ADDENDUM NO. 1

BID AND CONTRACT DOCUMENTS

FOR

BID No. 09P103

CHAFFEY COMMUNITY COLLEGE DISTRICT
CHINO HEALTH SCIENCE PARKING LOT
CHINO, CALIFORNIA
COUNTY OF SAN BERNARDINO

CHAFFEY COMMUNITY COLLEGE DISTRICT
5885 Haven Avenue
Rancho Cucamonga, CA 91737

The following changes, additions, deletions, clarifications, or corrections shall become part of the Bid and Contract Documents for Chaffey Community College District Bid No. 09P103, Chino Health Science Parking Lot Project at the Chino Campus, first advertised April 14, 2009. All other terms, specifications, and conditions remain the same. Each bidder is responsible for transmitting this information to all affected subcontractors and suppliers prior to the opening of bids. Each bidder shall acknowledge receipt of this Addendum on its Bid Form.

Modifications are identified by "clouds" and the following: Deletions ~~strikethrough~~
Insertions/Substitutions *italic-underlined*.

Item 1: **Modify** Part 7. CONTRACT APPENDIX, SUBPART B, SUPPLEMENTARY GENERAL CONDITIONS, Item D, as follows:

D. The Work shall be completed within **45** ~~calendar days~~ ***90*** *calendar days* (the "Completion Time") per the Contract and OWNER'S Notice to Proceed.

Item 2: **Modify** Part 7. CONTRACT APPENDIX, SUBPART B, SUPPLEMENTARY GENERAL CONDITIONS, Item D, as follows:

E. The agreed liquidated damages, as provided in Article 8.4.1 of the General Conditions, shall be $**1,000.00** per calendar day *for Phase 1, and* ***$1,000.00*** *per calendar day for Phase 2.*

Item 3: **Modify** Part 7. CONTRACT APPENDIX, SUBPART B, SUPPLEMENTARY GENERAL CONDITIONS, Item M, as follows:

M. This Bid requires the successful Contractor to have the following experience and technical expertise in order to be responsive:

a. The Contractor must have been in business under the same name/license number at the same location for a period of not less than **five (5)** continuous years. Contractor must provide this information in Section 4, Bidder Information Forms, subsections 4A4.0 and 4A5.0.
b. The Contractor, as a **prime contractor** under its current license number, must have completed:
    1. at least **two (2)** construction project for a California public school district, community college or university,
        a. that required DSA submittals and approvals as evidenced by a DSA Project Number,
        ~~b. of two or more stories~~
        c. with a construction cost of $300,000 or more,
        d. using design-bid-build, design-build, or CM-at-Risk delivery; and

    Contractor **must** use **different** projects to satisfy each requirement(s) above. Contractor must provide this information in Section 4, Bidder Information Forms, subsection 4C.
c. Contractor shall have provided accurate and complete information in Section 4, Bidder Information Forms, which is verifiable.

Item 4: **Delete** the existing SPECIFICATION, DIVISION 1 – GENERAL REQUIREMENTS, Section 01020, PROJECT PHASING & MILESTONE SCHEDULE, and **replace** with SPECIFICATION, DIVISION 1 – GENERAL REQUIREMENTS, Section 01020, PROJECT PHASING & MILESTONE SCHEDULE, attached to this ADDENDUM, to change the project from one phase to two phases with milestones.

Item 5: **Delete** the existing SPECIFICATION, DIVISION 11 – EQUIPMENT, Section 11155, PAY AND DISPLAY METERS, and **replace** with SPECIFICATION, DIVISION 11 – EQUIPMENT, Section 11155, PAY AND DISPLAY METERS, attached to this ADDENDUM.

Item 6: **Delete** the existing SPECIFICATION, DIVISION 16 – ELECTRICAL, Section 16050, BASIC MATERIALS AND METHODS, and **replace** with SPECIFICATION, DIVISION 16 – ELECTRICAL, Section 16050, BASIC MATERIALS AND METHODS, attached to this ADDENDUM.

Item 7: **Delete** the existing SPECIFICATION, DIVISION 16 – ELECTRICAL, Section 16510, LIGHTING, and **replace** with SPECIFICATION, DIVISION 16 – ELECTRICAL, Section 16510, LIGHTING, attached to this ADDENDUM.

END OF ADDENDUM NO. 1

PROJECT PHASING & MILESTONE SCHEDULE 01020

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Requirements for phasing of the Work include logistics, phasing, and completion of designated phases prior to commencement of subsequent phases.

1.02 RELATED SECTIONS

A.	Section 01010:	Summary of the Work
B.	Section 01040:	Coordination
C.	Section 01340:	Shop Drawings, Submittals, Product Data, & Samples
D.	Section 01310:	Construction Schedule
E.	Section 01500:	Construction Facilities, Use of Premises, & Temporary Controls
F.	Section 01700:	Contract Closeout

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 SUBMITTALS

A. CONTRACTOR shall submit a Project site logistics plan in accordance with and as required by this Section.

3.02 LOGISTICS

A. Prior to commencement of the Work, CONTRACTOR shall prepare and submit to CONSTRUCTION MANAGER, a detailed Project site logistic plan, in the same size and scale of the Drawings, setting forth CONTRACTOR plan of the Work relative to the following (as applicable), but not limited to, items:

1. In accordance with local ordinances a truck access route to and from the Project site.
2. The identification of any overhead wire restrictions for power, street lighting, signal, and/or cable.
3. Local sidewalk access and street closure requirements.
4. Protection of sidewalk pedestrians and vehicular traffic.
5. Project site fencing and access gate locations.

6. Construction parking.
7. Material staging and/or delivery areas.
8. Material storage areas.
9. Temporary trailer locations.
10. Temporary service location and proposed routing of all temporary utilities.
11. Location of temporary and/or accessible fire protection
12. Trash removal and location of dumpsters.
13. Concrete pumping locations.
14. Crane locations.
15. Location of portable sanitary facilities.
16. Mixer truck wash out locations.
17. Traffic control signage.
18. Perimeter and site lighting.
19. Storm Water Pollution Prevention Plan – SWPPP
20. Erosion Control Plan - ECP
21. Stockpile and/or lay down areas.

B. A revised Project site logistic plan may be required by the CONSTRUCTION MANAGER for separately identified phases of the Work as set forth in this Section.

C. Unless specifically required elsewhere in the Contract Documents, CONTRACTOR is responsible for securing and/or obtaining all approvals of authorities having jurisdiction relative to logistic plan activities.

3.03 PHASING OF THE WORK – GENERAL

A. CONTRACTOR shall prepare the Construction Schedule in order to complete the Work and related activities in accordance with the phasing plan. CONTRACTOR shall include all costs to complete all Work within the Milestones and/or Contract Time.

B. OWNER will be seriously damaged by not having all Work completed within the Milestones and/or Contract Time. It is mandatory the Work be complete within the Milestones and/or Contract Time.

C. Refer to ~~the Tentative Contract Milestone Bid Schedule that is in the Section 01310 Construction Schedule~~ *Item 3.04 and 3.05 below*, which details the ~~one (1)~~ *two (2)* phase*s* of the project. The Contract Completion Time is ~~45~~ *90* calendar days from the date of the Notice to Proceed.

3.04 PHASING OF THE WORK – GENERAL

D. CONTRACTOR shall prepare the Construction Schedule in order to complete the Work and related activities in accordance with the phasing plan. CONTRACTOR shall include all costs to complete all Work within the Milestones and/or Completion Time.

E. OWNER will be seriously damaged by not having all Work completed within the Milestones and/or Completion Time. It is mandatory the Work be complete within the Milestones and/or Completion Time.

