PROJECT MANUAL

ELECTRICAL DISTRIBUTION INSTALLATION AT CAMPGROUND-CLIFTY FALLS STATE PARK

Project Number - ENG2301725235

DEPARTMENT OF NATURAL RESOURCES

Owner:

Indiana Department of Natural Resources
Division of State Parks
Indiana Government Center South
402 W. Washington Street, Rm. W267
Indianapolis, IN 46204

Designed and Prepared By:

Indiana Department of Natural Resources
Division of Facilities, Fleet, Asset Management
And Engineering

March 2024

SPECIFICATIONS FOR

ELECTRICAL DISTRIBUTION
INSTALLATION AT CAMPGROUND
CLIFTY FALLS STATE PARK,
JEFFERSON COUNTY, INDIANA
PROJECT NO. ENG2301725235

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SECTION 010100

GENERAL REQUIREMENTS

PART I - GENERAL

1.01 DESCRIPTION

A. This project consists of furnishing all labor, materials, and associated equipment necessary to complete the following work:

1. **Base Bid**: Loop A (106 Campsites plus Amphitheater pedestal/wiring and two (2) Comfort Stations) --- coordination with new primary electrical work and transformer installation by Duke Energy, installation of new underground copper conductors and associated conduit, installation of new meter cabinets, new distribution panels with breakers, new 50/30/20-amp campsite power pedestals, and connection to existing panels in two (2) Comfort Stations. Provide two (2) spare campground pedestals complete with breakers.

   Base Bid shall also include all pavement, site, and miscellaneous work in ADA-compliant sites for Loop A.

   The installation of new underground copper conductors and conduit from the transformers to the new meters/distribution panels-Loop A.

   Disconnecting branch circuits from existing panels (Loop A) to the camp sites receiving new pedestals and power from the new panels. Removal of all abandoned work to 12 inches below grade.

   Demolition/disposal of existing pedestals and panels in Loop A.

   $10,000 Allowance as described in Section 010200 of these specifications.

2. **Alternate 1**: Loop B (63 Campsites plus one (1) Comfort Station) --- coordination with new primary electrical work and transformer installation by Duke Energy, installation of new underground copper conductors and associated conduit, installation of new meter cabinets, new distribution panels with breakers, new 50/30/20-amp campsite power pedestals, and connection to existing panel in one (1) Comfort Station. Provide two (2) spare campground pedestals complete with breakers.

   Alternate 1 shall also include all pavement, site, and miscellaneous work in ADA-compliant sites for Loop B.

   The installation of new underground copper conductors and conduit from the transformers to the new meters/distribution panels-Loop B.

3. **Alternate 2:** Paving of all non-ADA compliant sites in Loop A as described elsewhere in the drawings and specifications.

4. **Alternate 3**: Paving of all non-ADA compliant sites in Loop B as described elsewhere in the drawings and specifications.

B. The project is located at Clifty Falls State Park--Jefferson County, Indiana.

C. The Contractor shall perform all work required to complete the project in accordance with the contract documents and all applicable state/federal laws.

1.02 BID:

A. Base Bid and Alternates 1, 2 and 3:

1. The Contractor shall not be allowed extra compensation by reason of any matter which the Contractor could have fully informed himself of prior to bidding.
2. No verbal agreement, understanding or conversation with an agent or employee of the Owner, either before or after the execution of this contract, shall affect or modify the terms or obligations herein contained.
3. The Contractor shall not be allowed extra compensation for requirements imposed by the utility providing power. Such costs shall be considered part of the Bid.

1.03 COMMENCEMENT AND COMPLETION OF WORK:

A. Work shall be commenced on/after Monday November 11,2024.
B. All work required by the Contract Documents shall be completed within 120 calendar days after the commencement of the work. In no case shall the completion date extend beyond April 1, 2024.
C. This project, or portion thereof, will not be ready for substantial completion review until test and performance evaluations are completed, all items are installed, and the area is clear of construction rubbish and debris.

1.04 SUBMISSION OF POST-BID INFORMATION: Submit the following information within ten days of receipt of Notice to Proceed.

A. Designation of the work to be performed by the Contractor with his own forces.

B. A list of Subcontractors.

C. A list of manufacturers and suppliers.

D. Designation of location of disposal site for all project debris and excavated material.

E. Designation of the source of any fill material for the project.

1.05 WORKING HOURS:

A. Contractor shall perform all construction activity on Monday thru Friday, excluding state holidays, between the hours of 7:30 a.m. and 5:00 p.m., unless previous arrangements are made with the Owner.

B. All work performed at other times shall be only by approval from the Owner, confirmed in writing, and shall not constitute a change in the contract amount.

1.06 EXISTING SITE CONDITIONS:

A. Data on the drawings pertaining to present conditions, dimensions, type of construction, obstructions on or near site, location of utilities, etc. have been obtained from sources believed reliable, but accuracy of such data is not guaranteed and is furnished solely for accommodation of the Contractor.

B. The Contractor shall, prior to excavating, verify the location of all buried utilities, including buried power lines.

1.07 CONSTRUCTION AND STORAGE AREA:

A. The Contractor shall confine the construction operations and storage of materials within an area approved by the Owner.

1.08 PROTECTION OF FACILITIES AND PREMISES:

A. The Contractor shall be responsible for the protection of all existing facilities during the entire period of construction. Any damage to the existing facilities caused by the Contractor shall be repaired by the Contractor at his expense and in a manner approved by the Owner.

B. The Contractor shall confine his construction operations and storage of materials within an area approved by the Owner.

C. The Contractor shall, always, keep the premises free from accumulation of waste materials or rubbish caused by his employees or work. At the completion of the work, he shall remove all accumulated rubbish, tools, and surplus materials from and about the job site, and shall leave the premises in a neat, clean, and orderly condition.

1.09 CODE REQUIREMENTS AND MANUFACTURER'S INSTRUCTIONS:

A. In case of conflicts between State and Local codes and regulations, State codes and regulations shall prevail. All required permits for compliance with building codes, health regulations, historic preservation, floodway construction, or state highway

crossings have already been obtained by the Owner.

B. If the Contractor observes that any of the contract documents are at variance with the printed installation instructions of any manufacturer in any respect, he shall promptly notify the Owner in writing.

C. If the Contractor performs any work contrary to such State Building Rules and Regulations, ordinances, or manufacturer's printed instructions without notice to the Owner, the Contractor shall bear the cost arising from such non-conformance.

1.10 PRE-CONSTRUCTION MEETING:

A. The Contractor and his sub-contractor (if any) shall attend a pre-service/pre-construction meeting with an Inspector from the Indiana Department of Natural Resources and the Property Representative. The date for this meeting shall be scheduled by the Inspector within 10 days after the contract is finalized.

1.11 ROADWAY PROTECTION:

A. The Contractor shall, at his expense, be responsible for repairing all damage to the property's roads and drainage structures caused by his equipment and/or personnel.

B. The ingress and egress to the project site shall be approved by the Designer.

1.12 ARCHEOLOGICAL AND HISTORICAL ARTIFACTS:

A. If any objects are uncovered during construction which could possibly be of archeological or historical importance, this shall be immediately reported to the Owner. Work at that spot shall not proceed further until the Owner has evaluated the object and the area where it was found and approved continuation of the work.

B. If any construction time is lost due to such objects being found, an equal number of calendar days will be added to the project completion time given in the specifications.

1.13 SALVAGE RIGHTS:

A. Unless stated otherwise in these specifications or on the plans, all equipment and materials removed as part of this project and not being reused shall become the property of the Contractor and removed from the site.

B. All locks and locksets in any area to be demolished or removed from the facility shall remain the property of the Owner. The contractor shall carefully remove all locks and locksets from their current location and turn them over to the owner.

1.14 SITE ACCESS PRIOR TO BIDDING:

A. Bidders may obtain access to the construction site for on-site inspection prior to bidding, by contacting the following Department of Natural Resources personnel.

Mr. Larry Brown-Property Manager
1501 Green Road
Madison Indiana 47250
Ph. 765-251-3079
Email: lbrown2@dnr.in.gov

1.15 CONTRACT AWARD:

A. Contract award shall be based on the Base Bid or combination of the Base Bid and Alternate(s) chosen to be accepted by the State.

B. Add Alternates herein described are not to be included in the Base Bid Scope of Work.

C. Bidder shall provide a response to each alternate specified. The response must indicate the amount to ADD to the Base Bid. Substitution of materials or methods of work other than as called for in the documents, i.e. "voluntary alternates" shall be cause for rejections of bid as non-conforming.

END OF SECTION

SECTION 010200

$10,000 ALLOWANCE

PART 1 - GENERAL:

1.01 REMEDIATION ALLOWANCE

A. Contractor shall include an allowance of $10,000.00 in the Base Bid for remediation of unforeseen constraints.

B. If the allowance is not used in full, the remaining amount shall be deducted from the Contractor's final pay application and shall revert to the Owner.

B. Such constraints may include but are not necessarily limited to unforeseen subsurface conditions particular to this construction site; improperly recorded or unrecorded physical properties and conditions at the site; obstruction of or delays to reasonable work sequences by the Owner; uncommon adverse weather or site conditions; and conflict within or omissions from the Contract Documents.

C. All remediation work shall be proposed to and authorized by the Director of Public Works Division prior to execution, jointly documented by Contractor and Owner, and recorded in Contractor as-builts and project record documents.

END OF SECTION

SECTION 013400

SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

1.01 RELATED REQUIREMENTS SPECIFIED ELSEWHERE:

A. General Conditions
B. Section 010100 – General Requirements
C. Section 017200 - Project Record Documents

1.02 SHOP DRAWING, PRODUCT DATA & SAMPLE SUBMITTAL REQUIRED:

A. Items listed for submittal are intended to be a minimum. Non-listing of an item does not relieve the Contractor of the responsibility to verify compliance with the specifications of all products and equipment. Contractor is encouraged to submit shop drawings, product data or samples on all such items prior to their use.

