SCOPE OF WORK

1.01 GENERAL

The Pennsylvania Avenue Parking Lot Fence installation, Atlantic City consists of the following improvements:

A. The removal of the existing fence and foundations.

B. The construction of ornamental picket gates to the limits indicated on the plans.

C. The installation of salvaged ornamental aluminum fencing shown to the limits shown on the plans. The CRDA has 213 six foot sections of fence that can be utilized on the project. Contractor shall modify fence sections as necessary to for lengths needed on the plans. The modified fence sections shall not alter the structural capacity of the fence.

D. Installation of two magnetic card operated vehicle gate systems and two magnetic card operated pedestrian gate systems at the locations shown on the plans, including intercoms and connections to the master stations located in the building.

E. Electrical work including cables, conduits and connections to operate card readers and intercom on gates.

F. All other work contained in the Plans and Specifications or directed by the Engineer.

The above Scope of Work outlines the general items and distribution of work and shall not be construed as being all inclusive.

1.02 GENERAL INFORMATION

A. Where construction is being performed in traveled roadways the Contractor is to provide necessary traffic controls and devices, in accordance with the current Manual on Uniform Traffic Control Devices, the 2007 edition of the New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction, and in accordance with local authorities.

B. All bidders shall visit the site prior to bidding and ascertain for themselves the existing conditions, determine the difficulties which will be encountered for a complete job, and include all costs within the various related bid items outlined in this Proposal.
C. If and where needed, excess excavated material shall be used for backfilling throughout the Project limits to provide for the planned elevations. Offsite fill shall not be used unless the available onsite material is insufficient, either by quantity or quality, as determined by the Engineer. Material to be used shall be inspected by the Engineer prior to placement. No separate payment will be made for the hauling of materials from one area of a site to other areas of the site, or from one site to another site of the project. The Contractor shall also be responsible to remove excess unwanted material from the Project site and dispose of all excess unwanted material in an approved manner. Should the CRDA want any excess material, the material shall be delivered to the CRDA’s site at no additional charge.

D. Sidewalk and driveway areas that are removed for any portion of the proposed work shall be maintained in a passable condition at all times.

E. Throughout Project execution, any trees or stumps interfering with construction shall be removed at the discretion of the Engineer. The cost of any such removal shall be included in the pay item “Clearing Site.”

F. The Contractor is responsible for coordinating its work and that of all other contractors on the Project. Any costs related to this coordination shall be included in the various pay items of this Proposal.

G. The Contractor is responsible for obtaining all construction permits related or necessary to complete the work of this Proposal. It is the Contractor’s responsibility to ensure that all work complies with Federal, State and Local laws, ordinances, regulations, building codes, etc.

H. The Contractor shall be responsible for construction layout. Separate payment will not be made for this work.

I. The Contractor shall verify all dimensions, elevations and existing conditions in the field prior to the start of construction. Any errors and/or discrepancies shall be brought to the attention of the Engineer immediately.

J. The Contractor shall restore the site and adjacent properties, at a minimum, to their pre-existing condition; all paved and concrete areas disturbed during construction shall be restored and all grassed or landscaped areas disturbed during construction shall be fertilized and seeded or replanted. No separate payment will be made for restoration, unless otherwise specified on the Plans.

K. The Contractor shall obtain all utility markouts, verify the locations of all utilities both horizontally and vertically prior to the start of construction, and notify the Engineer of any conflicts. The Contractor shall also be responsible for
coordinating all other utility relocation, which may be necessary. There will be no separate payment for this work.

L. The Contractor shall notify the Engineer of any utility conflicts at least seven days in advance of the proposed work. Separate payment will not be made for down time if the Contractor fails to notify the Engineer of any conflicts as described above.

M. Suitable hard material for temporary trench finish specified shall be bituminous concrete cold patch. Separate payment will not be made for this material.

N. The Contractor shall be responsible for the location and preservation of underground and surface utilities and structures, at or adjacent to the site of construction, and shall repair or replace anything that is damaged at no additional cost to the Owner.

O. If and where certain work on the Project requires that existing facilities be removed and reinstalled, the costs for this work shall be included in the causing pay item of the Proposal.

P. No separate payment will be made for: Layout; dust control; cleaning and restorations; soil erosion and sediment control; sawcutting or sealing; utility pole temporary support, relocation of signs; conductors or conduits damaged during construction; or any other structures encountered.

Q. The 2007 U.S. Customary English Standard Specifications for Road and Bridge Construction, of the New Jersey Department of Transportation and as amended herein, shall govern the construction of this project.

R. The Owner reserves the right to reject or award any or all bids, either in whole or in part, whichever is in the best interest of the Owner.

S. The plans entitled “CRDA Parking Lot Improvements”, are appended hereto and are made part of these Specifications.

END OF SCOPE
SECTION 01300

SUBMITTALS

PART 1—GENERAL

1.01 Summary: This section specifies requirements for handling submittals.

1.02 General Procedures: Coordinate submittal preparation with performance of construction activities, and with purchasing or fabrication, delivery, other submittals and related activities. Transmit in advance of performance of related activities to avoid delays.

Coordinate transmittal of different submittals for related elements so processing will not be delayed for coordination with other submittals. The Engineer reserves the right to withhold action on a submittal requiring coordination until related submittals are received.

Processing: Allow two weeks for review. Allow more time if processing must be delayed for coordination with other submittals. The Engineer will advise the Contractor when a submittal must be delayed for coordination. Allow two weeks for reprocessing each submittal.

No extension of time will be authorized because of failure to transmit submittals sufficiently in advance of the Work to permit processing.

Submittal Preparation: Place a label or title block on each submittal for identification. Provide a 4" x 5" space on the label or beside the title block on shop drawings to record Contractor’s review and approval markings and action taken. Include the following information on the label for processing and recording action taken:

- Project Name
- Date
- Name and address of Engineer
- Name and address of Subcontractor
- Name and address of Supplier
- Name of Manufacturer

1.03 Submittal Transmittal: Package submittals appropriately for transmittal and handling. Transmit with a transmittal form. Submittals received from other than the Contractor will be returned without action.

1.04 Contractor’s Construction Schedule: Submit a fully developed, bar-chart type construction schedule at the pre-construction conference. Provide a separate bar for each construction activity and a vertical line to identify the first working day of each week.

Coordinate the construction schedule with the list of subcontracts, submittal schedule, progress reports, payment requests and other schedules.
Indicate completion in advance of the date established for substantial completion. Indicate substantial completion on the schedule to allow time for the Engineer’s procedures necessary for certification of substantial completion.

1.05 Distribution of Schedules: Distribute approved copies of the construction schedules to the Engineer, Owner, Subcontractors, and other parties required to comply with scheduled dates. Post copies in the temporary field office. When revisions are made, distribute to the same parties and post in the same locations.

Updating: Revise each schedule after each meeting or activity, where revisions have been made. Issue the updated schedules concurrently with report of each meeting. The revised schedule must be approved by the engineer.

1.06 Daily Construction Reports: Prepare a daily construction report, recording information concerning events at the site. Submit duplicate copies to the Engineer at weekly intervals. Include the following information:

- List of subcontractors at the site.
- High and low temperatures, general weather conditions.
- Accidents, stoppages, delays, shortages, losses.
- Emergency procedures.
- Change orders received, implemented.
- Partial completions, occupancies.
- Substantial completions authorized.

1.07 Shop Drawing: Submit new information, drawn to accurate scale. Indicate deviations from contract documents. Do not reproduce contract documents or copy standard information as the basis of shop drawings. Include the following information:

- Dimensions
- Identification of products and materials included.
- Notation of coordination requirements.
- Notation of dimensions established by field measurement.

Sheet Size: Except for templates, patterns and similar full-size drawings, submit shop drawings on sheets at least 8 1/2“ x 11” but no larger than 30” x 42”.

Do not use shop drawings without a final stamp indicating action taken in connection with construction.

1.08 Product Data: Collect product data into a single submittal for each element or system. Mark each copy to show applicable choices and options. Where product data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:

- Manufacturer’s printed recommendations.
- Compliance with recognized trade association standards.
- Compliance with recognized testing agency standards.
Application of testing agency labels and seals.
Notation of dimensions verified by filed measurement.
Notation of coordination requirements.

Submittals: Submit eight (8) copies of each required submittal. The Engineer will retain six (6) copies and return the others marked with action taken and corrections or modifications required. The owner, contractor and engineer upon agreement may modify the handling of submittals to have submittals submitted in an electronic format (PDF).

Unless noncompliance with contract document provisions is observed, the submittal may serve as the final submittal.

Distribution: Furnish copies of final submittal to installers, and other required for performance of construction activities. Show distribution on transmittal forms. Do not proceed with installation until an applicable copy of product data is in the installer's possession. Do not permit use of unmarked copies of product and data in connection with construction.

1.09 Samples: Submit full-size samples cured and finished as specified and identical to the product proposed. Mount, display or package samples to facilitate review. Prepare samples to match the Engineer's sample. Include the following:

1. Generic Description
2. Compliance with Recognized Standards
3. Source Availability and Delivery Time
4. Product name or name of manufacturer

Submit samples for review of kind, color, pattern and texture for a final check of these characteristics and a comparison of these characteristics between the final submittal and the component as delivered and installed. Where variations are inherent in the product, submit multiple units that show limits of the variations.

Refer to other sections for samples that illustrate details of assembly, fabrication techniques, workmanship, connections, operation and similar characteristics.

Refer to other sections for samples to be returned for incorporation in the work. Such samples must be undamaged at the time of use. On the transmittal indicate special requests regarding disposition of sample submittals.

Submittals: Except for samples illustrating assembly details, workmanship, fabrication techniques, connections, operation and similar characteristics, submit three (3) sets; one will be returned marked with the action taken. Maintain sample sets at the project site for quality comparisons.