3.05 PHASING OF THE WORK – SPECIFIC

A. CONTRACTOR shall prepare the Construction Schedule, and shall complete the following, but not limited to, Milestones, within the designated phases (and sub phases) in accordance with the following:

Phase 1: Construction of Health Science Parking Lot – forty five (45) calendar days, to be completed concurrently with Phase 2:

Milestone No. 1: Health Science Parking Lot Completed – Partially Substantially Complete

Phase 2: Installation of Lighting Fixtures – ninety (90) calendar days:

Milestone No. 2: Lighting Fixtures Installation Completed – Substantially Complete

B. The Completion Time shall be a total of ninety (90) calendar days from the date of commencement of the Completion Time as stipulated in the Notice to Proceed. Estimated commencement date is June 15, 2009, with Phase 1 to be completed by July 29, 2009 and Phase 2 to be completed by September 12, 2009.

END OF SECTION

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 the provision of all material, labor, equipment, and services necessary to furnish and install standalone P&D meters that shall function in the manner described herein.

B. System Design: This system shall be an un-gated revenue control system utilizing P&D meters for parkers who will pay for parking on each visit. The meter shall be accessible.

C. The primary components of the system shall include:

1. P&D METER. ***(OWNER FURNISHED CONTACTOR INSTALLED)***

D. Additional components and accessories include:

1. Initial supply of operating stock items. ***(OWNER FURNISHED CONTACTOR INSTALLED)***
2. Spare components and parts. ***(OWNER FURNISHED CONTACTOR INSTALLED)***

E. System Configuration

1. *One (1)* ***(OWNER FURNISHED CONTACTOR INSTALLED)*** P&D meter at the parking facility per sheet A*P*1.02.

F. List of Abbreviations:

1.	ANSI	American National Standards Institute
2.	NEMA	National Electrical Manufacturing Association
3.	NIC	Not in Contract
4.	NIMH	Nickel Metal Hydride
5.	NIS	Not in Service
6.	UPS	Uninterruptible Power Supply

G. Bid Requirements:

1. Bid Packages: Bid includes the provision of all material, labor, equipment, and services necessary to furnish and install *one (1)* ***(OWNER FURNISHED CONTACTOR INSTALLED)*** P&D meter.

2. Bidder shall submit the following with the bid:

    a. List of sub-contractors, identifying the nature of the work that shall be performed.
    b. Total cost and unit costs of each component, the cost of alternates and/or deducts as delineated on the Bid Form.
    c. Qualifications of the Contractor, Manufacturer(s) and Installer(s) of each primary component listed in 1.2.C with the Bid. Each submittal shall include the 5 most recently installed, complete projects which are similar in magnitude, complexity, and dollar value. Information shall include names, locations, contacts, telephone numbers, date of installation, number of spaces in facility and description of types and quantities of equipment.
    d. Owner will provide power per Section 2.2.B. Bidder shall include all required power conditioners in the bid amount *if system* or any component thereof requires power differing from that specified in Section 2.2.B.
    e. Owner will provide power wiring and conduit as shown on the drawings. Bidder shall include all communications wiring (if necessary) and any additional power wiring and conduit required by the Bidder's system in the bid amount.
    f. Bidder shall:

        1) Examine the site and Drawings.
        2) Identify any constraints or conflicts where equipment is to be installed.
        3) Include the cost of rectifying such constraints or conflicts in the bid.

    g. Submit detailed schedule showing Bidder's understanding of project requirements including milestones for shop drawings, fabrication, delivery, installation, testing, training and substantial completion. Milestones shall also include special project requirements related to coordination with work by others and phasing.

3. Unit Prices. Provide unit prices listed in the Bid Form.

H. Work Included:

1. Install all new ***(OWNER FURNISHED AND CONTRACTOR INSTALLED)*** P&D meters as described in this Section.
2. Comply with all applicable codes and standards.
3. Review plans and specifications to be certain that all functional requirements, as described, can be achieved with the equipment to be supplied.
4. Provide Shop Drawings and product literature in accordance with Section 1.3.C and Division 1.
5. Coordinate final and precise layout of conduits, stubs, bollards, and anchor bolts with those responsible for installation.
6. Provide and install all necessary device control wiring and communications wiring to equipment provided in this contract. Furnish and install all modems, electronics and communications equipment for communication network. Terminate and connect all communications cabling. Test, adjust and interface circuits prior to installation of P&D equipment. Make all connections of wiring to components.
7. Attend construction meetings, provide schedules as requested, and schedule field work which shall be coordinated with other trades.
8. Test equipment in accordance with Part 3 of these specifications.

9. Provide record drawings, operating manuals, maintenance manuals, spare parts, and training sessions as specified herein.

I. Work by Other *Trades*:

1. All electrical conduit and power wiring as shown on the Contract Documents.
2. All changes to and/or new construction of islands, curbing, drainage, bollards, signage and pavement markings.

J. The following sections contain requirements that relate to this section:

1. Concrete work is specified in Division 3.
2. Electrical work is specified in Division 16.

1.3 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specifications Sections.

B. Schedule: Contractor shall submit schedule of fabrication, delivery, installation, and testing within *7* days after award of contract. Update schedules at *7*-day intervals.

C. Shop Drawings shall include:

1. Dimensioned drawings showing plans, elevations, sections and large-scale details indicating coordination and relationships with other construction.
2. Product literature for each component or product.
3. Wiring diagrams detailing power, signal and control systems, and differentiating clearly between wiring installed by manufacturer, installer and others.

D. Samples: Submit samples of elements to be selected by Owner (including but not limited to paint finishes and standard reports) within *7* days after approval of the contract. Approval/selections will be returned to Contractor within *7* days of submittal.

E. Operating Documentation: Prior to the initiation of the field test and training, the Contractor shall deliver operations manuals, maintenance and administration manuals in the number as specified below:

1. Supervisor Manual - This manual is designed for the Supervisor or authorized individual for day-to-day operation of all specified software package(s). It shall explain all the features and functions (e.g., log-on/off, monitors, prepare and print standard and ad hoc reports) required for day-to-day management. The manual shall also have a section for problems and/or exception conditions so the Supervisor can resolve common operating problems. The manual shall also contain instructions on how to operate the P&D METER, perform normal maintenance (e.g., changing paper for the printer) and collect revenues from the machines. Two copies of this manual shall be provided plus one reproducible original.
2. Maintenance Manual - This manual shall contain detailed instructions on how to perform regular and preventive maintenance on all components of the P&D METERS and

communications network that can be performed by Owner's staff. Two copies of this manual shall be provided. The manual shall include:

a. Description of unit and component parts, including complete nomenclature and commercial number of all replaceable parts.
b. Operating procedures: Include start-up; break-in; routine and normal operating instruction; regulation, control, stopping, shut-down and emergency instructions; and special operating instructions as applicable.
c. Maintenance procedures: Include routine operations; guide to trouble shooting; servicing schedule; description of sequence of operation; as-installed control diagrams; as-installed color coded piping and wiring diagrams; and a list of spare parts and recommended quantities to be maintained in storage on-site.
d. Include trouble-shooting guide for repairs which can be performed by Owner's staff.
e. Include manufacturer's product data with each sheet annotated to clearly identify the data applicable to the installation and delete references to inapplicable information.
f. Supplement product data with drawings as necessary to clearly illustrate relations of component parts of equipment and systems.
g. Include copy of each manufacturer's warranty and give information sheet for proper procedures in the event of failure and instances that may affect the validity of warranties.

F. Record Drawings: Provide the Owner with a reproducible set of drawings and a CAD file in Autocad 2000 or later format showing any modifications or clarifications not present on original Contract Drawings including the actual equipment field wiring diagram and electrical circuitry and service schematics.