B. Shop drawings, product data or samples shall be submitted for the following items:

1. – Name Plate
2. – Conduit
3. – Wire and Cable
4. – Campsite Pedestals
5. – Panelboards
6. – Grounding Test Results
7. – Insulation Test Results

1.03 SHOP DRAWINGS:

A. Shop drawings shall:

1. Identify details by reference to sheet and detail numbers shown on Contract Drawings and/or section number of the Specifications; and
2. Be accompanied by installation instructions and all manufacturer's warranties that are required in the specifications.

B. The cost for all shop drawing submissions shall be included in the Contractor's Bid Price for Base Bid and Alternates.

1.04 PROJECT DATA:

A. If the Contractor uses the manufacturer's standard schematic drawings, it shall:

1. Modify drawings to delete information which is not applicable to work; and
2. Supplement standard information to provide additional information applicable to work.

END OF SECTION

SECTION 017200

PROJECT RECORD DOCUMENTS

1.01 GENERAL: Related requirements specified elsewhere:

A. General Conditions.
B. Section 013400 Shop Drawings, Product Data and Samples

1.02 MAINTENANCE OF DOCUMENTS:

A. The contractor shall maintain at the job site one copy of the project drawings and specifications, including all addenda, shop drawings and change orders, and shall make said documents available for inspection by the Owner.

B. Maintain and submit to the Owner a set of the project drawings showing all changes made over the course of the work and any differences between the existing facilities encountered and those shown on the drawings. These drawings must be submitted in electronic format via the latest version of AutoCAD with accompanying PDF files and approved prior to final payment.

1.03 OPERATION AND MAINTENANCE MANUAL:

A. Submit to the Owner 3 copies of an "Operation and Maintenance Manual" specified equipment. The manual shall contain the following information in addition to shop drawings.

1. Index of contents of manual and reference to use and location of item.
2. Complete operation data and maintenance instructions.
3. Parts lists and diagrams with component part numbers.
4. Wiring Diagrams.
5. Names and addresses of local distributors.
6. Warranty documentation.

B. Contractor shall perform all maintenance and retain all responsibility for required maintenance prior to submittal of the "Operation and Maintenance Manuals" to the Designer.

END OF SECTION

SECTION 021700

EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Furnish all labor, materials and equipment required for erecting, maintaining and removing temporary erosion and sediment controls. Contractor is responsible for obtaining any permits needed for offsite stockpiling, borrow pits and waste disposal in compliance with all requirements of 327 IAC 15-3-2 and 327 IAC 15- 5-5 (Rule 5)or other local, state or federal requirements.
B. Temporary erosion controls include, but are not limited to mulching, riprap check dams, seeding, watering, and reseeding on all disturbed surfaces including waste area surfaces `and stockpile and borrow area surfaces; scheduling work to minimize erosion and providing interceptor ditches at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits.
C. Temporary sediment controls include, but are not limited to silt fences, staked straw bale diversions and appurtenances at the foot of sloped surfaces which will ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits.
D. Contractor is responsible for providing and maintaining effective temporary erosion and sediment control measures during construction or until final controls become effective.
E. The erosion and sediment controls shown on the Drawings and specified herein are intended to provide the minimum measure necessary to prevent sediment runoff into storm water runoff. IDEM and/or the local Soil and Water District may request additional erosion control measures be installed for the project if the measures shown within the plans and specifications are determined to be insufficient. Contractor shall be responsible for providing and installing any additional measures needed to adequately prevent storm water runoff from the site and erosion of constructed or disturbed slopes as determined by IDEM and/or the local Soil and Water District at no additional cost to the Owner.

1.02 RELATED WORK

A. Section 02923 - LANDSCAPE GRADING
B. Section 02936 - SEEDING

PART 2 - PRODUCTS

A. Mulch and fertilizer shall be as specified in Sections 02936.
B. Erosion control blankets shall be excelsior blankets consisting of 100% weed free straw matrix stitched to a single or double net. The blanket shall be rated for channel

applications for slopes up to 1.5:1 and shall be for extended term (15 to 24 months) use. The blanket shall be 100% biodegradable natural netting that is wildlife friendly. Photodegradable netting is NOT acceptable.

C. Temporary silt fence fabric shall be in accordance with INDOT Specification 205.
D. Concrete Washouts shall be provided per the plan details.

PART 3 - EXECUTION

3.01 GENERAL

A. Erosion control practices shall be adequate to prevent erosion of disturbed and regraded areas.
B. Earthwork procedures shall be as specified in Section 02160.
C. Silt fences shall be located and staked as shown on the Drawings and/or as designated by the Engineer.
D. The Contractor is solely responsible for and shall provide silt fence, check dams, erosion control blanket concrete washouts and other adequate erosion control protection as required.
E. The Contractor shall maintain concrete washouts for washing of any concrete pouring or other equipment. Concrete shall not be washed into drainage or waterways or other areas other than the washouts themselves.
F. The Contractor shall install all materials in accordance with the manufacturer's directives.
G. The Contractor shall provide Erosion Control blanket on all areas disturbed by Linear Ditch Grading and on constructed slopes where the final slope is equal to or steeper that 3:1.

3.02 TEMPORARY SEEDING

A. This item shall consist of seeding a temporary cover of grass, or grass and small grain, in areas disturbed on the construction site which will not be redisturbed within a 14-day period. All disturbed grass areas which will remain undisturbed for this 14-day period shall receive temporary seeding. Temporary stockpiles shall also be temporarily seeded if left undisturbed for 14 days or more.
B. The seed mixtures to be used for temporary cover will be governed by the seeding specifications listed in Section 02936. The mixture of seeding shall be as follows:

C. Scientific Name	D. Common Name	E. Ounces/Acre
F. Avena sativa	G. Common Oat	H. 360.00
I. Lolium multiflorum	J. Annual Rye	K. 100.00
L.	M. Total	N. 460.00:

1. Lime will not be required for temporary seeding.
2. Fertilize at the rate of 400 pounds per acre of 10/10/10 fertilizer, or equivalent, broadcast uniformly on the area to be seeded.

3. All seed shall be broadcast evenly over the area to be seeded and cult packed or otherwise pressed into the soil. Seed and fertilizer may be mixed and applied after the seed has been prepared.
4. Mulch for temporary seeding will not be required except on those areas, in the Engineer's opinion, that are too steep to hold the seed without protective cover.
5. Water and maintain until the seed growth is well established for temporary protection.

3.03 MAINTENANCE OF CONTROLS AND PERFORMANCE

A. Erosion and sedimentation controls shall be inspected weekly and after significant rainstorms. Replace silt fencing, which is damaged, filter stone which is dislodged, erosion control blanket which is damaged, and make other necessary repairs.
B. Should any of the temporary erosion and sediment control measures employed by the Contractor fail to produce results consistent with normal and acceptable standards of the industry, the Contractor shall immediately take whatever steps are necessary to correct the deficiency at his own expense.
C. Remove all temporary erosion and sediment controls as final landscaping and grading is performed.

-END OF SECTION –

SECTION 022210

TRENCHING AND BACKFILLING

PART I - GENERAL

1.01 DESCRIPTION

A. This work includes excavation, trenching and backfilling for all electrical and related items.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Cast-in-Place Concrete: Section 033000.

1.03 CARE OF EXISTING STRUCTURES AND PROPERTY

A. All existing structures, utilities, and property near any excavation shall be supported and protected from damage by the Contractor during construction.

B. When other utilities, such as sewer, gas, water, or other pipes or conduits cross the excavation, the Contractor shall support said pipes and conduits without damage to them and without interrupting service. The manner of support such pipes, etc. shall be subject to review by the Owner, and if the item(s) are the property of a utility, by the utility company.

C. All property shall be thoroughly cleaned of all surplus materials, earth and rubbish placed thereon by the Contractor.

D. Any damage to structures, utilities and property resulting from the Contractor's work shall be promptly repaired by the Contractor. The quality of repair work shall meet the approval of the Owner and affected utility company.

1.04 EXISTING UNDERGROUND STRUCTURES

A. The Plans show the location of utilities based upon the best available information; however, the Owner does not accept any responsibility for the accuracy of this information, nor does he guarantee that all utilities within the work area are shown.

B. The Contractor shall notify the Owner, the Property Manager and the utility companies at least seventy-two (72) hours prior to the start of construction.

1. The utility companies are to locate existing underground utilities and structures within the site limits per directions from the Contractor.

2. The Contractor, prior to the start of construction, shall verify the location of existing underground utilities and structures within the site limits. It is the responsibility of the Contractor to make all exploratory investigation necessary to verify or locate the utility pipes, wires, structures, and appurtenances of others. The Contractor shall notify the Owner of any conflicts between the location of existing underground utilities or structures. Any conflicts found shall be recorded/documented by the Contractor.

PART II - PRODUCTS

Not Used.

PART III - EXECUTION

3.01 GENERAL TRENCHING

A. Unless otherwise directed or permitted, not more than one hundred feet (100') of any trench shall be open at any time.

B. During excavation, material satisfactory for backfilling shall be stockpiled at a safe distance from the banks of the trench to avoid overloading and to prevent cave-ins. Adequate drainage shall be provided by means of ditches, dikes, or other approved methods. Stockpiles shall be protected from contamination with unsatisfactory excavated material. If the Contractor fails to protect the stockpiles and the material becomes unsatisfactory, such material shall be removed and replaced with satisfactory on-site or imported material at no additional cost.

C. Trench excavation may be accomplished either manually or with mechanical trenching equipment. The blades of road patrols or graders shall not be used to excavate the trenches. The depth of trenches shall be a minimum of 2'-6" to allow minimum cable depth of 2'-0". The bottoms of trenches shall be smooth and free from all aggregate larger than ½". Bracing and sheathing shall be provided as necessary. If the excavation is below the required level, the excess excavated area shall be refilled with suitable backfill. The accumulation of water shall be prevented using pumps. When rocks or other granular material which might damage the cable are encountered, the excavation shall be backfilled with a 6-inch layer of sand or earth containing no particles that would be retained on a 1/4" sieve.