Unless noncompliance with contract document provisions is observed, the submittal may serve as the final submittal.

Sample sets may be used to obtain final acceptance of the construction associated with each set.
1.10 Distribution: Prepare additional sets for contractors, manufacturers, fabricators, installers, and others as required for performance. Show distribution on transmittal forms.

1.11 Engineer's Action: Except for submittals for record, information or similar purposes, where action and return is required, the Engineer will review each submittal, mark to indicate action taken and return. Compliance with specified characteristics is the contractor's responsibility.

Action Stamp: The Engineer will stamp each submittal with a self explanatory action stamp. The stamp will be appropriately marked to indicate action taken.

PART 2 – MATERIALS

A. Not Applicable

PART 3 – EXECUTION

A. Not Applicable

PART 4 – QUANTITY AND PAYMENT

A. No separate payment will be made for work performed under this section.

END OF SECTION
SECTION 02110

SITE CLEARING

PART 1 DESCRIPTION

Site Clearing consists of clearing of the site within the limits of construction, as noted, to include the following:

1. Removal and disposal of all trees and brush, weeds, roots, debris, and similar materials within the project site. Only vegetation to be removed are those items in direct conflict with the installation of the fence and gates. All trees and shrubs removed during the fence installation shall be replaced in-kind unless specifically directed otherwise by the owner.

2. Removal and disposal of all existing fencing in the area of the installation of the proposed fence. Removal of all existing fence foundations to the full depth of the foundation.

3. Removal of existing sign as noted on the plan. Removal to include any foundations and support structures completely.

4. Trimming trees required to install fence.

5. Removal of any other obstruction that may prevent the installation of the fence as necessary.

6. Utilization of an ISA Certified Arborist when trimming trees and repairing damaged trees.

PART 2 MATERIALS

A. Other Materials: At Contractor's option, subject to the approval of the Engineer.

PART 3 METHODS OF CONSTRUCTION

A. Reference standards used in this Specification Section:
New Jersey Department of Transportation:

1. Section 201: Clearing Site
2. Section 800: Landscaping

B. Protection:

Roads, structures, pavement areas, grass or landscaping to remain shall be protected by Contractor in a manner approved by the Engineer.

C. General:

Site Clearing shall conform to Section 201 of the Standard Specifications, and as designated in the Contract Documents or as directed by the Engineer.

1. Clear the project site within the limits of construction shown in the drawings, or as directed by the Engineer.

2. Repair all injuries to bark, trunk, limbs and roots or remaining plants by properly dressing, cutting, tracing, and painting using approved tree surgery methods, tools and equipment.

3. Clear designated areas of brush, weeds, trees, roots, debris, concrete, mulch and other unsuitable material.

4. Dispose of accumulated waste materials as specified in Section 01710.

5. All trees shall be removed to their full extent.

PART 4 QUANTITY AND PAYMENT

Site Clearing:

Payment for site clearing will be made as a Lump Sum as indicated on the Bid Form. Any salvage value the contractor may realize for the removed items is not guaranteed shall not be included as part of the bid. All costs shall include all materials, labor, equipment and all else necessary therefore and all work in connection therewith and incidental thereto.
END OF SECTION
SECTION 02453

TRAFFIC CONTROL SIGNS

PART 1 - DESCRIPTION

1.01 GENERAL

This work shall consist of fabricating, furnishing, assembling and erecting of Traffic Control Signs including Handicap Parking Signs.

Materials and construction operations not specifically covered in the Plans and Specifications shall be in accordance with the Manual on Uniform traffic Control devices for Streets and Highways, US Department of Transportation, Federal Highway Administration.

PART 2 - MATERIALS

2.01 MATERIALS

Materials shall conform to Section 612 of the NJDOT Standard Specifications for Road and Bridge Construction, 2007, with the exception of the sign post which shall be steel "U" posts with a green enamel finish.

Regulatory and warning signs, shall be fabricated of flat aluminum sheets and shall be covered with Type III Retro reflective sheeting Signs shall be fabricated in accordance with Subsection 911.01.02.

PART 3 – EXECUTION

3.01 METHOD OF CONSTRUCTION

a. Positioning Signs: The placement of signs shall be adjusted if they create interference in a sidewalk area. Stakes lost, damaged, displaced or removed shall be replaced.

Sites at which the signs are to be erected shall be inspected immediately following completion of grading and prior to determining the signpost lengths.

b. Mounting Signs: Signs shall be mounted on steel "U" posts sign supports. Upon notification that the signs have been installed, they will be examined at night by the Engineer. Should specular glare be apparent, the sign alignment shall be adjusted by shimming the sign. Signs mounted on two posts shall be shimmed wither at all bolts at one of the posts, or at the proper upper or lower bolts on both posts. Signs mounted on a single post shall be shimmed at either the upper or
lower bolts, whichever will best minimize glare. In all cases shims shall be used wherever necessary to prevent sagging of the center of a sign, and permit the secure tightening of all nuts and bolts.

c. Signs mounted on breakaway and non-breakaway sign supports shall be adjusted by rotating the sign on the posts.

d. Cleaning Signs: Before final inspection, all sign faces and support surfaces shall be cleaned of all foreign matter. Necessary measures shall be taken to provided that all signs, supports and sign sites will be in good condition and appearance.

PART 4 - QUANTITY AND PAYMENT:

1. Payment will be made on a Lump Sum basis under the items in the proposal for which the work is performed.

2. Payment shall include all labor and material required for a complete installation as shown on the plans and specified herein.

END OF SECTION
SECTION 2455

CONCRETE WHEEL STOPS

PART 1 – GENERAL

1.01 DESCRIPTION

This work shall consist of the furnishing and installation of concrete curb stops, including steel pins as shown on the plans and as specified herein.

PART 2 – MATERIALS

2.01 MATERIALS

A. Concrete shall conform to the requirements for Class B concrete as specified in Section 903 of the New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction, 2007.

B. Steel bars shall conform to Section 905 of the New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction, 2007.

PART 3 – EXECUTION

3.01 METHODS OF CONSTRUCTION

A. Accurately layout and mark location of concrete curb stops centered within the parking spaces as shown on the plans.

B. Upon approval of the curb stop locations by the Engineer, install steel pins (#6 Rebar) minimum depth 30” to assure that the curb stops are firmly held in position.

PART 4 – QUANTITY AND PAYMENT

4.01 QUANTITY AND PAYMENT

1. Payment will be made on a Lump Sum basis under the items in the proposal for which the work is performed.

2. Payment shall include all labor and material required for a complete installation as shown on the plans and specified herein.

END OF SECTION
SECTION 02846

ORNAMENTAL METAL FENCE SYSTEM

PART 1 - GENERAL

1.01 WORK INCLUDED

The contractor shall provide all labor, materials and other items necessary for installation of the ornamental aluminum fence system gates and the installation of the salvaged CRDA fencing specified herein and shown on the contract drawings. Contractor shall be responsible for transporting the existing fence from the CRDA's site to the work site.

1.03 SYSTEM DESCRIPTION

The manufacturer shall supply a total ornamental aluminum fence system of the design specified herein and shown on the contract drawings. The system shall include all components (i.e., pickets, rails, posts, gates and hardware) required.

1.04 QUALITY ASSURANCE

The contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and materials and techniques specified.

1.05 REFERENCES

ASTM B117 - Practice for Operating Salt-Spray (Fog) Apparatus.
ASTM D1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
ASTM D2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
ASTM D3359 - Test Method for Measuring Adhesion by Tape Test.

1.06 SUBMITTAL

Submitted manufacturer’s literature prior to installation.

1.07 PRODUCT HANDLING AND STORAGE

Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism and theft.
PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Obtain gates, including accessories, fittings, and fastenings, from a single source.

B. Products from other qualified manufacturers having a minimum of 5 years experience manufacturing aluminum ornamental picket fencing will be acceptable by the architect as equal, if approved ten days prior to bidding, and if they meet the following specifications for design, size, gauge of metal parts and fabrication.

C. The ornamental aluminum fence gates system shall be Ameristar or approved equal.

   Style: Majestic M-3
   Height: 6’

2.02 MATERIAL

A. Aluminum material for fence gate framework (i.e., tubular pickets, rails and posts) shall conform to the requirements of ASTM B221. The aluminum extrusions for posts and rails (outer channel) shall be Alloy and Temper Designation 6005-T5. The aluminum extrusions for pickets and rail inner slide channels shall be Alloy and Temper Designation 6063-T5.

B. The manufactured framework shall be subjected to thermal stratification coating process (high-temperature, in-line, multi-stage, multi-layer) including, as a minimum, a six-stage pretreatment/wash and an electrostatic spray application of a polyester finish. The topcoat shall be a “no-mar” TGIC polyester powder coat finish with a minimum thickness of 2-4 mils. The color shall be black.

C. Material for fence pickets shall be 1” square x 0.065” thick extruded tubing. The cross-sectional shape of the rails shall conform to the manufacturer's design with outside cross-section dimensions of 1-3/4” X 1-3/4” channel. The top wall of the rail .100” thick and the side wall of the rail 0.120” thick. The inner side channel of the rail shall be 0.080” thick. Picket holes in the rail shall be spaced 4.715” o.c. Picket retaining rods 1/8” diameter galvanized steel. Posts shall be 3” square with a minimum perimeter wall thickness of 0.080” and an interior reinforcing web thickness of 0.080”. High quality PVC grommets shall be supplied to seal all picket-to-rail intersections.

D. All fasteners shall be stainless steel. Bracket to rail attachments shall be made using specially designed one-way tamperproof security bolts with inverted “t-nuts”. Bolt through bracket to post connections.

E. Aluminum castings shall be used for all rings, post caps, finials, and miscellaneous adornments.
F. Crushed Stone shall be N.J.D.O.T size No. 57 conforming to Section 901.03 of the Standard Specifications.