G. The Contractor shall also deliver to the Owner original copies of all licenses, registrations, documentation, disks and other media as may have been included with those commercially available software packages provided with the system. In addition, the Contractor shall ensure that all licenses, registrations and warranties have been transferred to the Owner prior to final software turnover.

H. Contractor shall deliver a Training Plan which shall include a description of the training courses including identification of the instructional outcome and duration of the course.

I. Testing Plan and Documentation: Provide a test plan for review and approval by Owner and Engineer/Architect 30 days prior to start of first test. The plan shall include demonstrations of compliance with specifications, contractual compliance, definitions of all test objectives, participant responsibilities, documentation for tests, and procedures for dealing with failures during test. Provide checklist which detail tests for every functional requirement of the P&D meter, specified supplies/spare parts, training, operating and maintenance manuals and provide space for sign-offs by Contractor and Owner's Representative.

1.4 QUALITY ASSURANCE

A. Provide seven days notice to the Owner and Engineer/Architect to review completed installation prior to acceptance testing.

B. Provide equipment incorporating features which minimize maintenance and meet the following maintainability requirements:

1. Provide for ease of performance verification and failure detection while minimizing effort required for adjustment.
2. Provide unobstructed access to equipment components.
3. Minimize requirements for special tools and test equipment.
4. Provide for easy removal and replacement of components.

C. Provide a system and components that have a service life of ten years and specify periodic maintenance requirements in the maintenance manual to meet that life expectancy.

1.5 QUALIFICATIONS

A. Contractor/Installer shall:

1. Have continuously worked successfully with equipment manufacturer for minimum of three years.
2. Be approved in writing by P&D manufacturer(s).
3. Have a manufacturer approved equipment service center in sufficient proximity to respond on-site to service calls within four hours.

1.6 DELIVERY, STORAGE AND HANDLING

A. The Contractor shall assume care, custody and control of all P&D equipment and components; replace damaged materials at no cost to Owner; deliver equipment to site packaged to prevent damage and marked for easy identification; and store equipment in original containers in clean, dry location designated by General Contractor or Owner and agreed to by the Contractor.

1.7 TIME OF COMPLETION

A. Contractor shall coordinate installation and testing of equipment so that Owner may begin operation of P&D meters at time parking facility is opened to public for use. First 30 days of operation after complete installation will constitute test period as described in Part 3 of this Specification.

1.8 WARRANTY

A. General: Contractor shall warrant equipment and installation (100 percent parts and labor) for a period of one year from date of final acceptance by Owner. The system shall be maintained and serviced against any and all malfunctions due to manufacturing or installation defects at no cost to Owner during warranty period. Maintenance shall include preventive maintenance per manufacturer's recommendations, or as necessary to keep equipment in good working order.

Contractor shall be responsible for performing all maintenance and repair during the warranty period, including all preventive maintenance and minor repair tasks. Contractor shall keep a log of all maintenance, preventive maintenance and repair work performed under warranty to be given to Owner at the end of the warranty period.

B. Warranty Period: Warranty period shall begin after Contractor has demonstrated satisfactory performance of completed P&D METERS as specified in Part 3, "Operational and Test Cycle".

C. Response: Warranty response period shall be five days per week, 12 hours per day excluding holidays. Response time from initiation of trouble call to on-site response of qualified service technician must not exceed four hours.

D. Repair: Contractor shall repair or replace all defective or damaged items delivered under contract by end of calendar day following day on which notice was given by Owner or its agent. Contractor may elect to have any replaced item returned to manufacturer at no additional expense to Owner. If Contractor is not available, Owner/operator personnel may effect repairs. Contractor shall then reimburse Owner for parts and labor necessary to correct deficiencies as defined within warranty clause and time. Contractor shall pre-qualify appropriate Owner/ Operator personnel to effect repairs and identify the types of repair each trained individual is qualified to perform after training of owner personnel.

E. Limitations: Warranty shall not cover acts of vandalism, damage caused by third party, or natural phenomena. Warranty shall not cover damage caused during maintenance actions by untrained/unapproved Owner personnel.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS OF PRIMARY COMPONENTS - *(OWNER FURNISHED CONTRACTOR INSTALLED)*

A. Acceptable manufacturers for any and all primary components shall meet following requirements:

1. Manufacturer shall have been continuously in operation for past five years.
2. Manufacturer shall have current version of each primary component currently operating successfully in five or more parking facilities of similar size and activity.
3. If all components of P&D meters are not from same manufacturer, Contractor shall be responsible for the performance of these components, as they relate to the proper functioning of system as required herein.
4. Manufacturer must be able to demonstrate successful performance of the proposed system and equipment. Proof of successful performance shall be submitted in accordance with paragraph 1.2.H.3.d.
5. Acceptable manufacturer shall be Digital Payment Technologies – Intella-Pay Payment Station or Owner Approved Equal.

2.2 PROJECT SITE CONDITIONS

A. P&D meter components shall operate dependably within environmental conditions indigenous to the Greater Los Angeles area in California. Outdoor equipment shall be capable of operating in the temperature extremes of the geographic area stated.

1. Special electrical power and grounding.

a. Furnish and install on-line, regulating computer grade Uninterruptable power supply (UPS) for:

1) P&D meter with 30 minutes of back-up battery power.

b. Owner will provide "clean" power that for the purposes of this Project shall be defined as 115 VAC +/- 10% and 60 Hz from circuits dedicated to the P&D METERS. Contractor shall provide any additional power conditioning required for the operation of the system as described herein.

c. Provide dust and noise protection in strict accordance with equipment manufacturer's recommendations.

d. Equipment layout shall be in strict accordance with manufacturer's recommendations to allow proper movement of air through and around equipment.

2.3 EQUIPMENT REQUIREMENTS - *(OWNER FURNISHED CONTRACTOR INSTALLED)*

A. Provide complete operational parking system with all necessary components. It is the Contractor's SOLE RESPONSIBILITY to provide every component necessary for a complete functioning system.

B. See Contract Drawings for P&D meter layout.

C. Provide Owner with two sets of keys for each piece of equipment with locks and two sets of master keys. Keys shall be unique to this parking equipment: They shall not fit any other equipment in same city or metropolitan area.

D. Spare Components: Furnish the following spare components, complete and ready to use, prior to commencement of operational testing and maintain inventory of spare components at this level as components are used during warranty period. After expiration of warranty period, Owner will pay for replacement of parts as used from this inventory.

1. P&D METER:

a. One controller
b. One receipt printer unit
c. One note accepter

E. Stock: Furnish the following operating stock items prior to commencement of operational testing.

1. 50 rolls paper for each P&D METER
2. Three spare ribbons for each printer requiring ribbon

3. Two additional removable locking coin vaults for each P&D meter
4. Two additional removable locking bill vaults for each P&D meter

2.4 PERFORMANCE SPECIFICATIONS

A. Primary components of P&D METERS shall meet following specifications:

1. P&D METER shall be microprocessor controlled.
2. All field programmable functions of each device shall be reprogrammed from a handheld unit and any and all reprogramming changes shall be reported to the P&D daily log.
3. Primary components shall incorporate a crystal controlled time clock/calendar.
4. All devices shall be ergonomically designed for ease of use by patrons.
5. Cabinets shall be fabricated of a material that is strong and durable such as, but not limited to, composite, stainless steel, aluminum alloy, or welded 12-gauge steel. The mounting holes shall only be accessible from the inside of the cabinet. All surfaces shall be corrosion resistant and the exterior of cabinet shall be finished in a color chosen by Owner. Cabinets shall have hinged external doors.
6. Internal components shall be modular and plugged for easy maintenance and replacement.
7. Corrosion resistant connection boxes shall be provided for all wiring connections.