D. All suitable materials removed from the trench shall be used in refilling cable and conduit trenches. The backfill for trenches shall be placed in layers not to exceed 6 inches, loose measurement. The first layer shall be sand or earth containing no particles that would be retained on a 1/4" sieve. The second layer shall contain no particles that would be retained on a 1" sieve. Subsequent layers shall contain no particles that would be retained on a 3" sieve. The second layer and each subsequent layer shall be compacted with pneumatic hand tamps to the satisfaction of the Owner to prevent any future settlement of the backfilled area. Finish grading of earthwork shall be accomplished in a satisfactory manner. Materials authorized to be wasted shall be disposed of.

E. Dust conditions shall be kept to a minimum using water. Salt or calcium chloride shall not be permitted.

3.02 GENERAL EROSION CONTROL

A. Plan and execute construction and earth work by methods to control surface drainage from cuts and fills to prevent erosion and sedimentation. Keep to a minimum, the area of bare soil exposed at one time.

B. Seeding to protect disturbed areas shall occur as soon as reasonably possible following completion of earthwork activity.

C. Provide methods to control surface water, runoff, subsurface water, and water from excavations to prevent damage to the Work, the site, or adjoining areas.

D. The Contractor has full reasonability of inspecting the erosion control measures daily. At a minimum, practices need to be inspected weekly, within 24 hours after each storm event over ½ inch and daily during prolonged storm events. Failing practices shall be repaired or replaced immediately.

E. Comply with all federal, state statutes, rules, and regulations associated with control of storm water run-off from construction activities.

3.03 ROCK EXCAVATION

A. If encountered, the Contractor shall excavate rock as required for cable and conduit installation. He shall dispose of the excavated material and shall furnish suitable materials for backfill in place of the excavated rock. The cost of excavation and backfill shall be included in the contract bid amount.

B. Rock in trenches shall be excavated at a minimum of 6" below the cable depth of 2'-0", after it has been laid. Before the cable is laid, the trench shall be backfilled to the correct sub-grade with thoroughly compacted sand.

3.04 REMOVING MATERIAL

A. The Contractor shall remove all surplus material, re-grade and leave the site clear, free and in good order all roadways and sidewalks affected by the construction of the work. He shall maintain the surface over the trenches in good condition promptly fill all depressions during the warranty period.

B. Surplus or unsatisfactory excavated materials shall be properly disposed of off the site.

C. Excavated rock shall be disposed of off the site.

3.05 SEEDING

A. Seed mixture shall be classified as Seed Mixture "RU" in accordance with INDOT section 621.05(a).

B. Fertilizer shall be standard commercial fertilizer with an analysis of 12-12-12. Order in formula shall be 1) Total Nitrogen; 2) Available phosphoric acid; 3) Walter soluble potash.

C. Mulch for seeding shall be free from noxious weed seeds.

D. Installation

1. All areas to be seeded and transition areas will be raked and leveled to a smooth and uniform grade matching original ground elevation. Loosen soil to a depth of one to two inches below finish grade.

2. Install mulched seeding at a rate of 150 pounds per acre.

3. Install seeding in areas inaccessible to mechanical equipment, and small areas with a hand operated cyclone seeder and cover by hand raking to a depth of 1/4 inch.

4. Water seeded areas with a fine spray to a minimum penetration of 1 inch.

5. Fertilizer shall be applied in accordance with INDOT Section 621.04.

6. Mulch shall be applied to seeded areas at a rate to give a uniform blanket covering of 1/4 inch thick.

7. The Contractor shall not destroy empty seed and fertilizer containers without the permission of the Owner but shall retain them for inspection by the Owner to verify quantities of the materials.

END OF SECTION

SECTION 029230

LANDSCAPE GRADING

PART 1 - GENERAL

1.01 WORK INCLUDED

Final grading of topsoil for finish landscaping.

1.02 RELATED SECTIONS

Section 02160 - EARTHWORK
Section 02936 - SEEDING

PART 2 - PRODUCTS

A. Topsoil: Excavated Material free of rocks, roots larger than 1/2-inch, subsoil, debris and large weeds.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that trench backfilling has been inspected.
B. Verify substrate base has been contoured and compacted.

3.02 SUBSTRATE PREPARATION

A. Eliminate uneven areas and low spots.
B. Remove debris, roots, branches, stones, more than 1/2-inch in size. Remove subsoil.
C. Scarify subgrade to depth of 3-inches where topsoil is scheduled. Scarify areas where equipment is used for hauling and spreading topsoil and compacted subsoil.

3.03 PLACING TOPSOIL

A. Place topsoil in areas where seeding and planting are to occur to the thickness as scheduled. Place topsoil during dry weather.
B. Fine grade topsoil eliminating rough or low areas. Maintain profile and contour of subgrade.
C. Remove roots, weeds, rocks and foreign material while spreading.
D. Manually spread topsoil close to trees, plants and buildings to prevent damage.
E. Lightly compact placed topsoil.
F. Remove surplus subsoil and topsoil from site.
G. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.04 TOLERANCES

A. Top of topsoil; Plus, or minus 1/2-inch.

3.05 PROTECTION

A. Protect landscaping and other features remaining as final work.
B. Protect utilities and paving.

3.06 SCHEDULES

A. Compacted topsoil thickness at the following areas:
1. Seeded Grass: 3-inches.
2. Sod: 2-inches.

-END OF SECTION –

SECTION 029360

SEEDING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Seeding, mulching.
B. Maintenance.

1.02 RELATED SECTIONS

A. Section 02160 - EARTHWORK
B. Section 02923 - LANDSCAPE GRADING

1.03 DEFINITIONS

A. Weeds: Includes Dandelion, Jimsonweed, Quack grass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambs quarter, Chickweed, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimber Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.04 MAINTENANCE DATA

A. Includes maintenance instructions, cutting method and maximum grass height.

1.05 QUALITY ASSURANCE

A. Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

1.06 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for herbicide composition.
B. Provide certificate of compliance from authority having jurisdiction indicating approval of seed mixture.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division I.
B. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.
C. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.08 MAINTENANCE SERVICE

Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition for two cuttings.

PART 2 - PRODUCTS

2.01 SEED MIXTURES

A. Permanent Seed Mixture:
Shall be Mulch Seed Type of a cool season rye/bluegrass blend (150 lb. acre).

2.02 ACCESSORIES

Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.
Water: Clean, fresh and free of substance of water or matter which could inhibit vigorous growth of grass.
Erosion Fabric: Jute matting, open weave.
Stakes: Softwood lumber, chisel pointed.
String: Inorganic fiber.
Fertilizer: 12-12-12 Commercial Mixture.

PART 3 - EXECUTION

3.01 PREPARATION

Lawn: Till soil thoroughly to a minimum depth of 2". Apply fertilizer to soil at rate of 20 pounds per 1000 square feet immediately prior to seeding. Rake or lightly till fertilizer into soil. When topsoil is exceedingly dry, moisten to a depth of 4", 48 to 72 hours prior to start of seeding.
Perform watering to prevent run off.

3.02 SEEDING:

Sow seed uniformly over entire area in 2 operations at rate of 150 lbs. per acre. Apply the second seeding at right angles over the first. Seeding operation may be by broadcast method or drill equipment. Lightly cover seed by hand raking or dragging lawn areas to depth of 1/4". Smooth and firm seeded areas with a 200# roller and water with a fine spray. Cover all sloped areas (greater than 3 to 1 slopes) and other areas where erosion may occur with burlap erosion mat. Anchor securely in place. Mulch all seeded areas at a minimum rate of 1 Ton/acre. Mulch shall be held in place as the contractor will be responsible for replacing mulch which has blown away prior to adequate seeding germination. Mulch shall be held in place by one of the following methods.

1. Tilling or punching mulch into the soil.
2. Commercially produced mulch binder.
3. Binder twine fastened down with pegs spaced 6 feet or less apart.

4. Commercially produced polymeric plastic net held in place with wire staples.

3.03 LAWN ESTABLISHMENT

Provide daily maintenance until the lawn is well established. Provide necessary lawn care including fertilizing, weed eradication, watering, mowing, and removal of excess clippings and replacement of unsuitable sod.
Establishment period for lawns:
Seeded Lawns: extend until uniform stand of grass established over entire area.

-END OF SECTION-

SECTION 033000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. All cast-in-place concrete.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Trenching and Backfilling: Section 022210.
B. Concrete Reinforcement: Section 032000.

1.03 REFERENCE STANDARDS:

A. ACI - American Concrete Institute:
   1. ACI 301 - Structural concrete for building.
   2. ACI 305 - Hot weather concreting.
   3. ACI 306 - Cold weather concreting.
   4. ACI 318 - Building code requirements for reinforced concrete.
B. ASTM -American Society for Testing and Materials.
C. INDOT - Indiana Department of Transportation Standard Specifications.
D. All codes and specifications referenced herein shall refer to the current codes and specifications, including amendments, revisions, and addenda, in effect at the time of bid submittal.

1.04 SUBMITTALS:

A. Concrete Delivery Tickets
   1. THE CONTRACTOR SHALL SAVE ALL CONCRETE DELIVERY TICKETS AND DELIVER SUCH TICKETS TO THE OWNER OR HIS REPRESENTATIVE WHEN REQUESTED. FAILURE TO PROVIDE DELIVERY TICKETS AS SPECIFIED BELOW SHALL BE CAUSE FOR REJECTION OF CONCRETE WORK.
   2. Concrete delivery tickets for each batch of delivered concrete shall include the following information in accordance with ASTM C-94. All quantities shall be the total quantity batched in the delivery vehicle.
      a. Quantity of cement.
      b. Quantity of fine aggregate.
      c. Quantity of coarse aggregate.
      d. Quantity of each admixture.
      e. Initials of producer's representative.
      f. Sufficient information to determine the total quantity of free water.