2.03 FABRICATION

A. Pickets, rails and posts pre-cut to specified lengths. Rails shall be pre-punched to accept pickets.

B. The rail inner slide shall be fully inserted into the rail outer channel to form the raceway for the internal retaining rod. Grommets shall be inserted into the pre-punched holes in the rails, and pickets shall be inserted through the grommets so that pre-drilled picket holes align with the internal raceway of the two-part rails. (Note: This can best be accomplished by using an alignment template). Retaining rods shall be inserted into each rail so that they pass through the pre-drilled holes in each picket, thus completing the panel assembly.

C. Hinges: Structurally capable of supporting gate leaf and allow opening and closing without binding. Non-lift-off type hinge design shall permit gate to swing 180° (3.14 rad) inward.

E. Latch: Automatic electro magnet type with card reader.

F. Keeper: Provide keeper for each gate leaf over 5’ wide. Gate keeper shall consist of mechanical device for securing free end of gate when in full open position.

G. Card Reader & Intercom mounting: Structurally capable of supporting card reader and intercom and allow opening and closing without binding. Materials to be compatible with fence gate, reader and intercom

2.04 SETTING MATERIALS

A. Concrete: N.J.D.O.T. Class “B”.

PART 3 - EXECUTION

3.01 PREPARATION

All new installation shall be laid out by the contractor in accordance with the construction plans.

3.02 INSTALLATION

A. Fence posts set at spacing of existing posts. Gate posts spaced according to the gate openings specified in the construction plans.

B. Concrete set gate posts: Drill holes in firm undisturbed compacted soil or asphalt. Holes shall have diameter 4 times greater than outside dimension of the post or a minimum 12”, whichever is greater, and depths approximately 6” deeper than post bottom. Excavate deeper as required for adequate support in soft and loose soils, and for posts with heavy lateral loads. Set post bottom at a minimum of 36” below surface on crushed stone bedding. Place concrete around posts in a continuous pour. Trowel finish around post to match existing slab finish and slope.
1. Gate posts and hardware: Set keeper, stops, sleeves into concrete. Check each post for vertical and top alignment, and maintain in position during placement and finishing operations.

3.03 GATE INSTALLATION

A. Install gates plumb, level, and secure for full opening without interference.

B. Attach hardware by means which will prevent unauthorized removal.

C. Adjust hardware for smooth operation

D. Touch up hardware.

3.03 CLEANING

The contractor shall clean the jobsite of excess materials; post-hole excavations shall be scattered uniformly away from posts.

PART 4 – QUANTITY AND PAYMENT

4.01 QUANTITY AND PAYMENT

1. Payment will be made on a Lump Sum basis under the items in the proposal for which the work is performed.

2. Payment shall include all labor and material required for a complete installation as shown on the plans and specified herein.

END OF SECTION
SECTION 02850

PAVEMENT MARKINGS AND STRIPING

PART 1 - GENERAL

1.01 DESCRIPTION

A. This work shall consist of the striping and markings of bituminous surfaces with white, yellow and blue traffic paint, including all parking space delineation, handicap parking space markings, and removing existing striping or markings, as detailed on the plans.

PART 2 - MATERIALS

2.01 MATERIALS

A. All materials shall conform to Section 610.02 of the New Jersey Department of Transportation Standard Specifications, 2007 Edition. Pavement markings and striping shall be epoxy resin traffic paint conforming to subsection 912.03.11

PART 3 – EXECUTION

3.01 METHOD OF CONSTRUCTION

A. Method of construction shall conform to Section 610.03.01 of the New Jersey Department of Transportation Standard Specifications, 2007 Edition.

B.

PART 4 - QUANTITY AND PAYMENT

4.01 QUANTITY AND PAYMENT

1. Payment will be made on a Lump Sum basis under the items in the proposal for which the work is performed.

2. Payment shall include all labor and material required for a complete installation as shown on the plans and specified herein.

END OF SECTION
SECTION 02851

BOLLARDS

PART 1 – GENERAL

1.01 DESCRIPTION

The contractor shall furnish and install concrete filled steel pipe bollards as shown on the plan or as directed by the Engineer.

PART 2 – MATERIALS

A. Concrete NJDOT Class B air entrained.
B. Steel: Schedule 40.
C. Paint: Products of Sherwin Williams or approved equal for exterior metal.

PART 3 – EXECUTION

The bollards and components shall be installed plumb and in conformance with the bollard detail in the plans.

PART 4 – QUANTITY AND PAYMENT

Payment for this item will be made on a lump sum basis as shown on the drawings. Price bid shall include all labor and material necessary for a complete and functioning installation.

END OF SECTION.
SECTION 13730
SECURITY ACCESS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY
A. This Section includes a security access system consisting of a Central Station, operating system and application software, and field-installed Controllers connected by a high-speed electronic data transmission network, including barrier gate operators, card reader and intercoms and all else necessary for a complete and functioning application. The security access system shall have the following:

(4) Liftmaster mega arm Tower MATDCBB3 gate operators with battery back up
(2) 12 ft x 3" Aluminum arm with reflective yellow and black stripes
(2) 15 ft x 3" Aluminum arm with reflective yellow and black stripes and counterweights
(8) BX 24 12vdc loop detectors and wire
(4) 500 watt heaters
(80) 11 pin sockets
(1) CIPC 1300T super 2 panel
(4) HID ProxPro readers
(2) Linear GNC1 pedestals
(2) Schlage M490G Electromagnetic Locks

Intercom System shall consist of the following:

(1) Aiphone LEF-10 Master station
(1) Power Supply PS-1225UL
(4) LE-DL Surface mounted door stations with illuminated directory

1.3 SYSTEM DESCRIPTION
A. System shall consist of a PC-based Central Station CIPC 1300T super 2 panel, and field-installed Controllers HID ProxPro, readers connected by a high-speed electronic data transmission network to control and monitor the parking lot gate access.
B. Intercom System shall consist of a 10 Call Master station with LE-D and LE-DA door stations.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include operating characteristics, furnished specialties, and accessories. Reference each product to a location on Drawings

B. Shop Drawings:
   1. Diagrams for cable management system.
   2. Wiring Diagrams. Show typical wiring schematics including the following:
      a. Control Panel, gate control and card reader interconnections.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For security system and Intercom system to include in emergency, operation, and maintenance manuals, include the following:
   1. Microsoft Windows software documentation.
   2. Hard copies of manufacturer's specification sheets, operating specifications, design guides, user's guides for software and hardware, and PDF files on CD-ROM of the hard-copy submittal.
   3. System installation and setup guides, with data forms to plan and record options and setup decisions.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70, "National Electrical Code."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Controllers:
   1. Store in temperature- and humidity-controlled environment in original manufacturer's sealed containers. Maintain ambient temperature between 50 and
85 deg F (10 and 30 deg C), and not more than 80 percent relative humidity, noncondensing.

2. Open each container; verify contents against packing list, and file copy of packing list, complete with container identification for inclusion in operation and maintenance data.

3. Mark packing list with designations that have been assigned to materials and equipment for recording in the system labeling schedules that are generated by cable and asset management system specified in Part 2.

4. Save original manufacturer's containers and packing materials and deliver as directed under provisions covering extra materials.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: System shall be capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Control Station: Rated for continuous operation in ambient conditions of 60 to 85 deg F and a relative humidity of 20 to 80 percent, noncondensing.

2. Interior, Controlled Environment: System components, except central-station control unit, installed in air-conditioned interior environments shall be rated for continuous operation in ambient conditions of 36 to 122 deg F dry bulb and 20 to 90 percent relative humidity, noncondensing. NEMA 250, Type 1 enclosure.

3. Corrosive Environment: For system components subjected to corrosive fumes, vapors, and wind-driven salt spray in coastal zones, provide NEMA 250, Type 4X enclosures.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified to assure compatibility with the existing security system at CRDA.

2.2 SECURITY ACCESS AND INTERCOM SYSTEMS

A. Manufacturers:

1. Continental Instruments, Member of Napco Security Group.
2. Chamberlain Liftmaster
3. Linear Corp.
4. Aiphone Communications Systems
2.3 CONTROL PANEL

A. The two-reader Super-Two supports 2 readers have 8 inputs, 1 tamper alarm and 5 relay outputs. A locking steel enclosure, power supply and 7AH battery are included. Plug-in network interface, memory expansion, X-Y matrix keypad support and input/output expansion are optional. In addition to power for the controller and two readers, 1.2A at 12VDC is provided for accessories, including power strikes and mag-locks.

B. Super-Two is an expandable intelligent controller capable of supporting all access control functions for one or two doors. This distributed processor-based controller will operate as a standalone unit in the event communications with the server are interrupted. The Super-Two is programmed via CardAccess® software, a Windows based access control, security management and video integration solution. Once programmed, the controller does not require continuous server communications, as it automatically stores systems transactions in its internal memory. The Super-Two’s memory is field expandable, allowing for greater cardholder populations and/or a larger transaction buffer. The controller’s Flash EPROM firmware is easily upgraded when additional features or system enhancements are required. All Continental’s controllers feature extensive multi-stage lightning/ transient protection on-board for maximum reliability, even in harsh environments. The Super-Two accepts industry standard Weigand output devices and supports virtually all card/reader technologies. Proximity, Smart, Biometric, Magnetic Stripe, Barcode, Weigand and Keypad readers are easily connected and controlled. The Super-Two can store multiple (up to 10) card bit formats in its internal memory, making it a cost-effective retrofit panel. Supporting multiple bit formats allows existing card populations and readers to remain in place when upgrading to the Super-Two controller.

C. The network interface shall allow the Super-Two to be directly connected to a local area- network (LAN). Provide the 2M board for a 2-reader network panel capable of storing 210,000 card-holders.