B. Pay and Display Meters:

1. Operational Description

    a. Public Usage by cash parkers: Each P&D METER machine shall enable patron to key in amount of time purchased by pushing the appropriate keys on the machine. Machine shall accept payment of parking fees by coin or bill. As each coin or bill is inserted into machine, machine shall calculate and display parking time paid for. Machine shall issue a receipt for parking fee paid upon pressing of receipt button by patron. Machine shall have a memory system which stores data from each transaction, including amount paid, and time purchased. Information shall be written on the ticket requiring patrons to display parking ticket on their vehicle dashboard.

2. Machine shall contain concise customer instructions for user friendly operation. The machine shall have an easily readable alpha numeric display to communicate messages to user. The operating procedure shall generally progress from left to right and top to bottom; corresponding instructions shall be numbered and shall be pictorially illustrated. Messages displayed at changeable message indicator shall be instructional phrases such as; Enter Parking Time, Please Take Receipt, Please Wait While Receipt is Printing, Thank you.
3. Machines shall conform with the Americans with Disabilities Act accessibility guidelines for automated teller machines, August 1992 except that requirements related to persons with vision impairments need not be met.
4. Machine shall be capable of recognizing user errors, such as invalid entry, and shall provide guidance to user via display on machine.

5. The rate structure shall be programmable only from a hand-held unit, with the ability to accommodate the following:

    a. At least 6 fee structures each of which have three rate increments or blocks for each of up to 60 fee segments. Each block is an amount to be charged, duration for that charge and number of times that duration and charge is to be repeated over each 24 hour period of stay.
    b. Automatic adjustment for daylight savings time and leap year in fee calculations.
    c. 24 hour maximums.
    d. Grace time.
    e. Differential daytime, evening weekend and holiday rates.

6. Contractor shall initially set up fee structure to Owner's requirements. Machine shall accept coins and bills for payment of parking fees. Coins shall be accepted in nickel, dime, quarter and Susan B. Anthony dollar denominations (United States currency only). Both 1 and 5 dollar bills (United States currency only) shall be accepted.
7. Machine shall be equipped with separate coin and bill vaults. Both vaults shall be removable and locking, and shall be keyed differently than other machine locks such that access to money in vaults is not available when vaults are removed. Coin vault shall be a minimum of 7 gauge in thickness and shall have a storage capacity of $1,000. Machine shall have capability to stack bills in vault. Bill vault shall have capacity to store 2,000 bills. Each vault shall have a separate identification number.
8. Receipt shall be issued automatically. Information provided on receipt shall include amount of money deposited, time bought, expiration time, facility identity and time and date of transaction. Printer shall dispense a minimum of 5,000 receipts per roll of paper.
9. Each machine shall be capable of controlling a minimum of 1,000 parking spaces.
10. Upon completion of each transaction, machine shall store transactions in P&D memory. Each transaction shall be identified by machine number and transaction number.
11. Machine shall recognize a transaction as completed if any one of the following occurs:

    a. 40 seconds has elapsed since the last bill or coin was inserted
    b. The receipt button is issued

12. Machine shall contain locking system and appropriate alarm contacts to monitor for tampering. Machine shall be furnished and installed with locking anti-tamper devices to prevent unauthorized disconnection of both power and communications wiring connections.
13. Each machine shall monitor critical machine functions and transmit alarms to internal memory. Functions monitored shall include low paper, low battery, coin jam, bill jam, coin vault full, bill vault full, A.C. power off, door open, door closed, tampering and door forcements. Owner shall be able to key in code to view or print out monitoring and alarm reports.
14. Machine shall be capable of performing a self-diagnostic routine at programmable times or intervals. Self-diagnostic routine shall verify that machine functions are working properly. Functions to be checked shall include, but not be limited to, accuracy of fee calculation, clock, and coin and bill recognition. System shall be capable of producing a printout documenting the results of the diagnostic routine.

15. Machine shall dispense printed revenue report with current totals, grand totals, transaction distribution totals, and number of users. Reports shall be available from both dollar unit and coin unit.
16. P&D meter shall have a minimum accuracy of:

    a. Fee calculation accuracy: 99.9%
    b. Clock accuracy -- one minute per month.

17. Timing: System shall meet the following time performance requirements:

    a. Elapsed time from time that bill or coin is accepted until time purchased is displayed shall not exceed 1.5 seconds.
    b. Elapsed time from time that receipt button is pressed until receipt is issued shall not exceed three seconds.

18. The two P&D meters shall be linked together such that the Owner personnel can print reports for both meters from one of the machines.

C. Hand-held Programming Device: Contractor shall have option to provide a hand-held device to program the P&D meter or provide software into Owner laptop computer that allows the same capabilities as the hand-held unit.

2.5 SUBSTITUTIONS

A. It is recognized that there are variations in equipment between manufacturers and that some manufacturers may not be able to meet all specifications in the manner specified. Others provide extra features within standard unit. With submittal of Bid, submit letter summarizing any different approaches to providing specified features and/or any extra features that are provided as part of basic unit. This letter may be accompanied by catalog sheets, brochures, technical specifications, etc.

PART 3 - EXECUTION

3.1 PROJECT COORDINATION

A. General: Meet with Owner, Engineer/Architect, and General Contractor within 30 days of contract award to verify all details of P&D system. Schedule, as related to Work done under General Contract, must be achieved with adequate time for hookup, testing, and trial period as specified herein.

B. Submittals: Provide those responsible for related work with:

C. Meetings: Meet with Electrical Contractor, before any rough-in work begins, to review building plans as they relate to P&D meters, to explain details or precautions necessary to assure that all parking and revenue control equipment shall work properly, and to determine that all required conduits and wiring are properly laid out.

D. Additional Wiring: Provide all additional conduit and wiring which is needed for total system performance but which was not noted on Contract Documents. There shall be no additional cost to Owner for these items.

3.2 INSPECTION OF WORK BY OTHERS

A. Upon written notice from Contractor that the entire work or an agreed portion thereof is complete, Owner representative(s) and Contractor shall make final inspection of Work. The Owner and/or Owner's representative shall then notify the Contractor in writing of all particulars in which the Work has been found incomplete or defective. The Contractor shall immediately take such measures as are necessary to remedy such deficiencies.

3.3 INSTALLATION OF P&D METERS

A. Install P&D meters in accordance with manufacturer's recommendations and approved Shop Drawings.

B. Installation and Start-Up: Contractor shall be responsible for installation of all control and communication wiring and Contractor supplied equipment and its interfacing and interconnection with Owner supplied equipment. The Contractor shall authorize and accept responsibility for application of power to the equipment and initiation of operation, be responsible for running all initial diagnostics and system generation programs necessary to provide a complete working system.

3.4 TEST AND ACCEPTANCE PROGRAM

A. General: Format for all system acceptance testing reports shall be submitted to Engineer/Architect and Owner and must be approved before acceptance of P&D METERS.

B. Inspections and Testing: Inspections and tests observed by Owner and Engineer/Architect shall not relieve Contractor of responsibility for providing hardware, software and documentation in accordance with this Specification.