B. Concrete mix designs shall be submitted to the designer at least 15 days prior to planned use. Submittals shall include the following information:
   1. Source of cement
   2. Source of aggregates
   3. Brand of each admixture

C. For concrete expected to be placed between May 1 and September 30, concrete mix designs shall be submitted for additional hot weather concreting. These shall outline any special provisions for controlling concrete temperature, aggregate moisture content, and set time. This shall be submitted 15 days prior to planned use for approval by the Designer.

D. Submit concrete compression test results to Designer. Tests shall be as specified in Part 3 Execution.

1.05 ALLOWABLE TOLERANCES: MAXIMUM FLOOR SLOPE SHALL NOT EXCEED 2%.

A. Plus, or minus 1/4 inch in 10 feet for all finishes and walls.

B. Plus, or minus 1/4-inch maximum deviation from required elevations except as noted below:

1. All transitions between adjacent slabs, pavements, and entries shall be smooth to prevent tripping hazards.
2. Slabs that are to positively drain such as pitched floors, walks, and pavements shall not contain low spots which pond water.

1.06 PRODUCT DELIVERY AND STORAGE:

A. Deliver all concrete in ready mix vehicles in accordance with ASTM C-94.
B. Handle concrete rapidly from mixer to form.
C. Use buckets, chutes, troughs, conveyors, and pipes to handle concrete without segregation. Concrete shall not be permitted to drop more than 12 inches.

1.07 CONTRACTOR'S OPTIONS

A. 6-inch-thick sidewalks and exterior slabs constructed on prepared subgrade may be substituted for 4-inch-thick sidewalks and exterior slabs constructed on 4 inches of granular fill.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Portland Cement: ASTM C-150, Type I or Type III.

B. Air-entraining Admixture: ASTM C-260.

C. Fine Aggregate

1. ASTM C-33 or INDOT 903.02 Class A.
2. Natural sand composed of clean, sound, hard, durable particles.
3. Graded per INDOT 903.01(g) size #23.

D. Coarse Aggregate:

1. ASTM C-33 or INDOT 903.02 Class A.
2. Crushed limestone, crushed dolomite, crushed gravel, or uncrushed gravel.

3. 1-inch maximum aggregate size graded per INDOT 903.02 (e) size #8.
4. 12-inch maximum aggregate size graded per INDOT 903.02 (e) size #5.

E. Admixtures:

1. ASTM C-494 or ASTM C-1017.
2. All brands of admixtures shall be submitted for approval by the designer.

F. Mixing Water: Clean, potable water free of oils, acids, vegetable matter, alkaline, and other harmful impurities.

G. Expansion Joint Filler:

1. Foam or sponge fillers:
   a. Pre-molded, resilient, compressible, non-extruding and non-staining.
   b. Polyethylene, polyurethane, neoprene, or polyvinyl chloride.
   c. Closed-cell construction with 25% compressibility at 15 psi distributed pressure.
   d. Compatible with joint sealant.

2. Cane Fiber Filler:
   a. Pre-molded board product.
   b. Asphalt impregnated.
   c. ASTM D-1751.
   d. Non-extruding.

3. Cork Filler:
   a. ASTM D-1752.
   b. Manufactured from granulated cork particles bonded in resin.
   c. Non-extruding.
   d. Compatible with joint sealant.

H. Joint Sealant:

1. One-part, neutral cure, low modules silicone.
2. ASTM C-920 type S, NS, Class 25.
3. Compatible with concrete and limestone substrates without primer.
4. Complies with Federal Specification TT-S-00227E, Type 1, Class A, + 50%, -50% joint movement, minimum 15 shore A hardness.
5. Color shall be gray-limestone tint.

I. Concrete Curing Compound:

1. Interior Concrete: ASTM C-309 Type 1, clear or translucent.
2. Exterior Concrete: ASTM C-309 Type 1, clear or translucent.

J. Concrete Hardener and dust proofer:

1. Shall be magnesium/zinc fluor silicate or sodium silicate liquid hardener which will chemically react with calcium carbonate and free lime in the concrete.
2. Acceptable Products are as Follows:

    a. Lapidolith by Sonneborn
    b. Sciolith by Chem Masters
    c. Permalith by L.M. Scofield Company
    d. Other equal brands

K. Vapor Barrier:
1. 6 mil (0.006 inch) polyethylene sheeting.
2. All punctures and holes shall be covered by additional sheets with at least 12" overlap on all edges. Tape all seams.

L. Fibers:
1. 100% virgin polypropylene, polyester or nylon fibers.
2. Collated and fibrillated fiber bundles.
3. 3/4" inch in length.
4. Polyester fibers shall be coated to not react with cement.

2.02 CONCRETE MIX:

A. Concrete shall be batched and delivered in accordance with ASTM C-94 and ACI-318 chapter 4 except as more detailed herein.

B. Concrete shall be proportioned by a water/cement ratio method based upon requirements for a plastic and workable mix. The maximum water to cement ratio by weight shall equal 0.40 based upon saturated, surface dry aggregates.

C. Minimum compressive strength at 28 days: 4000 psi.

D. Permissible slumps are as follows:

1. 4 inches to 7 inches where water reducing or super- plasticizing admixtures are used.
2. 1 inch to 2 inches where water reducing or super- plasticizing admixture are <u>NOT</u> used.

E. Minimum cement contents are as follows:

1. 1-inch maximum aggregate size: 475 pounds of cement per cubic yard.
2. 12-inch maximum aggregate size: 425 pounds of cement per cubic yard.

F. Air Entrainment: 5% to 7% by volume.

G. Concrete mix shall contain 12 pounds of polypropylene fibers, 1 pound of polyester fibers, or 1 pound of nylon fibers per cubic yard of concrete.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Notify Designer at least 48 hours before scheduled concrete placement.

B. Tamp all trench bottoms and slab subbases until firm. Compaction shall be as shown on the drawings or otherwise shown in these specifications.

C. In spec trench bottoms, slab subbases, and forms for proper expansion joints, and proper placement of embedded items.

D. Do not place concrete until the bearing surfaces under wall or column footings have been inspected and approved by the Designer or his representative.

E. Remove all ice, debris, and deleterious material from forms.

F. Remove all oils, grease, ice, debris, and other deleterious matter from reinforcement.

G. Remove all free water from the area of concrete placement unless tremie is used. The use of a tremie shall be approved in writing by the Designer prior to concrete placement.

3.02 CONCRETE PLACEMENT:

A. Moisten all forms, including earth, until surfaces are moist, but not wet. Remove all free water.

B. Conveying equipment, including scheduled truck deliveries, shall be capable of providing a supply of concrete at the site of placement without separation of ingredients and without interruptions sufficient to permit the loss of plasticity between successive placements.

C. Concrete shall be deposited as nearly as practicable to its final position to avoid segregation due to re-handling or flowing.

D. Concreting shall be always carried on at such a rate that the concrete is plastic and flows readily into the forms and around the reinforcement.

E. No water shall be added to the concrete at the job site. Concrete which can not be placed and finished shall be removed from the project site at no cost to the Owner.

F. After concreting is started, it shall be carried on as a continuous operation until placing of a panel or section as defined by its boundaries or predetermined joints is completed.

G. All concrete shall be thoroughly consolidated by suitable means, such as spading, rodding and vibrating, during placement. Concrete shall be thoroughly worked around reinforcement, around embedded fixtures, and into corners of forms. Concrete shall not be over consolidated as to cause segregation or bleeding.

H. When placing concrete on sloped surfaces, placement shall begin at the lower end of the structure and proceed uphill with each successive placement thoroughly consolidated with the previous placement.

3.03 JOINTING:

A. Concrete contraction joints shall be installed in all slabs of pavements, and walks.

B. Concrete contraction joints shall be constructed to the following depths:

1. 4-inch-thick slabs: 1 inch depth.
2. 6-inch-thick slabs: 2-inch depth.
3. 8-inch-thick slabs: 2-inch depth.

C. Concrete contracting joints may be formed by tooling, sawing, insertion and removal of joint formers, or insertion of stay-in-place crack inducers.

1. Tooled joints shall be formed with clean tools having a maximum 1/16-inch radius at the joint bottom.
2. Sawn joints shall be 1/4“wide.
3. Insertion devices shall be a maximum of 1/4" wide with a pointed bottom.
4. Crack inducers shall be constructed of polyvinyl chloride with a maximum width of ¼-inch.

D. Expansion joints shall be installed at all locations indicated on the drawings and at all columns, piers, posts, manholes and walls. The maximum spacing of expansion joints in concrete floors and slabs shall not exceed the maximum allowed in the Indiana Building Code and the American Concrete Institute Standards.

1. All Expansion Joints in Concrete Walks and Connections of Concrete Walks and Entrance Slabs shall have a minimum of 3 evenly spaced 5/8” diameter by 8-inch-long dowels through the joint unless otherwise indicated. One end of the dowel shall be sleeved or wrapped to prevent the concrete from bonding to the dowel.

E. Expansion joint widths shall be as indicated on the drawings with a minimum width of 2 inches.

F. Expansion joints shall be sealed to prevent the intrusion of dirt and moisture. Sealant shall be compatible with joint filler, and all surfaces shall be primed according to manufacturer’s recommendations.

G. All construction joints shall be installed as expansion joints

3.04 CURING:

A. Start curing immediately after finishing and as soon as concrete is sufficiently stiff to not be damaged by curing covers.

B. Cure concrete for a minimum of seven days.

C. Protect concrete from heavy rain, mechanical injury, injurious action of sun, and injurious action of wind.

D. Do not use dry sand or cement to take up excess free water.

E. All concrete on this project shall be cured by either the wet method or with curing compounds.

F. Wet Curing:

1. Cover exposed concrete surfaces with clean, moist burlap sheets, with clean, moist blankets, or with clean plastic sheeting.
2. Support edges of burlap, blankets, or plastic sheets to keep them from blowing for the entire curing period.
3. Keep burlap or blankets continuously moist with the use of foggers, sprayers, misters, or sprinklers.

G. Membrane Curing:

1. Apply curing compound with pressure spraying equipment in sufficient thickness as recommended by the manufacturer to form an effective water seal.

3.05 HOT WEATHER CONCRETING:

A. Hot weather concrete provisions shall be in effect whenever the air temperature is above 80^{o} or above 75^{o} F. and rising, or whenever the concrete temperature is above 80^{o} F.

B. Concrete mixes for hot weather concreting shall include set retarding admixtures, water reducing and set retarding admixtures, or high range water reducing and set retarding admixtures.

C. In addition to the information required in 1.04 (A), delivery tickets shall include the following information:
1. Time of batching.
2. Time of arrival at the job site.
3. Time of last concrete placement.
4. Temperature at time of first delivery.
5. Moisture contents of both coarse and fine aggregates.

D. No concrete shall be accepted with a temperature over 99^{o} F. at delivery to the job site.

E. Concrete shall be placed in accordance with ACI-305.

F. Protect concrete from rapid moisture evaporation before and after finishing by providing wind breaks, by covering it with polyethylene sheeting, or by water misting.

3.06 COLD WEATHER CONCRETING:

A. Cold weather concrete provisions shall be in effect whenever the temperature is below 40° F. or below 50° F. and falling.

B. Concrete shall be placed in accordance with ACI-306.

C. Methods of heating materials and protecting concrete shall be approved by the Designer prior to placing concrete.

D. The use of salts, chemicals or foreign materials mixed with concrete to prevent freezing is prohibited.

E. The Contractor shall provide blankets, insulation and protective coverings to ensure concrete temperatures do not fall below 70° F. for 3 days after placing, or do not fall below 50° F. for 5 days after placing.

3.07 FIELD QUALITY CONTROL TESTS:

A. Contractor shall have copies of ASTM C-31, ASTM C-39, and ASTM C-145 at the job site. Personnel shall be familiar with sampling and testing requirements of these standards.

B. Concrete Compression Tests:

1. Make test cylinders and test them in accordance with ASTM C- 31 and ASTM C-39.
2. Testing shall be done by an independent laboratory approved by the Designer. Cylinders shall be delivered to the laboratory within 24 hours of sampling.
3. Provide one set of three cylinders for each 27 cubic yards of concrete placed in one day. Provide a minimum of two sets of three cylinders for each day of concrete placement.
4. One cylinder of each set shall be broken at 7 days, one cylinder broken at 28 days, and one cylinder reserved.
5. Contractor shall be responsible for payment of such tests and shall furnish necessary equipment.

C. Concrete Slump Tests:

1. Make tests at the time and place of concrete placement and in accordance with ASTM C-143.
2. Make tests periodically and as often in the opinion of the Designer or his representative when a change in consistency of the concrete is noted.
3. During hot weather, each batch of concrete shall be tested.
4. The Contractor shall provide slump cone, rods, and other necessary equipment to perform the test.

D. Temperature Tests:

1. The temperature of concrete for each slump test shall be required.

3.08 FINISHING:

A. All concrete floor surfaces shall receive Concrete Hardener and Dust Proofing. Application shall be in accordance with the manufacturer's printed instructions.
B. Interior slabs shall be finished with a wood float finish.
C. Exterior walks and slabs shall be finished with a light broom finish, or a wood float finish.
D. Brooming shall remove all tooling marks left by edgers or jointers.
E. All exposed edges shall be tooled to a 3-inch radius.
F. Curbs and exposed wall surfaces shall have all fine and irregular projections removed. Form tie holes and other cavities shall be saturated with water and filled with a mortar of fine aggregate, cement, and water.
G. Ramps (slopes greater than 1:20 or 5% gradient) shall be tinned with 0.09 inch to 0.013-inch-wide grooves 0.12 to 0.19 inches deep at approximate 3/4-inch centers. Grooves shall be transverse in the direction of the ramp.
H. All areas which have a drain shall have the concrete surfaces sloped as indicated on the drawings, but not less than 1/8" per foot and not more than 1:50
I. All areas with drains shall have positive drainage without ponding. All areas which have ponding shall be removed and replaced with new concrete.

END OF SECTION

SECTION 114400

FOOD COOKING EQUIPMENT - GRILL

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Installation of ADA Swing-Away Grill Fire Ring Manufactured by Indiana Correctional Industries

1.2 RELATED REQUIREMENTS

A. 30” diameter ring with 20”x 18” cooking surface 18” high. Constructed of 3/16” steel.

1.3 SUBMITTALS

A. Submittal Procedures: Section 013323, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
B. Product Data:
   1. Manufacturer's data sheets on each product to be used.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Typical installation methods.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum five years documented experience.

B. Installer Qualifications: Company specializing in performing Work of this section with minimum two years documented experience with projects of similar scope and complexity.

C. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.

1.5 PRE-INSTALLATION CONFERENCE

A. Convene a conference approximately two weeks before scheduled commencement of the Work. Attendees shall include Architect, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store and handle in strict compliance with manufacturer's written instructions and recommendations.
B. Protect from damage due to weather, excessive temperature, and construction operations.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.8 WARRANTY

A. Manufacturer's standard limited warranty unless indicated otherwise.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Indiana Correctional Industries, which is located at: 1110 South Vestal Drive, Plainfield, IN 46168 Toll Free Tel: 800-736-2550 Website: https://www.in.gov/idoc/indianacorrectionalindustries/files/JUN-2020-ICI-Product-Catalog.pdf
B. Substitutions: Not permitted.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.
   1. Protect existing construction and completed work from damage.
   2. Prevent damage from contact with fire brick and cement.
   3. Clean area and remove contaminants capable of affecting subsequently installed product's performance.

3.2 INSTALLATION - GENERAL

A. Install products according to manufacturer's instructions and approved submittal drawings.
   1. Installation Tolerances:
      a. Finished surface true to plane within 1 mm in 1000 mm (1/8 inch in 10 feet), non-cumulative.
      b. Joint width deviation maximum 25 percent of dimension indicated.

B. Cleaning

   1. Remove excess mortar before fully set.
   2. Clean exposed brick and mortar surfaces. Remove contaminants and stains.

C. Protection

   1. Protect brick paving from traffic and construction operations.
   2. Cover brick paving with reinforced kraft paper, and plywood or hardboard.
   3. Remove protective materials immediately before acceptance.
   4. Repair damage.

END OF SECTION

SECTION 260100

BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 SCOPE:

A. The Contractor shall furnish all supervision, labor, equipment, materials, tools and supplies to install electrical distribution panels, disconnect switches, pedestals and all U.G. conduit and conductors for a complete installation as shown on the Drawings and as specified herein. The work includes, but is not limited to the following:

1. All Demolition and removal of existing equipment.
2. Trenching and backfilling for installation of new U.G. conductors.
3. Concrete work as shown.
4. Installation of electrical distribution panels, disconnect switches, power panel outlets and U.G. conduits and conductors.
5. Installation of pads, bases, and anchors; and all platforms and supporting stands for electrical equipment.
6. Repair and return to original condition any existing facilities damaged in the process of completing this work.

Determine required location, arrangement and quantities of equipment and materials from Drawings. The Drawings are generally diagrammatic and indicate the general design and arrangement of the proposed work. The Contractor shall familiarize himself with the Drawings and shall be responsible for the final locations of his equipment to suit field conditions encountered and to avoid interference, without extra cost to the Owner. The Owner reserves the right to make minor changes in equipment location prior to roughing-in of the electrical work without any additional cost to the Owner.

1.02 GENERAL:

A. The approximate location of existing utilities and other obstacles that might interfere with this work are shown on the Drawings. The locations are shown to the best of the Owner's knowledge, and it shall be the contractor's responsibility to determine the exact locations and plan the work accordingly.

B. Certain portions of the work hereinafter described might necessarily be done by the utility company furnishing the power of the property affected. Any costs, whatsoever, that might be charged by the Utility Company for their work and/or materials shall be paid by the Contractor and the cost(s) shall be included as a part of this contract.

C. It is recommended that the successful low bidder notify the affected utility company that this work shall begin upon the bidder's receipt of the contract so that scheduling can be made accordingly.

D. Some of the installation to be performed by the Contractor will require moving machinery and/or inventory out of the way to make room to work. The property personnel will be responsible for providing clearance.

1.03 CODES AND STANDARDS:

A. All electrical work installed under this contract shall conform to current codes and standards listed

here and all applicable requirements of Federal, State and Local Authorities having jurisdiction, including the latest OSHA requirements.

B. All installations shall conform to all requirements of the following:

1. Indiana Electrical Code - NFPA Electrical Code - NEC (latest edition in effect at time of awarding contracts). Certify in writing, after completion of all punch list items, that all systems and workmanship conform to the named edition of the National Electrical Code.
2. Indiana Fire Prevention Code - International Fire Code - IFC
3. Indiana State Construction Industry Safety Code.
4. All Laws, Ordinances, Rules and Regulations in effect in/or by the State of Indiana and as required by Indiana Administrative Building Council and Local Authority having jurisdiction.
5. Respective utility providing electric and communication service.

C. Certain portions of the work as shown on the drawings and hereinafter specified shall exceed NEC minimum requirements however, all other work, materials and methods shall be no less than NEC minimums. Anything less than the NEC requirements and these specifications shall be rejected work.

D. Standards:

1. Underwriter's Laboratories, Inc. Labeling shall be provided where specified for specific items.
2. All materials shall be manufactured and tested in accordance with latest editions of U.L., NEMA, ANSI, ASA, AIEE and IPCIA Standards.
3. Owner's Requirements and Regulations, pertaining to safety, fire, conduct, parking, sanitary conditions, smoking, etc. shall be strictly adhered to by Contractor and his employees and sub-Contractors on the job.

1.04 WORKMANSHIP:

A. All materials and equipment shall be installed in accordance with the manufacturer's recommendations, as approved by the Engineer to conform with the Contract Documents.

B. The finished product shall be complete and functional. Where the term "Provide" is used in these Specifications, it shall mean to furnish, install and connect, unless otherwise stated.

C. All work under this section shall be performed by or under the direction of a licensed electrician.

1.05 PRODUCT STORAGE:

A. Conduit, fittings and boxes shall be stored on job site in such manner as to prevent damage and keep dirt and foreign matter from getting into product.

B. Equipment, apparatus, accessories and instruments shall be stored on job site, in original cartons or otherwise protected, in such a manner as to prevent weather damage or breakage, with openings covered to keep out dirt and foreign matter.

C. Wire and cable shall be stored on job site; in factory cartons or on spools, protected in such a manner as to prevent weather, heat or mechanical damage.

1.06 SUBMITTALS:

A. Submit shop drawings for all equipment specified in conformance with Section 013400. The submittal must include a written statement of exceptions and deviations from these specifications.

B. Shop drawings shall include complete data including physical dimensions and other information required for installation, performance capabilities and limitations, equipment wiring diagrams complete with sequence of operation, and schedules indicating locations when more than one type of an item is to be used. All shop drawings must be certified as being correct for the proposed work.

C. Shop drawings, brochures or catalog cuts showing more than one size or model shall be marked to indicate the size or model proposed for the application.

D. Prior to submittal, shop drawings shall be coordinated with the work of all other trades.

E. Shop drawings shall be identified as to the specific equipment. Identification shall be by reference to equipment designations as shown on the Drawings or by reference to the appropriate Article of the Specifications in which the equipment is specified.

1.07 INSTRUCTION MANUALS:

A. Three sets of Instruction Manuals shall be furnished to the Designer prior to acceptance with each set to include the following:

1. Manufacturer□s parts list identified with the make, model and serial number of the equipment furnished.

2. Schematic control and wiring diagrams identifying the location and function of all system components and controls.

3. Installation, operation, lubrication and maintenance instructions.

4. Manufacturer□s recommended spare parts list.

5. Test data and performance curves where applicable.

1.08 WORK VERIFICATION AND FIELD MEASUREMENTS:

A. All dimensions and clearances affecting the installation of work shall be verified in the field in relation to established datum, to building openings and to the work of other trades.

B. Location of all equipment and systems shall be coordinated to preclude interferences with other construction.

C. Should interferences occur which will necessitate deviations from layout or dimensions shown on the Drawings, the Designer shall be notified and any changes approved before proceeding with the work.

1.09 RECORD DRAWINGS:

A. A record shall be kept of all deviations in location or elevation of any underground or concealed installation from that shown on the Contract Drawings. Records shall consist of marked shop or Contract Drawings and shall be submitted to the Designer at any time upon request during or after

completion of construction. No such deviations from the Contract Drawings or approved shop drawings shall be made without prior approval by the Designer.

1.10 ACCESSIBILITY:

A. All work shall be installed to be accessible for operation, maintenance and repair with particular attention given to locating valves, controls and equipment requiring periodic lubrication, cleaning, adjusting or servicing of any kind. Access panels shall be provided when work is built in or concealed.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT:

A. All materials shall be new unless use of an existing item is indicated on Drawings or permitted in writing by Designer, best grade of each representative type. All conductors, raceways, devices, etc. shall be, as a minimum, of service class and capacity suitable for location and load for which they will be used. All materials shall be of domestic manufacture and shall comply with Codes and Standards as described herein.

B. Materials and equipment shall be furnished as specified in this Section and shall be in strict accordance with applicable ANSI, NBS, ASTM, NESC, NEMA, IEEE, IPCEA, UL, NEC, OSHA and NFPA standards. Manufacturer's products referred to in this Division shall establish minimum requirements for materials and equipment furnished for this installation.

PART 3 - EXECUTION

3.01 FASTENING TO BUILDING STRUCTURES:

A. The methods of attaching or fastening equipment or equipment supports or hangers to the building structure shall be approved by the Owner.

B. Cutting, burning, drilling, welding or the use of explosive driven fasteners on building structures shall require prior approval by the Designer for each type of application unless specifically shown on the Drawings.

3.02 MISCELLANEOUS WORK:

A. Excavation and backfilling for electrical work shall be the responsibility of the Electrical Contractor and shall meet the requirements of Section 022210: Trenching and Backfilling.
B. The Electrical Contractor shall provide all pads, bases and anchors required to complete the electrical work.
C. The Electrical Contractor shall provide all platforms and supporting stands for electrical equipment required to complete his work.

3.03 SERVICE TIE CONNECTIONS:

A. Contractor shall check and verify all voltage and phasing of service tie connections at switchboards.

B. Phasing to be maintained shall be A.B.C. top to bottom, east to west and north to south in all cases.

3.04 ELECTRICAL CONNECTIONS TO EQUIPMENT:

A. All equipment shall be wired completely in each detail, including all interlocks, safety switches, control devices, starters and disconnects.

B. Drawings include equipment anticipated to be furnished; however, in case other makes, etc., are furnished than shown, the furnished equipment shall be wired completely as required at no additional cost to the Owner. Any additional shall be borne by the Contractor furnishing the equipment.

C. All connections and wiring diagrams where shown on the Contract Documents are for bidding purposes only and the Electrical Contractor shall obtain final wiring diagrams from the Contractor furnishing the equipment. Diagrams as supplied shall be specifically for this Project.

D. Conduits and wires where shown on the Contract Documents are for bidding purposes. Electrical Contractor shall verify all wire sizes, number of wires required, and supply the proper number to each piece of equipment before installation.

3.05 NAMEPLATES:

A. All equipment shall have factory applied permanent nameplates indicating the manufacturer's name, model and serial numbers, voltage, current, phase and any other data necessary to conform with specified requirements.

B. In addition to the factory applied nameplate, the Contractor shall furnish and install identification plates on the exterior of all panels. For Example: Panel A Identification plates shall be laminated phenolic engraving stock a minimum of 1/16 - inch thick, white background black letters. Letters shall be no smaller than 2 inches tall. Identification plates shall be attached with drive pins or rivets.

3.06 PAINTING AND FINISHING:

A. All purchased equipment shall have a factory applied standard finish of the manufacturer's standard color unless otherwise specified.

B. Equipment which will be subject to abnormal conditions of high temperature, corrosive environment, etc., shall have finishes and/or protective coatings suitable for the service as noted on the Drawings and/or in the Specifications.

C. Finishes which are marred during shipping, handling or installation shall be touched up to match the original finish. Finish shall be satisfactory to the Owner or the unit shall be completely repainted.

D. Field fabricated bare iron or steel items required in installation of work under this Division shall have rough or shape edges removed, be thoroughly cleaned of dirt, rust, weld slag, grease or oil and be painted with one coat of Red Oxide primer and two coats of Exterior Enamel. Color shall be selected by the Designer.

E. All exposed galvanized surfaces, supports, panels, conduits, etc. shall be thoroughly cleaned of dirt and oil and be given a vinyl wash primer, then one coat of zinc dust primer and one coat of exterior enamel. Color as selected by the Owner.

3.07 IDENTIFICATION:

A. Underground-Type Plastic Line Markers: Manufacturers standard permanent, bright-colored, continuous-printed plastic tape, intended for direct-burial service; not less than 3" wise x 4 mils thick. Provide red tape with black printing reading: CAUTION ELECTRIC LINE BURIED BELOW.

B. Manufacturers:

1. Seton Name Plate Corp.

2. Allen Systems, Inc.

3. Emed Co., Inc.

4. Linetec, Inc.

END OF SECTION

SECTION 260519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. Connectors, splices, and terminations rated 600 V and less.

B. Product Schedule: Indicate type, use, location, and termination locations.

1.2 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

All conductors shall be copper.

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

C. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

D. Conductor Insulation:

1. Type USE-2: Comply with UL 854. **Use for all direct burial applications.**
2. Type THHN and Type THWN-2: Comply with UL 83. Use in conduit for all indoor applications.

E. Signaling Line Circuits: Twisted, shielded pair, size as recommended by system manufacturer.

2.2 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

C. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

1. Material: Copper.
2. Termination: Compression.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

C. Ground wires: #3 copper, or larger where required by NEC and application.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type USE, single conductor in raceway.

B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway OR Underground feeder cable, Type UF where allowed by code.

E. Exposed Branch Circuits, Including in Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Most applications--Type THHN/THWN-2, single conductors in raceway OR Metal-clad cable, Type MC; Residential only-- Nonmetallic-sheathed cable, Type NM.

A. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway OR Underground feeder cable, Type UF where allowed by code.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.

3.4

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor and identify as spare conductor.

3.6 INSULATION TESTS

A. Test and record insulation resistance of all circuits. Megger readings must be taken before energizing a circuit. When the insulation resistance tests less than 5,000,000 ohm, the

Contractor shall investigate causes and take remedial action to prevent damage to circuits. The megger test set shall have voltage rating as indicated below.

1. 125 to 1000V insulation 500V test set

B. All reports shall be certified and submitted to the Designer as shop drawings.

END OF SECTION 260519

SECTION 260526

GROUNDING AND BONDING FOR CAMPGROUND ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes grounding and bonding systems and equipment as/where required by the Indiana Electrical Code in a manner compliant with Code and manufacturer's instructions, plus the following special applications:

1. Underground electrical distribution including transformers.
2. Campground pedestals and panels—minimum #3 bare copper throughout for each circuit; larger where specified or required by Code.
3. Existing campground comfort stations.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product including conductors, ground rods and ground clamps.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans showing locations/details of grounding features.

B. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1. Plans showing as-built, dimensioned locations of:

a. Ground rods.
b. Ground rings.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 CONDUCTORS

A. Bare Copper Conductors(minimum size #3—larger where required by code or shown elsewhere in contract documents):

1. Stranded Conductors: ASTM B8.

2.3 CONNECTORS

A. Conduit Hubs: Mechanical type, terminal with threaded hub.

B. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.

2.4 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel, 3/4 inch by 10 feet.

B. Ground Plates: 1/4 inch thick, hot-dipped galvanized.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install stranded conductors unless otherwise indicated.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.

C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

3.4 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits…….
5. Flexible raceway runs.
6. Armored and metal-clad cable runs.
7. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

3.5 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.

2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

3.6 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal and at individual ground rods. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

4. Prepare dimensioned Drawings locating each ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

B. Grounding system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 260526

SECTION 260533

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Metal wireways and auxiliary gutters.
3. Surface raceways.
4. Boxes, enclosures, and cabinets.
5. Handholes and boxes for exterior underground cabling.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Metal Conduit: **ALL ABOVE-GROUND CONDUIT SHALL BE METALLIC**

1. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. GRC: Comply with ANSI C80.1 and UL 6.
3. IMC: Comply with ANSI C80.6 and UL 1242.
4. EMT: Comply with ANSI C80.3 and UL 797.
5. FMC: Comply with UL 1; zinc-coated steel.
6. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

B. Metal Fittings: Comply with NEMA FB 1 and UL 514B.

1. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Fittings, General: Listed and labeled for type of conduit, location, and use.
3. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.

4. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

2.2 BOXES, ENCLOSURES, AND CABINETS

A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

D. Metal Floor Boxes:

1. Material: Cast metal.
2. Type: Fully adjustable**.**
3. Shape: Rectangular.
4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

F. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.

G. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

H. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

I. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic.
3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

J. Cabinets:

1. NEMA 250, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Configuration: Designed for flush burial.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "ELECTRIC."
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: IMC.
3. Underground Conduit: RNC, Type EPC-40-PVC, Type EPC-80-PVC.
4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated.

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC Raceway locations include the following:

    a. Loading dock.
    b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    c. Mechanical rooms.
    d. Gymnasiums.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: GRC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 1/2-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use setscrew fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Do not install raceways or electrical items on any "explosion-relief" walls or rotating equipment.

C. Do not fasten conduits onto the bottom side of a metal deck roof.

D. Keep raceways at least 6 inches from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of change in direction.

G. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.

H. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

I. Support conduit within 12 inches of enclosures to which attached.

J. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Arrange raceways to keep a minimum of 1 inch of concrete cover in all directions.

4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.

K. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

L. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

M. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

N. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

O. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

P. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

Q. Surface Raceways:

1. Install surface raceway with a minimum 2-inch radius control at bend points.
2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

R. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.

S. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Conduit extending from interior to exterior of building.
4. Conduit extending into pressurized duct and equipment.
5. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.

6. Where otherwise required by NFPA 70.

T. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg. F and that has straight-run length that exceeds 25 feet.
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
    d. Attics: 135 deg F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per degree F of temperature change for PVC conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

U. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 36 inches of flexible conduit for recessed and semi-recessed luminaires**,** equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

V. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

W. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between the box and cover plate or the supported equipment and box.

X. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

Y. Locate boxes so that cover or plate will not span different building finishes.

Z. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

AA. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

BB. Set metal floor boxes level and flush with finished floor surface.

CC. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit.
2. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction.
3. Install manufactured duct elbows for stub-up at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
    b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

5. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

D. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLAION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies.

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Color and legend requirements for raceways, conductors, and warning labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes and stencils.
5. Tags.
6. Signs.
7. Cable ties.
8. Paint for identification.
9. Fasteners for labels and signs.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1.

B. Comply with NFPA 70.

C. Comply with ANSI Z535.4 for safety signs and labels.

D. Comply with NFPA 70E for arc-flash warning labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg. F.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

B. Color-Coding for Phase and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder and branch-circuit conductors.

1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG.

2. Colors for 208/120-V Circuits:

a. Phase A: Black.
b. Phase B: Red.
c. Phase C: Blue.

3. Colors for 240-V Circuits:

a. Phase A: Black.
b. Phase B: Red.

4. Colors for 480/277-V Circuits:

a. Phase A: Brown.
b. Phase B: Orange.
c. Phase C: Yellow.

5. Color for Neutral: White.
6. Color for Equipment Grounds: Bare copper or green.
7. Colors for Isolated Grounds: Green with two or more yellow stripes.

C. Warning Label Colors:

1. Identify system voltage with black letters on an orange background.

D. Warning labels and signs shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."

2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

E. Equipment Identification Labels:

1. Black letters on a white field.

2.3 LABELS

A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

B. Snap-around Labels: Slit, pre-tensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameter and that stay in place by gripping action.

C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil-thick, polyester flexible label with acrylic pressure-sensitive adhesive.

1. Self-Lamination: Clear; UV- weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
2. Marker for Labels: Permanent, waterproof, black ink marker recommended by tag manufacturer.
3. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

D. Self-Adhesive Labels: Polyester transfer-printed, 3-mil-thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Minimum Nominal Size:

a. 1-1/2 by 6 inches for raceway and conductors.
b. 3-1/2 by 5 inches or equipment.

2.4 BANDS AND TUBES

A. Snap-around, Color-Coding Bands: Slit, pre-tensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameters sized to suit diameter and that stay in place by gripping action.

B. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameters of and shrunk to fit firmly around item being identified. Full shrink recovery occurs at a maximum of 200 deg. F. Comply with UL 224.

2.5 TAPES AND STENCILS

A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils thick by 1 to 2 inches wide; compounded for outdoor use.

C. Tape and Stencil: 4-inch-wide black stripes on 10-inch centers placed diagonally over orange background and is 12 inches wide. Stop stripes at legends.

D. Floor Marking Tape: 2-inch-wide, 5-mil pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

E. Underground-Line Warning Tape:

Tape:

a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical utility lines.
b. Printing on tape shall be permanent and shall not be damaged by burial operations.
c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

F. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

2.6 TAGS

A. Write-on Tags:

1. Polyester Tags: 0.010 inch minimum thickness, with corrosion-resistant grommet and cable tie for attachment.
2. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
3. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.7 SIGNS

A. Baked-Enamel Signs:

1. Preprinted aluminum signs, high-intensity reflective, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal Size: 7 by 10 inches.

B. Metal-Backed Butyrate Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396-inch galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal Size: 10 by 14 inches.

C. Laminated Acrylic or Melamine Plastic Signs:

1. Engraved legend.
2. Thickness:

    a. For signs up to 20 sq. in., minimum 1/16 inch thick.
    b. For signs larger than 20 sq. in., 1/8 inch thick.
    c. Engraved legend with black letters on white face.
    d. Punched or drilled for mechanical fasteners with 1/4-inch grommets in corners for mounting.
    e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.8 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 Deg F according to ASTM D638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 Deg F according to ASTM D638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black.

C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 Deg F according to ASTM D638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F.
5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

G. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

H. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

I. System Identification for Raceways and Cables over 600 V: Identification shall completely encircle cable or conduit. Place adjacent identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

J. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

K. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment used for power transfer.

L. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

M. Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the wiring system legend and system voltage. System legends shall be as follows:

1. "EMERGENCY POWER."
2. "POWER."
3. "UPS."

N. Vinyl Wraparound Labels:

1. Secure tight to surface at a location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.

O. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.

P. Self-Adhesive Wraparound Labels: Secure tight to surface of raceway or cable at a location with high visibility and accessibility.

Q. Self-Adhesive Labels:

1. On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.

R. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.

S. Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.

T. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.

U. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.

Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

V. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

W. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.

X. Underground Line Warning Tape:

1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.
2. Limit use of underground-line warning tape to direct-buried cables.
3. Install underground-line warning tape for direct-buried cables and cables in raceways.

Y. Write-on Tags:

1. Place in a location with high visibility and accessibility.
2. Secure using general-purpose cable ties.

Z. Baked-Enamel Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on minimum 1-1/2-inch-high sign; where two lines of text are required, use signs minimum 2 inches high.

AA. Metal-Backed Butyrate Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on minimum 1-1/2-inch- high sign; where two lines of text are required, use signs minimum 2 inches high.

BB. Laminated Acrylic or Melamine Plastic Signs:

1. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on minimum 1-1/2-inch- high sign; where two lines of text are required, use signs minimum 2 inches high.

CC. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.2 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive raceway labels.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

D. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.

E. Workspace Indication: Apply floor marking tape to finished surfaces. Show working clearances in the direction of access to live parts. Workspace shall comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

F. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.

G. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive equipment labels.

1. Apply to exterior of door, cover, or other access.
2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:

a. Power-transfer switches.
b. Controls with external control power connections.

H. Arc Flash Warning Labeling: Self-adhesive labels.

I. Operating Instruction Signs: Self-adhesive labels.

J. Emergency Operating Instruction Signs: Self-adhesive labels with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions at equipment used for power transfer.

K. Equipment Identification Labels:

1. Indoor Equipment: Self-adhesive label.
2. Outdoor Equipment: Laminated acrylic or melamine sign.

END OF SECTION 260553

SECTION 261450

CAMPGROUND ELECTRICAL PEDESTALS

PART 1 - GENERAL

1.01 DESCRIPTION:

A. The work required under this Section includes, but is not limited to, furnishing and installation of all power outlet panels shown on the drawings and required herein.

1.02 SUBMITTALS:

A. Submit shop drawings and maintenance data for all equipment specified in this Section.

PART 2 - PRODUCTS

2.01 CAMPGROUND ELECTRICAL PEDESTALS:

A. Campground electrical pedestals shall be specifically designed and manufactured for recreational vehicle parks. Unit shall have all copper conductor interiors.

B. Unit shall be of all metal construction and shall be pedestal mounted. Pedestal shall be constructed of not less than 14-gauge steel. Pedestals shall be phosphate treated and finished with baked enamel. Unit shall be raintight when in use.

C. Mains shall be rated at not less than 100 amps. Main lugs shall be provided for loop feed wiring and shall accept copper conductors from #6 to 250 KCMIL. Ground lugs shall accept #10 thru #2 copper conductors.

D. Units shall be equipped with one 20 amp, 1 pole GFCI circuit breaker connected to one Duplex 20 amp receptacle NEMA 5-20R, one 30 amp, 1 pole circuit breaker connected to one single 30 amp receptacle NEMA 5-30R both 125 volt, 2 wire with grounding ANSI C73 13-1972 and, one 50 amp, 2 pole circuit breaker connected to one single 50 amp receptacle NEMA 14-50R 125/250 volt, 3 wire with grounding ANSI C73.12-1972. A 20 Amp GFCI receptacle is not an acceptable substitute for the GFCI circuit breaker required.

E. The trip point for the GFCI circuit breaker shall be set at. Not less than 4 ma. nor more than 6 ma.

F. Provide an auxiliary stabilizer foot for the pedestal.

G. Panel door shall be equipped for padlock.

H. All conductors inside unit shall be made from soft drawn lake copper.

I. Units shall be equal in all respects to Midwest Electric Products, Inc. Model UO75GP6-Cu. Approved equals: Square D and Milbank.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Panels and pedestals shall be installed in complete accordance with manufacturers installation instructions, contract drawings, and the Indiana Electrical Code.
B. Perform operational testing in accordance with manufacturer's directions and the Indiana Electrical Code. Verify ground connection and polarity of all receptacles.
C. Identify each campsite pedestal with the campsite number by installing an identification label on the front side of the front cover. Use 2" black lettering w/silver reflective vinyl background by Hillman or Ky-Ko. Protect the numbers by installing a ¼" Lexan 4"x7" clear U.V. resistant shield. Secure to lid using (4) pop rivets, one at each corner. Seal top of the shield using a clear RTV caulk.

END OF SECTION

SECTION 261600

PANELBOARDS

PART 1 - GENERAL

1.01 DESCRIPTION:

A. The work required under this Section includes, but is not limited to, the furnishing and installing of all panelboards shown on the drawings and specified herein.

PART 2 - PRODUCTS

2.01 CONSTRUCTION:

A. Where indicated on the Drawings, provide a dead-front, panelboard incorporating switching and protective devices of the number, rating and type noted herein or shown on the Drawings.

B. Cabinet shall be NEMA 3R rated, for surface mounting, constructed of heavy gauge steel in accordance with UL standard 50 for cabinets.

C. All panelboards shall be rated for the intended voltage and shall be in accordance with the Underwriter's Laboratories, Inc. A "Standard for Panelboard's" and Standard for Cabinets and Boxes and shall be so labeled where procedures exist.

D. All panelboards shall comply with NEMA Standards for Panelboards and National Electric Code.

E. All interiors shall be completely factory assembled with switching and protective devices, wire connectors, etc. All wire connectors, except screw terminals, shall be of the anti-turn solderless type and all shall be suitable for copper wire of the sizes indicated. Interiors shall be so designed that switching and protective devices can be replaced without disturbing adjacent units and without removing the main bus connectors and shall be so designed that circuits may be changed without machining, drilling or tapping.

F. A nameplate shall be provided listing panel type and rating.

G. Bus bars for the mains shall be of copper size in accordance with Underwriter's Laboratories standards. Unless otherwise noted, full size neutral bars shall be included. Bus bar taps for panels with single pole branches shall be arranged for sequence phasing of branch circuit devices.

H. The short circuit rating of the assembled panelboard shall be in accordance with U.L. Inc.

Standards and their test verification. Breakers shall be rated 65,000 AIC.

I. All panelboards shall be fitted with an equipment ground bar.

J. Boxes shall be made from unpainted galvanized code gauge steel having multiple knockouts except where noted. Boxes shall be of sufficient size to provide a minimum gutter space of 4" on all sides.

K. Hinged doors covering all switching device handles shall be included in all panel trims.

L. Doors in panelboard trims shall conform to the following:
   1. In making switching device handles accessible, doors shall not uncover any live parts.
   2. Doors shall have flush-type cylinder lock and catch, except that doors over 48" in height shall have auxiliary fasteners at top and bottom of door in addition to flush-type cylinder lock and catch. Door hinges shall be concealed. All locks shall be keyed alike. A directory frame and card having a transparent cover shall be furnished on each door.
   3. The trims shall be fabricated from code gauge sheet steel.

M. All exterior and interior steel surfaces of the panelboard trims shall be properly cleaned and finished with ANSI-61 paint over a rust-inhibiting phosphatized coating.

N. 1200 Amp panel shall be Square D “I-Line” style; Type “HCR-U”, Catalog No. HCR548612U interior with Type 3R box Cat. No.HC4486WP, including 1200 amp main breaker with back-feed main lug kit, solid neutral assembly HCWM12SN, and equipment ground bar kit PK32DGTA.

O. 800 Amp panels shall be Square D “I-Line” style; Type “HCM”, Catalog No. HCM 18738M interior with Type 3R box Cat. No. HC3273WP, including 800 amp main breaker, solid neutral and ground bar kit.

2.02 PANELBOARD DIRECTORY:

A. Provide each panel with a typewritten circuit directory filled in completely listing equipment served and campsite numbers.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Support panel cabinets independently with no weight bearing on conduits.

B. Install panelboards so top breaker is not higher than 6'-0" above the floor or finish grade. All panels same height. Adjacent panel cabinets shall be same size and mounted in horizontal alignment.

C. Protect panelboards and cabinets during construction to prevent damage and entry of dirt, paint, etc., Inspect and remove any debris, scrap wire, etc. from the cabinet interior before installing fronts.

D. Distribute and arrange conductors neatly in the wiring gutters. The contractor shall maintain the largest practical bending radius of conductors.

E. Connect ground electrode conductor to the equipment grounding terminal bar. Verify that the ground bar is securely bonded to the panelboard cabinet and that it is not connected to the neutral bar except at service equipment as permitted in the latest revision of NEC Article 250.

3.02 BALANCING ELECTRICAL LOAD:

Care shall be exercised in connecting various electrical loads to panelboards to arrive at a reasonable balance between loads on each phase at each panelboard. It shall be the responsibility of the Electrical Contractor to make tests and adjust loads at each panelboard to result in a reasonably balanced load condition, satisfactory to the Engineer.

END OF SECTION

SECTION 321416

BRICK UNIT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Brick pavers set in mortar on a rigid base.

1.2 RELATED REQUIREMENTS

A. Gold Glazed Firebrick by Superior Clay Corporation, Split Size.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.
B. ASTM International (ASTM):
   1. C144-11 - Aggregate for Masonry Mortar.
   2. C150/C150M-16 - Portland Cement.
   3. C207-06(2011) - Hydrated Lime for Masonry Purposes.
   4. C270-14a- Mortar for Unit Masonry.

1.4 SUBMITTALS

A. Submittal Procedures: Section 013323, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
B. Submittal Drawings:
   1. Show brick paving layout and patterns.
C. Manufacturer's Literature and Data:
   1. Description of each product.
D. Samples:
   1. Brick: Full size of type and color.
      a. Minimum five individual samples to show full color and texture range.
   2. Mortar: Samples of brick with mortar joints of each color.

1.5 QUALITY ASSURANCE

A. Mockups: Provide mockup of size indicated on drawings to confirm paving materials and pattern and to establish workmanship quality.

1.6 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.
B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.
C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

A. Store masonry materials under waterproof covers on planking clear of ground.

B. Protect products from damage during handling and construction operations.

1.8 FIELD CONDITIONS

A. Environment:
   1. Product Temperature: Minimum 4 degrees C (40 degrees F) for minimum 48 hours before installation.

1.9 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 PRODUCTS - GENERAL

A. Basis of Design: Section 090600, SCHEDULE FOR FINISHES.
B. Provide each paving system component from one manufacturer and from one production run.

2.2 BRICK

A. Firebrick: ASTM C902; Class SX, Type I.
   1. Manufacturing Tolerances: // Application PS // Application PX //.

2.3 MORTAR

A. ASTM C270, Type S, cement-lime proportion specification mix. Admixtures and Type N lime are not acceptable.
B. Hydrated Lime: ASTM C207 Type S.
C. Sand: ASTM C144.
D. Portland Cement: ASTM C150/C150M.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.
   1. Verify substrate depth accommodates brick paving installation thickness.
B. Protect existing construction and completed work from damage.
   1. Prevent damage from contact with mortar.
C. Clean substrates. Remove contaminants capable of affecting subsequently installed product's performance.

3.2 INSTALLATION - GENERAL

A. Install products according to manufacturer's instructions and approved submittal drawings.

3.3 BRICK INSTALLATION

A. Do not use bricks with chips, cracks, discoloration, or other visible defects.
B. Layout brick paving according to pattern indicated on drawings.
C. Installation with Portland Cement Mortar:

1. Install brick in full bed joint. Remove excess mortar. Strike joints flush with top surface of brick and tool slightly concave.
2. Cure mortar by maintaining damp condition for seven days.

D. Installation Tolerances:
1. Finished surface true to plane within 1 mm in 1000 mm (1/8 inch in 10 feet), non-cumulative.
2. Joint width deviation maximum 25 percent of dimension indicated.

3.4 CLEANING

A. Remove excess mortar before fully set.
B. Clean exposed brick and mortar surfaces. Remove contaminants and stains.

3.5 PROTECTION

A. Protect brick paving from traffic and construction operations.
B. Cover brick paving with reinforced kraft paper, and plywood or hardboard.
C. Remove protective materials immediately before acceptance.
D. Repair damage.

END OF SECTION