D. Up to 63 controllers (MicroTerm, MiniTerm, SmarTerm, SuperTerm, Turbo SuperTerm or Super-Two) can be intermixed on the same communications port. Ports with only the Turbo Superterm and the Super-Two can communicate with the server at 57.6 Kbps. Multiple communication networks (ports) can be connected to the CardAccess server (or to multiple CardAccess communication servers) for maximum system expansion and faster communications between the controllers and the servers. Controller communication choices include: hardwire (repeat or multi-drop mode), LAN/WAN, dial-up or fiber optics for maximum flexibility. Continental Instruments supports RS¬232 and RS-422 communication formats for optimal system configuration.

E. SuperTwo Capacities
   a. 20,000 cards standard (exp. to 125,000)
   b. 2 Five-wire, Wiegand output readers
   c. 2 Seven-wire X-Y Matrix type keypads
d. 8 Supervised inputs

e. 48 Additional inputs (Supervised)

f. 5 Form C rated standard outputs at 3A@24VDC/VAC

g. 48 Additional Form C rated outputs at 3A@24VDC/VAC

h. 1000 Standard transaction buffer(exp. to 250,000)
i. 256 Time schedules

j. 1,000 Access groups

k. 5 Sets of 100 holidays

l. APL Listed for FIPS compliance

m. Capable of processing 256 bit cards from card to controller to software

n. NVR/DVR integration

o. Sophisticated Alarm Integration

p. Reader Power 800mA@5VDC, 500mA@12VDC

q. Battery Backup 4-6 hours included

r. Enclosure Size 21.5”H x 21.25”W x 7”D, 48lbs.
s. UL Listings Optional UL294, UL1076, CE

2.4 CARD READER

A. Field equipment shall include HID ProxPro readers catalog number CICR2362P Continental Instruments or equal.

B. Shall include multicolor LED, internal or host control of LED and beeper and beeper off switch.

C. Provide Wiegand protocol interface compatibility with all standard access control systems

D. Operating temp 22 deg to 150 deg F.
2.5 GATE OPERATOR

A. Liftmaster mega arm MATDCBB3 gate operators with battery backup and BX 24 12vdc loop detectors.

B. Built in 312HM radio receiver

C. Operator speed 0.9 sec to open or close

D. Power 120 V AC 60 Hz

E. Accessory Power: 24 Vdc with Battery backup for accessory power

F. 500 watt heater.

G. UL325 and UL991 Listed Class I, II, III and IV

H. Motor ½ HP continuous duty 24 Vdc 1800 RPM

I. Gear reduction 60:1 in Synthetic oil bath

J. Chassis- powder coated ¼” Aluminum alloy

K. Cover: Aluminum

L. Universal controller with 8 inputs

M. Microprocessor electronics

N. Safety stop tailgate feature and tailgate alarm

O. Auto open on power fail

P. 12 foot X 3” Aluminum Arm and 15 foot X 3” Aluminum Arm and counterweights

Q. Anchor Bolts: 1/2" x 6" wedge anchors.

R. Warning signs: two warning signs placed on both side of the gate to warn pedestrians of the dangers of the motorized gate system

S. Primary and secondary entrapment protection.

T. Loop detectors and loop detector leads in accordance with the manufacturer's recommendations.

2.6 CURB MOUNT PEDESTAL

A. Model GNC-1 Gooseneck by Linear Corporation or equal
B. 2" x 44" height, 1/8" thick cold rolled steel gauge steel with powder coat finish, with powder coated 5.250" x 5.250" steel baseplate cover. All finished coatings to be black

2.7 SURGE AND TAMPER PROTECTION

A. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor-entry connection to components.

1. Minimum Protection for Power Connections 120 V and More: Auxiliary panel suppressors complying with requirements in Division 16 Section "Transient Voltage Suppression."

2. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Connections: Comply with requirements in Division 16 Section "Transient Voltage Suppression" as recommended by manufacturer for type of line being protected.

2.8 ELECTROMAGNETIC LOCK

A. Provide electromagnetic locks for swinging gate application. The lock shall have a holding force of 1500 lbs.

B. The lock shall have a magnetic bond sensor (MBS) to detect proper bond between magnet and armature and shall be monitored remotely.

C. The lock shall be provided with a door position switch (DPS) to indicate whether door is open or closed.

D. The lock shall be cat. number M490G, as manufactured by Schlage, or equal

2.9 INTERCOM SYSTEM

A. The intercom system shall be of an open voice, selective calling type with individual selector switches for each station. Capacity shall be 11 stations, fully intermixable with any number of master or sub stations. Master station shall be simplex operation, with hands free response from the called station. Master Station shall be LEF-10 as manufactured by Aiphone or equal.

B. Master station shall be equipped with station selector switches, OFF button for standby mode, TALK button for simplex operation, and PRIV (privacy) button to block unauthorized monitoring. Door release button (key symbol) shall allow for selective activation of up to 10 door strikes or maglocks through the use of relays. All Call button shall activate separate adaptor to provide simultaneous transmission to all stations in the system. Voice volume control shall adjust transmit and receive volume
at the calling master station, and a call tone volume control shall be located beneath the operation plate. An incoming call shall be annunciated by a momentary electronic call tone, and the corresponding station LED shall light for approximately 20 seconds. The LED shall not light if a master station calls another master station. A tone shall be heard at the called master while pressing the TALK/PRIV buttons on the calling master. LEDs above selector buttons shall illuminate when the station button is pressed at the calling master. The Occupied LED shall light to indicate that the system is in use, and the Off LED shall light on the master that has a channel selected.

C. Master station shall be equipped with extra contact terminals corresponding to each selector button, capable of controlling remote devices, such as door strikes, maglocks, lights, or camera systems.

D. Master station shall desk mount with an optional desktop terminal box. Sub stations shall be provided in the following configurations:

1. surface mount styles, without privacy;
2. surface mount with three call buttons, with or without privacy;
3. weather resistant door stations in surface or flush mount styles, mounted on or in standard 1-gang or 2-gang boxes;
4. vandal proof substation, outdoor styles, with surface mount box.

E. A separate adaptor shall provide All Call transmission, chime from up to three doors, and an auxiliary input to distribute background music to all or selected sub or master stations in the system.

F. Wiring shall be multiple conductors with an overall shield inside a single jacket, including nine (9) common wires, plus one (1) individual wire per station in the system between masters. Maximum 20 conductors, not including “K” terminals. Add one (1) wire for each station requiring external device control. Wiring to sub stations shall be three (3) conductors.

G. Manufacturer must have earned ISO 9001 certification for quality standards.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.
B. Examine roughing-in for LAN and control cable conduit systems to PCs, Controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with recommendations in SIA CP-01.

B. Comply with EIA/TIA-606, "Administration Standard for the Telecommunications Infrastructure of Commercial Buildings."

3.3 GROUNDING

A. Comply with Division 16 Section "Grounding and Bonding."

B. Comply with IEEE 1100, "Power and Grounding Sensitive Electronic Equipment."

C. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

D. Bond shields and drain conductors to ground at only one point in each circuit.

E. Signal Ground:

1. Terminal: Locate in each equipment room and wiring closet; isolate from power system and equipment grounding.

2. Bus: Mount on wall of main equipment room with standoff insulators.

3. Backbone Cable: Extend from signal ground bus to signal ground terminal in each equipment room and wiring closet.

3.4 IDENTIFICATION

A. In addition to requirements in this Article, comply with applicable requirements in Division 16 Section "Electrical Identification" and with TIA/EIA-606.

B. Using cable and asset management software specified in Part 2, develop Cable Administration Drawings for system identification, testing, and management. Use unique, alphanumeric designation for each cable, and label cable and jacks, connectors, and terminals to which it connects with same designation. Use logical and systematic designations for facility's architectural arrangement.

C. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
1. All wiring conductors connected to terminal strips shall be individually numbered, and each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with the name and number of the particular device as shown.

2. Each wire connected to building-mounted devices is not required to be numbered at the device if the color of the wire is consistent with the associated wire connected and numbered within the panel or cabinet.

D. At completion, cable and asset management software shall reflect as-built conditions.

3.5 SYSTEM SOFTWARE

A. Develop, install, and test software and databases for the complete and proper operation of systems involved. Assign software license to Owner.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. LAN Cable Procedures: Inspect for physical damage and test each conductor signal path for continuity and shorts. Use Class 2, bidirectional, Category 5 tester. Test for faulty connectors, splices, and terminations. Test according to TIA/EIA-568-1, "Commercial Building Telecommunications Cabling Standards - Part 1 General Requirements." Link performance for UTP cables must comply with minimum criteria in TIA/EIA-568-B.

2. Test each circuit and component of each system. Tests shall include, but are not limited to, measurements of power supply output under maximum load, signal loop resistance, and leakage to ground where applicable. System components with battery backup shall be operated on battery power for a period of not less than 10 percent of the calculated battery operating time. Provide special equipment and software if testing requires special or dedicated equipment.

3. Operational Test: After installation of cables and connectors, demonstrate product capability and compliance with requirements. Test each signal path for end-to-end performance from each end of all pairs installed. Remove temporary connections when tests have been satisfactorily completed.

C. Remove and replace malfunctioning devices and circuits and retest as specified above.
3.7 STARTUP SERVICE

A. Engage a factory-authorized service representative to supervise and assist with startup service. Complete installation and startup checks according to approved procedures that were developed in "Preparation" Article and with manufacturer's written instructions.

1. Enroll and prepare badges and access cards for Owner's operators, management, and security personnel.

3.8 PROTECTION

A. Maintain strict security during the installation of equipment and software. Rooms housing the control station, and workstations that have been powered up shall be locked and secured, with an activated burglar alarm and access-control system reporting to a Central Station complying with UL 1610, "Central-Station Burglar-Alarm Units," during periods when a qualified operator in the employ of Contractor is not present.