C. Installation Test Demonstrations: Upon installation of each piece of equipment, an installation test shall be performed. This test shall exercise the equipment in accordance with specific test procedures document required in Part 1 of this Specification as well as test every function of equipment. An Owner's representative may witness tests. The Contractor shall notify the Owner and Engineer/Architect in writing at least one week prior to each official test session. In the event that first test is not successful, the Contractor shall correct noted deficiencies and notify Owner and Engineer/Architect, at least two days in advance, that test session is ready to resume. The Contractor shall promptly correct all problems encountered at the Contractor's expense. A schedule of all tests shall be submitted for Owner's review and approval. The following specific tests shall be included in installation testing:

D. Thirty-Day Operational Test and Final Acceptance: Upon completion of all installation tests, demonstrations and training required herein, Owner or its agents shall operate complete system

for test period of thirty days. During this period, following performance standard must be met in order for final acceptance to be issued:

1. All mechanical components must be operational without downtime. For each downtime period of four hours or more, one working day will be added to acceptance cycle.
2. All electronic components must be operational without downtime or programming problems for complete monthly reporting cycle. For each downtime period of more than one hour, but less than eight hours or less or programming problem that delays report cycle, one working day will be added to acceptance cycle.
3. All test reports must correlate 100% with cash receipts in each P&D meter for test period.

3.5 TRAINING PROGRAM

A. The Contractor shall implement a training program for the Owner's personnel. This training program shall be documented by the Contractor in the Training Plan per Section 1.3 Submittals.

B. The Contractor shall conduct the required training at times and locations coordinated by the Owner:

LABOR CATEGORY	NO. TO BE TRAINED	NO. OF HRS PER PERSON
SUPERVISORS/CASH COLLECTORS	2	4
MAINTENANCE PERSONNEL	1	4

C. At the conclusion of maintenance training session(s), the Contractor shall submit to the Owner a list naming qualified Owner/Operator maintenance personnel. The list shall detail the level of maintenance/repair functions each of Owner/Operator personnel are qualified to perform.

D. Training shall consist of the following:

1. Supervisors: Supervisors shall be trained to:

    a. Operate the P&D meter.
    b. Perform primary maintenance on the P&D meters (trouble shoot/replenish supplies).

2. Maintenance personnel: Maintenance personnel shall be trained to perform primary maintenance on all major components of the system. Additionally, maintenance personnel shall be trained to:

    a. Replenish all system supplies.
    b. Clear paper jams.
    c. Reset the system after a power failure.
    d. Replace internal elements such as circuit boards.

e. Lubricate and clean internal components.
f. Be certified by the contractor to perform primary maintenance.
g. Perform all P&D meter functions.

END OF SECTION 11155

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conduit

B. Fittings and Conduit Bodies

C. 600 Volt Wires

D. Boxes

E. Emergency Phones

F. Telecommunications Cable - Category 6 – Outside Plant

1.2 RELATED SECTIONS

A. Section 16010 – Electrical General Requirements, applies to this section, with the additions and modifications specified herein.

B. Section 16170 – Grounding and Bonding.

C. Section 16195 – Electrical Identification.

1.3 APPLICABLE PUBLICATIONS: The following publications form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. American National Standards Institute, Inc. (ANSI) Publications:
1. C80.1 Rigid Steel Conduit, Zinc Coated
2. C80.3-83 Electrical Metallic Tubing, Zinc Coated
3. C80.5-77 Specification for Rigid Aluminum Conduit
4. FB 1 Fitting, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies
5. OS 1 Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports
6. OS 2 Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports

B. National Electrical Manufacturers Association (NEMA) Publications:
1. AB 1 Molded Case Circuit Breakers
2. ICS 2 Industrial Control Devices, Controllers, and Assemblies
3. ICS6 Enclosures for Industrial Controls and Systems
4. KS 1 Enclosed Switches
5. TC 2 Electrical Plastic Tubing and Conduit
6. WD 1 General Purpose Wiring Devices
7. WD 6 Wiring Device Configurations
8. RN 1 PVC Externally Coated Galvanized Rigid Steel Conduit and Electrical Metallic Tubing

C. National Fire Protection Association (NFPA) Publication:
   1. 70-2005 National Electrical Code (NEC)

D. State of California Administrative Codes:
   1. Title 24, Part 3, CCR, California Electrical Code

E. Underwriters Laboratories, Inc. (U.L.) Publications:
   1. 1-85 Standard for Flexible Metal Conduit
   2. 6-81 (R86) Rigid Metallic Conduit
   3. 50-80 Cabinet and Boxes
   4. 83-1983 Thermoplastic Insulated Wires
   5. 198E-82 (R87) Class R Fuses
   6. 360-80 (R86) Liquid-tight Flexible Steel Conduit
   7. 486A-1980 (R86) Wire Connectors and Soldering Lugs, for use with Copper Conductors
   8. 498-86 (R87) Attachment Plugs and Receptacles
   9. 508-84 (R85) Industrial Control Equipment
   10. 510-77 (R82) Insulating Tape
   11. 514A-1983 (R85) Metallic Outlet Boxes
   12. 514B-1982 (R85) Fittings for Conduit and Outlet Box
   13. 651-81 Schedule for 40 & 80 Rigid PVC Conduit
   14. 797-77 Electrical Metallic Tubing
   15. 869-84 Standard for Service Equipment
   16. 1242-83 Standard for Intermediate Metal Conduit

1.4 SUBMITTALS

A. Submit under provisions of Section 16010.

B. Product Data: Provide for:
   1. Conduit and Connectors (all types)
   2. Conductors (all types)
   3. Cabinets, Enclosures and Junction Boxes
   4. Safety Switches
   5. Wiring Devices (receptacles and switches)
   6. Device Plates

C. Test Reports: Provide for:
   1. Insulation resistance tests of low voltage conductors.
   2. Operational tests.

1.5 PROJECT RECORD DOCUMENTS

A. Accurately record actual routing of conduits larger than 1-1/2 inches.

B. Accurately record actual locations and mounting heights of device, outlet, pull and junction boxes.

C. Accurately record actual location of each new receptacle.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70 and with all state adopted amendments, except where requirements herein are more stringent.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. or a testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

1.7 QUALITY ASSURANCE**:** In each standard referenced to herein, consider the advisory provisions to be mandatory, as though the word "shall" has been substituted for "should" wherever it appears. Interpret references in these standards to "authority having jurisdiction," or other words of similar meaning, to mean COLLEGE Project Manager.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle Products to site under provisions of Sections 01600 and 16010.

B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

1.9 PROJECT CONDITIONS

A. Verify routing and termination locations of all conduits prior to rough-in.

B. Locate existing site utility lines prior to the excavation.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT: Materials and equipment shall conform to the respective specifications and standards and to the specifications herein. Electrical ratings shall be as indicated. Except where specifically indicated otherwise, provide only new materials having all legally required approvals and/or labels. Items of a similar nature shall be of the same type and manufacturer.

2.2 CONDUIT

A. Rigid Steel Conduit (Zinc-coated): ANSI C80.1, UL 6, hot-dip galvanized, threaded type.

B. Electrical Metallic Tubing: UL 797, ANSI C80.3.

C. Rigid Plastic Conduit: NEMA TC-2, UL 651, PVC Schedule 40, Carlon or approved equal.

D. Liquidtight Flexible Non-Metallic Conduit: UL 1660, Non-metallic, liquid-tight conduit with a polyvinyl chloride reinforced core. Conduit must conform to NEC 351B. Electri-Flex Liquatite® Type LNM-P, Kellems Polytuff I or approved equal.

E. Liquidtight Flexible Metallic Conduit (limited to 6 feet runs only): UL 360, Interlocked steel construction with a polyurethane jacket, Electri-Flex Liquatite® type CEA or approved equal. Limited to 4 feet run only.

