pull Boxes: Use hinged enclosure in interior dry locations, surfacemounted cast metal box in other locations.

3.3 INTERFACE WITH OTHER PRODUCTS

- A. Coordinate installation of outlet box for equipment with corresponding trade.

3.4 ADJUSTING

- A. Adjust flush-mounted outlets to make front flush with finished wall material.
- B. Install knockout closures in unused box openings.

3.5 CLEANING

- A. Clean interior of boxes to remove dust, debris, and other material.
- B. Clean exposed surfaces and restore finish.

END OF SECTION 26 01 30

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Wall switches.
- B. Wall dimmers.
- C. Receptacles.
- D. Device plates and decorative box covers.

1.2 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specifications and other Division 260 Specification Section, apply to this Section.

1.3 REFERENCES

- A. NEMA WD 1 General Purpose Wiring Devices.
- B. NEMA WD 6 Wiring Device Configurations.

1.4 SUBMITTALS

- A. Submit under provisions of Section 260010.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
- C. Manufacturer's Instructions:
 - 1. Indicate application conditions and limitations of use stipulated by product testing agency specified under regulatory requirements.
 - 2. Include instructions for storage, handling, protection, examination, preparation, operation and installation of product.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years documented experience.

1.6 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by third party agencies accredited by the NCBCC to label electrical and mechanical equipment, as suitable for purpose specified and shown, where such listing exists.

1.7 EXTRA MATERIALS

- A. Provide two of each style, size, and finish wall plate.

PART 2 - PRODUCTS

2.1 RECEPTACLES

- A. Description: NEMA WD 1; heavy duty, specification grade receptacle.
- B. Device Body: Verify color with the Architect before ordering.
- C. Duplex receptacles shall be of the grounding type, arranged for back and side wiring, with separate single or double grounding terminals. Receptacles shall be straight blade, rated 20 amps, 125 volt and the face configuration shall conform to the NEMA Standard No. WDI.101968. Self-grounding or automatic type grounding receptacles are not acceptable in lieu of receptacles with separate grounding screw lugs and a direct, green insulated conductor connection to the equipment grounding system.
- D. Receptacles shall be industrial specification or heavy duty grade, mounted vertically. Receptacles mounted over counters, back-splashes, etc., shall be mounted horizontally.
- E. Special wiring devices shall be shown on the drawings with complete description thereof.
- F. GFCI receptacles shall be rated minimum 20 amp (NEMA 5-20R configuration).
- G. GFCI receptacles shall be provided where installed to serve countertop and are located within 6 feet of a sink.

2.2 WALL SWITCHES

- A. Manufacturers:
 - 1. Hubbell.
 - 2. Eagle.
 - 3. Leviton.
 - 4. Substitutions: Under provisions of Section 01600.
- B. Description: NEMA WD 1, heavy duty, AC only general use snap switch, single-pole, three-way or for-way as indicated on the drawings.
- C. Device Body: Verify color with the Architect before ordering.

- D. Voltage Rating: 120/277 volts, AC.
- E. Current Rating: 20 amperes.
- F. Shall have quiet operating mechanisms without the use of mercury switches.
- G. Lighted handle switches shall have neon lights of the correct voltage as indicated on the drawings.
- H. Grounding: Switches shall contain one or two separate green, hex head grounding screw(s). Switches without factory installed grounding screws are not acceptable.

2.3 WALL DIMMERS

- A. Manufacturers:
 - 1. Hubbell.
 - 2. Eagle.
 - 3. Leviton.
 - 4. Substitutions: Under provisions of Section 01600.
- B. Description: NEMA WD 1, semiconductor dimmer for incandescent lamps, type as indicated on the Drawings.
- C. Device Body: Verify color with the Architect before ordering.
- D. Voltage: 120 [277] volts.
- E. Power Rating: Match load shown on Drawings; 600 Watts minimum.