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain security access system. "

PART 4 – QUANTITY AND PAYMENT

Payment for this item will be made on a lump sum basis as shown on the drawings. Price bid shall include all labor and material necessary for a complete and functioning installation.

END OF SECTION
1.01  REGULATORY REQUIREMENTS

A. Codes and Regulations:

Nothing in the contract documents shall be construed to conflict with any local, State or Federal laws, codes, or regulations governing any work operations to be performed under this contract; and all requirements shall be in accordance therewith, whether shown or specified otherwise, without any additional cost to the Owner.

All electrical work to be performed and all materials to be furnished shall be in accordance with the rules and regulations of the National Fire Protection Association, National Electric Code, The National Electrical Safety Code, Local Codes, the Utility Companies, the contract drawings and specifications, and to the satisfaction of the Engineer.

The Contractor shall, at all times in the performance of this contract, comply with the requirements of the Occupational Safety and Health Act of 1970 (OSHA).

B. Reference Standards:

Wherever the contract documents refer to the standard specifications of technical associations, institutes, or societies, or to standard Federal or State specifications, and reference shall be to the most recent revision or amendment thereof, unless otherwise noted.

C. Organization:

IES - Illuminating Engineering Society
NEC - National Electric Code
NFPA - National Fire Protection Agency
UL - Underwriters Laboratories
NEMA - National Electrical Manufacturers Association
NESC - National Electrical Safety Code
ANSI - American National Standards Institute

1.02  COORDINATION

A. Project Coordination:
The Contractor for this contract, while performing the required work, must give special consideration to coordination with the work of the other contractors. He shall, without additional compensation, make provisions for carrying on all work without interference with the other contracts, and must assume all responsibility for conditions affecting his work. All arrangements between contractors shall be made through the Engineer, whose decisions in all conflicts shall be final.

B. Mechanical and Electrical Coordination:

   Electrical Contractor: Shall furnish and install all conduits, conductors to provide necessary control connections and power connections to all electrically operated mechanical equipment and all control panels furnished by others as shown on the contract drawings.

1.03 TEMPORARY POWER

   The Contractor shall prepare and provide all necessary arrangements for temporary power required for this project.

1.04 ELECTRICAL SERVICE

   A. Provisions:

   Electric service for the magnetic lock and control panel shall be obtained from the existing power supply.

1.05 TELEPHONE SERVICE

   NA

1.06 SUBMITTALS

   A. Shop Drawings

   Before starting the work, each item and all materials to be furnished by this Contractor shall be unquestionably identified by submitting for approval manufacturer's catalog cuts and shop drawings.

   The manufacturer's equipment submittal shall include all descriptive material necessary for correctly appraising the quality of the equipment being offered for approval. Descriptive literature and drawings for all equipment being furnished under this section shall be included in one submittal and as a minimum shall include the following:
a. Eight (8) copies of a schematic drawing illustrating all equipment electrical connections.

b. Eight (8) copies of equipment specifications, outline dimension drawings, wiring diagrams for each item of equipment being furnished.

B. Submission & Deviations

Wherever the Contractor proposes to substitute equipment, he shall submit three sets of certified manufacturer's prints and one set of engineering data for the equipment he proposes to furnish along with one set of manufacturer's prints and one set of the engineering data for the specified equipment, for evaluation by the Engineer.

Where deviations from the Contract Drawings or Specifications are necessitated by unanticipated construction conditions or changes (and/or building limitations), the Contractor shall submit, in writing, his proposed method of proceeding. This submission shall be accomplished by an appropriate sketch if the deviation involves a relocation of existing or new equipment or materials.

C. As Built Drawings

Before the final payment for the work under this Contract, the Contractor shall furnish and deliver to the Engineer "as built" drawings.

The "as built" drawings shall depict the actual installation with all items clearly identified, all dimensions exactly as installed, and all details correct. The Contract Drawings can serve as a basis for preparation of the "as built" drawings. However, the Contractor is expected to prepare his own drawings and to delineate exactly the installation details of equipment installed under this contract such as, conduits, boxes and switches and all components which are shown partially or diagrammatically or where he has deviated from the Contract Drawings, using as many additional drawings as are required to show the final "as built" installation.

The electrical section of the "as built" drawings shall consist of one-line diagram of the power systems, elementary diagrams of power control and signal circuits, complete connection and interconnection wiring diagrams, including existing items furnished under other contracts and connected by the electrical contractor.

Connection diagrams shall show the actual equipment internal wiring diagrams together with terminal connection, physical layout with all points identified by the designation used by the equipment manufacturer.

The "as built" drawings shall be of the same size and format as the original Contract Drawings with all details required to show the "as built" condition. All underground installation shall be clearly identified and located with reference to fixed above ground structures.
A list of materials shall be provided on the drawings which identifies all equipment and materials installed by reference item number, description, manufacturer, and catalog number. Three sets shall be submitted to the Engineer for preliminary approval.

The final "as built" drawings furnished to the Engineer shall be one set of blackline (reproducible) prints on mylar of uniform size, completely indexed and neatly bound.

D. Operation & Maintenance Manuals

The contractor shall furnish O & M manuals containing the manufacturer's instructions for operation and maintenance of, and parts lists for specified equipment furnished under this contract with any additional data required by these contract documents. All such information shall clearly indicate the particular piece of equipment to which it applies including equipment name, manufacturer, model number, catalog number and year of manufacture.

Each O & M manual shall contain a complete set of schematic wiring diagrams and interconnection diagrams to other connected equipment.

The O & M manual shall be suitably bound in ring binders of good quality.

The contractor shall certify by endorsement on each manual that the O & M manual is complete and accurate.

E. Samples

Samples shall be submitted where required or as requested by the Engineer. Samples are physical examples which illustrate materials, equipment or workmanship and establish standards by which the work will be judged.

1.07 QUALITY CONTROL

Applications of the new materials, and the workmanship for the required adjustments of existing materials, shall be subject to the inspection and approval of the Engineer. Defective materials shall be removed from the site, and defective work replaced as directed at no additional cost to the Owner.

All materials shall be new, except where indicated existing materials are to be incorporated, and both workmanship and materials shall be of the best quality, subject to the approval of the Engineer.

Only mechanics skilled in each class of work shall be employed on such class of work. For application or installation of materials as specified by the Engineer of the manufacturer,
workmen or mechanics shall be factory trained and/or qualified by the manufacturer. All work shall be done in the best recognized manner, and when complete shall be left in perfect condition, to the satisfaction of the Engineer.

The object of these specifications is to provide the material and workmanship necessary to produce a first-class job.

No filament type indicator lights shall be employed. Indicator lights shall be made up of an array of LED’s. All indicator lights shall be wired to a lamp test push button to verify proper function.

1.08 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

A. Any temporary structures required for handling and storage of materials and equipment shall be provided by and at the expense of the Contractor. Locations for such structures must be approved by the Engineer. Upon completion of the work, the Contractor shall remove all equipment and temporary structures from the site. All equipment and materials shall be neatly stockpiled. All new materials shall be stored in manufacturer's containers to the extents practicable, and sheltered from weather.

B. Temporary Utilities: All power and light required for this contract shall be provided and maintained by the Contractor at his own expense. All temporary connections for electrical portable equipment or lighting units shall be subject to the approval of the Engineer. All temporary lines shall be furnished, installed, connected and maintained by the Contractor and shall be removed by him prior to completion of work.

C. Construction Aids: The Contractor shall furnish and install any and all necessary scaffolding and/or working platforms required for the work under this contract. No separate payment will be made for such work; payment therefor being included under the price bid for the items, if any, which require the use of scaffolding.

D. Security: During performance and until final acceptance, the Contractor shall be under an absolute obligation to protect the finished and unfinished work against any damage, loss, or injury. The Contractor shall take proper precautions to protect the finished work from loss, damage, or injury, pending completion and the final acceptance of all the work included in the entire contract, provided that such precaution shall not relieve the Contractor from any and all liability and responsibility for loss or damage to the work occurring before final acceptance on the site by the Engineer. Such loss, damage or injury shall be at the risk of and borne by the Contractor, whether arising from acts of omission of the Contractor or others. In the event of any such loss, damage or injury, the Contractor shall forthwith repair, replace, and make good the work without extension of time thereof, except as may be otherwise provided herein.

E. Temporary Controls:
1. Construction Cleaning: Keep work area in neat, clean condition. The Contractor shall keep the work areas and storage areas free from accumulation of waste materials and debris. Prior to the completion of the work, he shall remove from these areas all debris and residue, and all tools, scaffolding, equipment and materials used in connection with this contract, which are not the property of the Owner. Upon completion of the work, the Contractor shall leave the project structures and adjacent areas in a completely clean condition satisfactory to the Engineer.

Debris and materials to be removed and disposed of are not to be dumped on the site grounds, nor on any adjacent properties and areas.

The Contractor will be required to take all the necessary measures to keep the work area in a clean neat condition. All material and equipment shall be neatly stockpiled. Excavated materials shall be removed and the area cleaned, as required by the Engineer. Surfaces shall be sprinkled with water or otherwise treated, to keep the dust laid during the progress of the work.

Prior to the completion of the work, the Contractor shall remove from the site all debris, tools, equipment, and materials used in connection with this contract which is not the property of the Owner. The Contractor shall leave the site in a condition satisfactory to the Engineer.

1.09 TESTS

Perform tests to verify the satisfactory operation of all equipment furnished and installed under this contract, as follows:

1. Megger test on all wiring
2. Continuity test on all wiring
3. Ground test
4. Operational tests
5. Inspection by Underwriters and the furnishing of certificates.