F. PVC Coated Metal Conduit: NEMA RN 1, rigid steel conduit with external PVC coating, 40 mil thick.

2.3 FITTINGS

A. Fittings for Rigid Metallic Conduit and Intermediate Metallic Conduit: UL 514B, threaded-type.

B. Fittings for EMT: Compression type. Split or set-screw couplings are unacceptable.

C. Fittings for Liquidtight Flexible Metallic Conduit: ANSI FB 1.

D. Fittings for Liquidtight Flexible Non-Metallic Conduit: ANSI FB 1.

E. Expansion/Deflection Fittings: Provide fitting capable of a straight line expansion movement of 2" in either" direction and a movement of 3/4" from ¾"normal in all other directions, OZ Gedney Type AXDX. Provide complete with grounding and bonding jumpers.

F. Fittings for PVC Coated Metal Conduit: ANSI FB 1; steel fittings with external PVC coating to match conduit.

2.4 CONDUCTORS: Conductors shall bear the date of manufacture imprinted on the insulation with other identification. Wire and cable manufactured more than 6 months before delivery to the job site shall not be used.

A. 600 Volt Wires and Cables: UL 44, ICEA S-66-524, NEMA WC-7. Conductors shall be stranded copper per ASTM B-3 or B-8. Insulation shall be type THHN/THWN unless otherwise noted. Conductors 250 kcmil or larger shall be type XHHW.

B. Color Code Conductors in different voltage systems shall be as follows:

PHASE		208Y/120 VOLT WYE	480 VOLT
A	Black	Brown	
B	Red	Orange	
C	Blue	Yellow	
	Neutral	White	Gray
	Ground	Green	Green
	Isolated Ground	Green w/yellow stripe	N/A

C. Minimum size for branch circuits shall be No. 12 AWG, unless otherwise noted.

D. Use of MC cable is not allowed except for lighting whip, limited to 6 feet runs only.

2.5 OUTLET BOXES

A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, galvanized steel.
1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch m½ fixture studs where required.

B. Nonmetallic Outlet Boxes: ANSI/NEMA OS 2.

C. Cast Boxes: NEMA FB 1, Type FD, cast feralloy. Provide gasketed cover and threaded hubs by box manufacturer.

2.6 JUNCTION BOXES AND PULL BOXES: UL 50.

A. Provide pull and junction boxes of Code gauge steel sized as indicated or required. Provide 16 gauge steel minimum, unless otherwise noted. Indoor enclosures shall conform to NEMA ICS 6 for the Type 12, unless otherwise noted.

B. Size junction and pull boxes to not less than minimum Code requirements. Increase size above Code requirements where necessary to provide space for pulling, racking or splicing enclosed conductors, or where specified or indicated dimensions exceed Code requirements.

C. Fabricate sheet metal junction and pull boxes of galvanized, Code gauge, sheet steel. Include angle iron framing where required for rigidity. Boxes shall not deflect or deform visibly when covers are removed after conduit and conductors are installed, and any deflection occurring shall not prevent the easy installation and removal of cover attachment screws.

D. Do not use single covers for junction and pull boxes having cover length or width dimension exceeding three feet unless so specified, indicated, or approved. Sectionalize covers that exceed three feet in either dimension into two or more sections.

E. Equip metal junction and pull boxes exposed to weather (and not installed in or below grade) with raintight or weatherproof removable covers. Enclosures shall conform to NEMA ICS 6 for the Type 4, unless otherwise noted. Rain tight or weatherproof boxes shall be used threaded watertight hubs for top or side entry and may use knockout for bottom entry only. For exterior pull boxes, use a minimum of 14 gage galvanized G-90 grade sheet steel.

F. Use concrete junction and pull boxes for exterior underground conduit unless otherwise specified or indicated. Use non slip steel plate or cast iron covers and rims in no traffic areas, and cast iron covers and rims designed for AASHTO Class H20 wheel loading wherever vehicular traffic will occur.

G. For interior junction and pull boxes located in concrete floors, and 24" square o” smaller, use cast iron boxes with integral cast tapped conduit hubs, and having recessed cover flush in the box trim placing all elements of the face of the box flush in the plane of the surrounding floor. Equip boxes with watertight covers where so indicated.

H. For interior pull boxes located in concrete floors and larger than 24" square, use precast concrete boxes or form these boxes at the job site. Equip with angle iron cover rim, and with reinforced steel cover plate set flush with the finish floor plans. Specific plan details shall supersede these general requirements.

I. Equip grade level exterior pull boxes with a sump and with knockouts for conduit on sides and ends. Coordinate requirements for conduit openings with underground conduit requirements. Identify the covers of exterior grade level junction and pull boxes with the work "ELECTRIC"“casting or otherwise permanently inscribed in the metal of the cover. Equip exterior grade level pull boxes with pull irons where so indicated.

J. Equip surface sheet metal junction and pull boxes with covers aligning with the sides of the boxes and equip flush boxes with covers extending 3/4" all a¾”d the perimeter of the back box. Provide sufficient cover attachment screws to ensure that box covers will contact the surface of the box for the entire perimeter of the enclosure. Use galvanized or cadmium-plated screws, or brass screws to attach covers to boxes.

K. Use brass screws to attach junction and pull box covers to interior floor boxes or to boxes located where moisture may be present.

L. Acceptable manufacturers:
1. Sheet steel junction and pull boxes: Columbia Electric Co., .Hoffman Engineering Co., Pico Metal Products Co.
2. Cast iron junction and pull boxes: O.Z. Electric Manufacturing Co., Alhambra Foundry Co., Ltd., Crouse Hinds Co.
3. Concrete junction and pull boxes: Brooks Products Inc., Quickset Co.

2.7 WIRE CONNECTORS AND TERMINALS: For use with copper conductors. UL 486A.

2.8 INSULATING TAPES: UL 510.

2.9 NAMEPLATES: Provide as specified in Section 16195, "Electrical Identification."

2.10 EMERGENCY PHONES ***(OWNER FURNISHED CONTRACTOR INSTALLED)***

A. The CB I-s is the campus standard for emergency phone pedestals. It requires 120v power, has a CB 3100 speakerphone, a surge protector, analog telephone connection, a 70w HPS area light with Code Blue Beacon, overhead camera mount and ADA compliant.

B. Manufacturer: Code Blue Corp., 92 East 64th Street, Holland, MI

2.11 TELECOMMUNICATIONS CABLING – CATEGORY 6 - OSP

A. Materials
1. Application: Use for voice and data applications to interconnect services from workstation to the wiring closet in an outdoor environment..
2. Outside plant rated.
3. Four pair, 23 AWG, Category 6, UTP, as defined by the TIA/EIA standards intended for use with transmission rates up to and including 250 Mbps.
4. Copper wire insulated with polyethylene. Two insulated conductors twisted together to form a pair and four such pairs cabled around a cross filler to form the basic unit which is injected with a water resistant flooding compound and jacketed with UV resistant polyethylene jacket.

B. Manufacturer: Berk-Tek LANmark 6 – OSP (Campus standard: NO exceptions).

PART 3 - EXECUTION

3.1 INSTALLATION: Electrical installation shall conform to requirements of NFPA 70, state and local codes, and to requirements specified herein.

3.2 LOCATIONS

A. The shop drawings shall identify desired locations and arrangements of all electrical components. Coordinate with other trades to secure the best possible installation in the available space and under the developed conditions.

B. Before installing any equipment, conduit, or locating any outlet, examine the complete set of documents, including shop drawings and specifications, and verify all dimensions and space requirements. Make such minor adjustments as may be necessary to fit the building structure and accommodate the work of other trades. Install all electrical work to preserve legal headroom, access, work space, clearances and to keep openings and passage ways clear. Arrange for additional space if required for the servicing, maintenance, and replacement of the electrical equipment.