2.4 WALL PLATES

- A. Cover plates for flush mounted wiring devices and for telephone outlets shall be Type "302" stainless steel or nylon type, standard size, single or ganged as shown on the drawings. Cover plate mounting screws shall be slotted head oval screws, shall match the finish and material of the plate, and shall be furnished with the plate by the plate manufacturer. Quantity of 2% spare cover plates of each type shall be provided to the owner.
- B. Switch and receptacle cover plates on exposed work shall be galvanized cast ferrous metal or Feraloy, standard size, and shall be single or ganged as indicated on the drawings.
- C. Weatherproof Cover Plate: Exterior mounted switch and receptacle plates, and those noted to be weatherproof, shall be weatherproof PVC cover plates, standard size, single or ganged as indicated on the drawings, and shall be "approved " third party listed as "rain tight while in use."
- D. Provide a quantity of 2% of each type of installed cover plates of to the owner.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify conditions.
- B. Verify outlet boxes are installed at proper height.
- C. Verify wall openings are neatly cut and will be completely covered by wall plates. Provide larger plates as necessary to cover oversize holes.
- D. Verify floor boxes are adjusted properly.
- E. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.2 PREPARATION

- A. Provide extension rings as necessary to bring outlet boxes flush with finished surface.
- B. Clean debris from outlet boxes.

3.3 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install devices plumb and level.
- C. Install receptacles with grounding pole on top.
- D. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.
- E. Install decorative plates on receptacle outlets in finished areas.
- F. Connect wiring devices by wrapping conductor around screw terminal.
- G. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

3.4 INTERFACE WITH OTHER PRODUCTS

- A. Install convenience receptacle 16 inches to bottom of box above finished floor.

3.5 FIELD QUALITY CONTROL

- A. Inspect each wiring device for defects.
- B. Verify that each receptacle device is energized.
- C. Test each receptacle device for proper polarity.

D. Test each GFCI receptacle device for proper operation.

3.6 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

END OF SECTION 26 01 41

GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Grounding electrodes and conductors.
- B. Equipment grounding conductors.
- C. Bonding.

1.2 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specifications and other Division 260 Specification Section, apply to this Section.

1.3 SCOPE

- A. Verify and bring existing conditions into compliance with the grounding and bonding specified in this section.

1.4 REFERENCES

- A. ANSI/NFPA 70 National Electrical Code.

1.5 GROUNDING ELECTRODE SYSTEM

- A. Metal underground water pipe.
- B. Metal frame of the building.
- C. Rod electrode.

1.6 PERFORMANCE REQUIREMENTS

- A. Grounding System Resistance: 25 ohms.

1.7 SUBMITTALS

- A. Submit under provisions of Section 260010.

- B. Product Data: Provide data for grounding electrodes and connections.
- C. Test Reports: Indicate overall resistance to ground and resistance of each electrode.
- D. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation and installation of exothermic connectors.

1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum three years documented experience.

1.9 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by third party agencies accredited by the NCBCC to label electrical and mechanical equipment, as suitable for purpose specified and shown, where such listing exists.

PART 2 - PRODUCTS

2.1 ROD ELECTRODE

- A. Material: Copper clad steel.
- B. Diameter: 3/4 inch.
- C. Length: 10 feet.

2.2 MECHANICAL CONNECTORS

- A. Material: Bronze.

2.3 WIRE

- A. Material: Stranded copper.
- B. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.2 INSTALLATION

- A. Install Products in accordance with manufacturer's instructions.
- B. Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.
- C. Provide bonding to meet Regulatory Requirements.
- D. Equipment Grounding Conductor: Provide a separate, green insulated conductor within each raceway, sized per NEC Table 250-122. Terminate each end on suitable lug, bus, or bushing.
- E. Where conduits are terminated in concentric, eccentric or oversize knockouts, terminate conduit with a bonding bushing and a green or bare grounding jumper, sized per NEC Table 25095, to the ground bar.

3.3 SERVICE GROUNDING

- A. The electrical service shall be grounded by three (3) means:
 - 1. To the metallic cold water pipe, as per NEC Article 250-50.
 - 2. To the steel frame of the building, provided the building frame is effectively grounded.
 - 3. To ground rod(s). Ground rods shall be 10 feet long and 3/4 inch in diameter, and shall be of copper-clad steel construction.
 - 4. All ground connections shall be accessible.

3.4 FIELD QUALITY CONTROL

- A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.
- B. Use suitable test instrument to measure resistance to ground of system. Perform testing in accordance with Section 260123 Building Wire and Cable.

END OF SECTION 26 01 70

SUPPORTING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Conduit and equipment supports.
- B. Anchors and fasteners.

1.2 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specifications and other Division 260 Specification Section, apply to this Section.

1.3 REFERENCES

- A. NECA National Electrical Contractors Association.
- B. ANSI/NFPA 70 National Electrical Code.

1.4 SUBMITTALS

- A. Submit under provisions of Section 260010.
- B. Product Data: Provide manufacturer's catalog data for fastening systems.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation and starting of Product.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by third party agencies accredited by the NCBCC to label electrical and mechanical equipment, as suitable for purpose specified and shown, where such listing exists.

PART 2 - PRODUCTS

2.1 PRODUCT REQUIREMENTS

- A. Materials and Finishes: Provide adequate corrosion resistance.
- B. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.
- C. Anchors and Fasteners:
 - 1. Toggle bolts on hollow masonry.
 - 2. Metal expansion shields and machine screws, or standard pre-set inserts on concrete or solid masonry.
 - 3. Machine screws or bolts on metal surfaces.
 - 4. Wood screws on wood construction.

2.2 CHANNEL AND SUPPORT SYSTEMS

- A. Channel and angle support systems, hangers, anchors, sleeves, brackets, fabricated items and fasteners, shall be designed to provide secure support from the building structure, for electrical components.
- B. Description:
 - 1. Steel, unless otherwise noted shall be protected from corrosion with zinc coating, or with a treatment of equivalent corrosion resistance, using approved alternative finish or inherent material characteristics.
 - 2. Metal items for outdoor or damp location use shall be hot-dip galvanized steel, unless otherwise noted.
 - 3. Steel channel shall have 9/16-inch diameter holes at a maximum of 8 inches on center, in at least one surface.
 - 4. Fittings and accessories for steel channel shall match and mate, and be from the same manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation".
- C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.
- D. Obtain permission from Engineer before using powder actuated anchors.
- E. Do not drill or cut structural members.
- F. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
- G. Install surface mounted cabinets and panelboards with minimum of four anchors.

- H. In wet and damp locations use steel channel supports to stand cabinets and panelboards one inch off wall.
- I. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.
- J. Conduits installed on the interior side of exterior walls shall be spaced a minimum of 1/4" off the walls.

END OF SECTION 26 01 90

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Nameplates and labels.
- B. Wire and cable markers.
- C. Conduit markers.

1.2 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specifications and other Division 260 Specification Section, apply to this Section.

1.3 REFERENCES

- A. ANSI/NFPA 70 National Electrical Code.

1.4 SUBMITTALS

- A. Submit under provisions of Section 260010.
- B. Product Data: Provide catalog data for nameplates, labels, and markers.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation and installation of Product.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by third party agencies accredited by the NCBCC to label electrical and mechanical equipment, as suitable for purpose specified and shown, where such listing exists.

PART 2 - PRODUCTS

2.1 NAMEPLATES AND LABELS

- A. Nameplates: Furnish and install engraved laminated phenolic nameplates for all safety switches, panelboards, transformers, switchboards, motor control centers and other electrical equipment supplied for the project for identification of equipment, controlled, served, phase, voltage, etc. Nameplates shall be securely attached to equipment with self-tapping stainless steel screws, and shall identify equipment controlled, attached, etc. Letters shall be 1/2 inch high minimum. Embossed, self-adhesive plastic tape is not acceptable for marking equipment. Nameplate material colors shall be:
1. Fire Alarm System: Bright red surface with white core
 2. Telephone/Data System: Orange surface with white core
 3. Sound System: Dark Blue with white core
 4. Security System: Dark red (burgundy) surface with white core
 5. Emergency System: Green surface with white core
 6. Data Systems: Brown surface with white core
 7. Paging System: White surface with black core
 8. TV System: Purple surface with white core
 9. 208 Volt System: Blue surface with white core
 10. 480 Volt System: Black surface with white core
- B. Locations:
1. Each safety switch, panelboard, transformer, switchboard, motor control center and other electrical equipment supplied for the project. Information on the nameplate shall include; equipment controlled and/or served, phase and voltage.
- C. Letter Size: Minimum of 2 inch.
- D. Labels: Embossed adhesive tape, with 3/16 inch white letters on black background. Use only for identification of individual wall switches and receptacles.
- E. Label Information: Equipment controlled and/or served - voltage, phase, etc.

2.2 WIRE MARKERS

- A. Description: Cloth, tape, split sleeve, or tubing type wire markers.
- B. Locations: Each conductor at panelboard gutters, pull boxes, outlet and junction boxes and each load connection.
- C. Legend:
1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.

2.3 CONDUIT MARKERS

- A. Location: Furnish markers for each conduit longer than 20 feet.
- B. Color:
1. Fire Alarm System: Bright Red.
 2. Telephone/Data System: Orange
 3. Sound System: Dark Blue.

4.	Security	Dark Red (Burgundy)
5.	Emergency Systems	Green
6.	Data Systems	Brown
7.	Paging Systems	White
8.	TV Systems:	Purple
9.	208 Volt System:	Blue.
10.	480 Volt System:	Black.

- C. As an alternative to the above requirements, conduit in unfinished areas may be marked with spray paint.
- D. Empty conduit runs and conduit with conductors for future use shall be identified for use and shall indicate where they terminate. Identification shall be by tags with string or wire attached to conduit or outlet.

2.4 UNDERGROUND WARNING TAPE

- A. Description: 6 inch wide, 4 mils thick, plastic tape, detectable type, bright colored with suitable warning legend, continuously printed, describing buried electrical lines.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive nameplates and labels.

3.2 APPLICATION

- A. Install nameplates and labels parallel to equipment lines.
- B. Secure nameplate to equipment front using self-tapping stainless steel screws.
- C. Paint colored band on each conduit longer than 20 feet, 20 feet on center.
- D. Junction and pull boxes in conduit runs shall have their covers and exterior surfaces painted to match the colors in 2.3B above. This includes covers on boxes above lift-out and other type accessible ceilings.
- E. Identify all underground conduits using underground warning tape. Install one tape per trench at 6 to 8 inches below finished grade.
- F. Empty conduits and conduits with conductors, for future use shall be identified for use and shall indicate on each end where they terminate. Identification shall be by tags with string or wire attached to the conduit or outlet.

END OF SECTION 26 01 95

INTERIOR LUMINAIRES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Interior luminaires and accessories.
- B. Emergency lighting units.
- C. Exit signs.
- D. Ballasts.
- E. Fluorescent dimming ballasts and controls.
- F. Fluorescent lamp emergency power supply.
- G. Lamps.
- H. Luminaire accessories.

1.2 RELATED SECTIONS

- A. Section 26 0130 Boxes.

1.3 REFERENCES

- A. ANSI C78.379 Electric Lamps Incandescent and High Intensity Discharge Reflector Lamps Classification of Beam Patterns.
- B. ANSI C82.1 Ballasts for Fluorescent Lamps Specifications.
- C. ANSI C82.4 Ballasts for High Intensity Discharge and Low Pressure Sodium Lamps (Multiple Supply Type).
- D. ANSI/NFPA 70 National Electrical Code.
- E. ANSI/NFPA 101 Life Safety Code.
- F. NEMA WD 6 Wiring Devices Dimensional Requirements.

1.4 SUBMITTALS

- A. Submit under provisions of Section 26 0010.

- B. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
- C. Product Data: Provide wiring diagram, dimensions, ratings, construction and performance data, including optical efficiency and ballast-lamp system efficiency in lumens per watt.
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.
- E. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 26 0010.
- B. Accurately record actual locations of each luminaire.

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 26 0010.
- B. Maintenance Data: Include replacement parts list.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five (5) years documented experience.

1.8 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70, NFPA 101.
- B. Furnish products listed and classified by third party agencies accredited by the NCBCC to label electrical and mechanical equipment, as suitable for purpose specified and shown, where such listing exists.
- C. Furnish products with integral disconnecting means for fixture types with double-ended linear fluorescent lamps and for fixture types with field-serviceable ballasts. Provide external disconnecting means where the integral type cannot be furnished. Guard line side terminals against accidental touch.

1.9 EXTRA MATERIALS

- A. Furnish under provisions of Section 26 0010.
- B. Provide two of each plastic lens.

- C. Provide two of each type of ballast.

1.10 WARRANTY

- A. Minimum of five (5) years warranty is required with each electronic ballast.

PART 2 - PRODUCTS

2.1 LUMINAIRES

- A. Furnish products as specified in the Lighting Fixture Schedule on plans.
- B. Substitutions: Under provisions of Section 26 0010.
- C. Install ballasts, lamps, and specified accessories at factory.
- D. Emergency Exit Luminaire
 1. The fixture shall be completely self-contained, provided with maintenance-free battery and automatic charger.
 2. The battery shall be sealed, maintenance-free type, with minimum of 90 minutes operating endurance. It shall have a normal life expectancy of 10 years. Batteries shall be a high temperature type with an operating range of 0 degree C to 60 degrees C and contain a resealable pressure vent, a sintered positive terminal (+) and negative (-) terminal.
 3. The charger shall be fully automatic solid state type, full wave rectifying, with current limiting. Charger shall restore the battery to its full charge within 24 hours after a discharge of 90 minutes under full rated load. The unit shall be activated when the voltage drops below 80 percent. A low voltage disconnect switch shall be included if LEAD Battery is used, to disconnect the battery from the load and prevent damage from a deep discharge during extended power outage.
 4. The fixture shall have a pilot light to indicate the unit is connected to AC power. The battery shall have high rate charge pilot light, unless self-diagnostic type. Provide a test switch to simulate the operation of the unit upon loss of A.C power by energizing the lamps from the battery. This simulation must also exercise the transfer relay.
 5. The lighting source shall be light emitting diodes (LEDs). Maximum LED failure rate shall be 25% within a seven (7) year period; if exceeded, the manufacturer shall replace the complete unit at no charge to the owner.
 6. The entire unit shall be warranted for three years. The battery shall have an additional two years pro-rated warranty. Warranty shall start from the date of project final acceptance. Warranty shall be included in the closeout documents.
- E. Emergency Egress Luminaire
 1. The fixture shall be completely self-contained, provided with maintenance-free 12 volt battery , automatic charger and two lamps.
 2. Provide a pilot light to indicate the unit is connected to A.C power. The battery shall have high rate charge pilot light, unless self-diagnostic type. Provide a test switch to simulate the operation of the unit upon loss of A.C power by energizing the lamps from the battery. This simulation shall also exercise the transfer relay.

If fluorescent emergency unit is used, an LED charging indicator light must be easily visible after installation and a remote test switch shall be installed adjacent to the fixture.

3. The battery shall be sealed, maintenance-free type, with minimum of 90 minutes operating endurance. It shall have a normal life expectancy of 10 years. Batteries shall be a high temperature type with an operating range of 0 degree C to 60 degrees C and contain a resealable pressure vent, a sintered positive terminal (+) and negative (-) terminal.
4. The charger shall be fully automatic solid state type, full wave rectifying, with current limiting. Charger shall restore the battery to its full charge within 24 hours after a discharge of 90 minutes under full rated load. The unit shall be activated when the voltage drops below 80 percent. A low voltage disconnect switch shall be included if LEAD Battery is used, to disconnect the battery from the load and prevent damage from a deep discharge during extended power outage.
5. The entire unit shall be warranted for three years. The battery shall have an additional two years pro-rated warranty. Warranty shall start from the date of project final acceptance. Warranty shall be included in the closeout documents.

2.2 BALLASTS

A. Fluorescent Ballast:

1. Linear Fluorescent luminaires shall have a high efficiency ballast – lamp system with a minimum system efficiency of ≥ 90 mean lumens per watt for instant start ballasts and of ≥ 88 mean lumens per watt for rapid start ballasts.
2. Description: ANSI C82.11, Class P, sound rated A, high power factor (minimum 90%) electronic ballast.
3. Provide ballast suitable for lamps specified.
4. Voltage: Match luminaire voltage.
5. Source Quality Control: Certify ballast design and construction by Certified Ballast Manufacturers, Inc.
6. Lamp current crest factor shall be less than 1.7.
7. Input current third harmonics shall not exceed ANSI recommendations (32% total harmonic distortion, 27.5% of the third triplet).
8. Flicker shall be 15% or less with any lamp suitable for the ballast.
9. Ballast design shall withstand line transients per IEEE 587, Category A and shall meet FCC Rules and Regulations, part 18.
10. Ballast case temperature shall not exceed 25 degrees C rise over 40 degrees C ambient.
11. Provide end-of-life shutdown circuit.

B. High Intensity Discharge (HID) Ballast:

1. Description: ANSI C82.4, lamp ballast.
2. Provide ballast suitable for lamp specified.
3. Voltage: Match luminaire voltage.
4. Provide end-of-life shutdown circuit.

2.3 LAMPS

- A. Provide lamp type specified for luminaire.

- B. Reflector Lamp Beam Patterns: ANSI C78.379.
- C. Fluorescent lamps shall be 800 series, energy efficient type with CRI \geq 80, Minimum initial lamp lumens of \geq 3100 lumens, lamp life of \geq 24,000 hours at three hours per start.
- D. Fluorescent lamps shall comply with the EPA Guidelines regarding the Toxicity Characteristic Leaching Procedure TCLP.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrate and supporting grids for luminaires.
- B. Examine each luminaire to determine suitability for lamps specified.

3.2 INSTALLATION

- A. Install in accordance with manufacturers instructions.
- B. Install suspended luminaires using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.
- C. Support luminaires larger than 2X4 foot size independent of ceiling framing.
- D. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.
- E. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prohibit movement.
- F. Exposed Grid Ceilings: Support surface mounted luminaires on grid ceiling directly from building structure.
- G. Install recessed luminaires to permit removal from below.
- H. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.
- I. Where a recessed fluorescent, high intensity, or downlight fixture replaces a section or part of a ceiling tile, fixture is to be supported at the two (2) opposite ends to the steel frame of the building. Supports shall be provided with the same type of wire as used to support the lay-in ceiling track. Attach one end of the wire to one corner of the luminaire and the other end to the building's structural system. The lay-in luminaire shall then be screwed to the main runners of the lay-in ceiling track at all four (4) corners using sheet metal screws. For fire rated suspended ceiling, luminaire shall be supported to the Building Structure as per the Ceiling Design Criteria. Luminaire shall then be screwed to the main runners of the suspended ceiling track at all four (4) corners using sheet metal screws. See the ASTM Section "E-580-02" items 3.3, 4.3, 5.5 & 5.6 and the NEC 410-16C.

- J. Install wall mounted luminaires, emergency lighting units and exit signs at height as indicated on Drawings. If no height is indicated on Drawings, mount so that top of fixture is 12" below ceiling.
- K. Install accessories furnished with each luminaire.
- L. Connect luminaires, emergency lighting units and exit signs to branch circuit outlets provided under Section 26 0130.
- M. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
- N. Bond products and metal accessories to branch circuit equipment grounding conductor.
- O. Install specified lamps in each luminaire, emergency lighting unit and exit sign.

3.3 FIELD QUALITY CONTROL

- A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.4 ADJUSTING

- A. Adjust Work under provisions of Section 26 0010.
- B. Aim and adjust luminaires as indicated on Drawings or as directed.
- C. Adjust exit sign directional arrows as indicated.
- D. Re-lamp luminaries that have failed lamps at Substantial Completion.

3.5 CLEANING

- A. Clean Work under provisions of Section 26 0010.
- B. Clean electrical parts to remove conductive and deleterious materials.
- C. Remove dirt and debris from enclosure.
- D. Clean photometric control surfaces as recommended by manufacturer.
- E. Clean finishes and touch up damage.

3.6 DEMONSTRATION

- A. Provide systems demonstration under provisions of Section 26 0010.
- B. Provide demonstration of luminaire operation.

- C. Emergency Exit and Emergency Egress Luminaire test: The contractor shall perform a test on each unit after it is permanently installed and charged for a minimum of 24 hours. The battery shall be tested for 90 minutes satisfying NEC Article 700.12 (F) with voltmeter readings of the unit battery or with a foot candle meter for illumination readings. The egress luminaire test shall be done 10 days prior to final inspection. Any unit which fails the test shall be repaired or replaced, and tested again. A copy of the test report shall be sent to the Engineer and included in the O&M manual.

END OF SECTION 26 05 10