Provide the necessary equipment, materials, and man power to perform all tests. Furnish the services of equipment manufacturer service personnel to check out special equipment. Perform all tests in the presence of the Engineer and give the Engineer seven (7) days written notice prior to when tests will be performed.

All tests shall be documented and three (3) copies submitted to the Engineer for review. The test documents shall clearly identify equipment tested and results obtained.

When tests indicate defective equipment, materials, or workmanship, make the necessary corrections and have the defective material retested to the satisfaction of the Engineer.
Megger Tests: Conduct insulation resistance tests on all cables, control centers, and motor starters in the presence of the Engineer. Test all circuits with a 1,000 volt megger or an equivalent testing device and in no case allow the insulation resistance to be less than 100,000 ohms. Replace any wire or cable which fails during tests.

Continuity Tests: Test all parts of the electrical installation and prove free of unwanted grounds and other defects. Preliminary testing with magneto will be permitted but will not be accepted as a final test. Test all equipment to demonstrate that the wiring is correctly installed.

Operational Test: Operation test consists of two phases.

1. Control Circuits - Test all control circuits to demonstrate that they will operate the equipment in the manner specified. Have an electrician present during the tests of the equipment and control devices that were furnished and wired by the contractor.

2. Mechanical Tests - Upon completion of the mechanical work, schedule a day for testing the equipment installed under this contract. Have an electrician present to assist in the tests and insure that all equipment is coordinated and that all controls operate satisfactorily in coordination with equipment installed to the satisfaction of the Engineer.

For any material, equipment or appurtenances, the operation, capacity or performance of which does not comply with the contract drawings and/or specification requirements or which is damaged prior to acceptance, will be held to be defective material, remove it and replace it with proper and acceptable materials, equipment and/or appurtenances, or put in proper and acceptable working order, satisfactory to the Engineer.

After all tests and adjustments have been made, fully instruct the representatives of the Owner in all detail of operation and maintenance of equipment installed under this contract.

1.10 CONTRACT CLOSEOUT

A. Warranties

The Contractor shall guarantee all materials, workmanship and applications for a period of two years from the date of final acceptance and shall replace all defective material and workmanship and all other work damaged thereby without additional cost to the Owner.

B. Certification

After the completion of the work and prior to testing before the Engineer, have the installation inspected by the appropriate governmental agency for compliance with the National Electric Code and obtain certificates of approval, acceptance, and certification of compliance with code 16040-7.
regulations. Work will not be deemed complete until such certificates have been delivered to the Engineer. Any deficiencies must be immediately corrected at no cost to the owner.

C. Spare Parts

Spare parts shall be properly packaged and clearly identified. All spare parts shall be delivered to the CRDA. A copy of receipt, signed by the CRDA identifying all spare parts delivered shall be forwarded to the Engineer. No payment will be made without the above signed receipt.

In addition to equipment specified herein, the contractor shall furnish the following spare parts:

1. (3) 12’ X 3” Aluminum Arms
2. (3) 15’ X 3” Aluminum Arms

PART 4 – QUANTITY AND PAYMENT

A. No separate payment will be made for work performed under this section.

END OF SECTION
SECTION 16050
BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY
A. This Section includes the following:
   1. Supporting devices for electrical components.
   2. Electrical identification.
   3. Concrete equipment bases.
   4. Cutting and patching for electrical construction.

1.2 SUBMITTALS
A. Shop Drawings: Dimensioned plans and sections or elevation layouts and single-line diagram of electricity-metering component assemblies specific to this Project.

1.3 QUALITY ASSURANCE
A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.4 COORDINATION
A. Coordinate inserts, sleeves, and openings for electrical supports, raceways, and cable with general construction work.

B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment that requires positioning.

C. Coordinate electrical service connections to components furnished by utility companies.
   1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for service entrances and electricity-metering components.
D. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

A. Material: Stainless steel.

B. Metal Items for Use Outdoors or in Damp Locations: Stainless steel.

C. Slotted-Steel Channel: Flange edges turned toward web, and 9/16-inch- (14-mm-) diameter slotted holes at a maximum of 2 inches (50 mm) o.c., in webs. Strength rating to suit structural loading.

D. Nonmetallic Slotted Channel and Angle: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- (14-mm-) diameter holes at a maximum of 8 inches (203 mm) o.c., in at least one surface. Strength rating to suit structural loading.

E. Slotted Channel Fittings and Accessories: Recommended by the manufacturer for use with the type and size of channel with which used.

   1. Materials: stainless steel or PVC coated steel.

F. Expansion Anchors: Carbon-steel wedge or sleeve type.

2.2 ELECTRICAL IDENTIFICATION

A. Identification Device Colors: Use those prescribed by ANSI A13.1, NFPA 70, and these Specifications.

B. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape, not less than 1 inch wide by 3 mils thick (25 mm wide by 0.08 mm thick).

C. Tape Markers for Conductors: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

D. Color-Coding Cable Ties: Type 6/6 nylon, self-locking type. Colors to suit coding scheme.

E. Underground Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape compounded for permanent direct-burial service, and with the following features:

   1. Not less than 6 inches wide by 4 mils thick (150 mm wide by 0.102 mm thick).
   2. Embedded continuous metallic strip or core.
   3. Printed legend that indicates type of underground line.
F. Engraved-Plastic Labels, Signs, and Instruction Plates: Engraving stock, melamine plastic laminate punched or drilled for mechanical fasteners 1/16-inch (1.6-mm) minimum thickness for signs up to 20 sq. in. (129 sq. cm) and 1/8-inch (3.2-mm) minimum thickness for larger sizes. Engraved legend in black letters on white background.

G. Warning and Caution Signs: Preprinted; comply with 29 CFR 1910.145, Chapter XVII. Colors, legend, and size appropriate to each application.

1. Interior Units: Aluminum, baked-enamel-finish, punched or drilled for mechanical fasteners.
2. Exterior Units: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate with 0.0396-inch (1-mm), galvanized-steel backing. 1/4-inch (6-mm) grommets in corners for mounting.

H. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.

2.3 CONCRETE BASES

A. Concrete Forms and Reinforcement Materials: As specified in Section 504 of the Standard Specifications.

B. Concrete: N.J.D.O.T. Class "B" air entrained concrete.

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

A. Materials and Components: Install level, plumb, and parallel and perpendicular to other components, unless otherwise indicated.

B. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

C. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Damp Locations and Outdoors: stainless steel materials or nonmetallic, slotted channel system components.

B. Dry Locations: Corrosion resistant Steel materials.
C. **Strength of Supports:** Adequate to carry present and future loads, times a safety factor of at least four with, 200-lb (90-kg) minimum design load for each support element.

### 3.3 SUPPORT INSTALLATION

A. Size supports for multiple raceways or cable runs so capacity can be increased by a 25 percent minimum in the future.

B. Support individual horizontal single raceways with separate, non-corrosive pipe hangers or clamps.

C. Install sleeves for cable and raceway penetrations of concrete structures unless core-drilled holes are used.

D. Secure electrical items and their supports to structure, using the following methods unless other fastening methods are indicated:

   1. Fasteners for Damp, Wet, or Weather-Exposed Locations: Stainless steel.

### 3.4 IDENTIFICATION MATERIALS AND DEVICES

A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.

C. **Self-Adhesive Identification Products:** Clean surfaces before applying.

D. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.

E. Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power and communication lines. Locate 6 to 8 inches (150 to 200 mm) below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches (400 mm), overall, use a single line marker.

F. Install warning, caution, and instruction signs where required to comply with 29 CFR 1910.145, Chapter XVII, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. Indoors install engraved plastic-laminated instruction signs with approved legend where instructions
are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.

G. Install engraved-laminated emergency-operating signs with white letters on red background with minimum 3/8-inch- (9-mm-) high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

3.5 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger, in both directions, than supported unit unless noted otherwise. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated.

3.6 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair, refinish and touch up disturbed finish materials and other surfaces to match adjacent undisturbed surfaces.

PART 4 – QUANTITY AND PAYMENT

A. No separate payment will be made for work performed under this section.

END OF SECTION
PART 1 SUMMARY OF WORK - GENERAL

A. Work Covered by Contract Documents:

All work, materials, etc., shall be furnished and installed, whether or not specifically shown on the drawings and/or called for in the specifications, which may be necessary to comply with all of the requirements, due to the exigencies of the work, to complete the work and the contract in a satisfactory and approved manner.

The work to be done under this contract shall consist of furnishing all equipment, labor, materials required for the items listed in the proposal, and/or as shown on the contract drawings, together with all devices, connectors, splices and appurtenances, required for a safe, clean, complete and ready for service, reliable, substantial and rugged working installation, to the satisfaction of the Engineer and to execute the intent of this contract and these specifications.

The Contractor shall be responsible for determining the proper connection points for all power, control, and signal wiring installed under this contract, regardless of whether the connection points are in equipment furnished under this contract, existing equipment, or equipment furnished by others. The Contractor shall include in his bid prices any field surveys, wire tracing or other work required to ascertain the proper connection points for all wiring.

It is the intent of these specifications that the Contractor shall furnish equipment and material which is suitable for the purpose and for installation in the location as specified, and which is adequate and satisfactory for the service intended.

It is also the intent of the specification that the equipment, materials and accessories, as furnished, shall be complete in all respect and ready to operate.

The specifications cover the general design, construction arrangement, and certain particular features, but do not purport to cover all details entering into the design of the equipment and accessories.

Minor revisions in construction details will be made to accommodate equipment proposed and approved on the drawings thereof, submitted by the Contractor. Major revisions shall not be made nor shall equipment be submitted for approval which cannot
be installed in structures of the approximate dimensions and character specified herein.

Further, it is also the intent of these specifications to provide a complete contract including items which may be omitted or not shown but which are considered normal and accepted engineering practice for this type of contract at no additional cost to the Owner.

All work shall be done in a thorough and workmanlike manner and shall conform to the best modern practice in the manufacture and installation of high-grade equipment and materials. Wherever possible, all parts shall be made according to standard gauge to facilitate replacement and repair.

All materials furnished under these items shall be the best of their respective kinds and shall be free from defects in design and workmanship.

All materials or equipment not meeting the specified requirements shall be rejected, and shall be replaced at once by the Contractor with materials or equipment of the specified type and quality, at no cost to the Owner.

All materials for which no detailed specifications are given herein shall be of the quality and character best adapted and suitable for the purpose for which they are to be used and shall be subject to the approval of the Engineer.

Where any material or article or the maker or distributor thereof is specified by name, this is done for the purpose of more clearly describing the type or quality desired. Any material or article of equal quality, merit and performance, in the opinion of the Engineer, will be acceptable, if approval is given in writing.

All materials furnished and work done by the Contractor shall be subject to the inspection of the Engineer. Defective materials shall be removed from the site of the work and defective work repaired or replaced as directed. Facilities for handling and inspection of materials and equipment and for access to the work in progress, shall at all times be furnished by the Contractor.

Where any delay is encountered in carrying out work due to unfavorable operating conditions, the Contractor shall not be entitled to additional compensation therefore, but the time allowed equivalent to the period of actual delay.

PART 2 SCOPE OF WORK

As a minimum this shall include but not be limited to the following:
1. Furnish install connect and test a complete Security Access and Intercom System as shown on the drawings and described in Section 13730.

2. Furnish, install, connect and test all electrical and electrically operated equipment complete with all indoor and underground conduit and conductors, trenching and backfilling, interfacing with existing security and intercom systems, for a complete safe and reliable operating facility as shown on the drawings and/or herein specified.

3. Furnish all documentation, testing and certification as herein specified.

PART 3 SPECIAL NOTICE TO CONTRACTOR

A. Contractor must have on the construction site, all materials, equipment, construction facilities, adequate supervision and a sufficient number of qualified workmen to insure carrying out all of the work in the shortest possible time.

B. The Contractor shall not fabricate any work, order any equipment or materials or perform any construction prior to approval by the Engineer of all applicable Shop Drawings and/or Samples.

C. The Contractor must provide all necessary safety equipment and exercise precautionary procedures when working with/or near energized electrical equipment.

D. All presently paved or unpaved areas, disturbed during and by the performance of this Contract shall be restored to their original elevation, condition and appearance. Seeding and/or sodding shall be carried out in the sections designated by the Engineer. In all cases where doubt exists about the original appearance, the Engineer's records shall be used to settle any disputes.

E. Provide a blue line set of prints on the job site with completed conduits and equipment marked with colored high-lighter marker. Prior to final payment provide the Owner and the Engineer each with a set of "As-Built" drawings consisting of one (1) blue line print of each sheet, and one (1) reproducible print of each sheet.

F. Contractor shall acquire all permits and certificates. Submit a final inspection certificate from the appropriate governmental agency with request for final payment.

PART 4 QUANTITY AND PAYMENT

A. No separate payment will be made for work performed under this section.
END OF SECTION
PART 1 GENERAL

Provide a ground system for the electrical facilities furnished under this contract in accordance with the latest requirements of the National Electrical Code, Article 250, Utility Co., local codes and these documents. Connect the new ground to the existing ground system.

PART 2 MATERIALS

A. **Ground Rod**

The contractor shall furnish where shown on the drawings or as may be required by the NEC, utility company or local codes, a stainless clad 3/4" x 10' ground rod as manufactured by Teledyne, Inc. (FAX No. 219-295-5074) or approved equal.

B. **Ground System Connections**

All grounding system connections shall be exothermically welded, including all cable connections, ground rod connections and splices, cable to steel or iron and cable to lug terminations. All welding materials shall be CADWELD materials as manufactured by ERICO PRODUCTS, INC. or approved equal.

Connections made from this process must meet requirements of IEEE Standard 80 and 837 and as listed in MIL 419 and the National Electrical Code.

PART 3 EXECUTION

3.01 **GROUNDING ELECTRODE SYSTEM**

If available on the premises at each building or structure serviced, each item (a) through (d) below and any made electrodes shall be bonded together to form the grounding electrode system.

a. Metal Underground Water Pipe
b. Metal Frame of the Building
c. Concrete Encased Electrode
d. Ground Ring.

For complete definition refer to NEC Article 250-81.

3.02 EQUIPMENT GROUNDING

Exposed non-current carrying metal parts of fixed equipment likely to become energized shall be grounded in accordance with the latest requirements of the National Electrical Code.

Equipment fastened in place or connected by permanent wiring method such as non-current carrying metal parts of equipment, raceways, and other enclosures shall be grounded by an equipment grounding conductor contained within the same raceway, cable or cord or otherwise run with the circuit conductors. The equipment grounding conductor shall be individually covered or insulated and shall have a continuous outer finish that is either green or green with one or more yellow stripes.

3.03 GROUND TEST

Test the ground system to determine the resistance of the grounding electrode.

Provide additional ground rods as required to obtain a ground resistance not to exceed five (5) ohms.

PART 4 – QUANTITY AND PAYMENT

A. No separate payment will be made for work performed under this section.

END OF SECTION
SECTION 16200

RACEWAY & CONDUCTORS

PART 1 GENERAL

1. Provide raceways and conductors where shown on the plan and where necessary to provide a complete and functioning installation.

PART 2 MATERIALS

2.01 CONDUIT

A. Except where otherwise noted, or specified: 1) all exposed conduits indoors shall be EMT; 2) Direct buried or concrete encased conduits shall be Schedule 40 PVC or galvanized rigid steel. 3) Exposed exterior conduits shall be rigid aluminum.

B. It shall be straight and true and the interior of the conduit free from imperfections, including prefabricated bends. Inside surfaces shall be free from obstruction or imperfections liable to injure the electrical conductors and insulation. Conduit shall be capable of bending cold 90 degrees about a radius of 10 diameters without injury and it shall be delivered on the job in bundles of full length conduit, complete with thread protectors, each length marked with name or trademark of the manufacturer and the label of approval of the Underwriters' Laboratories.

C. Conduits shall be installed throughout structures in a completed system and must be so run that electrical conductors can be withdrawn and replaced at any time.

D. Conduits to be built into structure shall be properly protected and suitably supported to prevent strains at joints or injury by building operations, and shall be thoroughly protected at all times from the entrance of water or other foreign matter by being well plugged when work is interrupted. If left dead ended, they shall be furnished with iron caps or pipe plugs.

E. The interior of all conduits, conduit fittings, pull and junction boxes shall be carefully and thoroughly cleaned before and after installation.

F. Special care shall be taken to prevent conduits from becoming choked with cement or other debris.

G. No conduit smaller than 3/4" shall be used unless otherwise shown.

H. Flexible liquid-tite conduit shall be used in wet, dry, and non-hazardous locations to provide flexible connections between the rigid conduit system and motor terminal boxes, junction boxes and lighting fixtures and between the rigid system and any machine subject
to vibration.

I. Conduits shall be installed exposed in areas noted. All exposed conduits shall be run parallel to or at right angles to walls or beams and plumb on the walls. All conduits shall be fastened at least every 5', but must not be attached to or come into contact with any piping structures.

Exposed conduits shall be supported in an approved manner. Where conduits are supported with one-hole straps, spacers shall be used to provide 1/4” minimum clearance between the conduits and supporting surfaces. All hangers, racks, and straps shall be of the same material as the conduit.

J. Where conduit enters panel boards, pull boxes, or outlet boxes, secure it in place by galvanized locknuts and bushings, one lock nut outside and one locknut inside of box with bushing on conduit end. Tighten the locknuts against the box without deforming the box. Have all bushings be of the insulating type. Insure that bushings have the insulating material permanently fastened to the fittings.

K. Where embedded conduits cross building expansion joints, furnish and install an offset expansion joint or a sliding expansion joint. Insure that sliding expansion joints have bonding strap and clamp. Where conduits are exposed, provide expansion joints.

L. Make all conduits beneath floor be watertight. Where watertight conduits installation is required, use watertight conduit unions.

M. Insure conduit stub-ups in all accessible floor areas have a coupling, the top edge of which is flush with the finished floor surface. Seal couplings with a flush, threaded pipe plug.

N. The Contractor shall note that where conduit runs are shown on the contract drawings they are shown diagrammatically for the purpose of routing the conduits to avoid interferences. All home runs shall be installed as described herein.

O. Aluminum conduit shall be as manufactured by Allied Tube and Conduit, Inc. or equal.

2.02 CONCRETE EMBEDDED CONDUITS

A. The concrete encasement shall be constructed of 2,500 psi concrete and shall not be less than 3 inches all around the duct bank.

B. All concrete shall be vibrated. All concrete shall be made with Portland cement. Portland cement shall be Type 1, and shall meet all requirements of the latest ASTM Specifications for Testing Cement.

C. As soon as possible after the concrete encasement has been placed, the conduit shall be
thoroughly cleaned, to remove any concrete or debris, before hardening.

D. A period of 24 hours minimum shall be allowed for the concrete to set before the trench is refilled.

E. After the conduit is laid, the ends of all ducts in each manhole shall be plugged to prevent entry of foreign matter of any kind.

F. All conduit shall be equipped with not less than a 1/8 inch diameter polypropylene fish wire, secured in each manhole, after installation. Fish wire shall be properly tagged at each end, identifying distinction wiring cable I.D. system as herein specified.

G. Where duct bank crosses driveway or where vehicular traffic is anticipated, the duct bank shall be reinforced with re-bars.

2.03 FLEXIBLE CONDUIT - LIQUIDTIGHT

Where shown on the drawings and for connections to equipment subject to vibrations, provide flexible, liquid-tight conduit with hot dipped galvanized steel core over which is extruded a PVC cover and use Flexi-Guard, Type UAG as manufactured by O/Z Gedney Company or approved equal.

For water tight couplings and connectors for flexible conduit, provide liquid-tight fittings by O/Z Gedney Company or approved equal.

2.04 PVC RIGID NON-METALLIC CONDUIT - TYPE 40

A. Product

PVC Type 40 Conduit for application in underground concrete encased shall be in accordance with the National Electrical Code (Article 347).

B. Product Requirements

Conduit shall be Carlon Plus 40, 90

comply to NEMA Specification TC-2 (Conduit) and TC-3 Schedule 40 fittings-UL-514).

1. The conduit and fittings shall carry a UL label (conduit on each 10 foot length and be stamped or molded on fittings).

2. Conduit and fittings shall be identified for type and manufacturer and shall be traceable to location of plant, date and shift manufactured. The markings shall be legible and permanent.
3. The conduit shall be made from polyvinyl chloride C-2000 (recognized by UL) compound which includes inert modifiers to improve weatherability, and heat distortion. Clean rework material, generated by the manufacturer's own conduit production, may be used by the same manufacturer, provided the end products meet the requirements of this specification.

4. The conduit and fittings shall be homogeneous plastic material free from visible cracks, holes or foreign inclusions. The conduit bore shall be smooth and free of blisters, nicks or other imperfections which could mar conductors or cables.

5. Conduit and fittings shall be made by the same manufacturer to assure system integrity.

6. Final elbow and riser to grade or floor slab shall be heavy wall rigid steel conduit.

C. Testing and Acceptance Criteria

Conduit and fittings shall be tested in accordance with the testing requirements defined in NEMA TC-2, NEMA TC-3 (fittings) and UL-514. The acceptance criteria shall be as given in the same standards.

1. All conduit and fittings shall be solvent cemented in applications in accordance with instructions from the manufacturer.

2.05 ALUMINUM CONDUIT

Aluminum conduit shall be heavy-wall, rigid aluminum, Alloy 6063 T-1.

Conduit shall be lined with a silicone compound. Aluminum conduit shall conform to Federal Specification WW-C-00540c and ANSI Specification C-80.5. The aluminum conduit shall be as manufactured by Harvey Aluminum Company, Alcoa, or equal.

2.06 EXPANSION JOINT FITTINGS

A. The contractor shall furnish and install expansion joints in each conduit run to coincide with the expansion joints installed under the associated structural contract. Each joint shall provide a minimum of 4" expansion or contraction.

Each joint shall be installed with a grounding jumper and two bonding clamps to insure a continuous ground in each run.

B. Any outdoor exposed conduit run subject to expansion and contraction shall be furnished with an expansion fitting.
2.07 **WIREWAYS**

A. Wireway shall be hinged type constructed in accordance with Underwriters' Laboratories Standards UL 870 for Wireways, Auxiliary Gutters and Associated Fittings. Every component, including lengths, connectors and fittings, shall be UL listed. Provision shall be included in the construction to allow screwing the hinged cover closed without the use of parts other than the standard lengths, fittings and connectors. It shall be possible to seal the cover in the closed position with a sealing wire.

Where shown on the plan, provide a vented wireway.

Wireway shall be suitable for "lay-in" conductors. Connector covers shall be permanently attached so that removal is not necessary to utilize the lay-in feature.

All sheet metal parts and hardware shall be stainless steel. All screws installed toward the inside shall be protected by spring nuts or otherwise guarded to prevent wire insulation damage.

All connectors shall be slip-in type with self retained mounting screws. All hangers shall be two-piece with hook together feature to permit preassembly of wireway and hanger bottom plate before hanging on pre-installed upper bracket.

2.08 **CONDUCTORS**

A complete system of insulated copper conductors shall be installed in the conduit system, except where otherwise designated. All cables larger than #6 AWG use 90 degree C., 600 volt, type THHW or XHHW cross linked polyethylene insulation. Branch Circuit conductors sizes #6 AWG and smaller use type THN or THWN, 75 degree C, 600 volt composite insulation. Conductors shall be as manufactured by General Cable or reviewed equal. Aluminum conductors are not acceptable.

Except where otherwise noted, all signal and communication conductors shall be #14 AWG individually shielded twisted pairs, all power conductors shall be #12 AWG minimum, and all control conductors, unless otherwise specified shall be #14 AWG minimum.

All wires shall be brought to the job in unbroken packages and bear the date of manufacturing and shall not be older than 12 months.

Do not use mechanical means in pulling wires number 8 or smaller. Ensure lubricants.
are UL approved.

Color code all secondary branch-circuit and feeder conductors as follows:

1. Two-wire grounded system - 1 black, 1 white (neutral).

2. Three-wire, single-phase, grounded system - 1 black, 1 red, 1 white (neutral).

3. Three-wire, 3 phase ungrounded, delta system - 1 black, 1 red, 1 blue.

4. Four-wire, 3 phase, grounded wye or delta system - 1 black, 1 red, 1 blue, 1 white (neutral).

Connect all circuit conductors of the same color to the same ungrounded phase feeder conductor throughout the installation.

Provide any conductor intended solely for equipment grounding purposes with insulation green in color. Do not use conductors having white or green covering to indicate other than neutral or grounding. This limitation applies to all power, lighting, and control circuits.

For Wire No. 6 AWG or smaller, the required color coding is the color of the insulating covering. Accomplish color coding of wire larger than No. 6 AWG and other types of wire by means of self-adhesive, wraparound solid color type markers equal to E-Z Code or Brady "Perma-Code" cloth-type wire markers of the color code specified.

Where wire markers are used for color coding, mark each wire at all panel boards, auxiliary gutters, junction boxes, pull boxes, outlets, disconnect switches, circuit breakers not in panels and control centers.

Supply color coding of conductors of signal and control systems in strict accordance with approved diagrams or schedules prepared by the manufacturer of equipment or prepared by the Contractor.

Identify circuits by wire markers at the following locations:

1. Mark all power and lighting branch circuits and feeders at fixtures, outlets, and motors with markers indicating panel and circuit number at which each circuit or feeder originates.

2. Mark all branch circuits in the panelboard gutters. Have markers indicate corresponding branch-circuit numbers.
3. Mark all signal and control wires at all termination points, such as cabinets, terminal boxes, equipment racks, control panels, and consoles.

4. Prepare wire marking schedules and submit for approval. Use premarked, self-adhesive, wraparound cloth-type markers E-Z Code, Brady Perma-Code or reviewed equal.

All conductors protected by over current device rated 100 amps and less, shall have ampere rating corresponding to 60°C conductor temperature. If more than 3 current carrying conductors run in a raceway, derating per NEC art. 310 shall be applied to ampere rating corresponding to 60°C conductor temperature. Application of load diversity shall not be permitted.

All conductors protected by overcurrent devices rated higher than 100 amps shall have ampere rating corresponding to 75°C conductor temperature. If more than 3 current carrying conductors run in a raceway, derating per NEC art. 310 shall be applied to ampere rating corresponding to 75°C conductor temperature. Application of load diversity shall not be permitted.

2.09 INSTRUMENTATION CABLES

A. Multi conductor - Overall Shield

1. Conductors shall be multi conductor with an overall shield suitable for direct burial. The insulation shall be rated at 600V. Conductors shall be bare soft annealed copper, Class B, 7 strand concentric per ASTM B-8. Insulation shall be 15 mil nominal thickness, 90 degrees C temperature rating and flame retardant.

2. Cable shield shall be 1.35 mil blue aluminum-polyester tape overlapped to provide 100% coverage, and a 7 strand tinned copper drain wire, two sizes smaller than the conductor.

3. Overall jacket shall be flame retardant, 90 degrees C temperature rated and UL listed.

4. The minimum size conductor shall be 18 AWG for shielded instrumentation cable unless otherwise noted.

5. Multi conductor cable with overall shield shall be as manufactured by Okonite Company, Belden or approved equal.

2.10 CONDUCTOR TESTING & WARRANTY
All conductors shall be tested for continuity. In addition, all power conductors shall be meeggered to indicate compliance with the manufacturer's guaranteed values. A summary of test results shall be submitted for record purposes. All conductors shall be furnished with a manufacturer's one year warranty which shall be submitted at the time of cable approval and commence on the date of testing.

2.11 OUTLET BOXES AND FITTINGS

Outlet and fittings shall be of proper dimensions for each application, complete with watertight gaskets and covers secured with stainless steel screws.

Conduit fittings, such as elbows, tees, couplings, caps, bushings, nipples, and locknuts shall be threaded to provide a watertight connection.

Joints in conduit and between conduit and fittings shall be watertight and ends shall be reamed to prevent damage to conductor insulation. Joints shall be made with compression type couplings, Erikson Couplings or watertight unions.

A non-corrosive, conductive thread lubricant, such as "STL" thread lubricant as manufactured by Crouse-Hinds or approved equal shall be thoroughly applied on all threaded joints.

Cast metal outlet boxes shall be Crouse-Hinds Company, Appleton Electric Company or approved equal, and shall be coated inside and outside with corrosion-resisting epoxy finish or equal finish.

All junction boxes, fittings or other terminals without tapped conduit entrances shall be provided with double nuts and standard bushings. Running thread unions will not be permitted.

Device boxes shall be type FS or FD where surface mounted, type FS or FD PVC coated in corrosive areas and galvanized code gauge pressed steel where recessed in walls.

PART 3 EXECUTION

3.01 EXCAVATION AND BACKFILL

All work shall be in accordance with Section 700 of the New Jersey DOT Standard Specifications for Road and Bridge Construction.

PART 4 – QUANTITY AND PAYMENT

A. No separate payment will be made for work performed under this section.
END OF SECTION