C. Control devices shall not be mounted more than 48” above the floor.

D. Prior to installation, the COLLEGE Project Manager reserve the right to relocate any outlet or device within six feet of the location indicated on the plans and at no additional cost to the COLLEGE Project Manager.

E. No additional compensation will be allowed for omissions, inadequate space, misunderstandings or rejected work caused by neglect of these requirements.

3.3 CONDUIT

A. Rigid steel conduit shall be used for circuits greater than 600 volts installed above grade and may be used in all locations unless otherwise indicated.
   1. Rigid steel conduit shall not be installed below grade in direct contact with earth, it shall be encased in 3" concrete envelope or painted with two coats of black asphalt paint.
   2. Provide "DANGER - “HIGH VOLTAGE" labels to exposed conduits containing circuits greater than 600 volts. Refer to Section 16195.

B. Electrical metallic tubing (EMT) may be installed in indoor dry locations only; it shall not be installed lower than six feet above the finished floor. Restrictions applicable to EMT:
   1. Do not use in feeder circuits.
   2. Do not install below grade.
   3. Do not encase in concrete.
   4. Do not use in areas subject to severe physical damage (including, but not limited to, mechanical equipment rooms and electrical equipment rooms).
   5. Do not use in hazardous areas.
   6. Do not use outdoors.

C. PVC Schedule 40 conduit may be used underground within the building perimeter (below 600V):
   1. The top of the duct shall not be less than 24 inches below grade.
   2. Risers shall be galvanized rigid steel.

D. Use liquidtight flexible conduit in short lengths not to exceed 4 feet for final connections to lighting fixtures in accessible ceilings, motors, transformers and other vibration type equipment, or with the approval of the COLLEGE Project Manager, where absolutely necessary due to structural conditions. Provide green ground conductor in all flexible conduit.

E. Install conduit in accordance with NECA "Standard Installation." Determine actual material and hardware requirements and verify all dimensions by field inspection.

F. Arrange supports to prevent misalignment during wiring installation.

G. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

H. Group related conduits; support using conduit rack. Construct rack using steel channel provide space on each for 25 percent additional conduits.

I. Arrange conduit to maintain headroom and present neat appearance.

J. Route exposed conduit parallel and perpendicular to walls.

K. Maintain adequate clearance between conduit and piping.

L. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees.

M. Cut conduit square using saw or pipe cutter; de-burr cut ends.

N. Bring conduit to shoulder of fittings; fasten securely.

O. Provide pull fittings in all overhead conduit runs exceeding 200 feet of straight conduit, or having more than the equivalent of three 90 degree bends. Each 90 degree bend shall be considered the equivalent of 50 feet of straight run. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one-shot bender to fabricate or factory elbows for bends in metal conduit larger than 2 inch size.

P. Where conduit passes from one type of construction to another, or where there is a possibility of dissimilar movements, an expansion/deflection device or a suitable loop of sealtight flexible conduit shall be installed. Looped sealtight flexible conduit shall consist of 18" minimum ”length of looped conduit with a junction box at one or both ends, wherever conduit crosses building seismic joints.

Q. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

R. Provide 1/8" diameter polyethylene pull line in each new empty conduit except sleeves and nipples.

S. Conduit which penetrates fire walls, fire partitions, or floors shall be metallic on both sides of fire walls, fire partitions, or floors for minimum distance of 6 inches. Restore fire rating integrity at conduit penetration. All holes created to extend electrical systems through fire rated floors and walls shall be sealed by the electrical Contractor with an intumescent material capable of expanding up to 8 to 10 times when exposed to temperatures beginning at 250°F. It shall be UL Classified and have I.C.B.O., B.O.C.A.I. and S.B.C.C.I. (NRB 243) approved ratings to three hours per ASTM E-814 (UL 1479).

Acceptable Manufacturers: 3M, Carborundum, Hevi-Duty/Nelson

T. Where conductors of No. 4 AWG or larger are to be installed in a conduit, or where any conductors are to be deflected more than 30 degrees when leaving a conduit, terminate the conduit with an insulating bushing.

U. Conduit bending radius shall not be less than 10 times conduit diameter.

V. Ground and bond conduit under provisions of Section 16170.

W. All wires shall be run in conduit or approved wire ways. No exposed wire will be allowed.

3.4 600 VOLT CONDUCTORS

A. Splices:
   1. Splices in conductors #8 AWG and smaller shall be made with "Scotchlok“ insulate” connectors or equal of proper size for conductors being spliced.
   2. Splices in conductors #6 AWG and larger shall be made with pressure type solderless connectors. The splice area shall be taped to provide equal or greater insulation than the original. Tape run back over the original insulation shall extend 3 to 5 overall diameters of the insulated wire.

B. Connectors and terminal lugs shall be used for terminating stranded conductors #6 AWG and larger and shall be T&B, Ilsco, or approved equal solderless connectors.

C. Wire in panels, cabinets, pull boxes and wiring gutters shall be neatly grouped, strapped together with T&B Model Tyrap cable strap or laced with #12 stranded lacing twine and fanned out to the terminals.

D. Neutral conductor shall be continuous in outlet boxes and shall not be broken by addition or removal of devices.

E. Wiring methods in return air plenum spaces shall comply with NEC 300-22.

3.5 FITTINGS

A. Use threaded fittings for rigid metal conduit and compression fittings for tubing.

B. Use cement-on fittings for plastic conduit.

C. Fittings for flexible conduit shall be of the threadless hinged clamp type. Do not use fittings threaded internally into the flexible conduit ends.

D. Use fittings made of the same material as the raceway except:
   1. Malleable iron and steel are interchange fittings may be used for flexible steel conduit and for factory manufactured offsets.
   2. Use aluminum fittings only with aluminum conduit.
   3. Use plastic insulated bushings for conduit sizes larger than 1".
   4. Use ”insulated throat connectors for electrical metallic tubing.

3.6 BOXES, OUTLETS AND SUPPORTS: Provide boxes in wiring or raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures. Boxes for metallic raceways shall be cast-metal, hub-type when located in wet locations, when surface mounted on outside of exterior surfaces, when installed exposed up to 7 feet above interior floors, when installed under raised floor or when installed in hazardous areas. Boxes in other areas shall be sheet steel. Each box shall have volume required by NFPA 70 for number of conductors enclosed in the box. Provide gaskets for cast-metal boxes installed in wet locations.

3.7 JUNCTION AND PULL BOXES

A. Wherever possible use outlet boxes for junction and pull boxes.

B. Locate interior junction and pull boxes in machine rooms, equipment rooms, storage rooms, electrical rooms and similar utility spaces unless otherwise indicated or approved. Where junction or pull boxes must be used in finished areas, use flush boxes only equipped with prime finished sheet metal plates. Fasten plates to boxes with countersunk flat head screws. Provide plates with 3/4" trim ¾”around.

C. Do not use sectionalized boxes unless specified. Do not mix feeder and branch circuit conductors in a common pull or junction box.

D. Where more than one circuit passes through a common junction or pull box, tag conductors to indicate circuit number and panel designation.

3.8 OPENINGS, CHASES AND SLEEVES

A. Provide openings, chases, cutting, patching, sleeves and other products, necessary to permit the electrical raceways and cables to pass through the structure.

B. Establish locations for openings, chases and sleeves sufficiently in advance of construction to avoid cutting and patching. Perform any required cutting and patching for electrical work and obtain approval for cutting from COLLEGE Project Manager prior to work being done.

C. Repair damages to finished work and surfaces caused by cutting, to the satisfaction of COLLEGE Project Manager.

D. Install sleeves wherever raceways of any type pass through walls or floors above grade, except that sleeves are not required for drywall construction or laid up masonry construction used for interior partitions and not fire rated.

E. Use pipe or sheet steel sleeves for interior dry locations.

F. Install sleeves with both ends flush with wall surfaces and with upper ends 3" above floor surfaces. Install bottom end of floor sleeves flush with slabs if not concealed by ceiling system. Use steel pipe sleeves through floors.

G. Furnish galvanized steel 24 gauge roof jacks and pitch dams for roof penetrations. Size roof jacks to extend 6" out on roof and 8" up conduit above roof. Solder or braze a flashing collar to conduits passing through roof jacks. Size pitch dams to extend 6" above roof and 6" beyond roof opening.

H. Core drill existing concrete walls or slabs to pass new runs of conduit or tubing. Seal core drilled openings as described for sleeves.

I. For exterior walls below grade conduit entries, use manufacturer fabricated wall entrance seals.

3.9 FIELD TESTS: Provide grounding test to comply with current CEC. As an exception to requirements that may be stated elsewhere in the contract, the Inspector shall be given minimum

5 working days notice prior to each test. The Contractor shall provide all test equipment and personnel and submit written copies of all test results.

A. Distribution Conductors, 600 Volt Class: Test all conductors #8 AWG and larger to verify that no short circuits or accidental grounds exist. Tests shall be made using an instrument which applies a voltage of approximately 500 volts and provides a direct reading of resistance in ohms. Resistance readings of "infinite" value will not be accepted. Insulation resistance, corrected to 60°F, shall not be less than the following values:

250-750 kcmil	50 megohms
4-4/0 AWG	50 megohms
8-6 AWG	100 megohms

Record resistance readings, temperature and weather conditions on the test form.

B. Operational Tests: Demonstrate the operation of each switch, relay and other item of electrical control with the system fully energized and operating. Each shall be demonstrated three times. Any faulty or defective Contractor furnished materials and workmanship found during the tests shall be replaced or corrected by the Contractor at no additional cost to the COLLEGE Project Manager.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Exterior luminaires with lamps and ballasts, but not mounted on exterior surfaces of buildings.
   2. Luminaire-mounted photoelectric switches.

B. Related Sections include the following:

Section 16010 - Electrical General Requirements, applies to this section, with the additions and modifications specified herein.

Section 16050 - Basic Materials and Methods.

Section 16170 - Grounding and Bonding.

Section 16195 - Electrical Identification.

1.2 SUBMITTALS

A. Product Data: For each luminaire, arranged in the order of lighting unit designation. Include data on features, accessories, finishes, and the following:
   1. Physical description of fixture, including dimensions and verification of indicated parameters.
   2. Luminaire dimensions, effective projected area, details of attaching luminaires, accessories, and installation and construction details.
   3. Luminaire materials.
   4. High Pressure Sodium ballasts.
   5. High Pressure Sodium lamps.
   6. Electrical and energy-efficiency data for ballasts.
   7. Photometric calculations.

B. Shop Drawings: Anchor-bolt templates keyed to specific poles and confirmed by manufacturer. Concrete base design details and structural calculations to be performed by a structural engineer registered in the state of California.

C. Wiring Diagrams: Power, signal, and control wiring.

D. Coordination Drawings: Mounting and connection details, drawn to scale, for exterior luminaries.

E. Samples for Verification: For exterior luminaires designated for sample submission in the Exterior Luminaire Schedule.
   1. Lamps: Specified units installed.
   2. Ballast: Voltage and models of specified ballast types on plans.

3. Finishes: For each finished metal used in support components.

F. Source quality-control test reports.

G. Field quality-control test reports.

H. Operation and Maintenance Data: For luminaires to include in maintenance manuals.

I. Warranties: Special warranties specified in this Section.

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. FMG Compliance: Fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FMG.

C. Comply with IEEE C2, "National Electrical Safety Code."

D. Comply with CEC.

E. U.L. listed and labeled “Suitable for outdoor locations”.

1.4 WARRANTY

A. Special Warranty: Contractor shall use Client standard form to provide warranty in which manufacturer agrees to repair or replace luminaires or components of luminaires and lamps that fail in materials or workmanship; corrode; or fade, stain, or chalk due to effects of weather or solar radiation within specified warranty period. See section 01700 for more information.

1. Warranty Period for Luminaires: Five years.
   Warranty Period for Metal Corrosion: Five years.
   Warranty Period for Color Retention: Five years.
2. Warranty Period for Lamps: Replace lamps and fuses that fail within 12 months from date of Substantial Completion; furnish replacement lamps and fuses that fail within the second 12 months from date of Substantial Completion.

1.5 EXTRA MATERIALS

A. Furnish 10% extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: 10 for every 100 of each type and rating installed. Furnish at least one and a maximdum of ten lamps of each type.
2. Glass and Plastic Lenses, Covers, and Other Optical Parts: 10 for every 100 of each type and rating installed. Furnish at least one of each type and a maximum of ten parts.
3. Ballasts: 10 for every 100 of each type and rating installed. Furnish at least one and a maximum of ten of each type.

4. Globes and Guards: 2 for every 20 of each type and rating installed. Furnish at least one and maximum of ten of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

Products: Subject to compliance with requirements, provide one of the products specified.

2.2 LUMINAIRES, GENERAL

A. Complying with UL 1572, 1598 and listed for installation in wet locations.

B. Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Sheet Metal Components: Corrosion-resistant aluminum, unless otherwise indicated. Form and support to prevent warping and sagging.

E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.

F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.

G. Exposed Hardware Material: Stainless steel.

H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

I. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
   1. White Surfaces: 85 percent.
   2. Specular Surfaces: 83 percent.
   3. Diffusing Specular Surfaces: 75 percent.

J. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

2.3 EXTERIOR LUMINAIRES

A. Luminaire
   1. Products:

Provide exterior light fixture as detailed on fixture schedule or approved equal:

2. Ballast Types and Features: Electronic.
3. IESNA Lateral Distribution Class: IV.
4. IESNA Cutoff Category: Cutoff.
5. Minimum ballast factor, calculated as the ratio of lamp lumen output on a particular ballast as compared to that lamp's lumen output on a reference ballast under NEMA test conditions, is 0.90.
6. Minimum luminaire efficacy rating, calculated according to NEMA LE 5, NEMA LE 5A, or NEMA LE 5B, is.

2.4 FACTORY FINISHES

A. Finish: Coordinate finish with fixture schedule shown on sheet E0.

B. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for University's Representativeural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax.

2.5 SOURCE QUALITY CONTROL

A. Provide services of a qualified, independent testing and inspecting agency to factory test luminaires with ballasts and lamps; certify results for isofootcandle curves, zonal lumen, average and minimum ratios, and electrical and energy-efficiency data for ballasts.

B. Factory test fixtures with ballasts and lamps; certify results for isofootcandle curves, zonal lumen, average and minimum ratios, and electrical and energy-efficiency data for ballasts.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install new lamps in each new fixture.

B. Luminaire Attachment: Fasten to indicated structural supports.

C. Adjust luminaires that require field adjustment or aiming.

D. Contractor is responsible for the coordination of the Light Fixture installation as a Phase 2 item.

E. Contractor to coordinate procurement, lead times, and site infrastructure and complete as part of Phase 1, to allow installation of Phase 2 light fixtures for parking lot expansion project.

3.2 CONNECTIONS

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

3.3 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Tests and Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IESNA testing guide(s):
   1. IESNA LM-5.
   2. IESNA LM-50.
   3. IESNA LM-52.
   4. IESNA LM-64.
   5. IESNA LM-72.

C. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION