

PROJECT MANUAL

ORANGE COUNTY UTILITIES DEPARTMENT

OPERATIONS CENTER

8100 PRESIDENTS DRIVE

TECHNICAL PROVISIONS

FOR

PRE-ENGINEERED METAL BUILDINGS

PEMB PACKAGE



ORANGE COUNTY UTILITIES DEPARTMENT

July 2014

OCU FILE NO. 55347

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RE-BID SUBMITTAL**

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ORANGE COUNTY UTILITIES

TECHNICAL PROVISIONS

For

PRE-ENGINEERED METAL BUILDINGS PEMB Package

BID SET

PERPARED BY: RS&H, Inc. EB 0005620

DATE: JUNE 9, 2014

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Date: June 9, 2014

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ELECTRICAL MATERIALS AND METHODS 16050 

EXHIBITS 

- A. “REPORT OF SUBSURFACE EXPLORATION AND GEOTECHNICAL ENGINEERING EVALUATION”, BY NODARSE & ASSOCIATES, DATED 1/19/10.
- B. HYDRANT FLOW TEST REPORT, BY ORANGE COUNTY, PERMIT DOCUMENT, DATED 1/18/13.
- C. FIRE TRUCK MANUVERABILITY EXHIBIT, BY RS&H, PERMIT DOCUMENT, DATED 4/12/13.
- D. SITE PHASING PLAN, BY ORANGE COUNTY, ADD. NO. 6, DATED 8/1/13.
- E. SPECIFICATION SECTION 09960 – HIGH PERFORMANCE FERROUS METAL COATINGS, BY ORANGE COUNTY, ADD. NO. 6, DATED 8/1/13.

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SECTION 01010 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Work covered by the Contract Documents.
 - 2. Type of the Contract.
 - 3. Use of premises.
 - 4. Owner's occupancy requirements.
 - 5. Work restrictions.
 - 6. Specification formats and conventions.
- B. Related Sections include the following:
 - 1. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: Orange County Utilities
PEMB Package
 - 1. Project Location: 8100 Presidents Drive
Orlando, Florida 32089
 - 2. Owner: Board of County Commissioners
201 S. Rosalind Avenue
Orlando, Orange County, Florida
 - 3. Owner's Representative: Thomas Stangle, PE, Project Manager, Utilities Engineering Division, 2nd Floor, 9150 Curry Ford Road, Orlando, FL 32825
- C. Design Engineer: Reynolds, Smith and Hills, Inc., Orlando, FL
- D. The Work consists of the following:

This project proposes to construct three pre-engineered metal buildings (PEMB) at the Orange County Utilities Operations Center, located at 8100 Presidents Drive in Orlando, Florida, with the primary intent to provide open-air shelter for storage of miscellaneous materials and equipment. Scope of work includes two canopies connected to the existing warehouse building, on the north and east elevations, and one free-standing, two-story structure to be located in the north parking lot.

1.4 TYPE OF CONTRACT

- A. Project will be constructed under a single prime contract.

1.5 USE OF PREMISES

- A. General: Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits.
- B. Use of Site: Limit use of premises to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Limits: Confine constructions operations to areas within the Contract limits indicated.

1.6 OWNER'S OCCUPANCY REQUIREMENTS

- A. Owner Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed areas of project, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.
 - 1. Owner will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy.
 - 2. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.
 - 3. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of project.
 - 4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of project.

1.7 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the CSI 16-division format numbering system.

Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.

1. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.

- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01010

SECTION 01025 – MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 SCOPE

- A. Payments to the contractor shall be made on the basis of the bid item schedule as full and complete payment for furnishing all materials, labor, tools, equipment, and for performing all operations necessary to complete the work included in the delivery orders. Such compensation shall also include payments for any loss or damages arising directly or indirectly from the work, or from any discrepancies between the actual quantities of work and those shown in the delivery orders.
- B. The prices stated in the bid item schedule include all costs and expenses for mobilization except as noted in bid item schedule, taxes, labor, licenses, equipment, materials, commissions, transportation charges, expenses, patent fees and royalties, labor for handling materials during inspection, maintenance of traffic, together with any and all other costs and expenses for performing and completing the work as described in the delivery order and specified herein. The basis of payment for an item at the price shown in the bid item schedule shall be in accordance with its description of the item in this section and as related to the work specified. Unit prices will be applied to the actual quantities furnished and installed in conformance with the delivery orders.
- C. The contractor's attention is called to the fact that the quotations for the various items of work are intended to establish a total price for completing the work in its entirety.

1.2 MEASUREMENT

- A. The quantities for payment under each delivery order shall be determined by field measurement prior to the approval of the delivery order being issued. The County will witness all field measurements.
- B. When depths of cuts are indicated in the bid items, they shall be measured vertically from the edge of the existing grade to the sub-grade at several locations of the original cut and averaged.
- C. The quantities stated in the bid item schedule are approximate only and are intended to serve as a basis for the comparison of bids and to fix the value of the contract. The County does not expressly or implicitly agree that the actual amount of the work to be done in the performance of the contract will correspond with the quantities in the bid item schedule. The amount of work to be done may be more or less than the said quantities and may be increased or decreased by the County as circumstances may require. The increase or decrease of any

quantity shall not be regarded as grounds for an increase in the unit price or in the time allowed for the completion of the work, except as provided in the contract documents.

1.3 PAYMENT ITEMS

- A. Items are as enumerated on the bid form.

END OF SECTION 01025

SECTION 01027 - APPLICATION FOR PAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements governing the Contractors' Applications for Payment.
- B. The Contractors' Construction Schedule and Submittal Schedule are included in Section 01300 - SUBMITTALS.

1.3 SCHEDULE OF VALUES

- A. Coordinate preparation of the Schedule of Values with preparation of Contractors' Construction Schedule.
 - 1. Submit the Schedule of Values to the Owner at the earliest feasible date, but in no case later than Preconstruction Meeting. Refer to Section 01370.
 - 2. Sub-Schedules: Where the Work is separated into phases that require separately phased payments, provide sub-schedules showing values correlated with each phase of payment.
- B. Format and Content: Use the Project Manual Table of Contents as a guide to establish the format for the Schedule of Values.
 - 1. Identification: Include the following project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of the Engineer
 - c. Contractors' name and address
 - d. Date of submittal
 - 2. Arrange the Schedule of Values in a tabular form with separate columns to indicate the following for each item listed:
 - a. Generic name

- b. Related Specification Section
 - c. Change Orders (numbers) that have affected value
 - d. Dollar Value
 - e. Percentage of Contract Sum to the nearest one-hundredth percent, adjusted to total 100 percent
3. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Break principal subcontract amounts down into several line items:
 - a. A value will be given for at least every major specification section (subsections can logically be grouped together).
 - b. A single material subcontractor (i.e., sod, pavement) will not be required to be broken down into labor and material unless it is anticipated the materials will be stored and invoiced prior to installation.
 - c. All multiple item subcontracts or work items (i.e., concrete, playground equipment, etc.) will be shown broken down at least in labor and material (all taxes, burden and overhead and profit included).
 - d. Mobilization (move-on, bond, insurance, temporary office and sanitary service installation) shall not exceed 2 1/2% of contract price.
 - k. Logical grouping of specification subsections are permitted.
4. Round amounts off the nearest whole dollar, the total shall equal the Contract Sum.
5. For each part of the Work where an Application for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed, provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
6. Margins of Cost: Show line items for indirect costs, and margins on actual costs, only to the extent that such items will be listed individually in Applications for Payment. Each item in the Schedule of Values and Applications for Payment shall be complete including its total cost and proportionate share of general overhead and profit margin.
 - a. At the Contractors' option, temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown as separate line items in the Schedule of Values or distributed as general overhead expense.
7. Schedule Updating: Update and resubmit the Schedule of Values when Change Orders or Construction Change Directives result in a change in the contract sum.

1.4 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as reviewed by the Owners' representative and paid for by the Owner.
 - 1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the Final Application for Payment involve additional requirements. See items G, I, J and K of this section.
- B. Payment Application Times: The period of construction work covered by each Application of Payment is the period indicated in the Agreement.
- C. Payment Application Forms: Use the County's most updated form as the form for Application for Payment. Form given at the Preconstruction Conference.
- D. Application Preparation: Complete every entry on the form, including notarization and execution by person authorized to sign legal documents on behalf of the Owner. Incomplete applications will be returned without action.
 - 1. Entries shall match data on the Schedule of Values and Contractor Construction Schedule. Use updated schedules if revisions have been made.
 - 2. Include amounts of Change Orders and Construction Change Directives issued prior to the last day of the construction period covered by the application.
- E. Transmittal: Submit six (6) original executed copies of each Application for Payment to the Project Manager by means ensuring receipt within 24 hours; one copy shall be complete, including waivers of lien and similar attachments, when required.
 - 1. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to the Project Manager.
- F. Waivers of Mechanics Lien: With each Application for Payment submit waivers of mechanics liens from subcontractors of sub-subcontractors and suppliers for the construction period covered by the previous application.
 - 1. Submit partial waivers on each item for the amount requested, prior to deduction for retainage, on each item.
 - 2. When an application shows completion of an item, submit final or full waivers.
 - 3. The Owner reserves the right to designate which entities involved in the work must submit waivers.
 - 4. List all Subcontractors start and finish dates to substantiate any Notice to Owner received by the Project Manager.
- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of the first Application for Payment include the following:
 - 1. List of principal subcontractors

2. List of principal suppliers and fabricators
 3. Schedule of Values
 4. Approved Contractor Construction Schedule (preliminary if not final)
 5. Schedule of principal products
 6. Schedule of unit prices (if applicable)
 7. Submittal schedule (preliminary if not final)
 8. List of Contractor's staff assignments
 9. List of Contractor's principal consultants
 10. Copies of permits for trades requiring separate permits
 11. Copies of authorizations and licenses from governing authorities for performance of the Work
 12. Initial progress report
 13. Report of Pre-construction Meeting
 14. Initial settlement survey and damage report, (if required)
 15. Listing of all long lead procurement items monthly applications for payment will be accompanied with updated schedule and review of as-built drawings
- H. Interim Application for Payment: Payment will be processed once a month. No applications will be processed without receipt of previous months waiver of lien described in subsection F above. Payment for item will be based on percentage completed as determined and approved by the County Project Manager or invoice for stored materials. Retainage (10%) will be held for **all** interim applications.
- I. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment; this application shall reflect any Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work. Application shall also include all items listed in Part H. above.
- J. Administrative actions and submittals that shall proceed or coincide with Substantial Completion Payment. Substantial Completion per application include:
1. Submittal to obtain permit from Orange County Building Department for construction of Pavilions and playground equipment. Occupancy permits and similar approvals
 2. Warranties (guarantees) and maintenance agreements
 3. Test/adjust/balance records
 4. Maintenance instructions
 5. Start-up performance reports
 6. Change-over information related to Owner's occupancy, use, operation and maintenance
 7. Final cleaning
 8. Application for reduction of retainage, and consent of surety
 9. List of incomplete Work, recognized as exceptions to Project Manager Certificate of Substantial Completion
- K. Final Payment Application: Administrative actions and submittals that must precede or coincide with submittal of the final payment. Application for Payment

includes the following:

1. Completion of Project Close-Out requirements
2. Completion of items specified for completion after Substantial Completion
3. Assurance that unsettled claims will be settled
4. Assurance that all work has been completed and accepted
5. Proof those taxes, fees and similar obligations have been paid
6. Removal of temporary facilities and services
7. Removal of surplus materials, rubbish and similar elements
8. Change of door locks to Owner access

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION 01027

SECTION 01040 - PROJECT COORDINATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The Contractor is responsible for all project coordination.

1.2 DUTIES OF CONTRACTOR

- A. The following requirements are not to be construed as setting limits on the Contractor's responsibilities, but intend to guide the Contractor in the administration of its responsibilities.
- B. Coordinate work of all subcontractors.
- C. Establish on-site lines of authority and communication. Schedule and conduct progress meetings among Owner's representatives and subcontractors.
- D. Construction schedules:
 - 1. Prepare detailed schedule of contractor's operations and for all subcontractor's on project.
 - 2. Monitor schedules as Work progresses.
 - a. Identify potential variances between scheduled and probable completion date.
 - b. Recommend in writing to Owner's Representative any adjustments in schedule to meet required completion date.
 - c. Provide written summary reports of each monitoring.
 - d. Document all changes in the schedule to the Owner's Representative in writing.
 - 3. Observe Work to monitor compliance with schedule.
 - a. Verify that labor and equipment are adequate to meet and maintain the schedule for the Work.
 - b. Verify that product deliveries are adequate to meet and maintain the schedule for the Work.
 - c. Report any noncompliance to Owner, with recommendations for remedy.
 - d. Verify that adequate services are provided to comply with requirements for Work and climatic conditions.
 - e. Verify proper maintenance and operation of temporary facilities.
 - f. Administer traffic and parking controls for construction workers.

4. Changes:
 - a. Recommend necessary or desirable changes to the Owner's Representative.
 - b. Review subcontractor's requests for changes and substitutions. Submit recommendations to the Owner's Representative.
 - c. Process Change Orders.
 5. Permits and fees: Verify that all subcontractors have obtained all required permits.
 6. Inspections and testing:
 - a. Inspect Work to assure that it is performed in accord with requirements of the Contract Documents.
 - b. Arrange with Owner's Representative for special inspections or testing when required.
 - c. Reject work which does not conform to the requirements of the Contract Documents.
 7. Coordinate testing laboratory services:
 - a. Notify Owner's Representative of test schedule.
 - b. Verify that required personnel are present during test.
 - c. Verify that specified tests are made as scheduled.
 - d. Verify compliance of test results with specified criteria.
 - e. Operation of heavy construction equipment and/or compaction equipment shall be no closer than 200 feet from density test while test is in progress.
- E. Interpretations of Contract Documents:
1. Consult with Owner's Representative to obtain interpretation or clarifications utilizing the Request for Information form provided in the Contract Documents for any portions of Contract Documents, which may be unclear or ambiguous.
 2. Assist in answering of questions which may arise.
 3. Transmit written interpretations to interested parties.
- F. Administer processing of shop drawings, product data and samples.
- G. Owner-Furnished products: Accept delivery, arrange storage, protection, and security.
- H. Maintain reports and records at job site:
1. Daily log of progress of work and other pertinent data.
 2. Records:
 - a. Contracts.

- b. Purchase Orders.
 - c. Materials and equipment records, including record of Owner-Furnished products.
 - d. Applicable handbooks, codes and standards.
 - e. Labor man-hours expended for each trade on Work site.
 3. Obtain information from subcontractors and maintain record documents.
 4. At completion of project, deliver all records to Owner's Representative for turnover to Owner.
 5. Assemble documentation for handling of any claims or disputes which may arise.
- I. Ensure that specified daily cleaning is done during progress of Work and at completion of Contract.
- J. Start-Up:
 1. Direct the check-out of utilities, operational systems, and equipment.
 2. Assist in initial start-up and testing.
 3. Record dates of start of operation of systems and equipment.
 4. Submit to Owner's Representative written notice of beginning of warranty period for equipment put into service.
- K. Partial Owner Occupancy: Schedule early completion of any areas which may be designated by Owner for Owner's use prior to Substantial Completion of entire Project.
- L. Substantial Completion:
 1. Upon determination of Substantial Completion of Work or portion thereof, prepare for Owner's Representative a list of incomplete or unsatisfactory items.
 2. Upon Owner's certification of date of Substantial Completion, supervise correction and completion of the Work.
- M. Final Completion:
 1. Upon determination that Work is finally complete:
 - a. Submit written notice to Owner's Representative that Work is ready for final inspection.
 - b. Secure and transmit to Owner's Representative required closeout submittals.
 2. Turn over to Owner's Representative:
 - a. Operations and maintenance data.
 - b. Spare parts of materials if specified.

1.3 WORK OF OTHER CONTRACTORS

A. Access

1. During the course of the Work, the Contractor will make available to other contractors certain parts of the site roadway, embankments, bridges, landscaped areas, etc., for the installation of utilities and other items.
2. Other contractors will be working on adjacent sites and may require continued access through the project site.

1.4 STORAGE AND DISPOSAL OF MATERIALS

- #### A.
- The materials from excavations and those used in the construction of the Work shall be deposited in such a manner that they will not endanger the work and that free access may be had at any time to all hydrants, valves and gates in the vicinity of the Work. The suitable material shall be stockpiled where and as approved to provide a minimum of obstruction and the stockpiles shall be kept trimmed up in such a manner as to be of as little inconvenience as possible to travel of the adjoining contractors. Any unsuitable material including trash, debris, or excavated material shall be removed and disposed of by the Contractor off property within 24 hours.

END OF SECTION - 01040

SECTION 01050 - FIELD ENGINEERING

PART 1 - GENERAL

1.1 LINES AND LEVELS

- A. Contractor to be responsible for the accuracy of the construction lines and levels.
 - 1. Employ a licensed land surveyor to establish and maintain all lines and levels necessary for the locations and construction of the Work.
 - a. Submit qualifications of individual responsible for survey to Owner's Representative for approval.
- B. Contractor to verify levels on the drawings with existing levels, and notify the Owner's Representative of any discrepancies before proceeding with the Work.
- C. Contractor to maintain the survey provided by the Owner. All additional survey work required shall be the responsibility of the Contractor.
- D. All off-sets on the survey provided by the Owner will be as agreed upon between the Owner and Contractor.

1.2 OWNER'S RESPONSIBILITIES

- A. Owner will provide monumented vertical and horizontal control points. A total of three control points will be provided within the limits of construction at locations determined by the Owner.

1.3 CONTRACTOR'S RESPONSIBILITIES

- A. All surveying, engineering and layout required for the work other than that which is supplied by the Owner as listed above.
- B. All layout, offsets, engineering, grades, etc., required to perform all work related to his installation.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01050

FIELD ENGINEERING

01050-1

SECTION 01300 - SUBMITTALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for submittals required for performance of the Work, including:
 - 1. Contractor's Construction Schedule
 - 2. Submittal Schedule
 - 3. Daily Construction Reports
 - 4. Shop Drawings
 - 5. Product Data
 - 6. Samples
- B. Administrative Submittals: Refer to other Division-1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:
 - 1. Permits
 - 2. Applications for Payment
 - 3. Performance and Payment Bonds
 - 4. Insurance Certificates
 - 5. List of Subcontractors with start and finish dates (update as necessary)
 - 6. Schedule of Values
 - 7. Construction Schedule
- C. The Schedule of Values submittal is included in Section 01027 Application for Payment.

1.3 SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.

2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
 - a. The Project Manager reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
 3. Processing: Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for resubmittals.
 - a. Allow two weeks for initial review. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. The Project Manager will promptly advise the Contractor when a submittal being processed must be delayed for coordination.
 - b. If an intermediate submittal is necessary, process the same as the initial submittal.
 - c. Allow two weeks for reprocessing each submittal.
 - d. No extension of Contract Time will be authorized because of failure to transmit submittals sufficiently in advance of the Work to permit processing.
- B. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
1. Provide a space approximately 4" x 5" on the label or beside the title block on Shop Drawings to record the Contractor's review and approval markings and the action taken.
 2. Include the following information on the label for processing and recorded action taken.
 - a. Project name
 - b. Date
 - c. Name and address of Engineer
 - d. Name and address of Contractor
 - e. Name and address of subcontractor
 - f. Name and address of supplier
 - g. Name of manufacturer
 - h. Number and title of appropriate Specification Section
 - i. Drawing number and detail references, as appropriate.
- C. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Project Manager using transmittal form as provided by the Project Manager. Submittals received from sources other than the Contractor will be returned without action.
1. On the transmittal record relevant information and requests for data. On

the form, or separate sheet, record deviations from Contract Document requirements, including minor variations and limitation. Include Contractor's certification that information complies with Contract Document requirements.

2. Transmittal Form: As provide by the Project Manager
- D. Contractor shall be responsible for cost of re-review of rejected submittals, shop drawing, etc. Costs for re-review shall be reimbursed to the County by deducting the cost from the Contractors monthly progress payments. Costs to be determined by applying the consultants' standard billing rates, plus 10% handling by the County.
- E. Substitution request to specified products will be made within 30 days of Notice to Proceed. After the 30-day period, no requests for substitutions from the Contractor will be considered.
1. Substitution submitted within the first 30 days will have product data from specified and requested substitute submitted together and demonstrate better quality, cost savings if of equal quality, or show benefit to the County for accepting the substitute.
- F. Once submittals are approved or approved as noted, they will be scanned and converted to PDF documents with OCR (optical character recognition) and given to the owner.

1.4 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Critical Path Method (CPM) Schedule: Prepare a fully developed, horizontal bar-chart type Contractor's construction schedule. Submit in accordance with Section 01310 Project Meetings.
1. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the work as indicated in the Schedule of Values.
 2. Within each time bar, indicate estimated completion percentage in 10 percent increments. As work progresses, place a contrasting mark in each bar to indicate Actual Completion.
 3. Prepare the schedule on a sheet, series of sheets, stable transparency, or other reproducible media, of sufficient width to show data for the entire construction period.
 4. Secure time commitments for performing critical elements of the work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the work. Show each activity in proper sequence. Indicate graphically sequences necessary for completion of related portions of the work.
 5. Coordinate the Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment request and other schedules.

6. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for the Owner's procedures necessary for certification of Substantial Completion.
- B. Phasing: Provide notations on the schedule to show how the sequence of the work is affected by requirements for phased completion to permit work by separate Contractors and partial occupancy by the Owner prior to Substantial Completion.
- C. Work Stages: Indicate important stages of construction for each major portion of the work, including testing and installation.
- D. Area Separations: Provide a separate time bar to identify each major construction area for each major portion of the work. Indicate where each element in an area must be sequenced or integrated with other activities.
- E. Cost Correlation: At the head of the schedule, provide a two item cost correlation line, indicating pre-calculated and actual costs. On the line show dollar-volume of work performed as the dates used for preparation of payment requests.
 1. Refer to Section Applications for Payment for cost reporting and payment procedures.
- F. Distribution: Following response to the initial submittal, print and distribute copies to the Owner, subcontractors, and other parties required to comply with scheduled dates. Post copies in the project meeting room and temporary field office.
 1. When revisions are made distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.
- G. Schedule Updating: Revise the schedule monthly or activity, where revisions have been recognized or made. Issue the updated schedule concurrently monthly pay request.

1.5 SUBMITTAL LOG

- A. After development and acceptance of the Contractor's construction schedule, prepare a complete log of submittals.
 1. Coordinate submittals log with the list of subcontracts, schedule of values and the list of products as well as the Contractor's construction schedule.
 2. Prepare the log in chronological order; include all submittals required. Provide the following information:
 - a. Scheduled date for the first submittal

- b. Related Section number
 - c. Submittal category
 - d. Name of subcontractor
 - e. Description of the part of the work covered
 - f. Scheduled date for resubmittal
 - g. Scheduled date the Engineer's final release or approval.
3. All submittals must be received within the first 25% of contract time.
- B. Distribution: Following response to initial submittal, print and distribute copies to the Project Manager, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the project meeting room and field office.
1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.
- C. Log Updating: Revise the log after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

1.6 DAILY CONSTRUCTION REPORTS

- A. Prepare a daily construction report, recording the following information concerning events at the site; and submit duplicate copies to the Project Manager at weekly intervals:
1. List of subcontractors at the site
 2. Approximate count of personnel at the site
 3. High and low temperatures, general weather conditions
 4. Accidents and unusual events
 5. Meetings and significant decisions
 6. Stoppages, delays, shortages, losses
 7. Meter readings and similar recordings
 8. Emergency procedures
 9. Orders and requests of governing authorities
 10. Change Orders received, implemented
 11. Services connected, disconnected
 12. Equipment or system tests and start-ups
 13. Partial completions, occupancies
 14. Substantial Completions authorized

1.7 SHOP DRAWINGS

- A. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings.

Standard information prepared without specific reference to the Project is not considered a Shop Drawing and will be rejected.

- B. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:
1. All required dimensions
 2. Identification of products and materials included
 3. Compliance with specified standards
 4. Notation of coordination requirements
 5. Notation of dimensions established by field measurement
 6. Sheet Size: Except for templates, patterns and similar full-size Drawings on sheets at least 8 1/2" x 11" but no larger than 24" x 36".
 7. Initial Submittal: Submit one correctable translucent reproducible print and one blue-or black-line print for the Project Manager's review; the reproducible print will be returned.
 8. Initial Submittal: Submit 2 blue-or black-line prints for the Owner's review; one will be returned.
 9. Final Submittal: Submit 5 blue-or black-line prints; submit 7 prints where required for maintenance manuals. 3 prints will be retained; the remainder will be returned.
 10. Final Submittal: Submit 3 blue-or black-line prints; submit 5 prints where required for maintenance manuals. 2 prints will be retained; the remainder will be returned.
 - a. One of the prints returned shall be marked-up and maintained as a Record Documents.
 11. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connections with construction.
- C. Coordination drawings are a special type of Shop Drawing that show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or function as intended.
1. Preparation of coordination Drawings is specified in section Project Coordination and may include components previously shown in detail on Shop Drawings or Product Data.
 2. Submit coordination Drawings for integration of different construction elements. Show sequence and relationships of separate components to avoid any conflict including conflicts in use of space.
 3. Contractor is not entitled to additional payments due to lack of compliance with this Section.

1.8 PRODUCT DATA

- A. Collect Product Data into a single submittal for each element of construction or

system. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as Shop Drawing

1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:
 - a. Manufacturer's printed recommendations
 - b. Compliance with recognized trade association standards
 - c. Compliance with recognized testing agency standards
 - d. Application of testing agency labels and seals
 - e. Notation of dimensions verified by field measurement
 - f. Notation of coordination requirements
 - g. Manufacturers local representative and phone number.
2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
3. Preliminary Submittal: Submit a preliminary single-copy of Product Data where selection of options is required.
4. Submittals: Submit six (6) copies of each required submittal. The Project Manager will return two (2) sets to the Contractor marked with action taken and corrections or modifications required.
 - a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
5. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.
 - a. Do not proceed with installation until an applicable copy of Product Data applicable is in the Installer's possession.
 - b. Do not permit use of unmarked copies of Product Data in connection with construction.

1.9 SAMPLES

- A. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of materials, color range sets, and swatches showing color, texture and pattern.
 1. Mount, display, or package Samples in the manner specified to facilitate review of qualities indicated. Prepare Samples to match the Owner's Sample. Include the following:

- a. Generic description of the Sample
 - b. Sample source
 - c. Product name or name of manufacturer
 - d. Compliance with recognized standards
 - e. Availability and delivery time
 2. Submit Samples for review of kind, color, pattern, and texture, for a final check of these characteristics with other elements and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
 - a. Where variation in color, pattern, texture or other characteristics are inherent in the material or product represented, submit multiple units (not less than 3), that show approximate limits of the variations.
 - b. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation and similar construction characteristics.
 3. Preliminary submittals: Where Samples are for selection of color, pattern, texture or similar characteristics from a range of standard choices, submit a full set of choices for the material or product.
 - a. Preliminary submittals will be reviewed and returned with the Owner's mark indicating selection and other action.
 4. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation and similar characteristics, submit 3 sets; one will be returned marked with the action taken.
 5. Maintain sets of Samples, as returned, at the project site, for quality comparisons throughout the course of construction.
 - a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
 - b. Sample sets may be used to obtain final acceptance of the construction associated with each set.
- B. Distribution of Samples: Prepare and distribute additional sets to subcontractors, manufacturers, fabricators, suppliers, installers, and others as required for performance of the Work. Show distribution on transmittal forms.
1. Field Samples specified in individual sections are special types of Samples. Field Samples are full-size examples erected on site to illustrate finishes, coatings, or finish materials and to establish the standard by which the work will be judged.
 - a. Comply with submittal requirements. Process transmittal forms to provide a record of activity.

1.10 ENGINEER'S ACTION

- A. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Engineer/Project Manager will review each submittal, mark to indicate action taken, and return promptly.
 - 1. Compliance with specified characteristics is the Contractor's responsibility.
- B. Action Stamp: The Engineer /Project Manager will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, similarly as follows, to indicate the action taken:
 - 1. Final Unrestricted Release: Where submittals are marked, No Exceptions Taken, that part of the work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.
 - 2. Final-But-Restricted Release: When submittals are marked, Made Corrections Noted, that part of the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.
 - 3. Returned for Resubmittal: When submittal is marked, Revise and Resubmit, do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.
 - a. Do not permit submittals marked, Revise and Resubmit to be used at the Project site, or elsewhere where work is in progress.
 - 4. Rejected: Submittal does not comply with requirements of the Contract Documents. Submittal must be discarded and entirely new submittal shall be forward to the Project Manager without delay.

PART 2 PRODUCTS (NOT USED)

PART 3 Execution (NOT USED)

END OF SECTION 01300

SECTION 01310 - CONSTRUCTION SCHEDULE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Prepare and provide projected construction schedules for entire work in a logic bar graph, Critical Path Method (CPM) or combination thereof in a format which will be acceptable to the Owner. Revise periodically as directed by the Owner.
- B. Coordination:
 - 1. This project will require the contractor to complete work in phases, due to the need to keep the site operational during construction.
 - 2. Final schedules are subject to concurrence by the Owner and Owner's Representative as regards to activity description, logic, sequence, duration and resources required.
 - 3. It will be the responsibility of the Contractor to coordinate schedules of its own and its subcontractor's schedules as well as construction efforts by others under separate contract, as directed by the Owner or Owner's Representative. Coordination will be required for concurrent projects/permits under separate contract, including, but not limited to:
 - a. Civil/ Landscape Package – Renovation of existing civil site work and landscaping to increase parking for fleet vehicles. Proposed improvements consist of converting the current unpaved parking areas into paved parking and driveway areas and expanding the northern wet detention pond.
 - b. Interior Renovation Package – Interior renovation of existing building, including the addition of new overhead rolling doors on the east and west elevations

1.2 FORM OF SCHEDULES

- A. Contractor prepares and provides the following construction schedule in a format and system acceptable to the Owner and Owner's Representative.
 - 1. Summary Milestone Schedule: Submit a computer generated bar chart schedule broken down by the major project areas. Format shall be consistent with the format as provided by the Owner's Representative. Required milestones will be subject to Owner's and Owner's Representative's acceptance.
 - 2. Detailed Network Schedule - Either overall basis and/or by subnetworks as may be requested by the Owner's Representative. Manpower resources by activity should be indicated if requested by the Owner or Owner's Representative.
 - 3. Horizontal Bar Chart:

- a. Provide separate Horizontal Bar Column for each trade or operation indicating manpower resources if requested by the Owner or Owner's Representative.
- b. Order: Chronological order of beginning of each item of work.
- c. Identify each bar column by distinct graphic delineation.
- d. Horizontal Time Scale: Identify first work day of each week, length of workweek, and shifts involved.
- e. Scale and Spacing: To allow space for updating.

1.3 CONTENT OF SCHEDULES

- A. Provide complete sequence of construction by activity.
 1. Shop Drawings, product data and samples, submittal dates and dates approved copies will be required, etc., should be indicated if requested by the Owner or Owner's Representative.
 2. Product procurement, fabrication duration, shipping dates and on-site availability should be indicated if requested by the Owner or Owner's Representative. Contractor will prepare format which shall include names of subcontractors; description of material; manufacturers and vendors with address, phone number and person to contact, order number, shop drawings and samples status, manufacturing lead time, shipping dates, proposed delivery date, format of shipping, date material is required and commitments from manufacturers or vendors on their letterhead.
 3. Dates for beginning and completion of each element of construction.
 4. Decision dates for selection of finishes and products may be required by the Owner or Owner's Representative.
 5. Restraints reflecting impact of related work.
 6. Activities as directed by the Owner or Owner's Representative when required to interface activities performed by the Owner or other Contractors.
 7. Detailed sub-schedule and special area schedules as directed by the Owner or Owner's Representative to define critical areas of work.
 8. The Owner's Representative shall receive and review updates from the Contractor on the 25th of each month indicating the ACTUAL work status through the 20th day of the month, or more/less often when directed to do so by the Owner's Representative.
 - a. Schedule submission shall be made as part of the monthly Application for Payment.

1.4 CONTRACTOR'S RESPONSIBILITIES

- A. Coordinate the scheduled work of all its subcontractors.
- B. Incorporate the work of all subcontractors into the construction schedules.
- C. Provide schedule update information of all subcontractors.

- D. Maintain a management organization to fulfill the requirements of this Section.
- E. Attend and participate in scheduling meetings as may be requested by the Owner or Owner's Representative.

1.05 OWNER'S RESPONSIBILITIES

- A. Owner may provide technical assistance to Contractor in preparation of its construction schedule.

1.6 SCHEDULE MAINTENANCE PROCEDURES

- A. Milestone Schedule: Within 10 calendar days of Award of this Contract, the Contractor shall provide the following:
 - 1. A Summarized Milestone Schedule, prepared as a computer generated time-scaled CPM diagram in precedence diagramming format, identifying the major areas of the Project. Milestone Schedule shall identify all established milestones specified in the Contract Documents, to constitute one complete program for the entire work.
 - 2. The Summarized Milestone Schedule shall be used for the life of the Contract to delineate the interdependence and order of construction of the project Work areas. Also, it shall be employed as a framework for developing the Detailed Network Schedule described below.
 - 3. The Owner reserves the right to reject any submitted schedule by the Contractor, if, in the view of the Owner, said schedule reflects unreasonable assumptions on the part of the Contractor, its subcontractors or Owner's other Contractors. The Contractor shall be responsible for resubmitting within five (5) working days the actual reflection of current and projected status.
- B. Network Schedule: Within 10 calendar days of Owner's Representative's approval of the Summary Milestone Schedule, the Contractor shall provide the following:
 - 1. A Detailed Network Schedule shall be prepared as a CPM logic diagram in precedence diagramming format. The detailed network schedule shall identify the work to be performed in order to support the Master Milestone Schedule.
 - 2. The Detailed Network Schedule shall be utilized to monitor progress and shall, therefore, be maintained throughout the duration of the Project.
 - 3. Activities represented on the Detailed Network Schedule shall dovetail the summary milestone schedule so as to constitute one complete program for the whole of the project.
 - 4. The Contractor shall provide a detailed successor/predecessor report, in a format acceptable to the Owner's Representative, sorted by major project area. This report shall also include the duration of each activity and logic relationship.

- a. The Contractor shall submit both a printed copy and computer diskette to the Owner's Representative containing this information.
- C. Updating:
1. Show all changes which have occurred since the previous update and submittal. Provide the following update information:
 - a. Progress of each activity.
 - b. Completion dates.
 - c. Activities modified.
 - d. Revision of schedule restraints.
 - e. Revision in duration to any activities.
 - f. Revision of resources.
 - g. With each schedule update, provide a NARRATIVE REPORT, including: current and anticipated delay factors and their impact on the schedule.
 - h. Corrective action taken or proposed and its effect or intended effect on schedule.
 - i. Detailed description of revisions to schedule.

1.7 SUBMITTALS

- A. Submit to the Owner's Representative, the Summary Milestone Schedule within 10 days after Award of Contract consistent with submittal requirements set forth by the Contract Documents.
- B. Submit to the Owner's Representative, the Detailed Network Schedule within 14 calendar days of approval of Summary Milestone Schedule consistent with submittal requirements set forth by the Contract Documents.
- C. On the 25th of each month (along with the monthly Application for Payment), submit one print of the previous Detailed Network Schedule with annotations showing status and changes as required by paragraph 1.06.C.1. and one reproducible transparency of updated Detailed Network Schedule reference progress to the update data.
 1. Along with updated schedules, submit NARRATIVE REPORT.
 2. Submit additional detailed network logic necessary to fulfill the requirements described in paragraph 1.06.B. above.
 3. Submit updated Summarized Milestones Schedule to reflect current project status. Identify any changes invoked or contemplated to the original program plan.
 4. Submit one (1) computer diskette containing the detailed network schedule.

END OF SECTION 01310

SECTION 01370 - SCHEDULE OF VALUES

PART 1 - GENERAL

1.1 SUMMARY

- A. Submit to the Owner for approval, a Schedule of Values allocated to the various lump sum portions of the Work, within 15 days after the Notice to Proceed.
- B. Upon request of the Owner, provide support data which substantiates the correctness of the values.
- C. The Schedule of Values will be used by the Owner for the purpose of reviewing Lump Sum Bid Items and as a basis for interim or partial payments.
- D. The Schedule of Values shall indicate that 5% of the money due under the lump sum contract is reserved for Project Closeout. It is understood that payment will not be made of this reserve amount until all Project Closeout items have been submitted to the Owner by the Contractor in a manner and form satisfactory to the Owner and as provided by this specific Contract.
- E. Project Closeout items are defined as any item which this Contract requires the Contractor to furnish to the Owner as provided by the Standard Specifications, Supplemental Specifications, Special Provisions, Technical Special Provisions, or the Plans. Examples of such items are Operations and Maintenance Manuals, Systems and Equipment Testing, Department Personnel Training, Supplies required for initial operation of equipment, Project Record Drawings, Warranties and Guarantees, etc.

1.2 FORM AND CONTENT OF SCHEDULE OF VALUES

- A. The Schedule of Values shall be typed on 8-1/2-inch x 11-inch or 8-1/2-inch x 14-inch white paper. The Contractor's standard forms and computer printout will be considered for approval by the Owner upon the Contractor's request. The Schedule of Values shall identify the:
 - 1. Title of Project and Contract Number
 - 2. Location of Contract and Contract designation.
 - 3. Name and address of Contractor.
 - 4. Date of submission.
- B. The Schedule of Values shall list the installed value of the component parts of each item of the Work in sufficient detail to serve as a basis for computing unit prices for progress payments during construction.

- C. The Contractor shall identify each line item with the number and title of the respective major Section of the TSPs.
- D. For each major line item, the Contractor shall list sub-values of major projects or operations under the item.
- E. For the various portions of the Work, the Contractor shall prepare the Schedule of Values such that:
 - 1. Each item shall include proportional amount of the Contractor's overhead and profit.
 - 2. No stored material progress payments will be made for stored materials required for construction or for any work or equipment items to be incorporated therein, unless approved by the Owner.
 - 3. For items on which progress payments will be allowed for stored materials, the Contractor shall break down the value into:
 - a. The cost of materials, delivered and unloaded, with taxes included.
 - b. The total installed value.
 - 4. Prior to allowed progress payments on stored materials, paid invoices for those materials will be available upon request by the Owner.
 - 5. For all lump sum related line items, provide separate material and labor breakdowns.
 - 6. A separate line item for Project Closeout shall be provided.

1.4 SUBSCHEDULE OF UNIT VALUES FOR MATERIALS

- A. The Contractor shall submit a subschedule of unit costs and quantities for products on which progress payments are allowed for stored products.
- B. The form of submittal shall parallel that of the Schedule of Values, with each item identified the same as the line item in the Schedule of Values.
- C. The unit quantity for bulk materials shall include an allowance for normal waste.
- D. The unit values for the materials shall be broken down into:
 - 1. Cost of the material, delivered and unloaded at the Site, with taxes included.
 - 2. Copies of paid invoices for component material shall be included with the payment request in which the material first appears.
- E. The unit value multiplied by the quantity listed shall equal the cost of that item in the Schedule of Values.

1.5 REVIEW AND RE-SUBMITTAL

- A. After a review by the Owner, the Contractor shall revise and re-submit the Schedule of Values and Subschedule of Material Values as required.
- B. The Contractor shall resubmit the revised Schedules in the same manner.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01370

SECTION 01500 - TEMPORARY FACILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Sections include the following:
 - 1. Division 1 Section "Summary" for limitations on utility interruptions and other work restrictions.

1.3 DEFINITIONS

- A. Permanent Enclosure: As determined by Owner, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.4 USE CHARGES

- A. General: Cost or use charges for temporary facilities shall not be assessed to the Contractor. Allow other entities to use temporary services and facilities without cost, including, but not limited to, testing agencies and authorities having jurisdiction.
- B. Water Service: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- C. Electric Power Service: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- D. Sanitary Facilities: Contractor shall maintain existing sanitary facilities or provide portable facilities for use by construction personnel for the duration of the project work.

1.5 SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

1.6 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.7 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top rails.

2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of construction personnel. Keep office clean and orderly. Furnish and equip offices as follows:
 - 1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
 - 2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with not less than 1 receptacle on each wall. Furnish room with conference table, chairs, and 4-foot-square tack board.
 - 3. Drinking water and private toilet.

4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
 5. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
1. Store combustible materials apart from building.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
- C. Water Service: Use of Owner's existing water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
 - 1. Where installations below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
 - 1. Toilets: Use of Owner's existing toilet facilities within project building will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- G. Electric Power Service: Use of Owner's existing electric power service will be permitted, as long as equipment is maintained in a condition acceptable to Owner.
- H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
 - 2. Install lighting for Project identification sign.
- I. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line for each field office.
 - 1. Provide additional telephone lines for the following:

- a. Provide a dedicated telephone line for each facsimile machine and computer in each field office.
 - b. Provide one telephone line for Owner's use.
2. At each telephone, post a list of important telephone numbers.
- a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Engineer/ Project Manager's office.
 - e. Owner's office.
 - f. Principal subcontractors' field and home offices.
3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
1. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.
 2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits as directed.
1. Provide dust-control treatment that is non-polluting and non-tracking. Reapply treatment as required to minimize dust.
- C. Traffic Controls: Comply with requirements of authorities having jurisdiction.
1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- D. Parking: Provide temporary parking areas for construction personnel.
- E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.

- F. Project Identification and Temporary Signs: Provide Project identification and other signs as directed. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.
 - 1. Provide temporary, directional signs for construction personnel and visitors.
 - 2. Maintain and touchup signs so they are legible at all times.
- G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction.
- H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
 - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- I. Existing Elevator Use: Use of Owner's existing elevators will be permitted, as long as elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.
 - 1. Do not load elevators beyond their rated weight capacity.
 - 2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.
- J. Existing Stair Usage: Use of Owner's existing stairs will be permitted, as long as stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
 - 1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If, despite such protection, stairs become damaged, restore damaged areas so no evidence remains of correction work.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
 - 1. Comply with work restrictions specified in Division 1 Section "Summary."

- B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
 - 1. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- C. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- D. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- E. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
 - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations as indicated on Drawings.
 - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel.
- F. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
- G. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- H. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 - 1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.
- I. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
 - 1. Prohibit smoking in interior construction areas.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.

3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.
- D. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- E. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 2. At Substantial Completion, clean and renovate permanent facilities used during construction period.

END OF SECTION 01500

SECTION 01630 - PRODUCT SUBSTITUTIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Specification Section defines Products and specifies administrative and procedural requirements for handling requests for substitutions.

1.2 PRODUCTS

- A. The term Product generally refers to materials, products, components, and other items which the County has determined to be desirable to be incorporated into the project, which meet the established design criteria for the project, and which provide the desired quality.
- B. The Specifications generally list a minimum of three manufacturers/suppliers, with catalog/model numbers, for each product specified. The Contractor is advised that the use of Products on this Project is encouraged and will serve to expedite the review and approval of required submittals.

1.3 SUBSTITUTIONS

- A. If the Contractor proposes the use of a material, component, or other item for incorporation into the project which is not a Product, such item shall be considered a substitution. Approval of substitutions by the County is required before the Contractor may make submittals as required by the appropriate Section of the Specifications. Approvals of substitutions are subject to the following requirements and conditions:
 - 1. The burden of proof that a proposed substitution is equivalent to a Product rests entirely on the Contractor.
 - 2. The Contractor shall provide documentation satisfactory to the County that the proposed substitution complies with the plans and Specifications as follows:
 - a. Applicable Specification Section Numbers
 - b. Applicable Drawing Numbers
 - c. Samples, where applicable or requested.
 - d. A detailed comparison of the significant qualities of the proposed substitution relative to the specified item.
 - e. Information on how the proposed substitution coordinates with other items of Work on this project including any modifications to the various items of Work necessary to accommodate the substitution.

- f. Certification by the Contractor that the proposed substitution will perform adequately for the intended application as required by the plans and Specifications
 - g. Contractor's completion of the Appendix 01630-1 - Substitution Request Form included as Part of this Specification Section.
- 3. The County's decision to accept or reject a proposed substitution shall be final.
- B. Where an accepted substitution requires a different quantity or arrangement of foundations, supports, ductwork, piping, wiring, conduit, and any other equipment or accessories normal for the accepted substitution, the Contractor shall effect all required modifications including the work of other trades impacted by the substitution at no additional cost to the County.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01630

APPENDIX 01630-1 - SUBSTITUTION REQUEST FORM

Submit to: _____

Request No _____

Project: OCU PEMB Package

Date Received: _____

Spec. Sect. Number and Paragraph Reference: _____

Drawing(s) and Detail(s) Affected: _____

Proposed Substitution: _____

Manufacturer: _____

Product (model, pattern, etc.): _____

WHY IS SUBSTITUTION BEING SUBMITTED?

Select 1 of the following:

- Specified product is not available. Explain.
- Cost savings to Owner. Indicate comparative cost analysis.
- Other. Explain, be specific. _____

EFFECTS OF PROPOSED SUBSTITUTION

Complete the following questions, attach supporting data specifically edited for this submission.

Does substitution affect dimensions indicated on Drawings?

(NO) (YES, explain)

Does substitution affect Work of other Sections?

(NO) (YES, explain)

Does substitution require modifications to design, changes to Drawings, or revisions to Technical Special Provisions to be incorporated into the Project?

(NO) (YES, explain)

Attach list of at least 3 projects where substitution has been used within past 12 months, include name, address, and telephone number of Owner and Designer of Record.

ACKNOWLEDGEMENT

Undersigned accepts responsibility for coordination of proposed substitution and waives claims for additional costs resulting from the incorporation of proposed substitution into the Project.

Submitted by:

For County=s / Engineer=s Use:

Accepted (___) Not Accepted (___)

No Action Required (___)

Submission: Incomplete (___) Too Late (___)

Reviewed by/Date: _____

Comments: _____

Subcontractor=s signature and date: _____

Contractor=s signature and date: _____

END OF SECTION

SECTION 01700 - PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies general administrative and procedural requirements for project closeout. The requirements include, but are not limited to, the following:
 - 1. Functional Project Acceptance and Conditional Acceptance inspection procedures.
 - 2. Project Record Document submittals.
 - 3. Operating instructions and maintenance manual submittals.
 - 4. Submittal of warranties, guarantees, and maintenance agreements.
 - 5. Final cleaning.

1.2 RELATED WORK

- A. CLEANING: Section 01710.
- B. GUARANTEES/WARRANTIES/REPAIRS: Section 01740.

1.3 FUNCTIONAL PROJECT ACCEPTANCE

- A. Prior to a request for an inspection for Functional Project Acceptance, the Contractor shall conduct weekly walk-through inspections in the presence of the Engineer / Project Manager in the month prior to the request for Functional Project Acceptance. Each inspection shall determine outstanding work necessary to meet the Functional Project Acceptance requirements stipulation under this Section. A list of outstanding work required will be updated by the Contractor weekly. The outstanding work list will be reduced progressively from the initial weekly inspection until, in the opinion of the Engineer / Project Manager, the Contractor's work qualifies as to the state of readiness for the formal inspection punch-list prior to Functional Project Acceptance by the County.
- B. Functional Project Acceptance shall be based on the essential completion of the Contract requirements including, but not limited to, the following:
 - 1. All civil, structural, landscape, plumbing, mechanical, fire protection and electrical work is complete for the intended operation.
 - 2. Letter from the Contractor stating that all code violations have been corrected along with copies of Final Inspection Reports representing each discipline.
 - 3. All mechanical, electrical, equipment, security, fire alarm, and uninterruptible power systems have been made operational and tested

under the supervision of the manufacturer's qualified factory representative, in the presence of the accepting authority having jurisdiction over the Work.

- a. The manufacturers have issued a certified letter of compliance and satisfactory operation to the Engineer / Project Manager.
 - b. The manufacturers have provided the required operation training, for the purpose of aiding the County's maintenance and operations personnel to become familiar with the systems.
4. Turn over all releases enabling the County unrestricted use of the Work and access to services and utilities.
 5. Complete clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.
 6. Provide the Engineer / Project Manager with the following list of approvals and certifications:
 - a. Letter of approval from the building official or the authorized inspector or inspection firm.
 - b. Fire pump test certification by the State Fire Marshal.
 - c. Fire alarm test certification by the State Fire Marshal.
 - d. Certification of successful smoke removal and stairwell pressurization tests by the State Fire Marshal.
 - e. Certification that standpipes and sprinkler systems meet pressure and flow tests by the State Fire Marshal.
 - f. Certification and acceptance of standby generator liquid propane tanks by the Division of LP Tanks/Department of Insurance.
 - g. Certification and acceptance of standby generator underground and aboveground tanks by the Department of Environmental Protection.
- C. Upon the confirmation that the above requirements have been satisfied, the Contractor shall request the Engineer / Project Manager to schedule an inspection for Functional Project Acceptance.
- D. The Contractor shall obtain from the designated Building Code Administrator the certifications necessary to request a Certificate of Occupancy or Notice of Completion for this project. These items may include, but are not limited to, the following:
 1. Certification that the structure meets or exceeds the flood plain criteria defined in the FEMA document 44 CFR - Part 60.
 2. Certification of compliance to the Department of Environmental Regulation Management Pollution Control.
- E. After receipt of all such certifications, the Contractor shall obtain from the appropriate permitting agency a Certificate of Occupancy or Notice of Completion for the project and upon receipt thereof shall provide the following:
 1. Insurance change-over.

2. Make final change-over of permanent locks and transmit keys to the Engineer / Project Manager. Advise the Engineer / Project Manager of change-over in security provisions.
- F. After the Contractor receives the Certificate of Occupancy or Notice of Completion, the County will make a declaration of Functional Project Acceptance covering only that portion of the Project subject to Functional Project Acceptance, will occupy the new facilities, and will have two weeks to list any deficiencies not apparent during the inspection for Functional Project Acceptance.
- G. Functional project acceptance shall continue until Conditional Acceptance.

1.4 CONDITIONAL ACCEPTANCE

- A. Prior to a request for an inspection for Conditional Acceptance, the Contractor shall conduct a series of weekly inspections and a listing of outstanding work as conducted for Functional Acceptance until, in the opinion of the Engineer / Project Manager, the work qualifies for the formal inspection punch-list prior to Conditional Acceptance by the County.
- B. Conditional Acceptance for the Project shall require that the following be accomplished:
1. All record documents, maintenance manuals and equipment operational instructions have been turned over to the County's representatives and equipment operational demonstrations have been performed pursuant to Section 01720.
 2. All punch list items completed and accepted.
 3. Certification that construction meets the requirements of all permits issued.
 4. Remove temporary facilities from the site, along with construction tools and equipment, mock-ups, and similar elements.
 5. Deliver to the Engineer / Project Manager all Warranties, Guarantees, Workmanship Bonds, Maintenance Agreements, Final Certifications, and similar closeout documents on materials, systems and equipment, neatly bound and in order.
 6. Deliver to the person designated by the Engineer / Project Manager extra stock as specified in the TSPs.
 7. Provide instruction to County in maintenance of equipment and finishes.
 8. Deliver to the person designated by the County all special tools for items such as louver vanes, adjustable dampers, thermostats, allen-head locking devices as required by applicable TSPs.
- C. Upon Conditional Acceptance, the County shall provide written notice to the Contractor.
- D. Conditional acceptance shall continue until Final Acceptance.

ORANGE COUNTY UTILITIES

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 ELECTRONIC SUBMITTAL

- A. Electronic Close-out DVD: At the completion of the project, submit one copy of a DVD with entire project close out information below in PDF format. All letter, legal and brochure size sheets shall be portrait and the As-built drawings will be landscape. All fonts will be Arial. All items will be in PDF with OCR (Optical Character Recognition). This will enable a search engine to identify words on the scanned documents.
1. Contacts: Set up a separate PDF for the contacts. No bookmarks are needed for this section.
 2. As-Builts: All as-built drawings will be in landscape orientation.
 3. Submittals: All technical submittal items (approved and approved as noted) will be provided and sorted by the 16 standard divisions. Bookmarks will be needed for the appropriate divisions.
 4. Operations and Maintenance Manual: Specify the division name only in the bookmarks (1-16). Please note that all items will be in PDF with OCR (Optical Character Recognition). This will enable a search engine to identify works on the scanned documents.
 5. Permitting: This should include the Certificate of Occupancy or Notice of Completion and any other document that the Project Manager may include pertaining to the permitting for the project.

END OF SECTION 01700

SECTION 01710 - CLEANING

PART 1 - GENERAL

1.1 SUMMARY

A. Final Cleaning:

1. Provide final cleaning of the Work, immediately prior to Conditional Acceptance expected for a first-class cleaning and maintenance program.
2. Clean surfaces and areas to the following cleaning levels:
 - a. Remove all waste materials, rubbish and debris from and about the premises as well as all tools, construction equipment and machinery, and surplus materials.
 - b. Leave the site clean and ready for occupancy by the County. The Contractor will restore to their original condition those portions of the site not designated for alteration by the Delivery Order.
 - c. Replace broken and damaged materials.
 - d. Sweep paved areas to a broom-clean condition, remove stains, oil spills and other foreign deposits.
 - e. Wipe surfaces of mechanical and electrical equipment clean; remove excess lubrication and other substances.
 - f. Remove debris and surface dust from limited-access spaces including trenches, manholes, and similar spaces. Clean tops of horizontal surfaces of structural members in exposed areas.
 - g. Remove noticeable paint marks and construction stains.
 - h. Clean light fixtures and lamps so as to function at full efficiency. Replace any damaged lens.
 - i. Rake grounds which are neither planted nor paved, to a smooth, even-textured surface, breaking up or removing clumps of material.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01710

SECTION 01740 - WARRANTIES/REPAIRS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies general administrative and procedural requirements for warranties and related repairs (or replacement) required by the Contract Documents, including manufacturer's standard warranties on products and special warranties.
- B. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor from responsibility for performance of the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.2 RELATED WORK

- A. PROJECT CLOSEOUT: Section 01700.
- B. Specific requirements for warranties for the Work and products and installations that are specified to be warranted are included in other Specifications.
- C. Certifications and other commitments and agreements for continuing services to the County are specified elsewhere in the Specifications.

1.3 CONTRACTOR'S GUARANTEE

- A. Upon completion of the Work, the Contractor shall furnish a written guarantee stating that all materials and workmanship are guaranteed against defects for a period of one year from the date of Conditional Acceptance of the facility. Defects due to faulty materials and/or workmanship that develop during the guarantee period shall be repaired or replaced, as required, by the Contractor at no additional cost to the County and as acceptable to the County. For Contractor's guarantees greater than one year in duration, all other provisions as specified in this Section shall remain in force. Refer to other Specifications for these guarantees.
- B. The guarantee shall state the name of the County, provide full guarantee terms and conditions, effective date and termination date, and the name, license number, address and telephone number of the Contractor. The guarantee shall be signed by the Contractor or the Contractor's chief executive and notarized.
- C. The term start of the one year guarantee will not be recognized until all

outstanding work items (deficiency list) have been completed and acknowledged as accepted in writing by the County.

1.4 MANUFACTURER, SUPPLIER, AND SUBCONTRACTOR WARRANTIES

- A. In addition to Contractor's one year guarantee, all other manufacturer, equipment supplier, and subcontractor warranties shall commence on the Date of Conditional Acceptance of the total Contract as acknowledged in writing by the County, and taken over for use by the County.

Sewer Systems, Potable Systems, Security, Fire Alarm, HVAC, Plumbing Fixtures and Plumbing Systems, and Telephone/Intercom, Radio, and Standby Power Systems will not be accepted nor the initiation of warranty start recognized until these systems are functioning properly and acknowledged as accepted in writing by the County.

- B. Manufacturer and supplier warranties shall not relieve the Contractor of liability under the one year guarantee. Such warranties shall supplement the one year guarantee.

1. Written warranties made to the County are in addition to implied warranties, and shall not limit duties, obligations, rights, and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the County can enforce such other duties, obligations, rights, or remedies.
2. Ensure that all warranties comply with these stipulations prior to submission.

- C. Warranty Repairs:

1. All repairs or replacements resulting from a breach of warranty shall be promptly performed.
2. If, within 10 days after mailing of written notice by the County to the Contractor requesting repairs or replacement resulting from a breach of warranty, the Contractor shall neglect to make or undertake with due diligence to make the same, the County may make such repairs at the Contractor's expense; provided, however, that in the case of emergency where, in the judgment of the County, delay would cause serious loss or damage, repairs or replacement may be made without notice being sent to the Contractor, and Contractor shall pay the cost thereof.

1.5 SUBMITTALS

- A. Submit written warranties to the County prior to the Date of Conditional Acceptance. If the County designates a commencement date for warranties other than the Date of Conditional Acceptance, or a designated portion of the Work, submit written warranties on the County's request.

- B. Warranties shall be submitted properly executed by the Contractor, and also executed by the subcontractor, supplier, or manufacturer, or a combination thereof, as stipulated in other Specifications. Warranties shall also be fully identified and contain all appropriate terms and conditions.
- C. Provide a bound manual for all manufacturer, equipment supplier, and subcontractor warranties required by the Contract Documents. Identify each warranty with proper Specification Section.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01740

SECTION 02120 – EROSION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including the General Conditions, Supplementary Conditions, and Special Conditions, along with the General Requirements, apply to the work specified in this section.

1.2 SUMMARY

- A. The work specified in this section consists of measures required to control erosion on the project so as to prevent pollution of water, detrimental effects of public or private property adjacent to the project right-of-way and damage to work on the project. These measures will consist of construction and maintenance of permanent erosion control features or, where practical, the construction and maintenance of permanent erosion control features as shown in the plans or as may be directed by the Engineer.

1.3 REFERENCED STANDARDS

- A. The Florida Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition, are referred to hereinafter as the Standard Specifications. References to the Standard Specifications are used to specify materials, application, and installation. Administrative, contractual, and measurement and payment requirements are not applicable.
- B. Standard Drawings: Except as otherwise shown on drawings or specified herein, the applicable details of the Florida Department of Transportation (F.D.O.T.) Roadway and Traffic Design Standards, latest edition, shall apply. References to the F.D.O.T. Roadway and Traffic Design Standards are used to specify materials, application, and installation. Administrative, contractual, and measurement and payment requirements are not applicable.
- C. Chapter 62-621 Florida Administrative Code, "Generic Permits". The Florida Department of Environmental Protection's NPDES regulation for large and small construction activities.

1.4 SUBMITTALS

- A. NPDES NOI approval received from the FDEP.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. All materials in accordance with the Standard Specifications and Chapter 62-621 FAC.

PART 3 - EXECUTION

- 3.1 A. All installation and construction methods in accordance with the Standard Specifications.

END OF SECTION 02120

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SECTION 02200 – SITE GRADING, EXCAVATION, AND BACKFILLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including the General Conditions, Supplementary Conditions, and Special Conditions, if any, along with the General Requirements, apply to the work specified in this section.
- B. Refer to geotechnical report by Nodarse & Associates, 'Report of Subsurface Exploration And Geotechnical Engineering Evaluation', dated 1/19/10." See report included as attachment 1.

1.2 DESCRIPTION

- A. Work Included:
 - 1. Grading and reshaping site.
 - 2. Compact of on-site fill.
 - 3. Importing and compacting fill as required.
 - 4. Compaction of material beneath paving.
 - 5. Removal of unsuitable material.
 - 6. Layout and establishment of grades.
 - 7. Consolidation of existing soils.
- B. Related Work Specified Elsewhere:
 - 1. Site Clearing: Section 02110 - SITE CLEARING, STRIPPING AND GRUBBING.
- C. Inspection and Testing: All work specified in this section of the specifications will be subject to inspection and testing.
- D. Layout:
 - 1. Layout of property lines and establishment of benchmark has been performed.
 - 2. Perform additional required layout and establish all grades as needed for proper execution of the work using predetermined benchmark.

1.3 QUALITY ASSURANCE

- A. Perform earthwork and site grading in compliance with applicable requirements of governing authorities having jurisdiction.

1.4 JOB CONDITIONS

- A. Locate existing underground utilities in the areas of work before starting earthwork operations. Where utilities are to remain in place, provide adequate means of protection during earthwork operations.

1. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the utility owner immediately for directions. Cooperate with the Owner and public and private utility companies in keeping their respective services and facilities in operation. Repair damaged utilities to the satisfaction of the utility owner.
 2. Do not interrupt existing utilities serving facilities occupied and used by the Owner or others, except when permitted in writing by the Engineer and then only after acceptable temporary utility services have been provided.
- B. Use of explosives is not permitted.
- C. Protect structures, utilities, sidewalks, pavements, and other facilities from damages caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

PART 2 - PRODUCTS

2.1 DEFINITIONS

- A. Satisfactory soil materials are defined as those complying with AASHTO Designation M145, soil classification Groups A-1, A-2-4, A-2-5, and A-3.
- B. Unsatisfactory soil materials are defined as those described in AASHTO M145 for soil classification Groups A-2-6, A-2-7, A-4, A-5, A-6 and A-7, as well as peat and other highly organic soils, unless otherwise acceptable to the Engineer.
- C. Cohesionless soil materials include gravels, sand-gravel mixtures, sands, and gravelly sands.
- D. Cohesive soil materials include clayey and silty gravels, sand-clay mixtures, gravel-silt mixtures, clays and silty sands, sand-silt mixtures, clays, silts, and very fine sands.

2.2 SOIL MATERIALS

- A. Backfill and Fill Materials: Shall be satisfactory soil materials for backfill and fill, free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetable, and other deleterious matter. Use excavated or borrow material that has been sampled, tested, and certified as satisfactory soil material.

PART 3 - EXECUTION

3.1 UTILITIES

- A. Prior to commencing work at site, contact all utility companies that may have underground services on site and determine their location.
- B. Protect all underground utilities to remain in area of site grading and excavation.

- C. Do not interrupt existing utilities serving facilities occupied and used by the Owner or others, except where permitted in writing by the Engineer, and then only after acceptable temporary utility services have been provided.
- D. Repair immediately and restore services of any line or service damaged, broken, or interrupted by grading, excavation, and backfill operations, at no additional cost.

3.2 SAFETY AND PROTECTION

- A. Furnish, place, and maintain all supports, shoring, sheet piling, barriers, signs and warning lights required for safety and protection of site personnel and adjacent existing facilities.
 - 1. Include safeguards to minimize risk to unauthorized persons.
 - 2. Install supports, shoring, and sheet piling in accordance with applicable OSHA regulations.
 - 3. Protect and preserve the Owner harmless against damage and claims for damage resulting from these activities.
- B. Reference Points:
 - 1. Maintain all benchmarks, monuments, and other reference points, existing and/or furnished by others.
 - 2. Replace any reference points disturbed or destroyed as directed by Engineer at no additional cost.

3.3 EXCAVATION

- A. Excavation consists of the removal and disposal of materials encountered when establishing the required grade elevations.
- B. Excavation Classifications: All excavation shall be considered unclassified.
- C. Excavate to required subgrade elevations. Extra payment will not be made for excavations carried below required grades. Restore to proper elevations as specified for compacted backfilling.
- D. If unsuitable materials are encountered at the required elevations, carry excavations deeper and replace the excavated material as directed by the Engineer. Removal of unsuitable material and its replacement as directed will be paid on the basis of Contract Conditions relative to changes in the work. Dispose of excess unsatisfactory soil material off site.
- E. Prevent surface and subsurface or groundwater from flowing into excavations and flooding the project site and surrounding area.
 - 1. Do not allow water to accumulate in excavations. Remove water from excavations to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to the stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey the water away

- from the site.
 - 2. Convey water removed from excavations and rain water to collecting or run-off areas. Do not use trench excavations for site utilities as temporary drainage ditches.
 - 3. Obtain all required approvals, permits and licenses prior to dewatering and follow the rules and requirements of the authorities having jurisdiction.
- F. Excavated materials classified as A-3 soils shall be separated and stockpiled where directed until required for fill. Place, grade, and shape stockpiles for proper drainage. Dispose of excess unsatisfactory and remaining satisfactory soil material, trash, and debris off the site.
- G. Cut the surface under pavements to comply with cross sections, elevations, and grades as shown.

3.4 BACKFILL AND FILL

- A. Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface. When the existing ground surface has a density less than that specified under "Compaction" for the particular area classification, break up the ground surface, pulverize, moisture-condition to the optimum moisture content, and compact to the required depth and percentage of maximum density.
- B. All backfill and fill material shall be clean sand meeting AASHTO "A-3" classification.
- C. Placement and Compaction:
- 1. For areas outside pavement, place backfill and fill materials in layers not more than 12 inches in loose depth for material compacted by heavy compaction equipment, and not more than 6 inches loose depth for material compacted by hand-operated equipment.
 - a. Before compaction, moisten or aerate each layer as necessary to provide the optimum moisture content of the soil material. Compact each layer to the required percentage of maximum density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
 - b. Backfill excavations as promptly as the work permits, but not until completion of the inspection, testing, approval, and recording location of underground utilities, as required.
 - c. Compact top 6 inches of subgrade and each layer of backfill or fill material at 95 percent as determined by ASTM D 1557 for clean sands or clayey soils.
 - 2. For pavement, place and compact backfill and fill in accordance with the pavement section detail.
 - 3. For walkways, place and compact top 6 inches of subgrade and each layer of backfill or fill material at 98 percent for clean sands and clayey soils.

3.5 GRADING

- A. Uniformly grade all areas as shown on the drawings, including cut and filled areas and adjacent transition areas, so that finish surfaces are at the elevations as shown on the drawings.
- B. During site grading operations, provide adequate methods to ensure that site is kept reasonably free of standing water.
- C. Provide protective erosion control measures complying with all governing regulations, including silt screens, hay bales, settling ponds, and similar devices as needed or directed.
- D. Compact exposed cohesionless (sands without clay fines) soils at stripped or cut surface in paving areas including at least 5 feet beyond their edge using a track-mounted vibratory roller having a static weight of not more than 6,000 pounds. Provide at least 8 passes and continue compaction until dry densities equivalent to at least 98% of Modified Proctor maximum dry density, ASTM D 1557, are obtained. Where such areas are identified, undercut until firm material is found prior to any subsequent fill or construction operations. Earthwork operations should be planned such that exposure of stripped clay areas to weather is minimal.
- E. Finish ditches to ensure proper flow and drainage. Conduct final rolling operations to produce a hard, uniform, and smooth cross section.
- F. Grade areas to receive topsoil, sod, or paving to allow for such material. Do not allow surfaces to vary from the established grades more than the following:
 - 1. Finished surfaces: 0.2 feet.
 - 2. Areas under topsoil or sod: 0.2 feet.
 - 3. Areas under paving: 0.1 feet.
 - 4. Areas under walkways: 0.1 feet.
 - 5. Areas under building pads: 0.1 feet.

3.6 PAVEMENT SUBGRADE STABILIZATION

- A. In accordance with Section 02510 - ASPHALTIC CONCRETE PAVEMENT.

3.7 FIELD QUALITY CONTROL

- A. Quality Control Testing During Construction: Testing service must inspect and approve subgrades and fill layers before further construction work is performed.
- B. Perform field density tests in accordance with ASTM D 1556 (sand cone method), ASTM D 2167 (rubber balloon method), ASTM D 2922 (nuclear method), or ASTM D 2937 (drive-cylinder method).
- C. Make at least one field density test of the subgrade for every 10,000 square feet of paved area, but in no case less than three tests.
- D. In each compacted fill and backfill layer, make one field density test for every 10,000

square feet of overlaying paved area, but in no case less than three tests.

- E. If, in the opinion of the Engineer, based on reports of the testing service and inspection, the subgrade or fills which have been placed are below the specified density, additional compaction and testing will be required until satisfactory results are obtained.
- F. The results of density tests of soil-in-place will be considered satisfactory if the average of any four consecutive density tests which may be selected are in each instance equal to or greater than the specified density, and if not more than one density test out of five has a value of more than two percent below the required density.

3.8 SILTATION AND EROSION CONTROL

- A. Take adequate precautions to prevent siltation of streams, canals, lakes, and similar bodies of water.
- B. Provide, install, and maintain temporary erosion control features during this work as required. Provide temporary erosion control features consisting of, but not limited to, temporary grassing, temporary mulching, sandbagging, sediment basins, and silt fences.
- C. Remove all temporary erosion control features after work is complete.

3.9 GRADING AFTER INSTALLATION OF UTILITIES

- A. Contractor will be required to regrade all areas disturbed during the installation of utilities listed in the General Requirements. All regrading shall comply with requirements listed in this section.

3.10 MAINTENANCE

- A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris. Repair and re-establish grades in settled, eroded, and rutted areas to the specified tolerances.
- B. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, and compact to the required density prior to further construction.

3.11 DISPOSAL OF WASTE MATERIALS

- A. Removal from Owner's Property: Remove waste materials, including excavated material classified as unsatisfactory soil material, trash and debris, and dispose of it off the Owner's property.

END OF SECTION 02210

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SECTION 02500 – SITE DRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including the General Conditions, Supplementary Conditions, and Special Conditions, if any, along with the General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION

- A. Perform all the work in connection with all pipe, culverts, inlets, manholes, and auxiliary drainage structures indicated on the drawings or otherwise necessary to collect all surface and subsurface water and discharge such water into existing drainage facilities.

1.3 REFERENCED STANDARDS

- A. The Florida Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition, are referred to hereinafter as the Standard Specifications. References to the Standard Specifications are used to specify materials, application, and installation. Administrative, contractual, and measurement and payment requirements are not applicable.
- B. Standard Drawings: Except as otherwise shown on drawings or specified herein, the applicable details of the Florida Department of Transportation (F.D.O.T.) Roadway and Traffic Design Standards, latest edition, shall apply. References to the F.D.O.T. Roadway and Traffic Design Standards are used to specify materials, application, and installation. Administrative, contractual, and measurement and payment requirements are not applicable.

1.4 APPROVALS AND PERMITS

- A. The Contractor shall apply for and obtain any permits or approvals as may be required by the governing authorities except those obtained by the Owner. Where the construction requirements of agencies are more stringent than this specification, the Contractor shall abide by such requirements and this specification shall be considered as supplemental to those requirements.

1.5 PIPE

- A. Unless specified otherwise, pipe sizes shown on the drawings are based on a coefficient of roughness of 0.013 for concrete and 0.012 for HDPE (used for roof drains only).

1.6 WORKMANSHIP

- A. All workmanship, materials, equipment, and plant shall be in accordance with the applicable portions of the Standard Specifications. The specific sections of the above-mentioned Standard Specifications which are applicable are listed below.

PART 2 - PRODUCTS

2.1 MATERIAL

- A. Concrete Pipe: Concrete pipe for culverts shall conform to the Standard Specifications. All pipe shall be Class III unless otherwise noted on the drawings. The joints of new pipe shall be sealed with use of round gaskets.
- B. High-density polyethylene pipe: HDPE for roof drains shall conform to the Standard Specifications. Pipe shall be Class II.

2.2 INLETS AND MANHOLE

A. Concrete Structures

1. Concrete and reinforced concrete shall be 4,000 psi and shall meet the requirements in the Standard Specifications.
2. Reinforcing steel in accordance with the Standard Specifications.
3. Manhole frames and covers shall be of cast iron and shall meet the requirements of the Standard Specifications.
4. Structural steel frames and grates in accordance with the Standard Specifications.
5. Inlet grates shall be of the type indicated on the drawings and in accordance with the Standard Specifications.
6. Precast inlets and manholes shall be manufactured in accordance with the Standard Specifications and the Florida Department of Transportation (F.D.O.T.) Roadway and Traffic Design Standards.
7. Brick and concrete masonry units in accordance with the Standard Specifications.
8. Mortar for brick masonry in accordance with the Standard Specifications.
9. Hydrated lime in accordance with the Standard Specifications.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All excavation, trenching, backfilling, and compaction operations shall be in accordance with Section 02200 - SITE GRADING, EXCAVATION, AND

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CONSTRUCTION DOCUMENTS
REVISED PER PEMB ADDENDUM 1 6/6/13

BACKFILLING.

1. Pipe: The storm drain shall be installed in accordance with the Standard Specifications.
2. Concrete Drainage Structures: Headwalls, manholes, inlets, mitered end sections, and control structures shall be installed in accordance with the details shown. All work and materials shall be in accordance with applicable portions of the Standard Specifications.

END OF SECTION 02500

SECTION 02511 – PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including the General Conditions, Supplementary Conditions, and Special Conditions, if any, along with the General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION

- A. Work Included:
 - 1. Preparation of Surfaces
 - 2. Pavement Marking
- B. Related Work Specified Elsewhere:
 - 1. Cleaning and Protection: Section 02510 – Asphaltic Concrete Pavement
- C. Inspection and Testing:
 - 1. All work specified in this section of the specifications will be subject to inspection and testing.
 - 2. Contractor will pay for costs of testing.
 - 3. Placing additional work over material that has not been tested and approved may require the Contractor to remove permanent work, provide approved tests, and replace the work at no additional cost to the Owner.
- D. Pavement Markings: As shown in the construction plans.

1.3 REFERENCED STANDARDS

- A. The Florida Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition, are hereinafter referred to as Standard Specifications.

1.4 SUBMITTALS

- A. Submit prior to commencing any work of this section of the specifications:
 - 1. Paint Material: Material certification of conformance with specifications.

PART 2 - PRODUCTS

A. PAINT

1. All pavement marking and striping shall be reflective white or yellow and conform to FDOT standard 17346.

PART 3 - EXECUTION

3.1 CLEANING AND PROTECTION

- A. All surfaces shall be cleaned and prepared according to Section 2510. Area shall be free of sand and debris, ready for application.
- B. Air temperature - No application shall occur when ambient temperature of surrounding air is 50-degrees F or less.

3.2 PAINTING

- A. All application shall meet the requirements of Section No. 711, Florida Department of Transportation Standard Specifications for Road and Bridge Construction, Latest Edition.

END OF SECTION 02511

SECTION 02514 – PORTLAND CEMENT CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including the General Conditions, Supplementary Conditions, and Special Conditions, if any, along with the General Requirements, apply to the work specified in this section.

1.2 SCOPE

- A. The work under this section includes the furnishing and installation of all labor, material, equipment, testing, quality assurance and supervision required for the construction of all portland cement concrete pavement, as necessary, according to the contract documents.

1.3 REFERENCED STANDARDS

- A. The Florida Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition, are hereinafter referred to as Standard Specifications.

1.4 SUBMITTALS

- A. Shop drawings consisting of manufacturer's details or manufacturer's product data, specifications with application and installation instructions for proprietary materials and items, and portions and independent testing facility reports shall be submitted for review.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. In accordance with the Standard Specifications.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. In accordance with the Standard Specifications.

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END OF SECTION 02514

SECTION 02520 – CONCRETE CURBS AND WALKS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including the General Conditions, Supplementary Conditions, and Special Conditions, if any, along with the General Requirements, apply to the work specified in this section.

1.2 CODES AND REGULATIONS

- A. All work shall comply with applicable Local codes and regulations.

1.3 REFERENCED STANDARDS

- A. The Florida Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition, are referred to hereinafter as the Standard Specifications. References to the Standard Specifications are used to specify materials, application, and installation. Administrative, contractual, and measurement and payment requirements are not applicable.
- B. Standard Drawings: Except as otherwise shown on drawings or specified herein, the applicable details of the Florida Department of Transportation (F.D.O.T.) Roadway and Traffic Design Standards, latest edition, shall apply. References to the F.D.O.T. Roadway and Traffic Design Standards are used to specify materials, application, and installation. Administrative, contractual, and measurement and payment requirements are not applicable.

PART 2 - PRODUCTS

2.1 CONCRETE

- A. Comply with applicable requirements of the Standard Specifications for concrete materials, admixtures, bonding materials, curing materials, and others as required. Mix design to produce standard-weight concrete with minimum compressive strength of 3000 psi at 28 days, 2-inch to 4-inch slump range. All work shall have a minimum strength of 3000 psi and meet the conditions of Class I concrete, of the Standard Specifications.

2.2 FORMS

- A. Either steel or wood of sufficient strength to resist movement during concrete placement, straight and free of distortion and defects. Use flexible spring steel forms

on radius bends. Coat forms with a non-staining form release agent that will not discolor or deface the surface of the concrete.

2.3 EXPANSION JOINT FILLER

- A. Asphalt impregnated fiber strips ½-inch thick, full depth.

2.4 WELDED WIRE MESH

- A. Welded plain cold-drawn steel wire fabric, ASTM A 185.

2.5 FIBER REINFORCEMENT

- A. Polypropylene fiber specifically manufactured for temperature and shrinkage control in portland cement structures.

PART 3 - EXECUTION

3.1 DETAILS

- A. See details in the plans.

3.2 INSPECTION

- A. Examine the prepared subgrade for unstable areas in need of additional compaction. Do not proceed with work until unsatisfactory conditions have been corrected. Remove all trash, debris, and other loose material prior to placement.

3.3 LINES AND GRADES

- A. Set form to required lines and grades, rigidly braced and secured with a tolerance of 1/4-inch in 10 feet. Install sufficient quantity of forms to allow continuous progress of the work and so that forms can remain in place at least 24 hours after concrete placement. It is intended that the lip of the gutter shall match the original existing street elevation.
- B. Clean forms after each use and coat with form release agent as often as required to ensure separation from concrete without damage.

3.4 UTILITIES

- A. Take care not to damage existing utilities. All adjustments to the existing utilities that must be made for the work of this section shall be the responsibility of the Contractor.

3.5 JOINTS

- A. Construct expansion, contraction, and construction joints true-to-line with face perpendicular to surface of the concrete, unless otherwise indicated. Construct transverse joints at right angles to the centerline, unless otherwise indicated.
- B. Unless shown otherwise on the drawings, provide contraction joints at intervals of 10 feet except where a lesser interval is required for closure. No section shall be less than 4 feet in length. Construct joints for a depth equal to at least 1/4 concrete thickness, as follows:
 - 1. Tooled Joints: Form joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer.
 - 2. Sawed Joints: Form joints using powered saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut joints into hardened concrete as soon as surface will not be torn, abraded, or otherwise damaged by cutting action.
- C. Place construction joints at the end of all pours and at locations where placement operations are stopped for a period of more than ½ hour, except where such pours terminate at expansion joints. Construct joints as shown, or, if not shown, use standard metal keyway-section forms.
- D. Expansion joints shall be constructed at all radius points and at other locations indicated on the drawings. They shall be located at intervals of 500 feet between other expansion joints, ends of a run and between truck loads that exceed the time limits previously specified. Provide premolded joint filler for expansion joints abutting concrete curbs, walks, and other fixed objects, unless otherwise indicated.
 - 1. Extend joint fillers full width and depth of joint and below finished surface where joint sealer is indicated. If no joint sealer, place top of joint filler flush with finished concrete surface.
 - 2. Furnish joint fillers in one piece lengths for the full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together.
 - 3. Protect the top edge of the joint filler during concrete placement with a metal cap or other temporary material. Remove protection after concrete has been placed on both sides of joint.

3.6 REINFORCEMENT

- A. Welded Wire Mesh: Shall be placed in accordance with the Standard Specifications.
- B. Fiber Reinforcement: Shall be sized and mixed in accordance with the manufacturer's recommendations.

3.7 PLACING

- A. Comply with the requirements of the Standard Specifications for mixing and placing concrete and as herein specified.
- B. Do not place concrete until subgrade and forms have been checked for line and grade. Moisten subgrade if required to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- C. Place concrete using methods with prevent segregation of the mix. Consolidate concrete along the face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies or side forms. Use only square-faced shovels for hand-spreading and consolidation.
- D. Deposit and spread concrete in a continuous operation between transverse joints, as far as possible. If interrupted for more than ½ hour, place a construction joint.
- E. Curbs and Gutters: Automatic machine may be used for curb and gutter placement at Contractor's option. If machine placement is to be used, submit revised mix design and laboratory test results which meet or exceed the minimums herein specified. Machine placement must produce curbs and gutters to the required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified.

3.8 FINISHING

- A. After striking-off and consolidating concrete, smooth the surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust the floating to compact the surface and produce a uniform texture.
- B. After floating, test surface for trueness with a 10-foot straightedge. Distribute concrete as required to remove surface irregularities and refloat repaired areas to provide a continuous smooth finish.
- C. Work edge of gutters, back top edge of curb, and formed joints with an edging tool, and round to 1/2-inch radius, unless otherwise indicated. Eliminate any tool marks on concrete surface.
- D. After completion of floating and when excess moisture or surface sheen has disappeared, complete surface with a broom finish. Draw a fine-hair broom across concrete surface, perpendicular to line of traffic. Repeat operation if required to provide a fine line texture.
- E. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point-up any minor honeycombed areas. Remove and replace areas or sections with major defects.

3.9 CURING AND PROTECTION

- A. Comply with applicable requirements in the Standard Specifications. Protect and cure finished concrete. Use moist-curing method for initial curing whenever possible.

3.10 REPAIRS AND PROTECTIONS

- A. Minor defects shall be filled with mortar composed of one part portland cement and two parts fine aggregate. Plastering will not be permitted on the face of the curb, and any rejected curb, curb and gutter, or valley gutter shall be removed and replaced without additional compensation.
- B. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur. Sweep concrete pavement and was free of stains, discolorations, dirt and other foreign material just prior to final inspection.

3.11 BACKFILLING AND COMPACTION

- A. After the concrete has set sufficiently, but not later than three (3) days after pouring, the spaces in front and back of the curb shall be refilled to the required elevation with suitable material which shall be placed and thoroughly compacted in layers not thicker than 6 inches.

END OF SECTION 02520

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SECTION 02511 – PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including the General Conditions, Supplementary Conditions, and Special Conditions, if any, along with the General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION

- A. Work Included:
 - 1. Preparation of Surfaces
 - 2. Pavement Marking
- B. Related Work Specified Elsewhere:
 - 1. Cleaning and Protection: Section 02510 – Asphaltic Concrete Pavement
- C. Inspection and Testing:
 - 1. All work specified in this section of the specifications will be subject to inspection and testing.
 - 2. Contractor will pay for costs of testing.
 - 3. Placing additional work over material that has not been tested and approved may require the Contractor to remove permanent work, provide approved tests, and replace the work at no additional cost to the Owner.
- D. Pavement Markings: As shown in the construction plans.

1.3 REFERENCED STANDARDS

- A. The Florida Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition, are hereinafter referred to as Standard Specifications.

1.4 SUBMITTALS

- A. Submit prior to commencing any work of this section of the specifications:
 - 1. Paint Material: Material certification of conformance with specifications.

PART 2 - PRODUCTS

A. PAINT

1. All pavement marking and striping shall be reflective white or yellow and conform to FDOT standard 17346.

PART 3 - EXECUTION

3.1 CLEANING AND PROTECTION

- A. All surfaces shall be cleaned and prepared according to Section 2510. Area shall be free of sand and debris, ready for application.
- B. Air temperature - No application shall occur when ambient temperature of surrounding air is 50-degrees F or less.

3.2 PAINTING

- A. All application shall meet the requirements of Section No. 711, Florida Department of Transportation Standard Specifications for Road and Bridge Construction, Latest Edition.

END OF SECTION 02511

SECTION 02514 – PORTLAND CEMENT CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including the General Conditions, Supplementary Conditions, and Special Conditions, if any, along with the General Requirements, apply to the work specified in this section.

1.2 SCOPE

- A. The work under this section includes the furnishing and installation of all labor, material, equipment, testing, quality assurance and supervision required for the construction of all portland cement concrete pavement, as necessary, according to the contract documents.

1.3 REFERENCED STANDARDS

- A. The Florida Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition, are hereinafter referred to as Standard Specifications.

1.4 SUBMITTALS

- A. Shop drawings consisting of manufacturer's details or manufacturer's product data, specifications with application and installation instructions for proprietary materials and items, and portions and independent testing facility reports shall be submitted for review.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. In accordance with the Standard Specifications.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. In accordance with the Standard Specifications.

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END OF SECTION 02514

SECTION 02520 – CONCRETE CURBS AND WALKS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including the General Conditions, Supplementary Conditions, and Special Conditions, if any, along with the General Requirements, apply to the work specified in this section.

1.2 CODES AND REGULATIONS

- A. All work shall comply with applicable Local codes and regulations.

1.3 REFERENCED STANDARDS

- A. The Florida Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition, are referred to hereinafter as the Standard Specifications. References to the Standard Specifications are used to specify materials, application, and installation. Administrative, contractual, and measurement and payment requirements are not applicable.
- B. Standard Drawings: Except as otherwise shown on drawings or specified herein, the applicable details of the Florida Department of Transportation (F.D.O.T.) Roadway and Traffic Design Standards, latest edition, shall apply. References to the F.D.O.T. Roadway and Traffic Design Standards are used to specify materials, application, and installation. Administrative, contractual, and measurement and payment requirements are not applicable.

PART 2 - PRODUCTS

2.1 CONCRETE

- A. Comply with applicable requirements of the Standard Specifications for concrete materials, admixtures, bonding materials, curing materials, and others as required. Mix design to produce standard-weight concrete with minimum compressive strength of 3000 psi at 28 days, 2-inch to 4-inch slump range. All work shall have a minimum strength of 3000 psi and meet the conditions of Class I concrete, of the Standard Specifications.

2.2 FORMS

- A. Either steel or wood of sufficient strength to resist movement during concrete placement, straight and free of distortion and defects. Use flexible spring steel forms

on radius bends. Coat forms with a non-staining form release agent that will not discolor or deface the surface of the concrete.

2.3 EXPANSION JOINT FILLER

- A. Asphalt impregnated fiber strips ½-inch thick, full depth.

2.4 WELDED WIRE MESH

- A. Welded plain cold-drawn steel wire fabric, ASTM A 185.

2.5 FIBER REINFORCEMENT

- A. Polypropylene fiber specifically manufactured for temperature and shrinkage control in portland cement structures.

PART 3 - EXECUTION

3.1 DETAILS

- A. See details in the plans.

3.2 INSPECTION

- A. Examine the prepared subgrade for unstable areas in need of additional compaction. Do not proceed with work until unsatisfactory conditions have been corrected. Remove all trash, debris, and other loose material prior to placement.

3.3 LINES AND GRADES

- A. Set form to required lines and grades, rigidly braced and secured with a tolerance of 1/4-inch in 10 feet. Install sufficient quantity of forms to allow continuous progress of the work and so that forms can remain in place at least 24 hours after concrete placement. It is intended that the lip of the gutter shall match the original existing street elevation.
- B. Clean forms after each use and coat with form release agent as often as required to ensure separation from concrete without damage.

3.4 UTILITIES

- A. Take care not to damage existing utilities. All adjustments to the existing utilities that must be made for the work of this section shall be the responsibility of the Contractor.

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3.5 JOINTS

- A. Construct expansion, contraction, and construction joints true-to-line with face perpendicular to surface of the concrete, unless otherwise indicated. Construct transverse joints at right angles to the centerline, unless otherwise indicated.
- B. Unless shown otherwise on the drawings, provide contraction joints at intervals of 10 feet except where a lesser interval is required for closure. No section shall be less than 4 feet in length. Construct joints for a depth equal to at least 1/4 concrete thickness, as follows:
 - 1. Tooled Joints: Form joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer.
 - 2. Sawed Joints: Form joints using powered saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut joints into hardened concrete as soon as surface will not be torn, abraded, or otherwise damaged by cutting action.
- C. Place construction joints at the end of all pours and at locations where placement operations are stopped for a period of more than ½ hour, except where such pours terminate at expansion joints. Construct joints as shown, or, if not shown, use standard metal keyway-section forms.
- D. Expansion joints shall be constructed at all radius points and at other locations indicated on the drawings. They shall be located at intervals of 500 feet between other expansion joints, ends of a run and between truck loads that exceed the time limits previously specified. Provide premolded joint filler for expansion joints abutting concrete curbs, walks, and other fixed objects, unless otherwise indicated.
 - 1. Extend joint fillers full width and depth of joint and below finished surface where joint sealer is indicated. If no joint sealer, place top of joint filler flush with finished concrete surface.
 - 2. Furnish joint fillers in one piece lengths for the full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together.
 - 3. Protect the top edge of the joint filler during concrete placement with a metal cap or other temporary material. Remove protection after concrete has been placed on both sides of joint.

3.6 REINFORCEMENT

- A. Welded Wire Mesh: Shall be placed in accordance with the Standard Specifications.
- B. Fiber Reinforcement: Shall be sized and mixed in accordance with the manufacturer's recommendations.

3.7 PLACING

- A. Comply with the requirements of the Standard Specifications for mixing and placing concrete and as herein specified.
- B. Do not place concrete until subgrade and forms have been checked for line and grade. Moisten subgrade if required to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- C. Place concrete using methods with prevent segregation of the mix. Consolidate concrete along the face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies or side forms. Use only square-faced shovels for hand-spreading and consolidation.
- D. Deposit and spread concrete in a continuous operation between transverse joints, as far as possible. If interrupted for more than ½ hour, place a construction joint.
- E. Curbs and Gutters: Automatic machine may be used for curb and gutter placement at Contractor's option. If machine placement is to be used, submit revised mix design and laboratory test results which meet or exceed the minimums herein specified. Machine placement must produce curbs and gutters to the required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified.

3.8 FINISHING

- A. After striking-off and consolidating concrete, smooth the surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust the floating to compact the surface and produce a uniform texture.
- B. After floating, test surface for trueness with a 10-foot straightedge. Distribute concrete as required to remove surface irregularities and refloat repaired areas to provide a continuous smooth finish.
- C. Work edge of gutters, back top edge of curb, and formed joints with an edging tool, and round to 1/2-inch radius, unless otherwise indicated. Eliminate any tool marks on concrete surface.
- D. After completion of floating and when excess moisture or surface sheen has disappeared, complete surface with a broom finish. Draw a fine-hair broom across concrete surface, perpendicular to line of traffic. Repeat operation if required to provide a fine line texture.
- E. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point-up any minor honeycombed areas. Remove and replace areas or sections with major defects.

3.9 CURING AND PROTECTION

- A. Comply with applicable requirements in the Standard Specifications. Protect and cure finished concrete. Use moist-curing method for initial curing whenever possible.

3.10 REPAIRS AND PROTECTIONS

- A. Minor defects shall be filled with mortar composed of one part portland cement and two parts fine aggregate. Plastering will not be permitted on the face of the curb, and any rejected curb, curb and gutter, or valley gutter shall be removed and replaced without additional compensation.
- B. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur. Sweep concrete pavement and was free of stains, discolorations, dirt and other foreign material just prior to final inspection.

3.11 BACKFILLING AND COMPACTION

- A. After the concrete has set sufficiently, but not later than three (3) days after pouring, the spaces in front and back of the curb shall be refilled to the required elevation with suitable material which shall be placed and thoroughly compacted in layers not thicker than 6 inches.

END OF SECTION 02520

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SECTION 02821 - CHAIN-LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS.

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

1.2 SUMMARY

- A. Section Includes:
1. Chain-link fence
 2. Horizontal-slide gate
 3. Privacy Screen

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design chain-link fences and gates, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Chain-link fence and gate framework shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
1. Minimum Post Size: Determine according to ASTM F 1043 for framework up to 8 feet high, and post spacing not to exceed 10 feet.
 2. Minimum Post Size and Maximum Spacing: Determine according to CLFMI WLG 2445, based on mesh size and pattern specified and on the following:

1.4 ACTION SUBMITTALS

- A. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Show accessories, hardware, gate operation, and operational clearances.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of chain-link fence, and gate, from manufacturer.
- B. Product Test Reports: For framing strength according to ASTM F 1043.

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- C. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For the following to include in emergency, operation, and maintenance manuals:
 - 1. Polymer finishes.
 - 2. Gate hardware.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which installer agrees to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1 CHAIN-LINK FENCE FABRIC

- A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist. Comply with CLFMI Product Manual and with requirements indicated below:
 - 1. Fabric Height: 8 feet
 - 2. Steel Wire Fabric: 9 gauge
 - a. Mesh Size: 2 inches.
 - b. Coat: Polyvinyl Chloride (PVC) Finish: Comply with ASTM 668, with core wire diameter (gage) measured prior to application of PVC coating with not less than 0.30 ounce zinc per square foot of uncoated surface on 9 and 11 gage wire.
 - c. Color: Black, complying with ASTM F 934

2.2 FENCE FRAMING

- A. Posts and Rails: Comply with ASTM F 1043 for framing, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F 1043 based on the following:
 - 1. Fence Height: 8 feet
 - 2. Light Industrial Strength: Material Group IC-L, round steel pipe, electric-resistance-welded pipe.
 - a. Line Post: 1.9 inches (48 mm) in diameter.

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- b. End, Corner and Pull Post: 2.375 inches (60 mm)
- 3. Horizontal Framework Members: Intermediate, top, and bottom rails complying with ASTM F 1043.
 - a. Top Rail: 1.66 inches (42 mm) in diameter
- 4. Polymer coating over metallic coating.
 - a. Color: Black, complying with ASTM F 934.

2.3 TENSION WIRE

- A. Metallic-Coated Steel Wire: 7 gauge, marcelled tension wire complying with ASTM A 817 and ASTM A 824, with the same metallic coating as the fence material.

2.4 HORIZONTAL-SLIDE GATES

- A. General: Comply with ASTM F 1184 for gate posts and single sliding gate types.
 - 1. Classification: Type II Cantilever Slide, Class 1 with external roller assemblies.
 - a. Gate Frame Width and Height: Match existing gate width, height = 8'-0".
- B. Pipe and Tubing:
 - 1. PVC-Coated Steel: Protective coating and finish to match fence framing.
 - 2. Gate Posts: Comply with ASTM F 1184. Provide round tubular steel posts.
 - 3. Gate Frames and Bracing: Round tubular steel
- C. Frame Corner Construction: Assembled with corner fittings.

2.5 FITTINGS

- A. General: Comply with ASTM F 626.
- B. Post Caps: Provide for each post.
 - 1. Provide line post caps with loop to receive tension wire or top rail.

2.6 PRIVACY SCREENING

- A. Polypropylene mesh panels
 - 1. Min. 95% opacity

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- a. Color: Black

2. Edge Reinforcement

- a. 3/8" brass grommets @ 24" O.C.
- b. Hog Ring: PVC coated, color to match screen

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 100 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 INSTALLATION, GENERAL

- A. Install chain-link fencing to comply with ASTM F 567 and more stringent requirements indicated.

3.4 CHAIN-LINK FENCE INSTALLATION

- A. Post Setting: Set posts at indicated in drawings.
- B. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 30 degrees or more.
- C. Line Posts: Space line posts uniformly at 10 feet on center.
- D. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.
- E. Intermediate and Bottom Rails: Install and secure to posts with fittings.

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3.5 GATE INSTALLATION

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

END OF SECTION 02821

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SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. All concrete work shown is governed by this section. Concrete strength not otherwise designated shall be 3000 psi, as determined by the use of ASTM C31 and C39.

1.2 SUBMITTALS

- A. Shop Drawings: Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI Manual 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, diagrams of bent bars and arrangement of reinforcement. Show location of planned construction joints.
- B. Manufacturer's Data: Submit manufacturer's product data, specifications with application and installation instructions for proprietary materials and items, including admixtures, bonding agents, waterstops, joint systems, curing and sealing compounds, chemical hardeners and dry shake finish materials.
- C. Mix Design Test Reports: Submit proportions and testing facility reports for each proposed mix. Tests for mixes to be placed by pumping shall be made on samples from discharge end of similar pumping equipment. The submittal shall demonstrate compliance with ACI 318 Chapter 5. Concrete placed prior to approval of the mix shall be subject to removal and replacement as directed by the Architect/Engineer.
- D. Field Test Reports: The independent testing laboratory shall provide reports as described herein.
 - 1. Field test results shall be reported in writing to the Architect/Engineer and Contractor on the same day that tests are made.
 - 2. Reports of compressive strength tests shall contain the project title and AEP file number, date of concrete placement, name of Contractor, name of concrete supplier and truck number, name of concrete testing service, concrete mix number, location of concrete batch in the structure, batch time, placement time, quantity of any added water, slump, design and actual compressive strength and type of break for both 7-day tests and 28-day tests.
 - 3. If core tests become necessary, the core test results shall include the project identification name and number, date, name of Contractor, name of concrete testing service, location of test core in structure, concrete mix

number represented by core sample, nominal maximum size aggregate, design compressive strength, compression breaking strength and type of break (Corrected for length-diameter ratio, direction of applied load to core with respect to horizontal plan of the concrete as placed and the moisture condition of the core at time of testing).

1.3 QUALITY ASSURANCE

- A. Codes and Standards: Comply with the provisions of the following codes, specifications and standards, except as otherwise shown or specified. Where provisions of these codes and standards are in conflict with the building code in force for this project, the building code shall govern.
1. ACI 301 "Specifications for Structural Concrete for Buildings."
 2. ACI 302 "Guide for Concrete Floor and Slab Construction."
 3. ACI 318 "Building Code Requirements for Reinforced Concrete."
 4. ACI 304 "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete."
 5. ACI 311 "Recommended Practice for Concrete Inspection."
 6. ACI 347 "Recommended Practice for Concrete Formwork."
 7. ACI 117 "Standard Tolerances for Concrete Construction and Materials."
 8. CRSI "Manual of Standard Practice."
- B. Workmanship: The Contractor is responsible for correction of concrete work which does not conform to the specified requirements, including strength, tolerances and finishes. Correct deficient concrete as directed by the Architect/Engineer. Should construction or cold joints occur in an unapproved location or cylinders and cores indicate unacceptable concrete, load testing or removal and replacement of the concrete may be required as directed by the Architect/Engineer at no cost to the Owner.
- C. Design Mix: The Contractor shall employ, at his own expense, or obtain reports from a testing laboratory experienced in testing of concrete materials and mixes to perform material evaluation tests for the design of concrete mixes. Testing agency shall meet the requirements of ASTM E329.
- D. Quality Control Testing During Construction: Specified in PART 3.
1. Owner will employ and pay an independent testing laboratory acceptable to the Architect/Engineer to perform concrete tests during construction.
- E. Welding of reinforcing steel shall not be permitted.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

- A. Forms for Exposed Finish Concrete:
 - 1. Unless otherwise shown or specified, construct formwork for exposed concrete surfaces with plywood, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.
 - 2. Use overlaid plywood complying with U. S. Product Standard PS-1 "B-B High Density Overlaid Concrete Form," Class I.
- B. Form for Unexposed Finish Concrete: Form concrete surface which will be unexposed in finished structure with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces to be cured with water or curing compound.

2.2 REINFORCING MATERIALS

- A. Reinforcing Bar: ASTM A615 (S1), Grade 60.
- B. Galvanized Reinforcing Bar: ASTM A767, after fabrication and bending, only where specified or noted on drawings.
- C. Steel Wire: ASTM A82, plain, cold-drawn, steel.
- D. Welded Wire Fabric: ASTM A185, welded steel wire fabric.
- E. Welded Deformed Steel Wire Fabric: ASTM A497.
- F. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI recommendations, unless otherwise indicated. Wood, clay brick and other devices will not be acceptable.
 - 1. Slabs-On-Grade: Use supports or horizontal runners where wetted base material will not support chair legs.

2. Exposed-To-View Concrete Surfaces: Where legs of supports are in contact with forms, provide supports with legs which are hot-dip galvanized or plastic protected or stainless steel protected.

2.3 CONCRETE MATERIALS

A. Portland Cement: ASTM C150, as follows:

1. Provide Type I cement, except as otherwise indicated.
2. Provide White cement where shown or scheduled.
3. Use only one brand of cement for each required type throughout the project, unless otherwise accepted by the Architect/Engineer.

B. Aggregates:

1. General: Maximum aggregate size shall not be larger than 1/5 of the narrowest dimension between sides of forms, 1/3 of the depths of slabs, nor 3/4 of the minimum clear spacing between individual reinforcing bars or bundles of bars. Provide aggregates from one source of supply to ensure uniformity in color, size and shape.
2. Normal Weight Aggregates: ASTM C33, and as herein specified. Local aggregates not complying with ASTM C33 but which have shown by special test or actual service to produce concrete of adequate strength and durability may be used when acceptable to the Architect/Engineer.
 - a. Fine Aggregate: Clean, sharp, natural sand free from loam, clay, lumps or other deleterious substances.
 - b. Coarse Aggregate: Clean, uncoated, processed aggregate containing no clay, mud, loam, or foreign matter, as follows:
 - 1) Crushed stone, processed from natural rock or stone.
 - 2) Washed gravel, either natural or crushed. Use of pit or bank run gravel is not permitted.

C. Water: Clean, fresh, drinkable.

D. Admixtures: Provide admixtures produced by established reputable manufacturers and use in compliance with the manufacturer's printed directions. Do not use admixtures which have not been incorporated and tested in accepted mixes unless otherwise authorized in writing by the Architect/Engineer.

1. Air-Entraining Admixture: ASTM C260.
2. Water-Reducing Admixture: ASTM C494, Type A.

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3. Set-Control Admixture: ASTM C494, as follows:
 - a. Type D, Water-reducing and Retarding.
 - b. Type E, Water-reducing and Accelerating.
4. Fly Ash ASTM C618, Class F: Permitted up to a maximum of 20 percent by weight.
5. Chloride Ions: Do not use calcium chloride in concrete unless otherwise authorized in writing by the Architect/Engineer. Do not use admixtures containing chloride ions in excess of amount found in municipal potable water.
6. Superplasticizer: ASTM C494, Type F, not containing more chloride ions than potable water.

2.4 RELATED MATERIALS

- A. Waterstops: Provide flat, dumbbell type or centerbulb type waterstops at construction joints and other joints as shown. Size to suit joints.
 1. Rubber or PVC waterstops, at Contractor's option, with rubber units complying with Corps of Engineers CRD-C513 and PVC units complying with CRD-C572.
- B. Preformed Expansion Joint Fillers: Fiber type conforming to ASTM D1751 or Cork, ASTM D1752, Type II.
- C. Joint Sealing Compound: See Division 7.
- D. Moisture Barrier: See Division 7.
- E. Chemical Hardener: Colorless aqueous solution containing a blend of magnesium fluosilicate and zinc fluosilicate combined with a wetting agent, containing not less than 2 pounds of fluosilicates per gallon.
- F. Nonslip Aggregate Finish: Provide fused aluminum oxide grits, or crushed emery, as abrasive aggregate for nonslip finish with emery aggregate containing not less than 40 percent aluminum oxide and not less than 25 percent ferric oxide. Use material that is factory-graded, packaged, rust-proofed and nonglazing, and is unaffected by freezing, moisture and cleaning materials.
- G. Color Wear-Resistant Finish: Packages, dry, combination of materials, consisting of portland cement, graded quartz aggregate, coloring pigments and dispersing agents. Use coloring pigments that are finely ground, nonfading mineral oxides, interground with the cement. Color, as selected by Architect-Engineer, unless otherwise indicated.

H. Nonshrink Grout:

1. Materials: Grouting shall be performed with a material meeting the performance requirements that follow. Cement-based grouts shall have a minimum 5-year history of use and meet the following performance requirements at maximum water. They shall not contain expansive cement or metallic particles such as aluminum powder or iron filings.
 - a. Plastic Volume Change: The grout shall have no shrinkage (0.0 percent) and a maximum of 4.0 percent expansion from time of placement until final set when tested according to ASTM C827.
 - b. Hardened Volume Change: The grout shall have no shrinkage (0.0 percent) and a maximum of 0.2 percent expansion in the hardened state when tested according to CRD C-621.
 - c. Compressive Strength: The grout shall have a minimum 28-day compressive strength of 5,000 psi when tested according to ASTM C109, restrained.
 - d. Creep: The grout shall have creep characteristics equal to or less than the concrete on which it is bearing.
 - e. Working Time: The grout for anchor bolt sleeves shall have a fluid consistency with a time of efflux of less than 30 seconds and all other grout shall have a flow consistency greater than 125 percent for a minimum of 45 minutes when tested according to applicable consistency sections of ASTM C827 at 15 minute intervals.
2. Approved Manufacturers:
 - a. BASF Construction Chemicals, Shakopee, MN.
 - b. Sika Corporation, Lyndhurst, New Jersey.
 - c. Five Star Products, Inc., Fairfield, Connecticut.

I. Curing Materials:

1. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 ounces per square yard, complying with AASHTO M 182, Class 3.
2. Moisture-Retaining Cover: One of the following, complying with ASTM C171.
 - a. Waterproof paper.
 - b. Polyethylene film.

- c. Polyethylene-coated burlap.
- 3. Membrane-Forming Curing Compound: ASTM C309, Type I. Fully dissipating type compatible with all subsequently applied sealers, finishes, and other materials.
- J. Repair Materials: Proprietary systems recommended by the manufacturer for the specific applications required. Examples are as follows:
 - 1. Bonding Compound: Sikadur 32 Hi-Mod LPL.
 - 2. Patching Mortar: Sikatop 111 and 122.
 - 3. Injection Adhesive: Sikadur 35 Hi-Mod LV.

2.5 PROPORTIONING AND DESIGN OF MIXES

A. General:

- 1. All concrete not specifically designated shall be proportioned for a compressive strength of 3000 pounds per square inch at 28 days of age.
- 2. Water-Cement Ratio: All concrete subjected to freezing and thawing shall have a maximum water-cement ratio of 0.45. All concrete subjected to deicers, brackish water, seawater or spray from these sources or required to be watertight shall have a maximum water-cement ratio of 0.40.

B. Slump Limits:

<u>Type of Construction</u>	<u>Slump in Inches</u>	
	<u>Design</u>	<u>Tolerance</u>
Reinforced foundation walls and footing	3-1/2	∇ 1-1/2
Slabs and beams	4	∇ 1
Reinforced walls and columns	4-1/2	∇ 1-1/2
Pavements	1-1/2	∇ 2

- 1. Where use of superplasticizer is permitted, the slump shall be no greater than the design slump prior to addition of the admixture, and no greater than the supplier's recommendations, as indicated on the approved mix design submittal, after addition of the admixture.
- 2. For pump placement of concrete the slump shall be in accordance with the above limits at point of discharge. At the point of entry the slump shall not exceed the design slump plus the tolerance by more than 1 inch.

C. Proportion mixes by either trial mixture or field experience methods, using

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materials to be employed on the project for each class of concrete required, complying with ACI 211.1 for normal weight concrete. Mix design proportioning shall be in accordance with ACI 318 Chapter 5 including all required documentation.

D. Admixtures:

1. Use air-entraining admixture in all concrete, unless otherwise indicated. Add air-entraining admixture at the manufacturer's prescribed rate to result in concrete at the point of placement having 4-1/2 percent entrained air with tolerance in either direction from this optimum of 1-1/2 percent for normal weight concrete. Provide additional entrained air for small aggregate concrete where required for conformance with ACI 318 Table 4.1.1.
2. Use amounts of admixtures as recommended by the manufacturer for climatic conditions prevailing at the time of placing and approved in the mix design for the work. Adjust quantities and types of admixtures as required to maintain quality control.

E. Adjustment to Concrete Mixes: Mix design adjustments may be requested by the Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to the Owner and as accepted by the Architect/Engineer. Laboratory test data for revised mix designs and strength results shall be submitted to and accepted by the Architect/Engineer before using in the work.

2.6 PUMP PLACEMENT EQUIPMENT

- A. Minimum inside diameter of the pipe line shall be at least three times the maximum coarse aggregate size.
- B. Aluminum pipe shall not be used.
- C. Pump shall have an actual field service demonstrated capacity of placing not less than 25 cubic yards per hour.
- D. Standby placement capability equal to that being used shall be available on the job site at all times during pumping.

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PART 3 - EXECUTION

3.1 FORMS

- A. Design: Design of formwork, including shoring and reshoring, for structural stability and sufficiency is the Contractor's responsibility. Refer to Paragraph 3.10 - Shores and Supports herein. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by the concrete structure.
- B. Construction: Construct forms complying with ACI 347, to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up joints to prevent leakage of cement paste.
- C. Provisions for Removal: Fabricate forms for easy removal without hammering or prying against the concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Kerf wood inserts for forming keyways, reglets, and recesses to prevent swelling and for easy removal.
- D. Accessibility: Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.
- E. Edges: Chamfer exposed corners and edges 3/4 inches, unless otherwise noted, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- F. Form Ties: Factory-fabricated, adjustable-length, removable or snapoff metal form ties, designated to prevent from deflection, and to prevent spalling concrete surfaces upon removal.
 - 1. Unless otherwise shown, provide ties so portion remaining within concrete after removal is at least 1-1/2 inch inside concrete.
 - 2. Unless otherwise shown, provide form ties which will not leave holes larger than 1-inch diameter in concrete surface.
- G. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of opening, recesses and chases from trades providing such items. Accurately place and securely support items built into forms.

- H. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retighten forms after concrete placement if required to eliminate mortar leaks.
- I. Preparation of Form Surfaces:
 - 1. Coat and contact surfaces of forms with a form-coating compound before reinforcement is placed.
 - 2. Thin form-coating compounds only with thinning agent of type, and in amount, and under conditions of the form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in the forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.
 - 3. Coat steel forms with a nonstaining, rust-preventative form oil or otherwise protect against rusting. Rust-stained formwork is not acceptable.
- J. Slab on Grade: Coordinate with items installed by other trades. Verify compliance with applicable Division 2 requirements for subgrade preparation and maintenance prior to placement of reinforcing and concrete.

3.2 PLACING REINFORCEMENT

- A. References: Comply with the specified codes and standards, and Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.
- B. Preparation: Clean reinforcement of loose rust and mill scale, hardened concrete paste, earth, ice, and other materials which reduce or destroy bond with concrete.
- C. Support: Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chair, runners, bolsters, spacers, and hangers, as required. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces. Do not place reinforcing bars more than 2 inches beyond the last leg of continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.
- D. Coverage: Place reinforcement to obtain at least the minimum coverages for concrete protection.

- E. Splices: Provide standard reinforcement splices by lapping ends, placing bars in contact, and tightly wire tying.

3.3 JOINTS

- A. Construction Joints: Locate and install construction joints, which are not shown on the drawings, so as not to impair the strength and appearance of the structure, as acceptable to the Architect/Engineer.
 - 1. Provide keyways at least 1-1/2-inch deep in all construction joints in walls, slabs, beams and between walls and footings; accepted bulkheads designed for this purpose may be used for slabs.
 - 2. Place construction joints perpendicular to the main reinforcement. Continue all reinforcement across construction joints.
- B. Waterstops: Provide waterstops in construction joints as shown on the drawings. Install waterstops to form a continuous diaphragm in each joint. Make provisions to support and protect waterstops during the progress of the work. Fabricate field joints in waterstops in accordance with manufacturer's printed instructions. Protect waterstop material from damage where it protrudes from any point.
- C. Expansion Joints in Slabs-on-Ground: Construct isolation joints in slabs on ground at all points of contact between slabs on ground and vertical surfaces, such as column pedestals, foundation walls, grade beams and elsewhere as indicated.
- D. Construction (Control) Joints in Slabs-on Ground: Provide contraction joints in slabs-on-ground to form panels of patterns as shown. Use saw cuts or approved inserts creating a plane of 1/4 slab thickness. Saw cuts shall be made as soon as possible after final finishing without dislodging the aggregate, but in no case later than 12 hours after placement. Form contraction joints by inserting an approved plastic strip into the fresh concrete using manufacturer's standard straightedge setting tool until the top surface of the strip is flush with the slab surface. Prior to the concrete being floated, remove the top strip.

3.4 INSTALLATION OF EMBEDDED ITEMS

- A. General: Set and build into the work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use templates, setting drawings, diagrams, instructions and directions provided by suppliers of the items to be attached.
- B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain the required elevations and

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contours in the finished slab surface. Provide and secure units sufficiently strong to support the types of screed strips by the use of strike-off templates or accepted compacting type screeds

3.5 CONCRETE MIXING

- A. General: Mix materials in an acceptable drum type batch machine mixer. For mixers of one cubic yard, or smaller capacity, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after all ingredients are in the mixer, before any part of the batch is released. For mixers of capacity larger than one cubic yard, increase the minimum 1-1/2 minutes of mixing time by 15 seconds for each additional cubic yard, or fraction thereof. Provide a batch ticket for each batch discharged and used in the work, indicating the project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.
- B. Job-Site Mixing: This method is acceptable only for small quantities of concrete.
- C. Ready-Mix Concrete: Comply with the requirements of ASTM C94 or ASTM C685, and as herein specified.
 - 1. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required. When the air temperature is between 85 degrees F and 90 degrees F, reduce the mixing and delivery time from 1-1/2 hours to 75 minutes, and when the air temperature is above 90 degrees F, reduce the mixing and delivery time to 60 minutes.
 - 2. No additional water shall be added to concrete without the approval of the Architect/Engineer. Should additional water be required to obtain a slump as specified in this section for the type of concrete, the Contractor shall perform slump tests in accordance with ASTM C143 to determine the actual slump of the concrete in the mixer. The Contractor may then add water, but in no case shall the additional water exceed three percent of the mix-design water content, nor shall the slump of the mix exceed the maximum slump specified for the type concrete. Slump tests and the addition of water to the mixer shall be completed within 15 minutes of the arrival of the mixer at the site. Additional water shall not be added to the mix after the mixer has been on the site longer than 15 minutes. Where use of a superplasticizer is permitted, redosage with a high range water reducing admixture (superplasticizer) to maintain slump during the placing operation may be done only with prior approval of the supplier as to method and procedure.
 - 3. A delivery ticket showing truck number, date, and time that mixing was started shall be given to the Contractor's superintendent at the job site before placing the concrete from the truck mixer. At the job site the Contractor's super-intendent shall note on the delivery ticket the time of completion of the concrete placement from the truck and the general area of the structure in which the concrete was placed. A complete file of all delivery tickets shall be maintained and kept available at the job site until

completion of the project.

3.6 CONCRETE PLACEMENT

- A. General: Comply with ACI 304, and as herein specified.
- B. Preplacement Inspection: Before placing concrete, inspect and complete the formwork installation, reinforcing steel, and items to be embedded or cast-in. Thoroughly wet wood forms immediately before placing concrete where form coatings are not used. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.
- C. Monolithic Placement: Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or places of weakness within the section. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation due to rehandling or flowing. Maintain reinforcing in the proper position during concrete placement operation.
- D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24 inches and in a manner to avoid inclined cold joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
 - 1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with the recommended practices of ACI 309, to suit the type of concrete and project conditions. Lower frequency vibrators may be used with authorized 8 inches or greater slump concrete.
 - 2. Do not use vibrators to transport concrete inside of forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate the placed layer of concrete and at least 6 inches into the preceding layer. At each insertion limit the duration of vibration to the time necessary to consolidate the concrete and complete embedment of reinforcement and other embedded items without causing segregation of the mix.
- E. Placing Concrete Slabs:
 - 1. Deposit and consolidate concrete slabs in a continuous operation, within the limits of construction joints, until the placing of a panel or section is completed.

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2. Bring slab surfaces to the correct level with a straightedge and strike-off. Use bull floats or darbies to smooth the surface, leaving it free of humps or hollows. Do not sprinkle water on the plastic surface. Do not disturb the slab surfaces prior to beginning finishing operations.

F. Pump Placement:

1. Pump lines shall be operated on decks in a fashion that will not damage, depress, or displace reinforcing steel already in place. Use hangers, trestles, or brackets, where necessary, to prevent damage or displacement of forms or reinforcing.
2. Lines from pump to the placing area shall contain a minimum number of bends.
3. When short time delays occur because of concrete delivery, form repairs, or other factors, pump shall be operated slowly to and fro to keep concrete in motion.

G. Cold Weather Placing:

1. Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified. When air temperature has fallen to or is expected to fall below 40 degrees F, uniformly heat all water and aggregates before mixing as required to obtain a concrete mixture temperature of not less than 50 degrees F, and not more than 80 degrees F at point of placement.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.

H. Hot Weather Placing: When hot weather conditions exist that would seriously impair the quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

1. Wet forms thoroughly before placing concrete.
2. Do not use retarding admixtures unless otherwise accepted in mix designs.

3.7 CONCRETE FINISHING

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A. Finish of Formed Surfaces:

1. Rough Form Finish: For formed concrete surfaces not exposed-to-view in the finish work or covered by other construction, unless otherwise indicated. This is the concrete surface, having the texture imparted by the form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.
2. Smooth Form Finish: For formed concrete surfaces exposed-to-view, or that are to be covered with a coating material applied directly to the concrete, or a covering material bonded to the concrete, such as waterproofing, dampproofing, painting or other similar system. This is the as-cast concrete surface as obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas and form tie holes with all fins or other projections completely removed and smoothed immediately after removal and, for form work not supporting weight of concrete, no later than 72 hours after placement.
3. Smooth Rubbed Finish: Provide smooth rubbed finish to scheduled concrete surfaces, which have received smooth form finish treatment, not later than the day after form removal. Moisten concrete surfaces and rub with carborundum brick or other abrasive until a uniform color and texture is produced. Do not apply cement grout other than that created by the rubbing process.
4. Grout Cleaned Finish: Provide grout cleaned finish to scheduled concrete surfaces which have received smooth form finish treatment.
 - a. Combine one part portland cement to 1-1/2 parts fine sand by volume, and mix with water to the consistency of thick paint. Blend standard portland cement and white portland cement, amounts determined by trial patches, so that the final color of dry grout will closely match adjacent surfaces using an approved bonding agent.
 - b. Thoroughly wet concrete surfaces and apply grout immediately to coat surfaces and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least 36 hours after rubbing.

B. Finish of Unformed Surfaces:

1. Unformed Surfaces Related to Formed Surfaces. At tops of walls, horizontal offsets and similar unformed surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed

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surfaces uniformly across adjacent unformed surfaces, unless otherwise shown.

2. Monolithic Slab Finishes: Water shall not be applied during finishing operations.
 - a. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds for tile, portland cement terrazzo, and other bonded applied cementitious finish flooring material, and as otherwise shown on drawings. After placing slabs, plane surface to a tolerance so that depressions between high spots do not exceed 2 inch under a
 - b. 10 foot straightedge. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set, with stiff brushes, brooms or rakes.
 - c. Float Finish: Apply float finish to monolithic slab surfaces that are to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sandbed terrazzo, and as otherwise shown on drawings or in schedules. After screeding and consolidating concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane so that depressions between high spots do not exceed 5/16 inch under a 10-foot straightedge. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leaving, refloat surface to a uniform, smooth, granular texture.
 - d. Trowel Finish: Apply trowel finish to monolithic slab surfaces that are to be exposed-to-view, unless broom finish is required or as otherwise shown, and slab surfaces that are to be covered with resilient flooring, paint or other thinfilm finish coating system. After floating, begin first trowel finish operation using a power driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling to produce surface free of trowel marks, uniform in texture and appearance, and with a surface plane tolerance so that a minimum floor flatness of f-40 is achieved. Grind smooth surface defects which would telegraph through applied floor covering system.
 - e. Nonslip Broom Finish: Apply nonslip broom finish to exterior

concrete platforms, steps, sidewalks, and ramps, and elsewhere as shown on drawings or in schedules. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Texture shall be approved by Architect-Engineer from sample panels.

- f. Chemical-Hardener Finish: Apply chemical-hardener finish to interior concrete floors where shown on drawings or in schedules. Apply liquid chemical-hardener after complete curing and drying of the concrete surface. Dilute liquid hardener with water, and apply in 3 coats; first coat, 1/3 strength; second coat, 2 strength; third coat, 2/3 strength. Evenly apply each coat, and allow 24 hours for drying between coats.
 - 1) Apply proprietary chemical-hardeners, in accordance with manufacturer's printed instructions.
 - 2) After final coat of chemical-hardener solution is applied and dried, remove surplus hardener by scrubbing and mopping with water.

- g. Nonslip Aggregate Finish: When specifically indicated on the drawings or in schedules, apply nonslip aggregate finish to concrete stair treads, platforms, ramps, and elsewhere as shown or scheduled.
 - 1) After completion of float finishing, and before starting trowel finish, uniformly spread 25 pounds of dampened nonslip aggregate per 100 square feet of surface. Tamp aggregate flush with surface using a steel trowel, but do not force the nonslip aggregate particles below surface. After broad-casting and tamping, apply trowel finishing as herein specified.
 - 2) After curing, lightly work the surface with a steel wire brush, or an abrasive stone, and water to expose the nonslip aggregate.

3.8 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperature, and maintain without drying at a relatively constant temperature for a period of time necessary for hydration of cement and proper hardening.
 - 1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Continue curing for at least 7 days for

concrete containing Type 1 cement and 14 days for concrete containing Type II cement. Curing shall be in accordance with ACI 301 procedures. Avoid rapid drying at end of curing period.

- B. Curing Methods: Perform curing of concrete by moist curing, by moisture-retaining cover curing, by membrane curing, and by combinations thereof, as herein specified.
 - 1. Provide moist curing by following methods:
 - a. Keep concrete surface continuously wet by covering with water.
 - b. Continuous water-fog spray.
 - c. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4-inch lap over adjacent absorptive covers. Use Material that will not stain concrete surface.
 - 2. Provide moisture-cover curing as follows: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - 3. Provide membrane curing as follows:
 - a. Apply compound uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Recoat areas which are subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.9 SHORES AND SUPPORTS

- A. Design: Comply with ACI 347 for shoring and reshoring in multistory construction, and as herein specified. Contractor shall engage the services of a professional structural engineer to design shoring and reshoring and prepare and seal drawings for shoring and reshoring. Engineer shall be registered in the state where the project is located.
- B. Reshoring: Remove shores and reshore in a planned sequence to avoid damage to partially cured concrete. Locate and provide adequate reshoring to safely support the work without excessive stress or deflection.
- C. Duration: Keep reshores in place a minimum of 15 days after placing upper tier,

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and longer if required, until the concrete has attained its required 28-day strength and heavy loads due to construction operations have been removed.

3.10 REMOVAL OF FORMS

- A. Nonsupporting: Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.
- B. Supporting: Formwork supporting weight of concrete, such as beam soffits, joists, slabs and other structural elements, may not be removed in less than 14 days or until concrete has attained two thirds design compressive strength at 28-days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.
- C. Facing Material: Form facing material may be removed 4 days after placement, only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

3.11 REUSE OF FORMS

- A. Clean and repair surfaces of forms to be reused in the work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable. Apply new form coating compound material to concrete contact form surfaces as specified for new formwork.
- B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joints to avoid offsets. Do not use "patched" forms for exposed concrete surfaces.

3.12 MISCELLANEOUS CONCRETE ITEMS

- A. Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections and terminations slightly rounded.

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- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as specified or shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of the manufacturer furnishing machines and equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads and landings and associated items. Cast-in safety inserts and accessories as shown on drawings. Screed, tamp and finish concrete surfaces as specified or scheduled.
- E. Nonshrink Grout:
 - 1. Equipment bases, and other locations noted on the structural drawings, shall be grouted with nonshrink grout.
 - 2. Exposed grout shall be the nonmetallic type.

3.13 CONCRETE REPAIRS

- A. General:
 - 1. Patching defective areas will be permitted only when Architect/Engineer rules that structural adequacy of the concrete is not endangered and the overall appearance of the work is not materially affected.
 - 2. A proprietary bonding agent, repair mortars, and adhesives may be required, at no extra cost to the Owner to permit patching in lieu of removal and replacement of the defective area.
- B. Structural Repair of Defective Areas: Provide drawings of as-built conditions and proposed repair of defective areas for determination by the Architect/Engineer of the structural acceptability of the proposal. Where structural repairs are permitted, use epoxy-based mortar or epoxy adhesive. Do not proceed with repairs prior to written approval by the Architect/Engineer.
- C. Cosmetic Repair of Formed Surfaces: Remove and replace concrete having defective surfaces. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.
 - 1. Cut out honeycomb, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts down to solid concrete, but, in no case to a depth of less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Before placing mortar or proprietary patching compound, thoroughly clean, dampen with water and brushcoat the area

to be patched with patching material or bonding agent if required.

2. For exposed-to-view surfaces, blend white portland cement and standard portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.
 3. Repair concealed formed surfaces, where possible, that contain defects that adversely affect the durability of the concrete. If defects cannot be repaired, remove and replace the concrete.
- D. Cosmetic Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and to verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having required slope.
1. Repair finished unformed surfaces that contain defects which adversely affect durability of concrete. Surface defects include crazing, cracks in excess of 0.01 inch wide or which penetrate to reinforcement or completely through nonreinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.
 2. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.
 3. Correct low areas in unformed surfaces during, or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to the Architect/Engineer.
 4. Repair defective areas, except random cracks and single holes not exceeding 1-inch diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete, and apply bonding compound as recommended by manufacturer. Place patching concrete after the bonding compound has dried. Mix patching concrete of same materials to provide concrete of the same type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.
 5. Repair isolated random cracks and single holes not over 1 inch in diameter by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean off dust, dirt and loose particles. Dampen cleaned concrete surfaces and apply the bonding compound. Place dry

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pack after the bonding compound has dried. Mix dry-pack, consisting of one part portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

- E. Repair methods not specified above may be allowed, subject to acceptance by the Architect/Engineer.

3.14 FIELD QUALITY CONTROL

- A. Quality Control Testing During Construction: Sampling and testing for field quality control during the placement of concrete shall include the following:
1. Sampling Fresh Concrete: ASTM C172, except as modified for slump to comply with ASTM C94. Sampling for pumped concrete shall be at the discharge end of the pump.
 2. Slump: ASTM C143; one test for each concrete load at point of discharge; and one for each set of compressive strength test specimens.
 3. Air Content: ASTM C231 pressure method for normal weight concrete; one for every other concrete load at point of discharge, or when the indication of change requires.
 4. Concrete Temperature: Test hourly when air temperature is 40 degrees F and below, and when 80 degrees F and above; and each time a set of compression test specimens are made.
 5. Compression Test Specimens: ASTM C31; one set of 5 standard cylinders for each compressive strength. Cast and store cylinders for laboratory cured test specimens and field-cured test specimens as specified in ASTM C31.
 6. Compressive Strength Tests: ASTM C39; a compressive strength test consists of the average of 2 specimens tested at each required age. Obtain one set for each 100 cubic yards or fraction thereof, of each mix design placed in any one day or for each 5,000 square feet of surface area placed; 2 specimens tested at 7 days; 2 specimens tested at 28 days; 1 reserve.
- B. Additional Tests: The testing service shall make additional tests, as directed by the Architect/Engineer, of in-place concrete when test results or field observations indicate the presence of deficient concrete in the structure. The testing service may conduct tests to determine the strength and other

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characteristics of the in-place concrete by compression tests on cored cylinders complying with ASTM C42, or by load testing specified in ACI 318, or other acceptable nondestructive testing methods. The Contractor shall pay for tests conducted, and any other additional testing as may be required for deficient concrete.

1. Core Testing: The concrete testing service shall take cores drilled from hardened concrete for compressive strength determination, complying with ASTM C42 and as follows.
 - a. Take at least 3 representative cores from each member or area of suspect strength, from locations directed by the Architect/Engineer.
 - b. Test cores in a saturated-surface-dry condition per ACI 318 if the concrete will be wet during the use of the completed structure.
 - c. Test cores in an air-dry condition per ACI 318 if the concrete will be dry at all times during use of the completed structure.
 - d. Fill core holes solid with patching mortar and finish to match adjacent surfaces.
2. Conduct static load test and evaluation complying with ACI 318 if core tests are not sufficient to verify the strength of the concrete structure, if the results of the core tests are unsatisfactory, or if core tests are impracticable to obtain, as directed by the Architect/Engineer.

3.15 EVALUATION OF QUALITY CONTROL TEST

- A. Acceptance Criteria: Strength-level of an individual class of concrete in place shall be considered satisfactory if, on laboratory-cured cylinders, both of the following requirements are met.
 1. The average of all sets of three consecutive compressive strength tests equal or exceed the specified strength.
 2. No individual compressive strength test falls below specified strength by more than 500 psi.
- B. Tests of Field-Cured Cylinders: Strength test of specimens cured under field conditions shall be performed if required by the Architect/Engineer to check the adequacy of curing and protecting of the concrete placed. Specimens shall be molded by the field quality control laboratory at the same time and from the same samples as the laboratory cured specimens.
 1. Provide improved means and procedures for protecting concrete when the 28-day compressive strength of field-cured cylinders is less than 85

percent of companion laboratory-cured cylinders.

2. When laboratory-cured cylinders strengths are appreciably higher than the minimum required compressive strength, field-cured cylinder strengths need not exceed the required strength by more than 500 psi even though the 85 percent criterion is not met.

C. Failure to Meet Acceptance Criteria:

1. Failure to meet A.1. above may require improved curing methods (as indicated by tests of field cured cylinders) or adjustment of the concrete mix to achieve compliance.
2. Failure to meet A.2. above will render the concrete represented by such tests to be considered deficient and subject to additional testing.

D. Formed Concrete Dimension Tolerances:

1. Formed concrete having any dimension smaller or greater than required, and outside the specified tolerance limits, will be considered deficient in strength and subject to additional testing as herein specified.
2. Formed concrete having any dimension greater than required will be rejected if the appearance or function of the structure is adversely affected, or if the larger dimensions interfere with other construction. Repair, or remove and replace rejected concrete as required to meet the construction conditions. When permitted, accomplish the removal of excessive material in a manner to maintain the strength of the section without affecting function and appearance.

E. Strength of Concrete Structures: Concrete is considered deficient and the strength of the concrete structure in-place is considered potentially jeopardized if concrete fails to comply with any of the requirements which control the strength of structure, including the following conditions:

1. Failure to meet compressive strength test requirements.
2. Concrete which differs from the required dimensions or location in such a manner to reduce strength.
3. Void free placement.
4. Monolithic placement between approved construction joints with no cold joints.
5. Concrete subjected to damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibration.
6. Poor workmanship and quality control likely to result in deficient strength.

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- F. Acceptance Criteria for Core Tests: Strength of concrete for each series of cores will be considered satisfactory if their average compressive strength is at least 85 percent and no single core is less than 75 percent of the 28-day required compressive strength.

- G. Defective Work: Concrete work which does not conform to the specified requirements, including strength, tolerances, and finishes, shall be corrected at the Contractor's expense, without extension of time therefor. The Contractor shall also be responsible for the cost of corrections to any other work affected by or resulting from corrections of the concrete work. Deficient welds will require the Contractor to provide and pay for additional X-rays and tests. Repair or replace defective welds at no cost to the Owner.

END OF SECTION 03300

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SECTION 05500 - METAL FABRICATIONS

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 the following:
 - 1. Bollards
 - 2. Steel framing and supports for mechanical and electrical equipment.
 - 3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 4. Loose bearing and leveling plates.
 - 5. Steel weld plates and angles for casting into concrete not specified in other Sections.
- B. Products furnished, but not installed, under this Section include the following:
 - 1. Loose steel lintels.
 - 2. Anchor bolts, steel pipe sleeves, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
- C. Related Sections include the following:
 - 1. Division 3 Section "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, wedge-type inserts and other items indicated to be cast into concrete.
 - 2. Division 4 Section "Unit Masonry Assemblies" for installing loose lintels, anchor bolts, and other items indicated to be built into unit masonry.

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Paint products.
 - 2. Grout.
- B. Shop Drawings: Show fabrication and installation details for metal fabrications.
 - 1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
 - 2. Provide templates for anchors and bolts specified for installation under other Sections.
 - 3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code--Steel."
 - 2. AWS D1.3, "Structural Welding Code--Sheet Steel."

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
 - 2. Provide allowance for trimming and fitting at site.

1.6 COORDINATION

- A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

- B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 - 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.3 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.
- C. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
- D. Steel Tubing: ASTM A 500, cold-formed steel tubing.
- E. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

2.4 NONFERROUS METALS

- A. Aluminum Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.
- B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.
- C. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.

- D. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

2.5 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where indicated, flat washers; ASTM F 593 (ASTM F 738M) for bolts and ASTM F 594 (ASTM F 836M) for nuts, Alloy Group 1 (A1).
- D. Anchor Bolts: ASTM F 1554, Grade 36.
1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.
- E. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).
- F. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
- G. Wood Screws: Flat head, ASME B18.6.1.
- H. Plain Washers: Round, ASME B18.22.1 (ASME B18.22M).
- I. Lock Washers: Helical, spring type, ASME B18.21.1 (ASME B18.21.2M).
- J. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.
- K. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
1. Material for Anchors: Alloy Group 1 (A1) stainless-steel bolts complying with ASTM F 593 (ASTM F 738M) and nuts complying with ASTM F 594 (ASTM F 836M).

2.6 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Shop Primers: Provide primers that comply with Division 9 painting Sections.
- C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.
- D. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
 - 1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Available Products:
 - a. Benjamin Moore & Co.; Epoxy Zinc-Rich Primer CM18/19.
 - b. Carboline Company; Carbozinc 621.
 - c. ICI Devoe Coatings; Catha-Coat 313.
 - d. International Coatings Limited; Interzinc 315 Epoxy Zinc-Rich Primer.
 - e. PPG Architectural Finishes, Inc.; Aquapon Zinc-Rich Primer 97-670.
 - f. Sherwin-Williams Company (The); Corothane I GalvaPac Zinc Primer.
 - g. Tnemec Company, Inc.; Tneme-Zinc 90-97.
- E. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- G. Nonshrink, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy-duty loading applications.
- H. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- I. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.

2.7 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
 - 1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.8 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 - 1. Furnish inserts if units are installed after concrete is placed.
- C. Galvanize miscellaneous framing and supports where indicated.
- D. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.9 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- B. Galvanize plates after fabrication.

2.10 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with not less than two integrally welded steel strap anchors for embedding in concrete.

2.11 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
 - 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Galvanize exterior miscellaneous steel trim and interior miscellaneous steel trim, where indicated.

2.12 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 40 steel pipe for column protection and from 1/4-inch wall-thickness rectangular steel tubing for controls for door operators.
 - 1. Fill Schedule 40 steel pipe bollards with concrete.
 - 2. Cap rectangular steel tube bollards with 1/4-inch-thick steel plate.
 - 3. Where bollards are indicated to receive push-button controls for door operators, provide necessary cutouts for push-button controls and hole for wire.
- B. Fabricate rectangular steel tube bollards with 3/8-inch-thick steel base plates for bolting to concrete slab. Drill base plates at all 4 corners for 3/4-inch anchor bolts.
 - 1. Where bollards are to be anchored to sloping concrete slabs, angle base plates for plumb alignment of bollards.

2.13 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.

2.14 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
 - 1. ASTM A 123/A 123M, for galvanizing steel and iron products.
 - 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
- B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
 - 1. Exteriors (SSPC Zone 1B) and Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
- C. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
 - 1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
 - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 painting Sections.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05500

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SECTION 07600 - FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. This Section includes sheet metal accessories in the following categories:
 - 1. Reglets
 - 2. Formed roof drainage system.

1.2 PERFORMANCE REQUIREMENTS

- A. General: Install sheet metal accessories to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing.
- B. Sheet metal accessories shall meet the Florida Building Code wind load requirements.
- C. Install sheet metal accessories to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.
- D. Wind Loads: In accordance with the Florida Building Code.
 - 1. Design Wind Speed: As shown on the Structural documents.
- E. Thermal Movements: Provide sheet accessories that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 degrees F, ambient; 180 degrees F, material surfaces.
- F. Water Infiltration: Provide sheet metal accessories that do not allow water infiltration.

1.3 SUBMITTALS

- A. Product Data: Include manufacturer's material and finish data, installation instructions, and general recommendations for each specified accessory and fabricated product.
- B. Shop Drawings: Indicate thicknesses, dimensions, fastenings and anchoring methods, expansion joints, and other provisions necessary for thermal expansion and contraction. Scaled manufacturer's catalog data may be submitted for factory fabricated items.

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- C. Samples: 12-inch- long samples of factory-fabricated products exposed as finished Work. Provide complete with specified factory finish
- 1.4 QUALITY ASSURANCE
- A. Quality Control Standard: Sheet Metal & Air Conditioning Contractor's National Association (SMACNA), latest edition, and the Florida Building Code.
 - B. Installer Qualifications: Engage an experience Installer who has completed sheet metal flashing and trim work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
 - C. Mockups: Prior to installing sheet metal accessories, construct mockups indicated to verify selections made under Sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of Work.
- 1.5 PROJECT CONDITIONS
- A. Coordinate Work of this Section with interfacing and adjoining Work for proper sequencing of each installation. Ensure best possible weather resistance, durability of Work, and protection of materials and finishes.

PART 2 - MATERIALS

- 2.1 Pre-finished ANSI/ASTM A653 galvanized steel, minimum 24 gauge.
- A. Gutters: Shall be of free floating design supported without penetration by suspension from a gutter cleat, gutters shall be formed in continuous sections of profile and size indicated on drawings.
 - 1. Gutter Straps: Minimum 20 ga. perforated stainless steel cleat system as manufactured by fabricator. Holes to be 3/8" minimum on a 1/2" stagger. Provide 8" wide cleanouts @ 10'-0" o.c. where continuous stainless clip is used; 2" wide 16 gauge minimum straps spaced at no more than 18" o.c. if continuous system is not used.
 - 2. Anchorage Devices: Type as recommended by fabricator.
 - 3. Expansion joints: Provide manufacturer's standard expansion joint assemblies allowing for minimum 3/4" thermal movement; spacing per manufacturer.
 - B. Downspouts: Corrugated Rectangular Type of size indicated on drawings.
 - 1. Fabricate brackets to match color, finish, and thickness of downspouts.
 - C. Reglets: Surface mounted
 - 1. Fry Reglet SM Reglet, or equivalent for slim profile
 - a. Surface mounted with drive pins which are sealed with 7/8" diameter neoprene-faced washers

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- b. Factory punched slots 16" o.c. that allow for expansion
 - c. Sealant in two places (top and in recess above drive pins) at time of installation
2. Fry Reglet Vinylok Flashing Retainer, or equivalent for slim profile
- a. Polyvinyl choride retainer pressed into area with "tail" flat against roof flashing.
- D. Elastomeric Sealant: Generic type recommended by accessory manufacturer and fabricator of components being sealed.

2.2 FINISH

- A. Exterior Finish: Polyvinlidene Flouride (PVF2) minimum 70% Kynar resin (K-600) dry film thickness 0.8 mils minimum.
- B. Exterior Primer: Baked on epoxy primer coat dry film thickness 0.2 mils minimum.
- C. Total exterior dry film thickness: 1.0 mils minimum.
- D. Color: To match existing adjacent surfaces (field verify).
- E. Interior finish: Factory standard prime-coat, dry film thickness 0.5 mils minimum

2.3 FABRICATION, GENERAL

- A. Sheet Metal Fabrication Standard: Fabricate sheet metal flashing and trim to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of the item indicated.
- B. Form sections square, true, and accurate in size. Form gutter free from distortion or defects detrimental to appearance or performance. Allow for expansion at corners and joints. Form exposed sheet metal Work that is without oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems.
- C. Field measure conditions prior to fabricating work.
- D. Roll form gutters in longest practical lengths.
- E. Expansion Provisions: Provide manufacturer's standard expansion joints at 50'-0" o.c. maximum. Sections of less than 50'-0" shall be roll formed continuous without joints of any kind. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
- F. Separate metal from noncompatible metal or corrosive substrates with self-adhering flashing material or apply bituminous protective backing on surfaces in contact with dissimilar metals.
- G. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.

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- H. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.
 - 1. Size: As recommended by SMACNA manual or sheet metal manufacturer for application but never less than thickness of metal being secured.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions under which sheet metal accessories are to be installed and verify that Work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.
- B. General: Unless otherwise indicated, install sheet metal accessories to comply with performance requirements, manufacturer's installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Anchor units of Work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install Work with laps, joints, and seams that will be permanently watertight and weatherproof.
 - 1. Install exposed sheet metal Work that is without oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
- C. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards. Fill joint with sealant and form metal to completely conceal sealant.
 - 1. Use joint adhesive for nonmoving joints specified not to be soldered.
- D. Seams: Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
- E. Separations: Separate metal from noncompatible metal or corrosive substrates using self-adhering flashing material.
- F. Counterflashings: Coordinate installation of counterflashings with installation of assemblies to be protected by counterflashing. Install counterflashings in reglets or receivers. Secure in a waterproof manner by means of snap-in installation and sealant, lead wedges and sealant, interlocking folded seam, or blind rivets and sealant.
- G. Equipment Support Flashing: Coordinate equipment support flashing installation with roofing and equipment installation. Seal flashing to equipment support member.

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3.3 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.
- D. Provide final protection and maintain conditions that ensure sheet metal flashing and trim Work during construction is without damage or deterioration other than natural weathering at the time of Substantial Completion.

END OF SECTION 07600

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SECTION 13120 – METAL BUILDING SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Pre-engineering building and components including the structural steel frame and roof covering system with exterior roof panels, panel attachments, insulation, sealants, mastics, trim and flashings for the following:
1. Free standing awning/canopy along the east side of the building – approximately 280 feet long x 20 feet wide.
 2. Free standing canopy on the north side of the building – approximately 135 feet x 110 feet.
 3. Free standing, two level structure that will provide cover for parking at the first level and storage at the second level, complete with stairs – approximately 340 feet long x 30 feet wide.

1.2 RELATED SECTIONS

- A. Section 03300 - Cast-in-Place Concrete: Foundations and anchor bolts.
- B. Section 07600 – Flashing and Sheet Metal: Finish painting of structural members, doors, roof curbs, and factory prime painted miscellaneous items.

1.3 DESIGN CRITERIA

- A. All structural steel sections and welded plate members shall be designed in accordance with the Manual of Steel Construction, 13th Edition, American Institute of Steel Construction, Chicago, IL; and the latest edition of the Structural Welding Code – Steel, ANSI/AWS D1.1 American Welding society.
- B. All light gage cold-formed structural members and exterior covering shall be designed in accordance with the Cold-Formed Steel Design Manual, 2008 Edition, American Iron and Steel Institute. All standards for the welding of cold-formed members are based upon the latest edition of the Structural Welding Code – Sheet Steel, ANSI/AWS D1.3, American Welding Society.
- C. All steel joist shall be designed in accordance with the Standard Specifications

for Open Web Steel Joists by the Steel Joist Institute.

1.4 SYSTEM DESCRIPTION

A. General:

1. Provide pre-engineered metal building frame, metal roof panels, accessories and miscellaneous materials for a complete system.
2. Design structural systems according to professionally recognized methods and standards and legally adopted building codes.
3. Design under supervision of professional engineer licensed in the jurisdiction of the Project.

B. Design Requirements:

1. Roof pitch: ¼" per foot", 1 ½" per foot (East Canopy only).
2. Roof Live Load: 20 psf, non-reducible.
3. Collateral Loads: 3 psf.
4. Dead loads, including the weight of all indicated permanent construction:
 - a. Elements required for support of lights and light battens, hanging fixtures, mechanical equipment, piping, ceiling hanger wires, and all other items required to provide a complete building and not specifically indicated on the drawings.
5. Wind loads:
 - a. Roof Wind Load: Calculate in accordance with applicable code, using 136 mph Basic Wind Speed, Exposure Category C and Importance Factor of 1.0

C. Performance Requirements:

1. Provide frame with design roof profile after vertical dead load deflection has occurred.
2. System to withstand gravity and lateral loads in compliance with contract documents.
3. Allowable Deflections
 - a. Vertical: Clear span/240 for total load; clear span/360 for live load.
 - b. Lateral frame movement: Height/200 for a 25 year mean

recurrence wind load.

- c. Design wall and roof panel system to withstand specified loads with deflection of span/180, maximum.
4. Construct assembly to permit movement of components without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects, when subject to temperature range of 100 degrees F (37 degrees C).
5. Design and fabricate roof systems free of distortion or defects detrimental to appearance or performance.

1.5 SUBMITTALS

- A. Submit under provisions of Division 1 – General Requirements.
- B. Design Data: Provide detailed design criteria and calculations prepared by a licensed structural engineer.
- C. Certification: Manufacturer certification that the building conforms to the contract documents and manufacturer's standard design procedures.
- D. Shop Drawings: Show building layout, primary and secondary framing member sizes and locations, cross-sections, and product and connection details.
 1. Anchor Bolt Installation Drawings: Layouts with minimum bolt diameters.
- E. Product Data: Information on manufactured products to be incorporated into the project.
- F. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- G. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Not less than 5 years experience in the actual production of specified products.
 1. Member of the Metal Building Manufacturer's Association (MBMA).
 2. Certified by AISC in the Metal Building category.
 3. Primary manufacturer of frames, secondary steel, roof and wall sheeting, and trim.
- B. Installer Qualifications - Firm experienced in application or installation of systems

similar in complexity to those required for this project, plus the following:

1. Acceptable to or licensed by manufacturer.
 2. 3 years experience with systems.
 3. Successfully completed not less than 5 comparable scale projects using this system.
- C. Contractor and/or Installer shall provide and install all materials, fasteners, sealants, gaskets, trim accessories, etc. per pre-engineered building manufacturer's recommendations to meet all warranties.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.8 PROJECT CONDITIONS

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

1.9 WARRANTY

- A. Manufacturer shall warranty installed system for the periods described herein, starting from Date of Substantial Completion against all the conditions indicated below. When notified in writing from Owner, manufacturer/installer shall, promptly and without inconvenience and cost to Owner, correct said deficiencies.
 1. Materials and Workmanship Warranty: 3 years.
 2. Finish Warranty:
 - a. Finish coating shall not peel, blister, chip, crack or check in finish, and shall not chalk in excess of 8 numerical ratings when measured in accordance with ASTM D659.
 - b. Finish coating shall not change color or fade in excess of 5 NBS units as determined by ASTM D2244.
 - 1) Panel finish: 10 years.

- 2) Panel finish: 20 years.
3. Performance Warranty: Furnish written warranty, stating sheet metal roofing system and flashing under this Section will be maintained in watertight condition and defects resulting from the following items will be corrected without cost to Owner for a coverage amount at or exceeds value for the original value of the roof system for a period of 20 years. Warranty
 - a. Faulty workmanship.
 - b. Defective materials including sealants and fasteners.
 - c. Water infiltration.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
 1. VP Buildings, Inc.; Varco Pruden Buildings, Inc., 3200 Players Club Circle, Memphis, TN 38125.
 2. NUCOR Building Systems, 200 Whetstone Rd., Swansea, SC 29160.
 3. BUTLER Building Systems, Aagaard – Juergensen, LLC, 5695 Beggs Road, Orlando, FL. 32810
 4. Inland Building Systems, 2141 Second Avenue S.W., Cullman, AL 35055.
- B. Requests for substitutions will be considered in accordance with provisions of Division 1 – General Requirements.

2.2 STRUCTURAL STEEL FRAMING

- A. Primary Framing: Rigid Frame (RF Series) solid web framing consisting of tapered or uniform depth rafters rigidly connected to tapered or uniform depth columns. Provide a clear span that supports the loads at bay spacing indicated.

2.3 SECONDARY FRAMING

- A. Purlins: Zee-shaped; depth as required; with minimum yield strength of 55,000 psi (345 MPa); simple span or continuous span as required for design.
- B. Wind Bracing: Portal or torsional, in accordance with manufacturer's standard design practices; utilizing angles, and other members, with minimum yield

strengths as required for design.

- C. Primary Frame Flange Bracing: Attached from purlins or girts to the primary framing, minimum yield strength as required for design.
- D. Steel Joists: Manufactured according to “Standard Specifications for Open Web Steel Joists”; with steel angle top and bottom chord members and end and top chord arrangements as required for secondary framing.

2.4 ROOF COVERING SYSTEM

- A. Metal Roof System: Butler Manufacturing “MR-24[®]” roof system or equivalent for lowest height profile possible:
 - 1. Factory roll-formed, 24 inches wide, with 2 major corrugations, 2 inches high (2-3/4 inches including seam), 24 inches on center, 22 gage Galvalume steel.
 - 2. Flat of the Panel: Cross flutes 6 inches on center, perpendicular to major corrugations in entire length of panel to reduce wind noise.
 - 3. Variable Width Panels:
 - a. For roof lengths not evenly divisible by the 2'-0" panel width, factory-manufactured variable-width (9-inch, 12-inch, 15-inch, 18-inch, and 21-inch-wide) panels shall be used to ensure modular, weathertight roof installation.
 - b. Minimum Length: 15 feet.
 - c. Supply maximum possible panel lengths.
 - 4. Use panels of maximum possible lengths to minimize end laps.
 - 5. Extend eave panels beyond structural line of sidewalls.
 - 6. Factory punch panels at panel end to match factory-punched holes in eave structural member.
 - 7. Panel End Splices: Factory punched and factory notched. Equivalent splice may be submitted for Owner's approval.
 - 8. Panel End Laps: Locate directly over, but not fastened to, a supporting secondary roof structural member and be staggered, to avoid 4-panel lap-splice condition.

9. End Laps: Floating. Allows roof panels to expand and contract with roof panel temperature changes.
10. Self-Drilling Fasteners: Not permitted.

2.5 MATERIALS

- A. Structural Steel Plate, Bar, Sheet, and Strip for Use in Bolted and Welded Constructions: ASTM A 572/A 572M, A 529/A 529M, A 1011 or A 36/A 36M Modified 50, with minimum yield strength of 50,000 psi (345 MPa).
- B. Structural Steel Material for Use in Roll Formed or Press Broken Secondary Structural Members: ASTM A 607, with minimum yield strength of 55,000 psi (380 MPa).
- C. Galvanized Steel Sheet for Roll Formed or Press Broken Roof and Wall Coverings, Trim and Flashing: ASTM A 653/A 653M, with minimum yield strength of 50,000 psi (345 MPa).
- D. Galvalume Steel Sheet Used in Roll Formed or Press Broken Roof Covering: Aluminum-zinc alloy-coated steel sheet, ASTM A 792/A 792M, with minimum yield strength of 50,000 psi (345 MPa); nominal coating weight of 0.5 oz per sq ft (152 kg/sq m) both sides, equivalent to an approximate coating thickness of 0.0018 inch (0.05 mm) both sides.
- E. Hot Rolled Steel Shapes: W, M and S shapes, angles, rods, channels and other shapes; ASTM A 500, ASTM A 572/A 572M or ASTM A 36/A 36M as applicable; with minimum yield strengths required for the design.
- F. Structural Bolts and Nuts Used with Primary Framing: High strength, ASTM A 325.
- G. Bolts and Nuts Used with Secondary Framing Members: ASTM A 307.
- H. Panel Fasteners:
 1. For Galvalume and KXL finished roof panels: Stainless steel-capped carbon steel fasteners with integral sealing washer.
 2. For SP finished roof panels: Coated carbon steel.
 3. For wall panels: Coated carbon steel.
 4. Color of exposed fastener heads to match the wall panel finish.
 5. Concealed Fasteners: Self-drilling type, of size as required.
 6. Provide fasteners in quantities and location as required by the manufacturer.

- I. Flashing and Trim: Match material, finish, and color of adjacent components. Provide trim at rakes, including peak and corner assemblies, high and low eaves, corners, bases, framed openings and as required or specified to provide weathertightness and a finished appearance.

- J. Plastic Parts: Glass fiber reinforced resin or thermoformed ABS (Acrylonitrile-Butadiene-Styrene).
 - 1. ABS: Minimum 1/8 inch (3 mm) thick.
 - 2. Color: Manufacturer's standard color.

- K. Sealants, Mastics and Closures: Manufacturer's standard type.
 - 1. Provide at roof panel end laps, side laps, rake, eave, transitions and accessories as required to provide a weather resistant roof system; use tape mastic or gun grade sealant at side laps and end laps.
 - 2. Provide at wall panel rakes, eaves, transitions and accessories.
 - 3. Closures: Formed to match panel profiles; closed cell elastic material, manufacturer's standard color.
 - 4. Tape mastic: Pre-formed butyl rubber-based, non-hardening, non-corrosive to metal; white or light gray.
 - 5. Gun grade sealant: Non-skinning synthetic Elastomeric based material; gray or bronze.

2.6 FABRICATION

- A. Fabrication: Fabricate according to manufacturer's standard practice.
 - 1. Fabricate structural members made of welded plate sections by jointing the flanges and webs by continuous automatic submerged arc welding process.
 - 2. Welding operators and processes: Qualified in accordance with AWS D1.1.
 - 3. Field connections: Prepare members for bolted field connection by making punched, drilled, or reamed holes in the shop.

- B. Component Identification: Mark all fabricated parts, either individually or by lot or group, using an identification marking corresponding to the marking shown on the shop drawings, using a method that remains visible after shop painting.

2.7 FINISH

A. Schedule of Finishes:

1. Finish and color to be selected from Manufacturer's standard colors.

B. Shop Coat: Finish all structural steel members using one coat of manufacturer's standard rust inhibitive shop coat, after cleaning of oil, dirt, loose scale and foreign matter.

1. Primary Steel: One coat of light gray water reducible alkyd primer formulated to equal or exceed the performance requirements of Federal Specification TT-P-636D, TT-P-664C and SSPC Paint -25 to a minimum coating thickness of 1.0 mil.

2. Secondary Steel: Roll-formed: Hot dipped zinc coating per ASTM A653 G-30 specification followed by one coat of clear acrylic finish. The acrylic coated galvanized steel will equal or exceed the performance requirements of Federal Specification TT-P-66-4D and SSPC paint-25.

3. Roof Panels:

a. Exterior Finish: Factory painted exterior finish system of full strength, 70% Kynar 500 or Hylar 5000 fluoropolymer (PVDF) coating. Manufacturer shall warrant that coating shall not peel, crack or chip for 25 years. For a period of 25 years chalking shall not exceed ASTM D4214 #8 rating and will not fade more than more than 5 color differences units per ASTM D2244.

b. Color: TBD by Owner.

C. Finish Paint: Primary steel only to receive finish paint (galvanized and Kynar/Hylar coated surfaces to remain unpainted). Coordinate and verify manufacturer's primer is compatible with field-applied top coats. Refer to Section 09960, High Performance Ferrous Metal coatings

1. Color: TBD by Owner.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper and or timely completion.

1. Verify foundations are properly installed, to correct dimensions and within acceptable tolerances.

2. Verify location of covered or built-in work.

3. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Framing Erection: Erect framing in compliance with AISC Specification.
- B. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing. Locate braced bays as required by manufacturer.

3.3 ERECTION

- A. Setting Base and Bearing Plates: Clean concrete and masonry of bond-reducing materials and roughen surfaces before setting plates. Clean bottom surface of plates.
 1. Set plates for structural members on wedges, shims, or setting nuts.
 2. Tighten anchor rods after supported members have been positioned and plumbed.
 3. Pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow curing.
- B. Erect framing true to line, level, plumb, rigid, and secure. Comply with AISC specifications referenced in this section.
 1. Make field connections for primary framing using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts, snug tightened or pretensioned.
 2. Fasten secondary framing to primary framing using clips and non-high-strength bolts. Hold rigidly to a straight line by sag rods.
 3. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Standard Specifications, Load Tables, and Weight Tables for Steel Joists and Joist Girders".
 4. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.
 5. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.
- C. Do not field cut or alter structural members without written approval.

- D. After erection, prime bolts, welds, abrasions, and surfaces not primed with primer used in shop painting.

3.4 INSTALLATION OF ROOF SYSTEM

- A. Install in compliance with manufacturer's instructions.
- B. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.
- C. Fasten cladding system to structural supports, aligned level and plumb.
- D. Locate end laps over supports. End lap panels according to manufacturer's recommendations. Place sidelaps over bearing.
- E. Provide expansion joints where indicated.
- F. Use concealed fasteners.
- G. Install sealant and gaskets to prevent weather penetration.
- H. Install system free of rattles, noise due to thermal movement, and wind whistles.
- I. Install gutter system in compliance with manufacturer's instructions.
- J. Seal roof accessories watertight and weathertight with sealant in compliance with building manufacturer's standard procedures.
- K. Rigidly support and secure gutters and downpouts. Joint lengths with formed seams sealed watertight. Flash and seal gutters to downspouts.
- L. Apply bituminous paint on surfaces in contact with cementitious materials.
- M. Tolerances:
 - 1. Framing Members: 1/4 inch (6 mm) from level; 1/8 inch (3 mm) from plumb.
 - 2. Racking: 1/8 inch (3 mm) from true position. Provide shoring to maintain position prior to cladding installation.

3.5 FIELD QUALITY CONTROL

- A. Testing by Contractor:
 - 1. Roof installation inspection by roof manufacturer's representative; as required as part of warranty provision.
- B. Testing by Owner:
 - 1. High Strength Bolted Connections: Specification for Structural Joints Using ASTM A325 or A490 Bolts, with minimum testing of bolted

connections per the arbitration inspection procedure.

2. Welded Connections: AWS. Visual inspection of 100 percent of welds. Ultrasonic inspection of 50 percent of full and partial penetration welds. A rejection rate greater than 5 percent will increase the inspection to 100 percent.
3. General Testing: For materials and installed tolerances.

END OF SECTION 13120

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SECTION 15010 - BASIC MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including Contractual Conditions and other Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Mechanical systems, equipment, devices and accessories shall be installed, finished, tested and adjusted for continuous and proper operation. Any apparatus, material or device not shown on the Drawings but mentioned in these Specifications, or vice versa, or any incidental accessories necessary to make the project complete and operational in all respects, shall be provided. Include all materials, equipment, transportation, facilities, supervision, operation, methods and labor for the fabrication, installation, start-up and tests necessary for complete and properly functioning systems. The Contractor shall examine ALL Drawings and ALL Sections of the Specifications, and shall be responsible for ascertaining to what extent other Drawings and Specification sections affect their work as specified herein.

1.3 QUALITY ASSURANCE

- A. Code Compliance: Comply with all rules, laws, statutes, regulations, building codes, and the amendments of local, state and federal governments by the authorities having jurisdiction.
- B. ADA: Comply with the requirements of the Americans with Disabilities Act (ADA).
- C. HANDICAP ACCESS: Comply with Chapter 553, Part V, Florida Statutes, "ACCESSIBILITY BY HANDICAP PERSONS"; and the accessibility requirements manual from the Florida Board of Building Codes and Standards, Department of Community Affairs, latest Revisions.
- D. NFPA: Comply with the National Fire Codes compiled by the National Fire Protection Association.
- E. Florida Building Code: Conform in strict compliance to the Florida Building Code; Florida Mechanical Code; Florida Plumbing Code; Florida Fuel Gas Code; and the amendments to these codes which are enforced by the local authority having lawful jurisdiction.

1.4 DRAWINGS AND SPECIFICATIONS

- A. Equipment Placement: The drawings are diagrammatic, intended to show general arrangement, capacity and location of various components, equipment and devices. Reasonable changes in locations ordered by the Designer prior to the installation may be made at no additional cost.

- B. Drawing Scale: Due to the small scale of the drawings, and to unforeseen job conditions, all required offsets, transitions and fittings may not be shown but shall be provided at no additional cost.

1.5 DEFINITIONS

- A. Concealed: When standing inside a finished room, insulated or non-insulated piping or ductwork not visible after installation, such as inside a chase or above a ceiling.
- B. Exposed: When standing inside a finished room, insulated piping or ductwork is visible after installation, such as inside an equipment room or an air handling unit room.
- C. Protected: The surface of insulated or non-insulated piping or ductwork on the exterior of the building but protected from direct exposure to the weather by an overhang, eave, in an unconditioned parking garage or building crawl space.
- D. Unprotected: The surface of insulated on non-insulated piping or ductwork on the exterior of the building and exposed to the weather.
- E. Shall: A mandatory action required of the contractor.
- F. May: An action that is optional for the contractor.

1.6 SUBMITTALS

- A. Shop Drawings: Shop drawings include piping system layouts, ductwork layouts, fabrication and installation drawings of supports and anchorage for mechanical materials and equipment, and coordination drawings. Shop drawings also include proposed equipment layouts, drawn to scale, indicating that proposed equipment will fit into allotted space, including service access, connections, etc.
 - 1. Piping Systems: Submit shop drawings for piping systems drawn at a minimum scale of ¼ inch per foot on reproducible transparencies to verify clearances and equipment locations, required maintenance and operational clearances. Include the following:
 - a. Architectural and structural backgrounds with room names and numbers, including but not limited to plans, sections, elevations and details.
 - b. Fabrication and erection dimensions.
 - c. Arrangements and sectional views.
 - d. Details, including complete information for making connections to equipment.
 - e. Descriptive names of equipment

- f. Modifications and options to standard equipment required by Contract Documents.
 - 2. Ductwork: Submit shop drawings for duct systems at a minimum scale of 1/4 inch per foot to verify clearances and equipment locations. Show required maintenance and operational clearances. Include the following:
 - a. Architectural and structural backgrounds with room names and numbers, etc., including but not limited to plans, sections, elevations, details, etc.
 - b. Fabrication and erection dimensions.
 - c. Arrangements and sectional views.
 - d. Details, including complete information for making connections to equipment.
 - e. Materials and finishes.
 - f. Descriptive names of equipment.
 - g. Modifications and options to standard equipment required by Contract Documents.
 - 3. Coordination Drawings: Coordination drawings include detailed (minimum ¼ inch per foot) scaled drawings showing locations and positions of all Architectural, structural, electrical and mechanical elements for each mechanical equipment room and mechanical riser or chase.
- B. Product Data: Product data includes the manufacturer's printed literature. **ALL** equipment, material, product and performance data shall be **CLEARLY** marked to specifically identify the item(s) being submitted for inclusion in this project. Non-pertinent data shall be deleted or marked through. Any and all deviations from the requirements of the Contract Documents shall be specifically listed, and clearly shown in the submittal. Any deviations not specifically disclosed in the submittal shall be solely at the risk of the Contractor, and shall be subject to discovery at any time. Any undisclosed deviations shall be corrected by the Contractor to comply with the requirements of the Contract Documents at no additional cost to the Owner, regardless of the acceptance of the submittal by the Architect/Engineer.
- C. Performance Data: Provide performance data, wiring and control diagrams.
- D. Installation Instructions: Installation instructions include detailed information, from the manufacturer, indicating specific installation requirements, instructions, and recommendations. Generic installation instructions are not acceptable. Instructions shall be the same as those included with the product when it is shipped from the factory.

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- E. Written Operating Instructions: Operating instructions shall be the manufacturer's written operating instructions for the specified product. If the instructions cover more than one model or type of product they shall be clearly marked to identify the instructions that cover the product delivered to the project.
- F. Maintenance Instructions: Maintenance instructions shall be the manufacturer's printed instructions and parts lists for the equipment furnished. If the instructions cover more than one model or type of equipment they shall be marked to identify the instructions for the furnished product.
- G. The Architect/Engineer's acceptance of submittals shall not relieve this Contractor from responsibility for errors or deviations from the project requirements. Alterations to construction made necessary by reason of acceptance action on materials or equipment shall be the responsibility of the Contractor, and shall be made without additional cost to the Owner.
- H. Provide the required submittals as noted under each section of these specifications.
- I. Submittals shall be bound in a quality three-ring "D-ring" binder (maximum size of 3"), indexed by specification section. Provide labeled dividers for each section. Each item submitted shall have as its cover sheet a completed Submittal Identification Sheet.
 All required items are to be submitted for review at one time. If for any reason an item cannot be submitted, the item will be listed in the index and a section divider provided for inclusion when the item is submitted.
 If submittals are received by the engineer without the above requirements, they will be returned unreviewed to the Contractor for compliance. Any delays in construction caused by this noncompliance shall be the Contractor's responsibility.

1.7 INSTRUCTION TO THE OWNER

- A. General: Instructions to the Owner shall be accomplished by representatives of the manufacturers involved. Allow time for complete coverage of all operating procedures. Provide classroom instruction and field training in the design, operation and maintenance of the equipment and troubleshooting procedures. Explain the identification system, operational diagrams, emergency and alarm provisions, sequencing requirements, seasonal provisions, security, safety, efficiency and similar provisions of the systems. On the date of substantial completion, turn over the prime responsibility for operation of the mechanical equipment and systems to the Owner's operating personnel.
- B. Scheduling: Submit any remaining required items for checking at least one week before final inspection of the work. When submittal items are found acceptable, notify the Owner, in writing, that an "Instruction Conference" may proceed. Conference will be scheduled by the Owner. After the conference, copies of a memo certifying that the "Instruction Conference" and "Completed Demonstration" have been made will be signed by the Owner and the instructors, and one copy will be inserted in each submittal binder.

1.8 COORDINATION OF WORK AND DRAWINGS

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- A. Each Contractor and subcontractor shall be responsible for coordinating the installation of their equipment and work with the work of all other trades.
- B. The layout shown on the Drawings is necessarily diagrammatic but shall be followed as closely as actual construction and as other work will permit. Changes from these Drawings required to make this work conform to the building construction or other work of other trades shall be made by the Contractor without additional cost to the Owner, but only with the prior acceptance of the Architect/Engineer. All major changes shall be shown on the Shop Drawings to be submitted before changes are made.

1.9 JOB CONDITIONS

- A. Protection of Work:
 - 1. The Contractor shall protect their work from injury. Keep all pipe and lines capped or plugged, drained, or otherwise protected from injury, including damage done by flooding or stoppage from building materials or dirt.
 - 2. The Contractor shall protect equipment and fixtures furnished under their contract from damage during the construction of the building and shall provide all tarpaulins, drop cloths, barricades, temporary heaters, auxiliary pumping equipment or other precautions as may be required. Any material or equipment that is injured or damaged shall be removed immediately and replaced with new materials or equipment.
- B. Damage to Building: Any damage to the building or its contents incurred by the installation and/or testing of the systems installed under these contracts shall be repaired promptly at no additional cost to the Owner.
- C. Overloading of Building: Care shall be taken that floors are not overloaded during building operations, and the Contractor shall promptly remove all materials, which may overload any part of the building.
- D. Removal of Rubbish:
 - 1. The Contractor shall at all times keep the premises free of all waste or surplus materials, rubbish and debris, which is caused by their employees, or resulting from their work.
 - 2. The Contractor shall provide drop cloths, or any other material necessary to protect floors, walls, furniture, equipment, etc., from soil or damage.
 - 3. In case of dispute, the Owner will remove the rubbish, excess materials, or do all cleaning required, and charge the cost to the Contractor.

1.10 WARRANTY

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- A. The warranty for all mechanical equipment (whether manufacturer's or contractor's warranty) shall comply with the requirements noted in the General Conditions. This equipment shall include, but not be limited to: plumbing fixtures, water heaters, pumps, packaged air conditioning units, condensing units, supply and exhaust fans, air handling units, fan coil units, and temperature control equipment. The warranty period shall be as defined in the General Conditions, and shall not be diminished or reduced for utilization of the equipment by the contractor during construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Specified Products: Manufacturer's names and product model numbers indicated on the drawings and in these specifications establish the type, style, quality, performance, and sound rating of the desired product. Listing of other manufacturers indicates that their equivalent products would be acceptable if they meet the specification requirements, the specific use and installation shown on the drawings, including space and clearance requirements, and the energy consumption and efficiency of the specified product.
- B. Space Requirements: All manufactured products furnished on this project must have the required space and service areas indicated in the manufacturer's printed literature or shown on their approved shop drawings. When the manufacturer does not indicate the space required for servicing the equipment, the space shown on the drawings or as required by the Designer must be provided.

2.2 MATERIAL AND EQUIPMENT

- A. General: Material and equipment used shall be produced by manufacturers regularly engaged in the production of similar items, and with a history of satisfactory use as judged by the Designer.
- B. Specified Equipment: Equipment shall be the capacity and types indicated. Equipment and material furnished shall be the manufacturer's standard item of production unless specified or required to be modified to suit job conditions. Sizes, material, finish, dimensions and the capacities for the specified application shall be published in catalogs for national distribution. Ratings and capacities shall be certified by a recognized rating bureau. Products shall be complete with accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.
- C. Compatibility: Material and equipment of one and the same kind, type or classification and used for identical or similar purposes shall be made by the same manufacturer. Where more than one choice is available, select the options which are compatible with other products already selected. Compatibility is a basic general requirement of product selection.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. General: Personnel who install materials and equipment shall be qualified by training and experience to perform their assigned tasks.
- B. Performance: Material and equipment installations not in compliance with the Contract Documents, or installed with substandard workmanship in the opinion of the Designer, shall be removed and reinstalled.

3.2 CLEANING AND PROTECTION

- A. General: Refer to Division 1.
- B. Housekeeping: Keep interiors of duct and pipe systems clean and free from dirt, rubbish and foreign matter. Close open ends of piping and ductwork at all times throughout the installation. Install MERV 8 filter media over each return air grille and open return duct opening; change media regularly during construction when dirty to keep duct interiors clean. Prevent dust, debris and foreign material from entering the piping and ductwork.
- C. Equipment Protection: Protect fan motors, switches, equipment, fixtures, and other items from dirt, rubbish and foreign matter. Do not operate air handling equipment if the building is not clean or if dust can enter the coils or the fan housings.
- D. Equipment Cleaning: Thoroughly clean equipment and entire piping systems internally upon completion of installation and immediately prior to Submittal Completion. Open dirt pockets and strainers, blow down each piping system and clean strainer screens of accumulated debris. Remove accumulated dirt, scale, oil and foreign substances. Thoroughly wipe clean internal surfaces of ductwork and air handling units prior to substantial completion.
- E. Fixture Cleanup: Remove temporary labels, stickers, etc., from fixtures and equipment. Do not remove permanent name plates, equipment model numbers, ratings, etc.
- F. Filter Replacement: Provide filters, with the same MERV rating as required for the final installation, for the protection of the air moving equipment and ductwork continuously throughout the construction phase. Provide a new set of clean filters for the test and balance of the air side equipment.
- G. Protection of Finished Installation: Where installation is required in areas previously finished by other trades, protect the area from marring, soiling or other damage.

3.3 CORRECTION OF WORK

- A. General: At no additional cost to the Owner, rectify discrepancies between the actual installation and Contract Documents when in the opinion of the Testing and

Balancing Agency (T&B Agency) or the Designer the discrepancies will affect system balance and performance.

- B. Drive Changes: Include the cost of all pulley, belt, and drive changes, as well as balancing dampers, valves and fittings, and access panels to achieve proper system balance recommended by the T&B Agency.

3.4 COORDINATION AND ASSISTANCE

- A. General: Provide all labor, equipment, tools and material required to operate the equipment and systems necessary for the testing and balancing of the systems and for the adjustment, calibration and repair of all automated control devices and components. These services shall be available on each working day during the period of final testing and balancing.
- B. Drawings and Specifications: Provide to the T&B Agency a complete set of project record drawings and specifications and an approved copy of all HVAC shop drawings and equipment submittals. The T&B Agency shall be informed of all changes made to the system during construction, including applicable change orders.
- C. Coordination: Coordinate the work of all trades and equipment suppliers to complete the modifications recommended by the T&B Agency and accepted by the Designer. Cut or drill holes for the insertion of air measuring devices as directed for test purposes; repair to as-new condition, inserting plastic caps or covers to prevent air leakage. Repair or replace insulation and re-establish the integrity of the vapor retardant.

3.5 PROTECTION OF MATERIALS AND EQUIPMENT

- A. Requirements: Do not store fiberglass insulation or any equipment within the building until it has been "dried in". If dry space is unavailable and the insulation and equipment must be installed or stored before the building is "dried in" and completely enclosed, provide polyethylene film cover for protection.
- B. Replacement of Damaged Stored Material and Equipment: Any material and equipment that has been wet or otherwise damaged prior to installation shall be replaced with new material regardless of the condition of the material and equipment at the time of installation.
- C. Repair of Damaged Installed Material and Equipment: After installation correct or repair dents, scratches and other visible blemishes. At the direction of Designer replace or repair to "as new" condition equipment which has been damaged during construction.

3.6 COORDINATION OF SERVICES

- A. Interruption of existing services: Provide shutoff valves at points of interconnection to minimize downtime.

3.7 LAYOUT OF EXISTING EQUIPMENT

- A. The existing installation and all layouts are shown for reference only. Unforeseen conditions probably exist and existing and new work may not be field located exactly as shown on the drawings. Verify existing conditions in the field and notify the Designer of any deviations required to install the work as shown. Coordinate new work with existing equipment, including removing, relocating, rerouting, extending with new materials, and reinstall existing piping, ductwork, conduits, wiring, tubing, supports and other equipment. The Designer shall make the final decision on all deviations or modifications required by the existing conditions.

3.8 OWNERSHIP OF REMOVED EQUIPMENT

- A. Construction materials and items of mechanical and electrical equipment which are removed and not reused shall be removed from the jobsite unless indicated as to be retained for the Owner. Include rigging, removal and hauling cost, as well as any salvage value, in the contract.

END OF SECTION 15010

CHECK-OUT MEMO

This form shall be completed and a copy provided to the Owner at the Owner’s Performance Verification and Demonstration meeting. A copy shall also be included in the specification section of the Operation and Maintenance Manual for the equipment checked.

Project Name: _____

Type of Equipment Checked: _____

Equipment Number: _____

Name of Equipment Manufacturer: _____

Signature below by the Manufacturer’s authorized representative signifies that the equipment has been satisfactorily tested and checked out on the job by the manufacturer.

1. The attached Test Data and Performance Verification information was used to evaluate the equipment installation and operation.
2. The equipment is properly installed, has been tested by the manufacturer’s authorized representative, and is operating satisfactorily in accordance with all requirements, except for items noted below. *
3. Written operating and maintenance information has been presented to the Contractor, and gone over with him in detail.
4. Sufficient copies of all applicable operating and maintenance information, part lists, lubrication checklists, and warranties have been furnished to the Contractor for insertion in the Operation and Maintenance Manuals.

Manufacturer’s Representative: _____
 (Print or Type Name and Title)

 (Print or Type Address and Phone Number)

Signature of Manufacturer’s Representative: _____
 Date Checked

Witnessed By: _____
 (Signature and Title of Contractor’s Representative)

*Exceptions Noted at Time of Check-Out: (Use additional pages if necessary.)

PERFORMANCE VERIFICATION AND DEMONSTRATION TO OWNER

This form verifies that the Owner has been given a demonstration of the proper operation on the equipment or systems noted below.

Project Name: _____

Specification Division Number & Name: _____

Equipment/Systems Demonstrated: _____

Along with a complete demonstration of the equipment/system, these items have been reviewed at this demonstration and shall be included in the Operation and Maintenance Manuals, under the appropriate specification section:

- 1) Written operating instructions.
- 2) Test data and performance verification information as required by the installer and/or manufacturer.
- 3) Maintenance information published by manufacturer.
- 4) Check-out Memo signed by manufacturer's representative.
- 5) Printed warranties by manufacturer of equipment.
- 6) Explanation of the warranty/guarantee on the system.
- 7) Prints showing actual "As-Built" conditions.

 (Name of General Contractor)

 (Signature, Title, Date)

 (Name of Subcontractor)

 (Signature, Title, Date)

A demonstration of the system/equipment in operation and of the maintenance procedures has been successfully completed.

 Name of Owner's Representative)

 (Signature, Title, Date)

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SECTION 15060 - PIPE AND FITTINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Basic Requirements: Provisions of Section 15010, BASIC MECHANICAL REQUIREMENTS, are a part of this Section.

1.2 SUMMARY

- A. General: Provide and install pipe and fittings as indicated and including all offsets, fittings, sleeves and similar items required but not necessarily indicated due to drawing scale for complete and operable systems.

1.3 SUBMITTALS

- A. General: Provide shop drawing and manufacturer's data sheet for the following items:
1. Manufacturers Literature:
 - a. Complete design and construction data for dielectric unions and flanges.
 - b. Complete design and construction data for no-hub couplings.
 - c. Complete design and construction data for grooved mechanical fittings and couplings for steel piping systems.
 - d. Complete design and construction data for grooved mechanical fittings and couplings for copper piping systems.
 - e. Manufacturer's data on piping and fittings used, with an indication of each specific application.
 2. Performance Data: Submit a copy of the Welding Procedure Specification with the Procedure Qualification Record and certificates of the welders and welding operators required by Section IX of the ASME Boiler and Pressure Vessel Code.
 3. Installation Data:
 - a. Manufacturer's printed installation instructions for no-hub couplings.
 - b. Manufacturer's printed instructions for the installation of grooved mechanical fittings and couplings for steel pipe.
 - c. Manufacturer's printed instructions for the installation of grooved mechanical fittings and couplings for copper pipe.

- d. UL approval number, installation materials, and procedures for pipe penetrations of fire-rated walls and floor.

1.4 APPLICABLE STANDARDS

- A. General: All equipment, material, accessories, methods of construction and reinforcement, finish quality, workmanship and installation shall be in compliance with the applicable standards and codes listed in paragraph entitled "Code Compliance" in Section 15010.
- B. Quality and Weight: The quality and weight of materials shall comply with requirements and specifications of the appropriate standards of the American Society of Testing and Materials, American National Standards Institute, American Society of Mechanical Engineers, and the American Welding Society.
- C. Piping System: All pressurized piping systems shall conform to ASME B31.9, Code for Pressure Piping, Building Services Piping.
- D. Welder Certification: Welders shall be tested and certified within the last 2 years by the National Certified Pipe Welding Bureau or recognized testing agency acceptable to the Designer. Competent certified welders shall perform all welding operations. Each welder shall possess a stamp to identify his work and shall stamp each weld. A copy of the certification shall be available at the jobsite for each welder.
- E. Welding Installation: Welding shall be in accordance with the welding procedures and requirements set forth in "Welding of Pipe Joints" of the "Code for Pressure Piping" in the American Welding Society Welding handbook. Pipe welding shall comply with the provisions of the latest revision of the applicable code, whether ASME Boiler and Pressure Vessel Code, ANSI Code for Pressure Piping, or state or local requirements as may supersede these codes. All pipe welds shall be either x-rayed or witnessed by an independent certified welding inspector.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Application: This section covers the material and installation of various pipe and fittings which may be indicated in other sections of these specifications for use in a specific piping system. Pipe and fittings specified in this section may not be substituted in piping systems for the specific pipe and fitting materials indicated in those individual sections of these specifications.
- B. Fittings: Fittings shall be at a minimum the same gauge as the connected piping, and shall be compatible with the piping material (i.e., galvanized fittings on galvanized pipe.) The use of field-fabricated fittings is prohibited.
- C. Lead Content: Pipe, fittings or any other piping device which includes any lead in the alloy shall not be used in any potable water system.
- D. Connection of Different Pipe Materials: Where different types of above ground pipe material or different weights or schedules of pipe are joined, provide a stainless steel

coupling with an elastomeric gasket for the connection. The coupling shall incorporate a full-length shield of 304 stainless steel, with bolts manufactured of 304 stainless steel which tighten the shield around the gasket to provide a solid connection.

2.2 STEEL PIPING

- A. Pipe: Black steel pipe shall be seamless or electric resistance weld for pipe sizes 2 inch and above, seamless below 2 inch, conforming to ASTM A 53-89a Grade B, or ASTM A 106 Grade B. Galvanized pipe shall conform to ASTM A 53-89a. Unless otherwise noted, black and galvanized steel pipe smaller than 12 inches shall be schedule 40 and pipe 12 inches and larger shall be standard schedule. The ASTM number shall be marked on each length of pipe.
- B. Schedule 10: Black steel schedule 10 pipe shall be continuously-welded and in conformance to ASTM A-135.
- C. Fittings:
 - 1. Threaded Fittings: Malleable iron 150 lb. or 300 lb. class conforming to ASTM A-47 and ANSI B16.3, or cast iron 125 lb. or 250 lb. class conforming to ASTM A-234 and ANSI B16.4. Threads shall conform to ANSI B1.20.1, standard pattern.
 - 2. Pipe Nipples: Provide nipples of same material as pipe schedule 80. Threads shall comply with ANSI B1.20.1. Nipples shall not be threaded full-length (no close nipples).
 - 3. Welded Fittings: Forged, seamless, black steel, long radius, conforming to ANSI B16.11 for socket-type welds and ANSI B16.9 for butt-type welds. Weldolet fittings may be used in lieu of forged tees where branch connections are not larger than three-quarters the size of main pipe, except on piping 2 inch and smaller, where forged fittings shall be used exclusively. Mitered elbows, tees and reducers are prohibited.
 - 4. Unions: Unions shall be malleable iron or steel with ground joint on piping 1-1/2 inch and smaller; flanges shall be used on sizes 2 inch and larger. Unions shall conform to ANSI B16.39 with ANSI B1.20.1 threads and shall have hexagonal ball-and-socket joints with bronze metal-to-metal seating surfaces, female ends, and a seat ring pressed into the headpiece so it cannot be forced out.
 - 5. Couplings: All couplings shall be taper tapped. Couplings shipped with pipe are not acceptable.
 - 6. Flanges: Forged carbon steel, welding neck type conforming to ANSI B16.5. Flanges shall have raised face and gaskets with bolt spacing for the required pressure classification. Flanges connecting to equipment having flat face flanges shall be flat face style. Gasket material shall be ring-type for raised face flanges, full face for full face flanges, 1/16 inch thick compressed heat-resistant fiber or neoprene; gasket shall not contain any asbestos. Flange

bolts shall conform to ASTM A307 hex bolts, with ANSI B18.2 hex nuts. Black steel flanges shall have galvanized steel bolts and nuts; galvanized steel flanges shall have galvanized steel bolts and nuts.

7. Grooved Mechanical Fittings and Couplings: Mechanical pipe couplings for steel pipe shall be self-centering and shall engage and lock in place the grooved or shouldered pipe and pipe fitting ends in a positive watertight couple. Mechanical couplings shall have a central cavity pressure-responsive housing fabricated in two or more parts of malleable iron castings in accordance with ASTM A47, or ductile iron in accordance with ASTM A536; where pipe is galvanized, couplings shall be galvanized. Mechanical fittings shall be malleable or ductile iron conforming as specified above, or shall be manufactured for fabricated steel complying to ASTM A53 or ASTM A106. Couplings shall have two or more nuts with electroplated oval type ASTM A183 bolts, locking pins, toggles, or lugs as required to secure grooved pipe and fittings. Housing clamps shall hold in place a composition water-sealing gasket designed to allow internal water pressures serve to increase the watertightness of the seal. Gaskets shall be neoprene or EPDM and suitable for use to 230 degrees F. Rigid couplings shall be used for rigid joints, otherwise use flexible-type couplings.
- a. Manufacturer:
- 1) Victaulic Company of America
 - 2) ITT Grinnell Gruvlok
 - 3) Tyler Pipe
 - 4) Central Sprink, Inc.

PART 3 - EXECUTION

3.1 GENERAL

- A. Installation: Pipe and fittings shall be installed as specified in this section unless specific installation instructions are provided in the individual sections covering the piping system. Install each run with a minimum of joints and couplings, but with adequate and accessible unions for disassembly and maintenance/replacement of valves and equipment. Reduce sizes where indicated using reducing fittings. Align piping at connections within 1/16 inch misalignment tolerance.
- B. Routing and Placement: Piping shall be run without traps or pockets. Coordinate installation with structural features, and with other piping, equipment and the work of other trades. All piping shall be installed as close to the structure overhead as possible.
- C. Prohibited Installation: Do not run piping through transformer vaults, elevator equipment rooms or other electrical or electronic equipment spaces and enclosures. Do not run piping over electrical panels. Where pipe joints or valves in water lines occur within two feet in horizontal directions from electrical panels or equipment, provide drip pans sized to afford protection. Pans shall be 20-gauge galvanized steel with edges turned up 2-1/2 inches on all sides, reinforced with galvanized steel angles or by rolling edges over 1/4-inch diameter steel wire. Provide a drain with

3/4-inch flange and pipe to nearest floor drain, and support the pan assemblies as required to prevent sagging or swaying.

- D. Interior Piping: Interior piping shall be run parallel to the walls and ceilings; avoid diagonal runs. Provide a minimum 6 inch clearance between walls and horizontal piping.
- E. Exterior Piping: Exterior piping (above and below grade) shall essentially be routed and located as indicated on the drawings; however, actual placement shall be verified by confirming exact location of structures and other utilities in the field and by careful layout prior to execution of the work.
- F. Insulated Piping: Pipe requiring insulation shall be installed with sufficient clearances to permit proper application of insulation.

3.2 EXPANSION AND CONTRACTION

- A. Provision for Expansion: Piping shall be installed with provisions for expansion both horizontally and vertically in all long runs including runouts from risers. Expansion loops and expansion elbows shall be provided for expansion and contraction where required, and/or where shown on the drawings.
- B. Pipe Anchors: Provide pipe anchors as indicated or as required to eliminate excessive piping movement in thermal and pressure piping systems.

3.3 JOINTS AND CONNECTIONS

- A. General: Align all pipe before joints are made. Joints and connections shall be air, gas and water tight.
- B. Steel Pipe Joints: All pipe joints up 2 inch shall be socket-type welded; pipe 2-1/2 inch and larger shall be butt fusion welded.
- C. Welded Joints: All welds shall be first quality metal, thoroughly fused to the base metal at all points, free of cracks, oxidation, blow holes and nonmetallic inclusions. The welder shall leave his indelible identifying mark on the piping adjacent to each weld.
- D. Threaded Joints: Use ANSI B2.1 threaded joints in piping with a minimum wall thickness of Standard Schedule pipe. Assemble the joint wrench-tight, applying force on the end of the fitting into which the pipe is being joined. If a seam fails during cutting or threading, that portion of pipe shall be discarded. Threaded joints shall have a minimum of 3 threads engaged and a maximum of 3 threads exposed.
- E. Dissimilar Metals: Dielectric unions or flanges shall be provided at all junctions of copper or brass pipe or fittings and ferrous material to prevent electrolysis and galvanic corrosion. Where copper or brass tubing or fittings are anchored, supported, or may come in contact with ferrous piping system materials, isolate the two materials with a non-conducting neoprene spacer.

- F. Flanges: Connect pipe flanges to pipe ends in accordance with ANSI B31.1.0 Code for Pressure Piping; clean flange faces and install gaskets. Using a torque wrench, tighten flange to the torque specified by the manufacturer of the flange to provide uniform compression of gaskets.
- G. Roll or Cut-Grooved Mechanical Couplings for Steel Pipe: Pipe grooving shall be in accordance with the pipe coupling manufacturer's recommendations. Piping shall be roll-grooved, except where indicated. Pipe wall thickness shall be a minimum of Standard Schedule. Before the assembly of couplings, lightly coat the pipe ends and the outside of gaskets with the coupling manufacturers recommended lubricant to facilitate installation. Tighten bolts or lugs to the proper torque as directed by the manufacturer to provide a watertight joint.
- H. Rated Penetrations: Provide UL-approved method of sealing fire- and fire/smoke rated wall and floor penetrations. Submit method proposed prior to installation.

3.4 PIPE SIZE REDUCTIONS AND ENLARGEMENTS

- A. Prohibited Fittings: Screwed bushings are prohibited, except where available space prevents use of reducing couplings.
- B. No-Hub Clamps: No-hub clamps with bushings shall not be used for pipe size reduction. Cast iron fittings are required.
- C. Reducing Couplings: Eccentric reducing couplings shall be installed throughout water piping to prevent air or water pockets occurring due to a change in pipe size. Eccentric couplings on water lines shall bring the pipes flush on top except as otherwise specified or indicated. Concentric reducing couplings in horizontal water circulating piping may be utilized if a manual air vent on the larger pipe adjacent to the reducer is installed.

3.5 PRESSURE TESTING

- A. Pressure Test: Prior to insulating and concealing the piping system, apply a water pressure test to all parts of each system before equipment is connected. Use a hydrostatic pressure of not less than 100 psig or 150 percent of system operating pressure whichever is greater. Test system for a period not less than four hours. There shall be no leaks at any point in the system at this pressure.
- B. Concealed Work: Leave concealed work uncovered until required tests have been completed, but if necessary, make tests on portions of the work and those portions of the work may be concealed after being inspected and found free of leaks. Make repairs to defects that are discovered as a result of inspections or tests with new materials; caulking of screwed joints, cracks or holes will not be accepted. Repeat tests after defects have been eliminated.
- C. Field Testing: Complete all pressure testing prior to insulating, wrapping or concealing.

END OF SECTION 15060

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SECTION 15300 - FIRE PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Basic Requirements: Provisions of Section 15010, GENERAL MECHANICAL PROVISIONS, are a part of this Section.

1.2 SUMMARY

- A. General: Provide the fire protection systems indicated on the drawings and within this specification section.

1.3 ADDITIONAL REQUIREMENTS

- A. Related Sections: Other Sections of Division 15 which relate to the requirements of this Section may include but are not limited to the following:
 1. 15050, BASIC MATERIALS AND METHODS
 2. 15060, PIPE AND PIPE FITTINGS

1.4 SUBMITTAL

- A. General: Refer to paragraph entitled "SUBMITTAL" in Section 15010. Include the following data:
- B. Manufacturers Literature: Provide dimensional outline drawing, product data, and verification of UL/FM approval for all fire protection equipment and products.
- C. Working plans shall be submitted for approval to the authority having jurisdiction before any equipment is ordered for purchase or installed and before they are submitted to the Architect / Engineer. Deviation from approved plans will require permission of the authority having jurisdiction. Any requirements by the authority having jurisdiction for the contractor's working plan drawings to be sealed and signed by a professional engineer or registered fire protection engineer shall be the responsibility of the contractor. Plans shall be a minimum of 1/8" = 1 foot scale as prescribed in Section 15010 and/or as required by codes. Plans shall include sprinkler piping cut lengths, offsets, fittings and devices, elevations, hanger locations, sprinkler head count by type, elevation sections and other installation information.

1.5 APPLICABLE STANDARDS

- A. General: All equipment, material, accessories, methods of construction and reinforcement, finish quality, workmanship and installation shall be in compliance with the paragraph entitled "Code Compliance" in Section 15010.
- B. Current editions of the NFPA National Fire Codes (NFPA), or the latest Revisions of these Codes as adopted by the authority having lawful jurisdiction, as follows: NFPA -13 Fire Sprinkler System: The fire sprinkler protection systems installation, flushing and testing shall comply with the requirements of NFPA 13, and 24.
- C. Pipe Thread Pattern: All threads shall be in accordance with local fire department specifications and NFPA 1963.
- D. UL/FM Approval: All equipment, piping, fittings, valves, couplings, hangers and devices shall be approved by Underwriters' Laboratory (UL) and Factory Mutual (FM) for use in fire protection service.
- E. Licensure: a State of Florida Licensed Fire Protection Contractor shall install the fire protection systems.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. General: Refer to paragraph entitled "MANUFACTURERS" in Section 15010.
- B. Single Manufacturer: All items of a similar type shall be by the same manufacturer.

2.2 PIPE AND FITTINGS

- A. Sprinkler piping and fittings shall be in accordance with applicable local codes or regulations and Section 15060, but shall be not less than the standards of NFPA 13. Piping 2" and smaller shall be schedule 40 with treaded or grooved fittings, piping 2 ½" and larger may be schedule 10 with grooved fittings.
- B. Hangers, Supports, and Sleeves:
 - 1. Sprinkler piping and fittings shall be supported with UL and FM approved hangers, and shall be in accordance with applicable local codes or regulations and Section 15060, but shall be not less than the standards of NFPA 13. Hangers and rods shall be galvanized.
 - 2. Acceptable manufacturers: Grinnell, B-Line, Hilti, Fee & Mason, Michigan and PHd.
 - 3. Adjustable Clevis hanger: Grinnell Fig. 260.
 - 4. Adjustable Swivel loop hanger: Grinnell Fig. 69.

5. Beam Clamp: Grinnell Fig. 92 and Grinnell Fig. 218.
6. Concrete Fasteners: Grinnell steel shell and expander plug.
7. Concrete Insert: Grinnell Fig. 152.
8. Riser Clamp: Grinnell Fig. 261.
9. Powder-driven inserts shall not be accepted.
10. Threaded rods shall be galvanized coated. All hangers and support components shall be galvanized coated.

C. Fire Stopping

1. All pipes passing through rated floors or walls shall be sleeved and fire stopped to an equivalent rating of the floor or wall assembly. Firestop materials shall meet ASTM E814 requirements
2. Acceptable manufacturers: Hilti and 3M.

2.3 SPRINKLER HEADS

- A. Provide sprinkler heads of type indicated and to suit each location.
- B. Sprinkler heads in areas with ceilings shall be the semi-recessed pendent type, white painted with one piece escutcheon plates. Where indicated, sprinkler heads shall be the fully concealed type, with white cover plate. Sprinkler heads in areas without ceilings shall be upright type with brass finish. Sprinkler head guards are to be installed in areas where heads are exposed to damage.
- C. Side wall heads, where applicable, mounted on a wall or soffit shall be provided with white painted nipples.
- D. Sprinkler heads in areas with 2' x 2' lay-in tile ceilings shall be installed in the center of the tile. Heads in areas with 2' x 4' lay-in tiles shall be installed in the center of one-half tile as if the tiles were 2' x 2' (i.e. 12" from one 2' end, and 12" from both 4' sides). Tolerance shall be plus or minus 1/2" in any direction.
- E. Orifice size for all sprinkler heads shall be 1/2 inch unless indicated otherwise.
- F. Quick response type head shall be used throughout all light hazard occupancy areas.

2.4 VALVES

- A. Sprinkler valves shall conform to applicable requirements of the local authority having jurisdiction, of SECTION 15100 VALVES, and of NFPA 13.

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- B. Acceptable Valve Manufacturers: Stockham, Nibco, Grinnell, Mueller, Kennedy, Crane, and Central.
- C. Acceptable Backflow Preventer Manufacturers: Hersey, Watts, Wilkens, Febco, and Ames.
- D. Acceptable Insulated Enclosures: Hot Box, HydroCowl, or equivalent.
- E. Acceptable Hose Valve manufacturers: Potter-Roemer, Elkhart, Guardian and Croker.
- F. Outside system valves:
 - 1. Cutoff valves in valve pit: Stockham G-610 flanged pattern outside screw and yoke wedge gate valves, epoxy coated.
 - 2. Underground sectional control valves: Stockham G-605 flanged, or G-606 mechanical joint, or G-607 Tyton joint, NRS gate valve, epoxy coated. Provide cast iron roadway box, extended to grade.
- G. Interior Valves:
 - 1. Check valves:
 - a. Iron body, Stockham G-939 swing check valve, flanged body.
 - b. Bronze body, Nibco KT-403-W threaded check valve with dielectric unions.
 - c. Grooved iron body, Central Check valve-90.
 - d. Wafer check, Central Model "B", wafer check valve.
 - e. Riser Check, Central Model 590 FR.
 - 2. Gate valves:
 - a. Iron body, O.S.&Y. gate valves, Stockham G-634, flanged and G-633 threaded.
 - b. Bronze body, O.S.&Y. gate valve, Nibco T-104-0, threaded with dielectric unions.
 - 3. Butterfly valves(with integral tamper switch):
 - a. Grooved, 2 ½" through 12". Nibco GD-4765-8N.
 - b. Grooved, 1" through 2 ½", Milwaukee Butterball.
 - 4. Dry Pipe Valve and Accessories

- a. Dry Pipe Valve: Viking, model E or F-1 U.L. listed and FM approved latching differential type with EPDM rubber to air and water seats. Dry pipe valve shall be furnished with conventional trim package and E-1 Accelerator Trim Kit.
- b. Provide Model D-2 Air Maintenance Device to regulate system air pressure furnished by riser mounted air compressor.

2.5 SUPERVISORY SWITCHES AND WATERFLOW DEVICES

- A. Acceptable manufacturers: Potter Electric Signal Co., Potter-Roemer, Simplex, GEM.
- B. Gate Valve Tamper Switch: Provide an electronic supervisory tamper switch on each isolation valve in the sprinkler system. Unit shall have a red tamper-proof cover, which will activate an alarm or trouble signal when adjusted. Provide unit with single-pole, double throw switches, and mounting bracket, Potter Electric Signal Co. OSYSU-1.
- C. Flow Switch: Provide an electric flow switch where indicated or required. Flow shall be sensed by an immersion paddle, with an adjustable retard setting from 0 to 70 seconds to minimize false alarms. Flow switch shall have single pole, double throw switches to activate a flow alarm, or to indicate a trouble signal if the flow switch housing is tampered. Flow alarm shall be automatically resetting. Provide clamp-on housing to secure unit to pipe, or threaded connection for tee fitting, Potter Electric Signal Co. VSR-F.

2.6 INSPECTOR'S TEST AND DRAIN

- A. Acceptable manufacturers: G/J Innovations, AGF Manufacturing and Testdrain.
- B. Sight Drain: Sight drain shall have 2 view windows to provide visual observation of water flow, and shall have female threaded connections, Potter-Roemer 6171/6172/6173/6174.
- C. Inspector's Test and Drain: Test and drain shall be provided with integral sight glass, integral 1/2 inch test orifice and positive positioning of handle for off, test and drain operations, G/J Innovations, Inc "Sure-Test".

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Hangers: All hanger spacing shall comply with the requirements of NFPA-13
- B. Gauges: Provide gauges and gauge valves at the top of each standpipe, roof manifold, and on sprinkler risers. Gauge scale shall be 0-300 psi unless otherwise indicated.

- C. Flushing: The entire system shall be flushed with clean water to remove debris resulting from installation. Flush through a burlap bag to retain debris for examination.
- D. Provide drain valves, pipes and test connections as required by NFPA-13. Pipe drain lines and test connections to the exterior of the building or as indicated on the drawings.
- E. Drain plugs shall be installed on trapped sections of piping 5 gallons or less. Auxiliary drain valves, 3/4 inch or larger and plugs shall be installed on trapped sections of pipe greater than 5 gallons.

3.2 EQUIPMENT INSTRUCTION PLATES

- A. General: Provide engraved instruction plates detailing emergency procedures at each system control panel and at each hazard area manual discharge station locations. Permanent nameplates shall be used in the control panel to identify control logic units, contactors and major circuits.

3.3 HYDROSTATIC TESTS

- A. General: Above ground and below ground piping systems shall be hydrostatically tested at not less than 200 psi pressure, or at 50 psi in excess of the maximum pressure, whichever is greater, for a period of 2 hours. The test pressure shall be read from a gauge located at the low elevation point of the individual system or portion of the system being tested. The underground piping shall not have leakage exceeding the amounts specified in NFPA 24. Leakage quantities shall be determined by pumping at the specified test pressure from a calibrated container. Repair leaking joints and retest as necessary until all systems have been tested. Test the piping between the check valve in the fire department inlet pipe and the outside connection the same as the balance of the system.

3.4 SYSTEM INSPECTION AND CHECKOUT

- A. General: After the installation is complete, the system shall be inspected by factory trained personnel in accordance with the manufacturer's recommended procedures.
- B. System Operation: Operate systems as required to demonstrate that the systems are operating in accordance with the design, including line pressure testing. Supply instruments required to read data. Adjust systems to operate at the required performance levels. Advise Architect 7 days prior to testing. Tabulate data and submit on 8-1/2 x 11-inch sheets with time, name of tester and the local authority having jurisdiction and witnessing the test, with one copy for each Technical Information Brochure.

3.5 INSTRUCTIONS TO OWNER

- A. General: Provide to Owner's designated representatives a minimum of 2 hours on-site instructions in operation and maintenance of all fire protection systems and equipment. Furnish 6 sets of typed operating instructions. Written and signed acknowledgement of the instructions seminar shall be submitted prior to final acceptance. Submit in writing to the Owner an "Instruction in Operation Conference" notification of the mutually agreed upon time for the conference. At the end of the conference, 6 copies of an Instruction in Operation Conference Memo shall be signed by all parties and one copy shall be inserted in each Technical Information Brochure.

END OF SECTION 15300

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SECTION 16050 – ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including Contractual Conditions and other Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Division 16 of the specifications covers all electrical work for the project. Work shall include labor material and accessories required to accomplish the work as specified and as indicated. Electrical systems, equipment, devices and accessories shall be installed, finished, tested and adjusted for continuous and proper operation. Any apparatus, material or device not shown on the Drawings but mentioned in these Specifications, or vice versa, or any incidental accessories necessary to make the project complete and operational in all respects, shall be provided. Include all materials, equipment, transportation, facilities, supervision, operation, methods and labor for the fabrication, installation, start-up and tests necessary for complete and properly functioning systems. The Contractor shall examine ALL Drawings and ALL Sections of the Specifications, and shall be responsible for ascertaining to what extent other Drawings and Specification sections affect their work as specified herein.
- B. North Canopy, East Canopy, and Interior High Bay Lighting: Contractor shall supply a fixture layout and electrical wiring plan signed and sealed by an electrical engineer licensed in the State of Florida. The layout and electrical plan shall be based on the fixture layout and the location of the existing electrical panels in the attached exhibits. It is the contractor's responsibility to obtain all permits associated with lighting and electrical improvements.

1.3 SUBMITTALS

- A. Shop Drawings and Product Data:
 - 1. Shop drawings: Shall be submitted for all electrical items used for this project. Dimensioned plans and sections or elevation layouts of electrical equipment. Shop drawings shall include sufficient information to indicate complete compliance with specifications.
 - 2. Product data: Shall include illustrations, catalog sheets, installation instructions, drawings, and certifications as necessary. Each sheet shall show manufacturer's name or trademark.

3. At the time of each submission, any deviations from the contract documents shall be called to the attention of the Architect-Engineer in writing, and be plainly marked on the shop drawings and product data.
4. Where catalog sheets submitted include multiple products not directly associated with the specified project, the project solely pertaining to the specified project shall be plainly marked to facilitate the architect-engineering review.
5. The A/E shall be reimbursed cost to review re-submittals subsequent to the second submittal.
6. Provide signed and sealed drawings by a professional engineer showing photometric and electrical improvements.

B. Record Drawings:

1. Provide one complete set of contract drawings in clean, undamaged condition, indicating all significant changes from the work as shown. Use multiple pencil colors to aid in the distinction between work of separate electrical systems. In general, record every substantive installation of electrical work which previously is either not shown or field modified.
 - a. Indicate mains and branches of wiring systems, with switchboard panel boards and control devices located and numbered. Locate devices requiring maintenance.
 - b. Indicate changes in equipment ratings and locations.
 - c. Indicate scope of each change order, noting change order number.
2. Refer to general conditions and Division 1 for additional requirements pertaining to record documents.

C. Submit the following upon completion of the work:

1. Certificate of final inspection from local authority.
2. O&M Manuals.

1.4 CODES, PERMITS AND INSPECTIONS

- A. Installation shall comply with all laws applying to electrical installation in effect; with the regulations of the National Electrical Safety Code, National Electrical Code (NEC, NFPA-70), other applicable publications of the National Fire

Protection Association, all local governing codes and ordinances and with the regulations of the serving utility company. Provide required permits.

1.5 DEFINITIONS

- A. EMT: Electrical Metallic Tubing.
- B. FMC: Flexible Metal Conduit.
- C. GRS: Rigid Steel Conduit
- D. IMC: Intermediate Metal Conduit.
- E. LFMC: Liquidtight Flexible Metal Conduit.
- F. MWW: Metal Wireway.
- G. RAC: Rigid Aluminum Conduit
- H. RMC: Rigid Metal Conduit
- I. RNC: Rigid Nonmetallic Conduit.
- J. SMR: Surface Metal Raceway.
- K. Concealed: When standing inside a finished room, insulated or non-insulated piping or ductwork not visible after installation, such as inside a chase or above a ceiling.
- L. Exposed: When standing inside a finished room, piping is visible after installation, such as inside an equipment room.
- M. Protected: The surface of insulated or non-insulated piping on the exterior of the building but protected from direct exposure to the weather by an overhang, eave, in an unconditioned parking garage or building crawl space.
- N. Unprotected: The surface of piping on the exterior of the building and exposed to the weather.
- O. Shall: A mandatory action required of the contractor.
- P. May: An action that is optional for the contractor.

1.6 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. Code Compliance: Comply with all rules, laws, statutes, regulations, building codes, and the amendments of local, state and federal governments by the authorities having jurisdiction, including, but not limited to the current edition the Florida Building Code, NFPA 70, NFPA 72 and ADA (Americans with Disabilities Act).
- C. Manufacturers' names and catalog numbers
 - 1. In some instances, specific references have been made to one or more manufacturer's names and model or catalog numbers. Use of names and catalog numbers does not indicate that the equipment specified is necessarily an "off the shelf" item. Variances may be due to requirement of a desired finish, material, or other modification.
 - 2. In the case of panelboards, safety switches and other equipment requiring wire and cable terminations, ascertain that lug sizes and wiring gutters or space allowed for proper accommodation and termination of the wires and cables are adequate.

1.7 COORDINATION

- A. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the work.
- B. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.
- C. Each Contractor and subcontractor shall be responsible for coordinating the installation of their equipment and work with the work of all other trades, including the contractor and trades associated with the Interior Renovation Project.

1.8 PROTECTION OF ELECTRICAL EQUIPMENT

- A. Electrical equipment shall be protected from the weather, in particular, dripping or splashing water, at all times during shipment, storage and construction. Manufacturer's recommendations with regard to storage and protection shall be followed. Should any apparatus be subjected to possible injury by water, it shall be thoroughly dried and put through a dielectric test, at the expense of the

Contractor, to ascertain the suitability of the apparatus or it shall be replaced without additional cost to the Owner.

- B. Damaged or defective equipment: inspect all electrical equipment and materials prior to installation. Damaged equipment and materials shall not be installed or placed in service until the Owner has been notified. Replace or repair to new condition and test repaired damaged equipment in compliance with industry standards at no additional cost to the Owner. Contractor shall provide equipment required for testing.

1.9 EXISTING CONDITIONS

- A. Contractor shall visit the site and familiarize himself/herself with the existing conditions. No additional compensation will be provided due to Contractor's failure to visit the site prior to bidding.
- B. Within 30 days of the notice to proceed, the Contractor shall verify in detail the existing conditions which may be different than those shown or not shown on the drawings. Contractor shall bring the findings to A/E's attention for disposition. If Contractor cannot verify the existing conditions within 30 days then he/she shall request in writing, with justifications, the additional time required to complete the task. No additional compensation will be provided as a result of failure to verify existing conditions within the established time period.
- C. Included is the construction document for the Interior Renovation showing the existing and proposed locations of the electrical panels. The contractor shall use this in conjunction with the site visits.

1.10 JOB CONDITIONS

- A. Protection of Work:
 - 1. The Contractor shall protect their work from injury.
 - 2. The Contractor shall protect equipment and fixtures furnished under their contract from damage during the construction of the building and shall provide all tarpaulins, drop cloths, barricades, temporary heaters, auxiliary pumping equipment or other precautions as may be required. Any material or equipment that is injured or damaged shall be removed immediately and replaced with new materials or equipment.
- B. Damage to Building: Any damage to the building or its contents incurred by the installation and/or testing of the systems installed under these contracts shall be repaired promptly at no additional cost to the Owner.

- C. Overloading of Building: Care shall be taken that floors are not overloaded during building operations, and the Contractor shall promptly remove all materials, which may overload any part of the building.
- D. Removal of Rubbish:
 - 1. The Contractor shall at all times keep the premises free of all waste or surplus materials, rubbish and debris, which is caused by their employees, or resulting from their work.
 - 2. The Contractor shall provide drop cloths, or any other material necessary to protect floors, walls, furniture, equipment, etc., from soil or damage.
 - 3. In case of dispute, the Owner will remove the rubbish, excess materials, or do all cleaning required, and charge the cost to the Contractor.

1.11 WARRANTY

- A. The warranty for all electrical equipment (whether manufacturer's or contractor's warranty) shall comply with the requirements noted in the General Conditions. This equipment shall include, but not be limited to: light fixtures, lighting controls, receptacles and load centers. The warranty period shall be as defined in the General Conditions, and shall not be diminished or reduced for utilization of the equipment by the contractor during construction.

PART 2 - PRODUCTS

2.1 ELECTRICAL WORK

- A. Summary of Work: The Contractor shall perform electrical services as outlined below for three pre-engineered metal structures: the pole barn, the north canopy, and the east canopy.
 - 1. The pole barn is a free standing two-story structure requiring both power and lighting on each level. The Owner will provide a single phase, two pole, three wire, 60 Amp, Nema 3R, disconnect available for providing service to a panel and thereby the structure. Field verify the location of the existing power service, which is to be installed under a separate package.
 - 2. The north canopy is a structure attached to the existing operations building requiring lighting and lighting controls. The Contractor will connect to existing panels or circuits within the operations building. Field

verify existing branch circuit availability with owner to determine location of spare circuit breakers for use of canopy lighting.

3. The east canopy is a structure attached to the existing operations building requiring lighting and lighting controls. The Contractor will connect to existing panels or circuits within the operations building. Field verify existing branch circuit availability with owner to determine location of spare circuit breakers for use of canopy lighting.
4. Provide electrical (power and fire alarm) to support the new fire protection system that is a part of this scope of work. At the two (2) dry valve pipe risers as indicated on sheet FP-1.0 and detailed on sheet FP-0.1, furnish and install a 120V power connection to the pipe mounted air compressor and a fire alarm interface (tamper switch) for the shut off valve and pressure switch to indicate tripping of the dry pipe valve. Field verify existing branch circuit availability with owner to determine location of spare 20A/1P circuit breakers for use of air compressor. Field verify existing fire alarm system circuits and tie into existing notification circuit serving the area. Match existing fire alarm system manufacturer and route fire alarm cabling in conduit.

B. Scope of Work: The Contractor shall furnish all labor, material, equipment, and services required to execute, install and complete ready for use, all-inclusive electrical systems. The finished systems are to include all parts lists, operating instructions, wiring and control diagrams for these systems. The Contractor shall provide complete working drawings; install the approved systems as called for and specified herein and as shown on the working drawings provided by the Contractor, including but not limited to the following:

1. Complete secondary distribution systems for lighting, power, and equipment
2. Lighting fixtures and lamps
 - a. Freestanding metal building (2-story): Provide two fixtures, evenly spaced, per bay, on first and second levels. Lighting fixtures shall be 4' fluorescent (2) T5 lamp unit, UL wet label listed, lensed/gasketed as manufactured by Columbia Lighting (LUN4-228-EPU) or equal.
 - b. East canopy: Based on sketch showing 14 fixtures equally spaced per Hubbell HBL-60LU-X2-5K-A-070-ND or equal
 - c. North canopy: Based on sketch showing 42 fixtures equally spaced in each direction per Hubbell HBL-60LU-X2-5K-A-070-ND or equal
 - d. Interior High Bay: Based on sketch showing 32 fixtures equally spaced per Hubbell LLHV4-50M-NST-EDU or equal
3. Wiring devices, wall plates, etc.

4. Complete grounding of electrical systems and equipment
5. Complete conduit and wiring

Where words "install", "provide" or equivalent words are used, they shall mean that the Contractor will furnish and completely install devices, equipment, material, wiring, conduit, etc., as required for a complete operating installation.

- C. Standards/Codes/Regulations: All equipment, devices, apparatus, and all installations shall be in full compliance with all applicable standards, requirements, rules, regulations, codes, statutes, ordinances, etc., of city, county; state and federal governments, Owner's insurance company, local utilities, and labor regulations. All equipment and material shall be Underwriter's Laboratory listed and labeled. Installations shall comply with applicable sections of every other specification.
- D. Testing: Conduit Systems, grounding electrode conductors and grounding equipment conductors shall be tested to insure complete grounding. Underground conductors ("hot" conductors) shall be tested for shorts. Tests shall be made in the presence of the Owner and/ or the local electrical inspector.
- E. Grounding: The Contractor shall install a completely grounded electrical system meeting all requirements of the National Electrical Code.
- F. Load Center Panel: The Contractor shall furnish and install a circuit breaker distribution panel for 60 Amp, single phase, three wire, 120/240 volt to service the pole barn, named LSA. Panel front shall have concealed hinges and concealed trim clamps and screws. Panel shall be factory assembled, with thermal magnetic type automatic quick-break and manual quick-make circuit breakers. Multi-pole breakers shall have common trip. Panel shall be complete with trim, dead front, main lugs or breaker, flush lock. Panel shall be provided with typed circuitry directory, framed under plastic on inside of panel door.

Provide quantity and size of circuit breakers as required. Panelboard enclosure shall be NEMA 3R rated.

The electrical panel shall be furnished with a ground bus. A grounding electrode conductor, sized in accordance with the National Electric Code, shall be installed from the ground bus to a new ground rod. All conduits entering the panel enclosures shall be furnished with grounding bushings and bonded with (1) #8 AWG to the ground bus. All receptacle outlets, equipment cabinets, etc., shall be provided with a bonded insulated ground wire connection to the conduit system.

- G. Identification: Every electrical device, piece of equipment, panel, etc. which does not have an identifying nameplate shall be inscribed with 1/2" high minimum white engraved lettering to identify its use, by means of the abbreviations used in these specifications and in the approved plans.

- H. Conduit and Raceways: All wiring shall be installed in conduit, concealed unless otherwise allowed by the owner. Conduits shall be thin wall, galvanized steel, electric metallic tubing (EMT) for interior installations rigid galvanized steel (RGS) for exterior installations, both using compression type fittings. All conduits shall be sized in accordance with National Electrical Code. All conduits must bear Underwriter's Laboratory label. All conduits shall be provided with locknuts and insulating bushings at outlet boxes, panel tubs, etc. All open ends of conduits shall be provided with caps during construction.
- I. Fittings, Boxes, Etc. All junction boxes, pull boxes, outlet boxes, switch boxes, fasteners, etc. shall meet all requirements of Underwriter's Laboratories and National Electrical Code for wet and/or damp location. All boxes shall be galvanized steel. All multiple switch boxes shall be solid gang. All outlet boxes shall be provided with plaster rings as required. Pull boxes or junction boxes shall be furnished in all runs of conduit having equivalent of four (4) 90 degree bends. Conduit shall be connected to boxes with proper connectors with locknuts and ends protected with metallic insulating bushings. Boxes for fixtures shall be provided with fixture studs as required.
- J. Lighting, Branch Circuit and Feeder Wire and Cable. All wire shall be Type THWN or THWN-2. Wiring for all branch circuits for lighting or receptacles shall be no smaller than #12 AWG wire and shall be larger where required to meet allowable current carrying capacity and voltage drop requirements of circuit in accordance with the National Electrical Code. Circuiting shall be installed in accordance with NEC requirements and shall be divided and balanced about neutral in the associated panel. Grounded equipment conductor shall be identified by a white permanent cover. All wire and cables shall be copper with 600 volt insulation. No. 12 AWG and No. 10 AWG wire may be solid or stranded. All No.8 AWG and larger wires and cables shall be stranded.
- K. Splices: No splices will be allowed in conduit runs.
- L. Lighting Fixtures and Controls: Provide by one of the following approved lighting manufacturers:
1. Hubbell Lighting, Inc.
 2. Phillips Lighting
 3. GE Lighting

Fixtures shall be furnished and installed complete, including assembly, mounting hardware, wiring and installation of each unit in place. All lenses and metal parts shall be thoroughly cleaned after fixtures are installed. Surface fixtures shall be surface mounted and shall include all necessary fittings for a complete installation. Fixtures shall be securely fastened to steel outlet boxes. Outlet boxes shall bear Underwriter's Laboratory label. Surface or chain mount fixtures such that all are at the same height and align with the bottom of the lowest joist of the structure. Seismic sway bracing shall be installed as required by code. Coordinate sensor and switch locations with owner prior to installation. Provide

one day of lighting controls commissioning to coordinate all lighting control settings with owner present.

Pole barn fixtures shall be controlled via weatherproof infrared motion sensors (with coverage at each entrance) that have programmable variable time out option and with accessible weatherproof wall mounted override. Fixtures shall be provided at each bay, first and second level.

North Canopy, East canopy and High Bay lighting fixtures shall each be controlled with weatherproof infrared motion sensors (with coverage at each entrance) that have programmable variable time out option and with accessible weatherproof wall mounted override. Coordinate sensor and switch locations with owner prior to installation.

Circuit a maximum of 1500 kVA in light fixture load per 20 Amp branch circuit.

- M. Supports for Light Fixtures: The Contractor shall provide all supports and required seismic bracing for all lighting fixtures. The method of mounting the lighting fixtures to the pole barn and canopies will be submitted to the Engineer for approval.
- N. Wiring Devices: A wall switch and receptacle, etc., shall be located as prescribed by code, and on the wall just inside each entrance. The pole barn shall have a receptacle located at every other bay. Circuit a maximum of (8) duplex receptacles per 20 Amp branch circuit. Wall switches in the pole barn bay units shall be located 5'-0" above the finished floor; but the Contractor shall check building conditions in every case and shall locate outlets as approved by the Owner so as to avoid interference with other work. Wiring devices shall be provided as follows:
 - 1. Duplex Grounded Receptacles: 20 amp, 125 volt, Qwik Gard GFDR - 115BC
- O. Operating Instructions: The Contractor shall provide complete, typed and framed covered operating instructions covering the complete systems operations such as follows:
 - 1. Electrical service disconnecting instructions
 - 2. Indicate equipment which will require service
 - 3. Provide to Owner, a copy of approved shop drawings and installation/maintenance instructions shipped with equipment

2.2 RACEWAYS

- A. FMC: Zinc-Coated Steel.
- B. IMC: ANSI C80.6, Zinc-Coated Steel, with threaded fittings.

- C. RMC:
 - 1. GRS: ANSI C80.1, Galvanized Rigid Steel Conduit
 - 2. RAC: ANSI C80.5, Aluminum Rigid Conduit
- D. RNC: NEMA TC 2, schedule 40 PVC, with NEMA TC3 fittings.
- E. Raceway Fittings: Specifically designed for the raceway type with which used.

2.3 CONDUCTORS

- A. Conductors, No. 10 AWG and smaller: Solid or stranded copper.
- B. Conductors, larger than No. 10 AWG: Stranded copper.
- C. Insulation:
 - 1. Thermoplastic, rated 600 V, 75 degrees C minimum, Type THW, THHN/THWN, or USE.
 - 2. Thermosetting, rated 600 V, 90 degrees C minimum, Type XHHW or UF/RHW/XHHW.
- D. Wire connectors and splices: Units of size, ampacity rating, material, type, and class suitable for service indicated.

2.4 BOXES, ENCLOSURES, AND CABINETS

- A. Cast-metal outlet and device boxes: NEMA FB 1, Type FD, with gasketed cover.
- B. Cast-metal pull and junction boxes: NEMA FB 1, cast aluminum with gasketed cover.
- C. Finish: For enclosure or cabinet components, provide manufacturer's standard color paint applied after fabrication to factory-assembled surface raceways, enclosures, and cabinets before shipping.

2.5 WIRING DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Bryant Electric, Inc./Hubbell subsidiary.
 - 2. Eagle Electric Manufacturing Company, Inc.

3. Hubbell Incorporated; wiring device-Kellems.
 4. Leviton Manufacturing Company, Inc.
 5. Pass & Seymour/Legrand; Wiring Devices Division.
- B. Receptacles
1. GFCI Receptacles: Straight blade, non-feed-through type, with integral NEMA WD 6, Configuration 5-20R duplex receptacle; complying with UL 498 and UL 943. Design units for installation in a weatherproof enclosure and NEMA 3R cover.

2.6 SLEEVES FOR RACEWAYS

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Coordinate sleeve selection and application with selection and application of firestopping.

2.7 SLEEVE SEALS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 1. Advance Products & Systems, Inc.
 2. Calpico, Inc.
 3. Metraflex Co.
 4. Pipeline Seal and Insulator, Inc.
- B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.
 1. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 2. Pressure Plates: Carbon steel. Include two for each sealing element.

3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.8 SUPPORTING DEVICES

- A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.
- B. Metal items for use outdoors or in damp locations: Hot-dip galvanized steel.
- C. Slotted-steel channel supports: Flange edges turned toward web, and 9/16-inch diameter slotted holes at a maximum of 2 inches O.C., in webs.
- D. Slotted-steel channel supports:
 1. Channel thickness: Selected to suit structural loading.
 2. Fittings and accessories: Products of the same manufacturer as channel supports.
- E. Nonmetallic channel and angle systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch diameter holes at a maximum of 8 inches O.C., in at least one surface.
 1. Fittings and accessories: Products of the same manufacturer as channels and angles.
 2. Fittings and accessory materials: Same as channels and angles, except metal items may be stainless steel.
- F. Raceway and cable supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.
- G. Pipe sleeves: ASTM A53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
- H. Cable supports for vertical conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for non-armored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.
- I. Expansion anchors: Carbon-steel wedge or sleeve type.
- J. Toggle bolts: All-steel springhead type.
- K. Powder-driven threaded studs: Heat-treated steel.

- L. Grounding and bonding shall conform to NEC 250, provide ground lugs in cabinets, boxes and switches, ground exterior disconnects to building steel.

2.9 ELECTRICAL IDENTIFICATION

- A. Identification devices: A single type of identification product for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and these specifications.
- B. Raceway and cable labels: Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and minimum length of color field for each raceway and cable size.
- C. Colored adhesive marking tape for raceways, wires, and cables: Self-adhesive vinyl tape, not less than 1 inch wide by 3 mils thick.
- D. Underground warning tape: Permanent, bright-colored, continuous-printed, vinyl tape with the following features:
 - 1. Not less than 6 inches wide by 4 mils thick.
 - 2. Compounded for permanent direct-burial service.
 - 3. Embedded continuous metallic strip or core.
 - 4. Printed legend that indicates type of underground line.
- E. Tape markers for wire: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.
- F. Engraved-plastic labels, signs, and instruction plates: Engraving stock, melamine plastic laminate punched or drilled for mechanical fasteners 1/16-inch minimum thickness for signs up to 20 sq. in. and 1/8-inch minimum thickness for larger sizes. Letters shall be engraved, 5/32-inch high and all capitals.

2.10 TOUCHUP PAINT

- A. For equipment: Equipment manufacturer's paint selected to match installed equipment finish.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Use the following raceways for installations:
 - 1. Exposed or Concealed Outdoors: IMC or GRS.
 - 2. Exposed or Concealed Interior: EMT.
 - 3. Underground, single run: RNC.
 - 4. Underground, grouped: RNC.
 - 5. Boxes (Outdoors) and MWW: NEMA 250, Type 3R
 - 6. Enclosures (Outdoors): NEMA 250, Type 4, stainless steel.
- B. Minimum raceway size: For power and control: 3/4-inch trade size. For data (LAN) and telephone: 3/4-inch trade size.

3.2 RACEWAY AND CABLE INSTALLATION

- A. Install raceways and cables at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Locate horizontal raceway runs above water and steam piping.
- B. Use temporary raceway caps to prevent foreign matter from entering.
- C. All conduit connections shall be made with compression type fittings. Screw type connections shall not be allowed.
- D. Make conduit bends and offsets so inside diameter is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.
- E. Use raceway and cable fittings compatible with raceways and cables and suitable for use and location.
 - 1. Use insulating bushings to protect conductors.
 - 2. Use GRS elbows where RNC turns out of slab and for bends having radius less than 10-feet.
- F. Install raceways embedded in slabs in middle third of slab thickness where practical, and leave at least 1-inch concrete cover.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
 2. Space raceways laterally to prevent voids in concrete.
 3. Install conduit larger than 1-inch trade size parallel to or at right angles to main reinforcement. Where conduit is at right angles to reinforcement, place conduit close to slab support.
 4. Transition from nonmetallic conduit to rigid steel conduit or IMC before rising above floor.
 5. Make bends in exposed parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for exposed parallel raceways.
- G. Install pull wires in empty raceways. Use no. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of the pull wire.
- H. Do not install aluminum conduits embedded in or in contact with concrete.
- I. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
1. Run parallel or banked raceways together on common supports.
 2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- J. Terminations:
1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
 2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
- K. Surface raceways: install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.
- L. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.3 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Coordinate sleeve selection and application with selection and application of firestopping.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 2 inches above finished floor level.
- G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway unless sleeve seal is to be installed or unless seismic criteria require different clearance.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint.
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway penetrations. Install sleeves and seal with firestop materials.
- K. Roof-Penetration Sleeves: Seal penetration of individual raceways with flexible, boot-type flashing units applied in coordination with roofing work.
- L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

3.4 SLEEVE-SEAL INSTALLATION

- A. Use type and number of sealing elements recommended by manufacturer for raceway material and size. Position raceway in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.5 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

3.6 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

3.7 WIRING METHODS FOR POWER, LIGHTING, AND CONTROL CIRCUITS

- A. Feeders: Single conductor Type THHN/THWN insulated conductors in raceway or type MC conductors.
- B. Underground feeders and branch circuits: Type THHN/THWN or single-wire, type UF/RHW/XHHW insulated conductors in raceway.
- C. Branch circuits: Type THHN/THWN insulated conductors in raceway.
- D. Remote control signaling and power-limited circuits: Single conductor Type THHN/THWN insulated conductors in raceway for Classes 1, 2, and 3, unless otherwise indicated.

3.8 WIRING INSTALLATION

- A. Install splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.
- B. Connect outlet and component connections to wiring systems and to ground. 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.

3.9 WIRING DEVICES INSTALLATION

- A. Install devices and assemblies level, plumb, and square.
- B. 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.

3.10 ELECTRICAL SUPPORTING DEVICE APPLICATION

- A. Damp locations and outdoors: Hot-dip galvanized materials or nonmetallic, u-channel system components.
- B. Support clamps for PVC raceways: Click-type clamp system.
- C. Selection of supports: Comply with manufacturer's written instructions.
- D. Strength of supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb design load.

3.11 SUPPORT INSTALLATION

- A. Install support devices to securely and permanently fasten and support electrical components.
- B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.
- C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
- D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.
- E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.
- F. Install 1/4-inch diameter or larger threaded steel hanger rods, unless otherwise indicated.
- G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.
- H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.
- I. Simultaneously install vertical conductor supports with conductors.
- J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.

- K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.
- L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.
- M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:
 - 1. Wood: Fasten with wood screws or screw-type nails.
 - 2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
 - 3. New concrete: Concrete inserts with machine screws and bolts.
 - 4. Existing Concrete: Threaded studs driven by a powder charge and provided with lock washers may be used instead of expansion bolts.
 - 5. Steel: Welded threaded studs or spring-tension clamps on steel.
 - a. Field welding: Comply with AWS D1.1.
 - 6. Threaded Studs: Welding to steel structure may be used.
 - 7. Light steel: Sheet-metal screws.
 - 8. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.12 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 and dry surfaces before applying.

- D. 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 below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches, overall, use a single line marker.
- E. Color-code system secondary service, feeder, and branch-circuit conductors throughout the AC secondary electrical system as follows:

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

- F. Install warning, caution, and instruction signs where required to comply with 29 CFR, Chapter XVII, Part 1910.145, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. 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.

3.13 FIELD QUALITY CONTROL

- A. Inspect installed components for damage and faulty work, including the following:
 1. Raceways.
 2. Building wire and connectors.
 3. Supporting devices for electrical components.
 4. Electrical identification.
 5. Concrete bases.
 6. Cutting and patching for electrical construction.
 7. Touchup painting.
- B. Perform the following field tests and inspections and prepare test reports:
 1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.

2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.
3. Remove malfunctioning units, replace with new units, and retest as specified above.

3.14 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 and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing fire-stopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.15 REFINISHING AND TOUCHUP PAINTING

- A. Refinish and touch up paint.
 1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
 2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
 3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.16 CLEANING AND PROTECTION

- A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.
- B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of substantial completion.

END OF SECTION 16050

SECTION 09960
HIGH PERFORMANCE FERROUS METAL COATINGS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The work of this section includes surface preparation, coating systems and methods of application. All work shall be done in strict accordance with this specification, the Contract Documents, and the manufacturer's printed instructions.

B. The Contractor shall furnish all supervision, labor, tools, materials, equipment, maintenance of traffic, containment systems, scaffolding, other structures and incidentals required for transportation, unloading, storage, surface preparation, protection of the public and environment, application of products, and cleanup necessary to complete this Contract in its entirety.

C. The scope of Work includes painting all exposed miscellaneous metal, pipe, fittings, valves, hangers, straps, support, hardware, equipment, appurtenances, and all other work required to be painted unless otherwise specified. The Contractor shall also paint all surfaces he affects or damages during his performance of the Work, which may be exposed to view in the finished work including, but not limited to, metals, pipe, fittings, valves, equipment and all other existing items similar to proposed items specified for painting. Miscellaneous metal items to be painted shall be included in the Work of this Section where they come within the general intent of the Specifications or as stated herein.

D. In general the following surfaces shall be painted:

1. Pipe, fittings, flanges, appurtenances and other metal surfaces to 1 ft below grade. Pipe 1 ft below grade and within 6-inches above grade shall be considered immersion surface and shall be coated with the immersion surface high performance coating system.
2. Metal or Galvanized materials including, but not limited to: pipe straps, hangers, pipe support floor stands, nuts, bolts, hardware and tapping saddles. Pipe straps to be removed and coated on both sides.
3. Pipe Surfaces under pipe straps. Pipe straps shall be removed and pipe coated underneath pipe straps regardless if pipe straps are to be coated. No more than two-thirds of the total number of pipe straps shall be removed at any given time unless the pipe is supported in a cradle.
4. Incidentals within the limits of the project including but not limited to bollards, adjacent walkways, walls or supports containing graffiti.
5. Contractor shall provide new 1/2" neoprene that shall be placed at contact interfaces between materials including, but not limited to, pipe support floor stands, pipe straps, and access barriers. The Contractor shall remove and replace existing neoprene where exposed with new material. In situations where 1/2" neoprene is not sized properly for existing conditions, the County on a case by case basis may require a different thickness.

E. The following surfaces or items are not generally required to be painted, unless noted otherwise. The Contractor shall properly protect these materials from surface preparation, coating application, or damage.

1. Polished chrome, aluminum, nickel, stainless steel, brass, or bronze materials.
2. Stainless steel finish hardware.
3. Flexible couplings.
4. Labels, signs or nameplates including but not limited to: UL, FM, equipment identification, performance rating, name and nomenclature plates.
5. Aluminum handrails, walkways, window, louvers, and grating unless otherwise specified herein.

1.02 REFERENCES

- A. SSPC – Society for Protective Coatings
- B. ASTM – American Society of Testing Materials
- C. NACE – National Association of Corrosion Engineers
- D. NSF – National Sanitation Foundation (Standard 61)
- E. AWWA – American Water Works Association

1.03 DEFINITIONS

- A. Field Coating is the coating of new or rebuilt items at the job site. Field coating shall be the responsibility of the Contractor.
- B. Shop Coating is the coating of new or rebuilt items in the shop prior to delivery to the jobsite.
- C. Exterior – Outside, exposed to weather
- D. Interior – Inside, not subject to immersion service
- E. Immersion service – Material submerged or subject to splash or spray
- F. WFT – Wet Film Thickness
- G. DFT – Dry Film Thickness
- H. MDFT – average minimum dry film thickness
- I. SCARIFY – Roughen the entire existing coating surface by use of brush off blasting, hand tools, sanding, etc to provide an anchor profile for adhesion by new coating systems. Scarified surface shall be approved by the Coatings manufacturer and County prior to over-coating. Existing rust spots, weld slag, sharp edges, defects etc shall be removed by SSPC-SP3 Power tool cleaning.

J. General: The following referenced surface preparation specifications of the Joint Surface Preparation Standards from NACE International (NACE) and The Society for Protective Coatings (SSPC) shall form a part of this Specification:

1. SSPC-SP1 Solvent Cleaning. Remove all grease, oil, salt, acid, alkali, dirt, dust, wax, fat, foreign matter, and contaminants, etc. by one of the following methods: steam cleaning, alkaline cleaning, or volatile solvent cleaning. Rags and solvents must be replenished frequently to avoid spreading the contaminant rather than removing it. Low-pressure (1500-4000 psi) high volume (3-5 gal/min) water washing with appropriate cleaning chemicals is a recognized "solvent cleaning" method. All surfaces should be cleaned per this Specification prior to using hand tools or blast equipment and between each coating application.

2. SSPC-SP2 Hand Tool Cleaning. Removal of loose rust, loose mill scale, loose paint and loose foreign matter to a clean sound substrate by hand chipping, scraping, sanding, and wire brushing. Tightly adherent rust, mill scale or paint may remain providing that it cannot be removed by lifting with a dull putty knife

3. SSPC-SP3 Power Tool Cleaning. Removal of loose rust, loose mill scale, loose paint and loose foreign matter, to a clean sound substrate by power tool chipping, descaling, sanding, abrasive grinding wheels, needle guns, wire brushes, etc. Tightly adherent rust, mill scale or paint may remain providing that it cannot be removed by lifting with a dull putty knife

4. SSPC-SP5 White Metal Blasting (NACE-1). Complete removal of all visible oil, grease, dust, dirt, mill scale, rust, coating, oxides, corrosion products, and other foreign matter, leaving the surface a uniform gray-white color.

5. SSPC-SP6 Commercial Blast (NACE-3). Complete removal of all visible oil, grease, dust, dirt, mill scale, rust, coating, oxides, corrosion products, and other foreign matter, leaving only light shadows or discolorations from stains of rust, mill scale, or previous coating on 33% of the unit surface area. At least 66% of each unit surface area is to be free of all visible discoloration or staining.

6. SSPC-SP 7 Brush-Off Blast (NACE 4). Complete removal of oil, grease, dust, dirt, loose rust, loose mill scale, and loose coatings, leaving tightly adherent mill scale, rust and previous coating. Tightly adherent rust, mill scale or paint may remain providing that it cannot be removed by lifting with a dull putty knife.

7. SSPC-SP10 Near White Blast (NACE 2). Complete removal of all visible oil, grease, dust, dirt, mill scale, rust, coating, oxides, corrosion products, and other foreign matter, leaving only light shadows or discolorations from stains of rust, mill scale, or previous coating on 5% of the unit surface area. At least 95% of each unit surface area is to be free of all visible discoloration or staining.

8. SSPC-SP 11 Power Tool Cleaning to Bare Metal. Complete removal of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxide, corrosion products, and other foreign matter and retain or produce a minimum 1.0 mil surface profile. Slight residues of rust and paint may be left in the lower portion of pits if the original surface is pitted.

9. SSPC-SP 12 Waterjetting (NACE-5). Surfaces preparation by ultra-high pressure water jetting discharged from a nozzle at pressures of 70 MPa (10,000 psig) or greater to prepare a surface for coating or inspection. The difference in degrees of surface cleanliness is defined by the amount of pressure as follows:

Low Pressure Water Cleaning (LP WC) Less than 34 MPa (5,000 psi)

High Pressure Water Cleaning (HP WC) 34 to 70 MPa (5,000-10,000 psi)

High Pressure Water Jetting (HP WJ) 70 to 210 MPa (10,000-30,000 psi)

Ultra-High Pressure Water Jetting(UHP WJ) Above 210 MPa (30,000 psi)

WJ-1 Clean to Bare Substrate: Complete removal of all visible rust, dirt, previous coatings, mill scale, and foreign matter. Discoloration of the surface may be present.

WJ-2 Very Thorough or Substantial Cleaning: Complete removal of all visible oil, grease, dirt, and rust except for randomly dispersed stains of rust, tightly adherent thin coatings, and other tightly adherent foreign matter limited to a maximum of 5% of the surface.

WJ-3 Thorough Cleaning: A WJ-3 surface shall be cleaned to a matte (dull, mottled) finish is free of all visible oil, grease, dirt, and rust except for randomly dispersed stains of rust, tightly adherent thin coatings, and other tightly adherent foreign matter limited to a maximum of 33% of the surface.

WJ-4 Light Cleaning: A WJ-4 surface shall be cleaned to a finish which is free of all visible oil, grease, dirt, dust, loose mill scale, loose rust, and loose coating. Any residual material shall be tightly adherent.

10. SSPC-SP13 Surface Preparation of Concrete (NACE-6). Complete removal of contaminants, laitance, form oils, dust, dirt, loosely adhering concrete, and previous coating. Blasting, High-pressure water cleaning or waterjetting methods should be performed sufficiently close to the surface so as to open up surface voids, bug holes, air pockets, and other subsurface irregularities, but so as not to expose underlying aggregate.

11. SSPC-SP 14 Industrial Blast Cleaning (NACE-8). Complete removal of oil, grease, dust, dirt, loose rust, loose mill scale, and loose coatings, leaving tightly adherent mill scale, rust and previous coating evenly distributed on 10% of the unit surface area. Stains and discolorations may be present on 90% of the unit area. Tightly adherent rust, mill scale or paint cannot be removed by lifting with a dull putty knife.

12. SSPC-SP 15 Commercial Grade Power Tool Cleaning. Complete removal of all visible oil, grease, dirt, rust, coating, oxides, mill scale, corrosion products, and other foreign matter, except random staining shall be limited to no more than 33 percent of each unit area of surface. Staining may consist of light shadows, slight streaks, or minor discolorations caused by stains of rust, stains of mill scale, or stains of previously applied coating. Slight residues of rust and paint may also be left in the bottoms of pits if the original surface is pitted. (Equivalent standard as SSPC-SP6 Commercial Grade Blast Cleaning NACE-3).

1.04 SUBMITTALS

A. Submit to the Engineer as provided in the General Conditions and Division 1, shop drawings, manufacturer's specifications and data on the proposed paint systems and detailed surface preparation, application procedures and dry film thickness.

B. Contractor / Applicator Qualifications as listed below shall be submitted prior to the WORK.

1. The Contractor's Project Superintendent / Project Manager shall be at minimum certified NACE Level 1 and be in good standing with NACE International prior to to the WORK. The Contractor shall have a Competent Person onsite as defined by OSHA. Certification credentials shall be provided to the County and verifiable through the NACE.org certification search website.

2. The Contractor must show proof that all employees associated with this project shall

have been employed by the Contractor for a period not less than six (6) months.

3. Coating shall be performed by experienced painters in accordance with the recommendations of the coating manufacturer and the Contract Documents. All paint shall be uniformly applied without sags, runs, spots, or other blemishes. Work that shows carelessness, lack of skill, or is defective in the opinion of the County, shall be corrected at the expense of the Contractor.

4. The applicator shall have practical experience and successful history in the application of the specified products to surfaces of water supply and wastewater collection and treatment facilities. A written list of references shall be provided to show experience and costs with high performance coatings on pipelines and aerial crossings as well with all other aspects with the defined Scope of Work.

5. The Contractor shall provide a list of equipment owned and maintained by the Contractor that shall be utilized on the project.

6. The Contractor shall provide their written QA / QC program.

7. Contractors shall submit their protection and containment plan to prevent blasting debris, paint chips, paint overspray from entering water bodies, common areas or leaving the immediate work zone.

C. Schedule of Painting Operations: The Contractor shall submit for approval a complete Schedule of Painting Operations within 30 days after the Notice to Proceed. It shall be the Contractor's responsibility to properly notify and coordinate with the County for schedule updates and site activities. This Schedule shall include for each surface to be painted, the brand name, the volume of solids, the coverage and the number of coats the Contractor proposes to use in order to achieve the specified dry film thickness. When the schedule has been approved, the Contractor shall apply all material in strict accordance with the approved Schedule and the manufacturer's instructions. Wet and dry paint film gauges shall be utilized by the County to verify the proper application while Work is in progress.

D. Protection and Containment Plan: The Contractor shall submit for approval the process, equipment, design, materials, requirements, disposal and methods to provide for protection of the environment, collection of abrasive blasting material, collection of existing coatings, protection of the public and protection for public access.

E. Maintenance of Traffic Plan (MOT): The Contractor shall prepare and submit a Traffic Control Plan to the Owner, and Orange County Public Works Department or Florida Department of Transportation for review and acceptance prior to commencing any Work on the site. The Traffic Control Plan shall detail procedures and protective measures proposed by the Contractor to provide protection and control of traffic affected by the Work consistent with the following applicable standards:

1. Standard Specifications for Road and Bridge Construction, Latest Edition including all subsequent supplements issued by the Florida Department of Transportation (FDOT Spec.).
2. Manual of Traffic Control and Safe Practices for Street and Highway construction, Maintenance and Utility Operations, FDOT.
3. Right-of-Way Utilization Regulations, Orange County, Florida, latest edition.

F. Test panels/samples: At the request of the County, samples of the finished work prepared in strict accordance with these Specifications shall be furnished, and all painting shall be equal in quality to the approved samples. Finished areas shall be adequate for the purpose of determining the quality of workmanship. Experimentation with color tints shall be furnished to the satisfaction of the County where standard chart colors are not satisfactory.

G. Equivalent materials of other manufacturers may be substituted on approval of the Engineer. Substitutions that decrease the film thickness, the number of coats applied, change the generic type of coating, or fail to meet the performance criteria of the specified materials will not be approved. Prime and finish coats of all surfaces shall be furnished by the same manufacturer. Requests for substitution shall include Manufacturer's literature for each product giving the name, generic type, descriptive information, evidence of satisfactory past performance, and an independent laboratory certification that their product meets the performance criteria of the specified materials including but not limited to the following:

1. Abrasion – Fed. Test Method Std. No. 141, Method 6192, CS-17 Wheel, 1,000 grams load
2. Adhesion – Elcometer Adhesion Tester
3. Exterior Exposure – Exposed at 45 degrees facing the ocean (South Florida Marine Exposure)
4. Hardness – ASTM D3363-74
5. Humidity – ASTM D2247-68
6. Salt Spray (Fog) – ASTM B117-73

1.05 QUALITY ASSURANCE

A. Manufacturer's Qualifications

1. All paints and/or coatings applied in the performance of the Work shall be supplied by one paint supplier and be the product of one manufacturer; unless the County specifies or accepts a specialty paint not available from that manufacturer.
2. The paint manufacturer shall have supplied paint for water and wastewater facilities for a minimum of ten (10) years, and products supplied shall be contained within the manufacturer's standard water and wastewater brochure.
3. When the manufacturer's minimum recommendations exceed the specified requirements, Contractor shall comply with the manufacturer's minimum recommendations.

B. Safety and Health Requirements.

1. General: In accordance with the requirements of the OSHA Regulations for Construction, the Contractor shall provide and require the use of personal protective and lifesaving equipment for all persons working in or about the Project including, but not limited to, head and face protection, fall protection, safety harnesses and respiratory devices. Applicable health and safety precautions required by appropriate regulatory agencies such as OSHA, ANSI, etc., shall be followed.
2. Ventilation: Ventilation shall be adequate to reduce the concentration of air contaminants to the degree that a hazard to workers does not exist.
3. Sound Levels: Whenever the occupational noise exposure exceeds the maximum allowable sound levels, the Contractor shall provide and require the use of approved ear protective devices.

4. Illumination: Adequate illumination shall be provided while work is in progress. Whenever required by the County, the Contractor shall provide additional illumination and necessary support sufficient to cover all areas to be checked. The level of illumination required for observation purposes shall be determined by the County.
5. Temporary Ladders and Scaffolding: All temporary ladders and scaffolding shall conform to the applicable requirements of the OSHA Regulations for Construction. The Contractor shall provide access to the County for all areas of work during each phase of construction.
6. Safety of Public. Provide scaffolding, signage, temporary pedestrian access and barricades as required to protect the public from the work area. Areas to be closed off shall require public notice.

C. Pre-Job Conference

1. A pre-job meeting shall be held prior to the commencement of the Work, prior to significant phases or per specific site location if the Work is not contiguous. Attendance shall include the County, Engineer, Contractor, and Painters Site Supervisor. The meeting will address site specific issues including but not limited to: schedule, access to the site, safety requirements, surface preparation, application, coating systems, inspection, quality control, MOT, protection of the public and protection of the environment as covered in the specifications.
2. Copies of all manufacturer's instructions and recommendations shall be furnished to the County and Engineer by the Contractor prior to the meeting.
3. It shall be the responsibility of the Coating Manufacturer to have their factory representative meet in person with the Contractor and Engineer a minimum of three times during the job as a consultant on surface preparation, mil thickness of coating and proper application of coating unless meeting is determined to be unnecessary by the Engineer.

D. Surface Preparation

1. Visual Standard SSPC-VIS-1 (Swedish SIS OS 5900), "Pictorial Surface Preparation Standards for Painting Steel Surfaces" and The National Association of Corrosion Engineers, "Blasting Cleaning Visual Standards" (TM-01-70 and TM-01-75) shall be the standards used to evaluate proper surface preparation.
2. To facilitate inspection, the Contractor shall on the first day of blasting operations, blast metal panels (12" x 12" x 1/4") to the degree called for in the Specifications and as noted above. Once a sample panel has been approved, it shall establish the quality of all subsequent Work by reference. The sample shall then be stored in a dry, sealed plastic container on the job site. Sample panels shall be prepared and approved for each type of sandblasting specified and shall be maintained and utilized by the County throughout the duration of sandblasting operations as reference standards of quality. Coatings shall be applied only at temperatures and conditions recommended by the paint manufacturer.

E. Inspection Devices:

1. The Contractor shall utilize, until final acceptance of the Work, inspection devices in good working condition for the detection of holidays, environmental conditions, and measurements of wet and dry-film thicknesses of protective coatings. Inspection devices shall be operated in strict accordance with the manufacturer's printed instructions and applicable SSPC and NACE standards and guidelines.

2. Thickness and Holiday Checking: Thickness of coatings shall be checked with a nondestructive, magnetic type thickness gauge. Coating integrity of coated surfaces shall be tested with an approved holiday detection unit per the paint manufacturer's recommendation. All pinholes shall be marked, repaired in accordance with the paint manufacturer's printed recommendations and re-tested. No pinholes or other irregularities will be permitted in the final coating. In cases of dispute concerning film thickness or holidays, the Contractor shall abide by the County's determination unless independent tests are performed by a certified lab at the Contractor's expense. Field measurements of film thickness shall not exceed the requirements of SSPC-PA 2 Measurement of Dry Coating Thickness with Magnetic Gages. Discrepancies shall be measured and verified with a micrometer or Tooke gauge if no other option is available.

1.06 PRODUCT DELIVERY STORAGE AND HANDLING

A. Delivery: All materials shall be delivered to the job in undamaged, original packages with seals unbroken and in legible, labeled containers. Packages shall not be opened until the County inspects them and they are required for use. Labels shall show name of manufacturer, type of coating, formulation, date, color and manufacturers' recommendations and instructions for use.

B. Storage: All painting materials shall be stored in a clean, dry, well-ventilated place, protected from sparks, flame, and direct rays of the sun or from excessive heat. Paint susceptible to damage from low temperatures shall be kept in a heated storage space when necessary. The Contractor shall be solely responsible for the protection of the materials he stores at the job site. Empty coating cans shall be neatly stacked in areas the Owner designates, and shall be removed from the job site on a schedule the Owner determines.

C. Mixing: Mechanical mixers, capable of thoroughly mixing the pigment and vehicle together, shall mix the paint prior to use where required by manufacturer's instructions, however, thorough hand mixing will be allowed for small amounts up to one gallon. Pressure pots shall be equipped with mechanical mixers to keep the pigment in suspension, when required by manufacturer's instructions. Otherwise, intermittent hand mixing shall be done to assure that no separation occurs. Materials shall be in full compliance with the requirements of pertinent codes and fire regulations.

D. Thinning: Catalysts or thinners shall only be utilized as recommended by the manufacturer, and shall be added or discarded strictly in accordance with the manufacturer's instruction. Unless the manufacturer specifically requires thinning for brush or roller application, no thinning shall be permitted.

1.07 PROJECT SITE CONDITIONS

A. Application: Paint shall be applied only on thoroughly dry surfaces and during periods of favorable weather, unless specifically allowed by the paint manufacturer. Except as provided below, painting shall not be permitted when the atmospheric temperature is below 50° F, or when freshly painted surfaces may be damaged by rain, fog, dust, or condensation, and/or when it can be anticipated that these conditions will prevail during the drying period.

B. No coatings shall be applied unless the relative humidity is below 85% unless recommended by the manufacturer.

C. No coatings shall be applied unless surface temperature is a minimum of 5° above dew point; temperature shall be maintained during curing.

1.08 WARRANTY

A. Warranty Inspection: Warranty inspection shall be conducted during the eleventh month of the one (1) year warranty period following completion of all painting Work. All defective Work shall be repaired in strict accordance with this Specification, and to the satisfaction of the paint manufacturer and the County.

B. Fluoropolymer / Fluorourethane. The Contractor shall warrant through the Manufacturer that the coating system shall not: check, crack, blister or delaminate from the substrate; change color more than 12 MacAdam units as determined in accordance with ASTM D2244; exhibit loss of gloss in excess of 24 units as measured by a gloss meter in accordance with ASTM D523-8; or chalk in excess of a rating of 8 as measured in accordance with ASTM D4214, Method A. Warranty coverage shall be effective for a period of 15 years from Final Completion depending on color. The Contractor shall notify the Manufacturer prior to ordering materials and begin the warranty process. Sample panels shall be obtained from the Manufacturer, and at least 2 sample panels shall be provided to the County in addition to the Manufacturers minimum requirements regarding the warranty process. The Contractor shall not be permitted to install the coating system until the Manufacturer has provided assurance that the color, substrate, surface preparation or existing conditions are in conformance with the Manufacturer's requirements for warranty.

PART 2 - PRODUCTS

2.01 GENERAL

A. The painting schedule has been prepared on the basis of Tnemec and Carboline products, and their recommendations for application.

B. No paint containing lead shall be allowed.

2.02 COATING SYSTEMS

A. The following summarizes the painting systems for various types of applications.

B. The Contractor shall have the coating color matched or tinted by the coating supplier to exactly match Tnemec Color Codes as shown below. Manufacturers other than Tnemec shall submit a color matched swatch to the County for approval prior to ordering materials.

Generic Name	Application	Tnemec
Safety Blue	Water Master Meters / Assemblies	True Blue / Safety 11SF
Safety Green	Wastewater Master Meters	Hunter Green 08SF
Safety Green	Pump Station Piping	Hunter Green 08SF
Safety Red	Fire Backflow Assemblies	Candy Apple Red / Safety 06SF
Safety Yellow	Bollards	
Pantone Purple 522C	Reclaimed Master Meters / Assemblies	Purple Rain / Safety 14 SF
Safety Green	Hydrant Bonnet & Caps	Hunter Green 08SF
Safety Orange	Hydrant Bonnet & Caps	Tangerine Orange / Safety 04 SF
Safety Red	Hydrant Bonnet & Caps	Candy Apple Red / Safety 06SF
TBD	Hydrant Barrel	TBD

C. Minimum film thickness shall be per manufacturer's recommendations unless a greater thickness is specified. The Contractor shall measure minimum film thickness in the field by utilizing a wet film gauge, which the County shall verify. Regardless of anchor profile, the Contractor shall utilize a wet film gauge to verify that the County-specified average minimum dry film thickness (MDFT) is being applied. The calculated value for wet film thickness (WFT) shall be derived from County's average MDFT unless the manufacturer's minimum range is greater. Following the manufacturer's recommended drying time, the Contractor shall measure and provide results to the County verifying that the average minimum dry film thickness meets the MDFT for each coat and final system, utilizing a dry film gauge. The County may conduct side-by-side verification.

D. Coating systems shall incorporate the paints specified below, applied at the average dry film thickness (DFT) in mils per coat noted, and have the specified minimum average dry film thickness (MDFT) for each individual coat and total system.

**HP – High Performance Coatings of FERROUS METALS
System HP-2B**

EXTERIOR EXPOSURE, UV EXPOSURE (NON-IMMERSION)

Over-coating of localized inaccessible existing coatings and galvanized metal

Coat	Tnemec	Carboline
Prime	Chembuild 135 4.0 to 9.0 DFT Avg 5.0 MDFT	Carboguard 553 3.0 to 4.0 DFT Avg 3.5 MDFT
Intermediate	Hi-Build Epoxoline II Series N69 4.0 to 8.0 DFT Avg 4.5 MDFT	Carboguard 60 4.0 to 6.0 DFT Avg 4.5 MDFT
Finish	Endura-Shield Series 73 2.0 to 3.0 DFT Avg 2.5 MDFT	Carbothane 133 HB 3.0 to 5.0 DFT Avg 3.5 MDFT
Total	12.0 MDFT	11.5 MDFT

System HP-9
 EXTERIOR EXPOSURE, UV EXPOSURE (NON-IMMERSION)
 Over-coating of existing coating

Coat	Tnemec	Carboline
Existing	Existing coating system	Existing coating system
Prime	Typoxy Series 27WB 4.0 to 14.0 DFT Avg 4.5 MDFT	NA
Intermediate	Hi-Build Epoxoline II Series N69 4.0 to 8.0 DFT Avg 4.5 MDFT	NA
Finish	Endura-Shield Series 73 2.0 to 3.0 DFT Avg 2.5 MDFT	NA
Total	11.5 MDFT	NA

System HP-10
 EXTERIOR EXPOSURE, UV EXPOSURE (NON-IMMERSION)
 Complete removal of existing coating system

Coat	Tnemec	Carboline
Prime	Zinc Series 90-97 2.5 to 3.5 DFT Avg 3.0 MDFT	Carbozinc 621 3.0 to 8.0 DFT Avg 3.5 MDFT
Intermediate	Hi-Build Epoxoline II Series N69 4.0 to 8.0 DFT Avg 4.5 MDFT	Carboguard 60 4.0 to 6.0 DFT Avg 4.5 MDFT
Finish	Endura-Shield Series 73 2.0 to 3.0 DFT Avg 2.5 MDFT	Carbothane 133 HB 3.0 to 5.0 DFT Avg 3.5 MDFT
Total	10.0 MDFT	11.5 MDFT

DFT = Dry Film Thickness
 MDFT = Minimum Dry Film Thickness

2.03 EQUIPMENT

A. The Contractor's surface preparation, coating and painting equipment shall be designed and suitable for the application of the specific materials herein specified. The Contractor shall submit a list of all applicable equipment owned by the Contractor. The Contractor's equipment shall be subject to the approval of the County based on the manufacturer's data.

B. Effective oil and water separators shall be used in all compressed air lines serving spray painting and sandblasting operations to remove oil or moisture from the air before it is used.

Separators shall be placed as far as practical from the compressor.

C. The Contractor shall furnish all equipment for application of the paint and the completion of the Work in first-class condition and shall comply with recommendations of the paint manufacturer.

PART 3 - EXECUTION

3.01 GENERAL

A. All coating and painting shall conform to the applicable requirements of the Society for Protective Coatings (SSPC) Manual (most recent edition). Any material applied upon improperly prepared surfaces shall be removed and redone to the satisfaction of the Owner at the sole expense of the Contractor.

B. All Work shall be done by skilled craftsmen who are qualified to perform the required work and shall be done in a manner comparable to the best standards of practice found in that trade.

C. The Contractor shall provide a supervisor to be at the work site during surface preparation, cleaning and coating operations. The supervisor shall have the authority to coordinate the work and make other decisions pertaining to the fulfillment of their contract.

D. Prior to assembly, all surfaces that will be made inaccessible after assembly, shall be prepared as specified herein, and shall receive the paint or coating system as specified herein.

E. Coating shall not be applied to wet or damp surfaces and shall not be applied in inclement weather. Do not apply when the surface temperature is less than 5° F above the dew point, or if relative humidity is greater than 85%. Dew or moisture condensation should be anticipated and if such conditions are prevalent, coating should be delayed until the surfaces are dry. Further, the day's coating should be completed well in advance of when condensation will occur, in order to permit the film a sufficient drying time prior to the formation of moisture.

F. Any surfaces not specifically named in the Scope of Work, and not specifically exempted, shall be prepared, primed and painted in the manner and with materials consistent with these Specifications. The Owner shall select which of the manufacturer's products, whether the type is indicated herein or not, shall be used for such unnamed surfaces. No extra payment shall be made for this painting.

G. Contractor shall inspect each pipe joint, pipe strap, personal barriers and appurtenances after providing access to the location but prior to commencing surface preparation activities. The Contractor shall immediately report leaks, damage, stripped bolts or nuts to the County.

3.02 SURFACE PREPARATION

A. Solvent Cleaning: All dust, dirt, oil, or any contaminants that would affect the adhesion or durability of the finish coating must be removed before hand tool cleaning, abrasive blasting and

prior to each coating layer application by cleaning per SSPC-SP1 "Solvent Cleaning."

B. Defects: All ferrous metal surfaces shall be free of all defects. The Contractor shall remove by chipping or grinding all sharp edges; other defects shall be ground smooth in accordance with NACE Standard RPO178, Appendix C. Weld flux, weld spatter, slag and excessive rust scale shall be removed by SSPC-SP 11 Power Tool Cleaning to Bare Metal. All weld seams, sharp protrusions, and edges shall be ground smooth prior to surface preparation or application of any coatings.

C. Gaskets: Existing gaskets in between flanged joints shall be cut or ground flush with the existing flanged joint prior to surface preparation or field blasting operations. The Contractor shall not field blast into bell and spigot joints or under tapping saddles. Contractor shall blast perpendicular to the pipe surface. SSPC-SP3 Power Tool Cleaning shall be used inside bells and against tapping saddles to avoid damage to gaskets and locking mechanisms.

D. Field blasting cleaning for all surfaces shall be accomplished by dry sandblasting method unless otherwise directed, or the County provides written approval

1. The abrasive used in blast cleaning shall produce an anchor profile in accordance with the recommendations of the manufacturer of the protective coating, which is to be applied to the surface being cleaned.
2. At all times during the blast cleaning operations, adequate means shall be employed to absolutely insure that existing protective coatings shall not be exposed to abrasion from blast cleaning operations.
3. All blast cleaned surfaces shall be carefully dried and cleaned prior to application of specified coatings. No coatings or paint shall be applied over damp or moist surfaces.
4. Field blasting and priming shall be completed on any particular area during the same workday, and the application of the primer shall follow immediately after surface preparation and cleaning prior to formation of any form of corrosion. If the surface is not primed within 8 hours, complete surface preparation shall be repeated.
5. The Contractor shall at all times keep the area of his work in reasonably clean condition shall not permit blasting materials to accumulate in an uncontrolled manner such as to constitute a nuisance or hazard to the satisfactory prosecution or the Work, operation of the existing facilities, public safety, environmental nuisances or public access.
6. "Touch-up systems will be same as original specification except that approved manufacturer's organic zinc-rich shall be used in lieu of inorganic zinc where this system was originally used. Also, strict adherence to manufacturer's complete touch-up recommendations shall be followed. Any questions relative to compatibility of products shall be brought to the attention of the COUNTY and Coating Manufacturer; otherwise, Contractor assumes full responsibility.
7. Areas that are inaccessible to abrasive blasting, including adjacent to concrete pedestals, tapping saddles, pressure gauges or other appurtenances shall be cleaned in accordance with SSPC-SP 11 "Power Tool Cleaning to Bare Metal" immediately adjacent to the area as approved by the County.

E. Specified Surface Preparation: All surfaces shall be cleaned per SSPC-SP1 "Solvent Cleaning". In addition to the surface preparation for the specific Service Condition, surface preparation shall be as follows:

Substrate	Condition	Surface Preparation
All Surfaces	All – Prior to Surface Preparation	SSPC-SP1 Solvent Cleaning
Steel	Exterior / Non-Immersion	SSPC-SP10 Near White Blast (NACE 2)
Steel	Exterior / Immersion	SSPC-SP5 White Metal Blasting (NACE-1)
Ductile Iron Pipe	Exterior / Non-Immersion	SSPC-SP6 Commercial Blast (NACE-3)
Ductile Iron Pipe	Exterior / Immersion	SSPC-SP10 Near White Blast (NACE 2)
Ferrous Metal	Exterior / Non-Immersion / Inaccessible to abrasive blasting	SSPC-SP 11 Power Tool Cleaning to Bare Metal
Existing Galvanized Metals	Exterior / Non-Immersion	SSPC-SP 7 Brush-Off Blast (NACE 4)
PVC	Exterior / Non-Immersion	SSPC-SP1 Solvent Cleaning & Scarify by brush blast, power tools or hand sanding
Existing Coating System to be Over-Coated	Exterior / Non-Immersion	Scarify by brush blast, power tools or Hand Sanding with fine abrasive

1. Exposed Pipe: Bituminous coated pipe shall not be used in above ground or exposed locations and shall be factory epoxy primed for all new pipe installations. After installation all exterior, exposed flanged joints shall have the gap between adjoining flanges sealed with a flexible caulking shall meet ASTM C-920 and shall be Sika Flex 1A or equal to prevent rust stains.
2. The Contractor shall not abrasive-blast or prepare more surface area than can be coated in the same day; prepare surfaces and apply prime coatings within an 8-hour period.
3. Contractor shall coordinate with the County prior to surface preparation. County approval shall be required prior to application of the prime coat.

3.03 APPLICATION EQUIPMENT

A. Brush and / or Rollers

1. Top quality, properly styled brushes and rollers shall be used. Rollers with a baked phenolic resin core shall be utilized.
2. The brushing or rolling shall be done so that a smooth coat, as nearly uniform in thickness as possible, is obtained. Brush or roller strokes shall be made to smooth the film without leaving deep or detrimental marks.
3. Surfaces not accessible to brushes or rollers may be painted by spray, by dauber or sheepskins, and paint mitt.
4. It may require 2 coats to achieve the specified dry film thickness if application is by brush and roller.

B. Air, Airless or Hot Spray

1. The equipment used shall be suitable for the intended purpose, shall be capable of properly atomizing the paint to be applied, and shall be equipped with suitable pressure regulators and gauges.
2. Paint shall be applied in a uniform layer, with a 50% overlap pattern. All runs and

sags should be brushed out immediately or the paint shall be removed and the surface resprayed.

3. High build coatings should be applied by a crosshatch method of spray application to ensure proper film thickness of the coating.
4. Areas inaccessible to spray shall be brushed; if also inaccessible to brush, daubs or sheepskins shall be used, as the manufacturer authorizes.
5. Special care shall be taken with thinners and paint temperatures so that paint of the correct formula reaches the receiving surface.
6. Nozzles, tips, etc., shall be of sizes and designs as recommended by the manufacturer of the paint being sprayed.
7. Edges, corners, crevices, welds, and bolts shall be given a brush coat (stripe coat) of each coating. The stripe coat shall be applied by a brush and worked in both directions prior to spray application. Special attention shall be given to filling all crevices with coating.

3.04 WORKMANSHIP

A. General

1. Under no circumstances shall Asphaltic seal coats and mastics be overcoated.
2. Paints shall be mixed in proper containers of adequate capacity. All paints shall be thoroughly stirred before use and shall be kept stirred while using. No unauthorized thinners or other materials shall be added to any paint.
3. Only skilled painters shall be used on the Work, and specialists shall be employed where required.
4. Extreme care shall be exercised in the painting of all operable equipment, such as valves, electric motors, etc., so that the proper functioning of the equipment will not be affected.
5. The Contractor's scaffolding shall be erected, maintained, and dismantled without damage to structures, machinery, equipment or pipe. Drop cloths shall be used where required to protect the environment, the public, buildings, equipment, and areas surrounding the Work. All surfaces required to be clear for visual observations shall be cleaned immediately after paint application.
6. The prime coat shall be applied immediately following surface preparation within 8 hours of the same working day. All paint shall be applied by brushing, paint mitt and roller, conventional spraying, or airless spraying, using equipment approved by the paint manufacturer.
7. Each coat of paint shall be recoated as per manufacturer's instructions. Paint shall be considered recoatable when an additional coat can be applied without any detrimental film irregularities such as lifting or loss of adhesion.
8. Surfaces that will be inaccessible after assembly shall receive either the full specified paint system or three shop coats of the specified primer before assembly.
9. Finish colors shall be as specified per the color table in section 2.02 of this specification, and shall be factory mixed (i.e., the Contractor shall not tint the paint, unless the COUNTY and the Coating Manufacturer so authorizes.)
10. All shop-coated surfaces shall be protected from damage and corrosion before and after installation by treating damaged area immediately upon detection. Abraded or corroded spots on shop-coated surfaces shall be cleaned per SSPC-SP1 Solvent Cleaning" and then touched up with the same materials as the shop coat in accordance

with the manufacturers instruction. At the discretion of the Owner, all shop coated surfaces that are faded, discolored, or that require more than minor touch up shall be field blast cleaned and repainted.

B. Field Coating: All painting at the site shall be designated "Field Coating".

1. All paint shall be at ambient temperature before applying, and no painting shall be done when the temperature is below 50 degrees F, in dust-laden air, when rain is falling, mist is present, when relative humidity exceeds manufacturer's recommendation when temperature is less than 5° F above the dew point, or until all traces of moisture have completely disappeared from the surface to be painted.

2. Protective coverings or drop cloths shall be used to protect existing appurtenances, concrete walkways, concrete structures, existing surfaces, the public, the environment and equipment. Care shall be exercised to prevent paint or coating overspray and spatter onto surfaces that are not to be painted. Surfaces from which such materials cannot be removed satisfactorily shall be painted or repainted, as required to produce, a finish satisfactory to the County.

3. All edges, corners, crevices, welds, hardware and irregular surfaces shall receive a brush coat (stripe coat) of the specified product for each coat prior to application of each complete coat.

4. Coating shall be applied in a neat manner that will produce an even film of uniform and proper thickness, with finished surfaces free from brush marks or other irregularities. Each coat shall be carefully examined and faulty material, poor workmanship, holidays, damaged areas and other imperfections shall be touched up prior to applying succeeding coats. Each coat shall be thoroughly dry and hard before the next coat is applied in accordance with the coating manufacturer's recommendations for drying time between coats. Coating shall be cleaned in accordance with SSPC-SP1 prior to the application of next coating. In no case shall coating be applied at a rate of coverage greater than the maximum rate recommended by the coating manufacturer.

5. Coating failures shall not be accepted and shall be entirely removed down to the substrate and the surface recoated. Failures include, but are not limited to, holidays, sags, checking, cracking, teardrops, fat edges, fisheyes, or delamination. Any repairs made on surfaces shall be repaired in accordance with the coating manufacturer's instructions.

6. Each coat shall be uniform in coverage and color. Successive coats of paint shall be tinted so as to make each coat easily distinguishable from each other with the final undercoat tinted to the approximate shade of the finished coat.

7. Painting shall be continuous and shall be accomplished in an orderly manner so as to facilitate inspection. Surfaces of exposed members that will be inaccessible after erection shall be cleaned and painted before erection.

8. All materials shall be applied in accordance with the manufacturer's instructions. If spray painting is required, Contractor shall accept all responsibility for any damage caused by overspray and/or drifting paint mist.

9. Caulking: The Contractor shall caulk all voids or interfaces including but not limited to: flanges, threads, nuts, saddles, gaps, voids or spaces between appurtenances and pipe to be coated immediately after the prime coat to prevent rust formation where ferrous metal is not accessible to surface preparation or blasting. Flexible caulking shall meet or exceed ASTM C-920 and shall be Sika Flex 1A or equal.

3.05 FIELD QUALITY CONTROL

At a minimum, the Contractor shall provide field quality control and verification of the coating film thickness utilizing the below methods.

A. Wet Film Gauge. Both the Contractor and the County shall use a wet film gauge to verify the applied coating desired wet film thickness (WFT) to produce the required minimum DFT.

$$\text{Target WFT} = \text{County specified average MDFT} / \text{Volume Solids} \times 100\%$$

If thinner is applied per the manufacturer's recommendations, the volume of solids shall be reduced accordingly. Regardless of anchor profile, surface pattern or base metal calculation of the substrate, the gauge reported WFT shall meet the target WFT value for the substrate or previously coated surface to ensure the required average MDFT will be achieved.

B. DFT Magnetic Gauge. Dry Film Magnetic Pull-Off Gauge (Type I) shall be utilized to determine DFT in accordance with SSPC-PA 2 "Measurement of Dry Coating Thickness with Magnetic Gages." The average of the readings shall meet the County-specified MDFT for each coating application. Electromagnetic Gauge (Type II) shall not be considered acceptable for use on ductile iron pipe.

C. Holiday Testing: Each coating layer shall be holiday tested at the recommended 100-125 volts DC per mil in accordance with the latest edition of the following standards: NACE SP0188-2006, NACE Standard RP0490, ASTM G62 and per the manufacturer's recommendations. All low voltage holiday testing shall be performed using a Tinker & Rasor Model M-1 Holiday Detector, or equal. Areas found to have holidays shall be marked and repaired in accordance with the paint manufacturer's instructions.

D. Destructive Testing: Destructive testing using a Tooke gauge shall only be utilized in cases of dispute regarding DFT. The County shall be permitted up to three (3) cuts using the Tooke Gauge and the Contractor shall be responsible for repairing the areas examined at no additional cost.

E. Environmental Testing: humidity, dew point and temperature shall be constantly measured and logged. Any electronic gauges shall be first calibrated against a sling psychrometer each day.

3.06 INSPECTION OF SURFACES

A. Before application of the prime coat and each succeeding coat, all surfaces to be coated shall be subject to inspection and approval by the County. The Contractor shall correct any defects or deficiencies before application of any subsequent coating. Coatings applied without County approval shall be removed and reapplied at no cost to the County.

B. The Contractor shall provide the County access to all areas of the Work. All scaffolding or lifts shall be in compliance with OSHA requirements.

C. The Contractor shall furnish samples of surface preparation and of painting systems to be used as a standard throughout the job, unless omitted by the County.

D. When any appreciable time has elapsed or has exceeded the manufactures recommendations between coatings, the County shall carefully inspect previously coated areas and surfaces that are damaged or contaminated, in the opinion of the County shall be cleaned and recoated at the Contractor's expense. Re-coating times of manufacturer's printed instructions shall be adhered to.

E. Coating thickness shall be determined by the use of a properly calibrated "DeFelsko Positest FM" Type 1 Coating Thickness Gauge (or equal) for ferrous metal or a "Tooke" Paint Inspection gauge (or equal) for non-ferrous and cementitious surfaces. Please note that use of the "Tooke" gauge is classified as a destructive test.

3.07 PROTECTION, CONTAINMENT AND CLEAN-UP

A. The premises shall at all times be kept free from accumulation of waste material and rubbish caused by employees or work. At the completion of the painting remove all tools, scaffolding, surplus materials, and all rubbish from and about the site and leave the area "broom clean" unless more exactly specified.

B. It shall be the responsibility of the Contractor to protect at all times, in areas where painting is being done, floors, sidewalks, walls, bridges, environment, public property, equipment, vehicles, appurtenances, and finished surfaces adjacent to paint work. Cover all electric plates, surface hardware, nameplates, gauge glasses, etc., before start of painting work.

C. The Contractor shall contain all spent abrasives, old paint chips, paint overspray and debris by means suitable to the County, including but not limited to, full shrouding of the area. The Contractor shall provide a complete design and plan of the intended shroud or cover. Care must be taken not to modify or damage the structure during the use of the shroud. If damage should occur, the Contractor is held responsible for all repairs. The Contractor's containment must be adequate enough to stop blasting residue from being released into the environment. There should be no visible emissions of particulate matter or visible deposits on the ground outside the containment area. Water jetting or wet abrasive blast cleaning for the purpose of removing paint and surface debris shall be conducted within a containment designed, installed, and maintained in order to capture paint chips and debris. Collection of the water is not required. Mesh containment materials that capture paint chips and debris while allowing the water to pass through shall have openings a maximum of 25 mils (625 microns) in greatest dimension. Low Pressure Water Cleaning for the purpose of removing chalk, dirt, grease, oil and other surface debris can be performed without additional containment provided paint chips are removed and collected prior to Low Pressure Water Cleaning (LP WC).

D. At completion of the work, remove all paint where spilled, splashed, splattered, sprayed or smeared on all surfaces, hardware, equipment, painted, and unpainted surfaces.

E. After completion of all painting, the Contractor shall remove from job site all painting

equipment, surplus materials, and debris resulting from this work.

F. The Contractor is responsible for the removal and proper disposal of all hazardous materials from the jobsite in accordance with Local, State, and Federal requirements as outlined by the Environmental Protection Agency.

3.08 SCHEDULE OF WORK

Asset	Location	Description	Surface Prep	Coating System No.
All	All systems and sites shall receive Solvent Cleaning prior to surface prep & Coating.	All	SSPC-SP1	----
Steel	Shop	Structural Steel Members, Steel framing & supports, steel weld plates, bearing plates,	SSPC-SP10 Near White Blast (NACE 2)	HP-10 Prime Coat
Steel	Varies - Onsite	Existing Zinc Rich Primer for Structural Steel Members, Steel framing & supports, steel weld plates, bearing plates,	SSPC-SP 7 Brush-Off Blast (NACE 4)	HP-10 Intermediate & Final
Steel	Shop	Galvanized Steel	SSPC-SP10 Near White Blast (NACE 2)	Hot Dipped Galvanized
Steel	Varies - Onsite	Existing Galvanized Steel	SSPC-SP 7 Brush-Off Blast (NACE 4)	HP-2B

END OF SECTION

SECTION 15000A

VENTILATION FOR GARAGE MAINTENANCE AND ADJACENT PARKING AREA

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Design and construction guidelines for ventilation of the garage maintenance and adjacent parking area.

1.02 REFERENCES

- A. 2012 International Mechanical Code
- B. National Fire Protection Association (NFPA):
 - 1. 90A – Standard for Installation of Air Conditioning and Ventilation Systems.
 - 2. 70 – National Electric Code (NEC)
- C. National Roofing Contractors Association (NRCA)
- D. Air Movement and Control Association International, Inc. (AMCA):
 - 1. 210, Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating.
- E. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):
 - 1. HVAC Systems-Duct Design
- F. Underwriters' Laboratories, Inc., (UL):
 - 1. 181A- Closure Systems for Use with Rigid Ducts.
- G. Reynolds Smith and Hills Technical Provisions for Pre-Engineered Metal Buildings Division 16 Electrical.

1.03 SYSTEM DESCRIPTION

- A. Design requirements:
 - 1. The ventilation system shall meet the 2012 International Mechanical Code Section 404.
 - 2. The two maintenance bays shall be designed to allow for continuous running of the engine.
 - 3. The entire area shall be ventilated by using existing skylight roof openings and installing fans on the roof.
 - 4. Any new work shall not disturb the existing fire rated structure. Any changes will be required to preserve the integrity of the fire rating.
 - 5. New Electrical design shall include but not limited to:

- a. Conduct a study of the existing electrical system and determine the new power requirements.
- b. Provide detail design and drawings for the new power connection to the existing system and new conduit and wiring to the new ventilation equipment to be installed.
- c. Drawings and specifications shall be prepared and sealed for approval by the authority having jurisdiction.
- d. Contactor shall supply drawings and calculations as necessary. Documents shall be signed and sealed by licensed engineers in the State of Florida.

B. Design criteria:

- 1. The ventilation system is to be designed per NFPA-90A and shall use air intake from the wall louvers on West side of building. The maintenance bay and high ceiling general parking area have a floor area of 14,934 square feet. The low ceiling general parking area that requires a ducted exhaust is 10,500 square feet.
 - a. The location of the air intake and exhausts shall provide for cross ventilation of the entire space. The required total maximum ventilation rate is 0.75 cfm per square foot. Per code the reduced flow may not be less than 0.05 cfm/sqft. The design shall create a minimum negative pressure of 0.05 inch water column between the parking/garage areas and the adjacent occupied areas. The maximum negative pressure differential shall be 0.15 inch water column.
 - b. The two garage maintenance bays shall be equipped with individual exhaust systems that have individual on/off control. Each system shall be designed so it can be connected to the tail pipe(s) of a vehicle that is being serviced. (Note that the two garage maintenance system exhaust rates are not part of the required maximum ventilation rate in 1.03. B.1.a.)
 - 1) Each of the two maintenance bays will require a utility set fan equal to Greenheck Model SWB with an exhaust rate 10% more than the largest truck to be worked on. Design shall identify the largest truck exhaust rate and add 10 % for the total CFM to be exhaust from each fan. The fan shall be connected to a collection system. Each collection system shall include but not be limited to, motorized retractable hose on reel equal to Monoxivent series 9000-W-TMTR, a wye hose system to allow for dual exhaust. The system shall be positioned to allow connections at the top of the truck as well as at ground level. The system shall include a lifting pole for high connections and tailpipe adapters. All system equipment shall be equivalent to that provide by Monoxivent.
 - 2) Provide and install a carbon monoxide sensor in the garage maintenance area per the manufacturer instruction. Wire the sensor and provide controls that will turn on all the general ventilation fans described in 1.03 B.1.c. The control system shall require a manual reset of the sensor and fan control after an alarm event. A high alarm shall initiate a sound and beacon signal.
 - c. Multiple fans mounted on the roof over the existing skylight opens used for general ventilation of the adjacent parking area shall be equal to

Greenheck model RBE, and at least one shall be designed to provide multiple intakes using ductwork in the area that is beneath a second level office area. The ductwork shall be designed and installed per SMACNA standards. The ductwork and intakes shall provide an even flow of exhaust from this area using a minimum of 14 intakes. Each of the intakes shall terminate with a grille and OBD equal to Titus model 25R, and sized for a maximum core velocity of 600 FPM. See Figure 1 for additional description of the area requiring ductwork.

- d. The controls for the general ventilation fans shall allow for individual fans to be turned off or on by individual wall mounted thermostat. All fans shall have an override control that turns the fan on if the space carbon monoxide sensor senses a high alarm.
- e. Install counter balanced backdraft dampers on the existing 4 -48x48 wall louvers equal to Ruskin CDB6. These dampers will be used to provide the negative pressure referred to in item B.1.a

2. Approved Fan Manufactures
 - a. Greenheck
 - b. Cook
 - c. Penn Ventilator

C. Permitting

1. Permits and Codes: Contractor is responsible for obtaining all necessary permits/certifications for the improvements including but not limited to Orange County Building Permit. Contractor and engineer are responsible to meet all necessary code requirements for design and construction.

D. Coordination

1. The phasing and scheduling sequence of this work shall be coordinated with the Interior Renovation Contractor. It is the responsibility of the contractor to that all work within the Interior Renovation Contractors area of work be coordinated and scheduled accordingly.

1.04 SUBMITTALS

- A. Provide a complete materials list with manufacturer's information for each product.
- B. Shop drawings and calculations: Submit detailed shop drawings.
 1. Shop drawings: Include floor plan layout of ductwork and sections showing the duct elevations.
 2. Provide details for equipment and duct supports.
 3. Following acceptance by the Engineer, submit plans for approval by authority having jurisdiction.
- C. Closeout submittals:
 1. As-built drawings: Furnished upon completion of the work, showing any deviation from the approved shop drawings.

1.05 PROJECT CONDITIONS

- A. Visit the site of work and examine the premises in order to be completely familiar with the scope of work.
- B. Notify Engineer of any discrepancies found.

PART 2 EXECUTION

2.01 EXAMINATION

- A. Preparation: Coordinate work with existing conditions.

2.02 INSTALLATION

- A. Install equipment in accordance with manufacturers instructions.

2.03 WIRING

- A. System wiring and installation: Per NEC -70, with the applicable codes, Drawings, and recommendations of the manufacturer.
- B. Color code, tag and check wiring to assure that it is free from shorts and grounds.
 - 1. Tag circuits showing circuit number and equipment served.
- C. Install system wiring in conduit:

2.04 TESTING

- A. General: Perform Test and Balance of all the new fans and their collection systems.:
 - 1. Procure the services of an independent air balance and testing agency belonging to and in good standing with the AABC, NEBB, or the TABB to perform air balancing, testing, and adjustment of the new ventilating air systems.
- B. Provide final Test and Balance report to Owner.

2.05 WARRANTIES

- A. Contractor shall provide one (1) year labor and parts, or as extended by other standard manufacturer(s) warranties/guarantees.

END OF SECTION

ORANGE COUNTY UTILITIES OPERATION CENTER
FUEL FACILITY

**SECTION 17000 - FUEL STORAGE FACILITY INCLUDING TANK AND ACCESSORIES
INCLUDING TRUCK WASHOUT AREA**

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Provide engineering documents and construction of two underground fuel storage tanks (20,000 gallon diesel and 15,000 gallon gasoline), accessories, connections, operation, canopy structure, and truck washout area in accordance with the Contract Documents.

1.2 WORK INCLUDED (BUT NOT LIMITED TO)

- A. Double Wall Fiberglass Underground Fuel Storage Tank (UST)
- B. Manhole and Cover
- C. Fuel Filter
- D. Pumps
- E. Dispensers
- F. Fuel Monitoring System
- G. Control System
- H. Dual or Single Slip Tank Fitting
- I. Overflow Prevention Valve
- J. Piping Requirements
- K. Venting System
- L. Tank Backfill
- M. Fuel Island Pavement
- N. Contiguous Concrete Pavement
- O. Truck Washout Area
- P. Fuel Island Canopy
- Q. Canopy Lighting

1.3 QUALITY ASSURANCE

- A. General:
 - 1. NFPA 30 - Flammable Combustible Liquid Code.
 - 2. NFPA 30A – Automotive and Marine Service Station Code
 - 3. Standard for the Installation of Oil Burning Equipment, for oil piping materials and components, oil piping installations, and inspection, and testing of fuel oil piping systems.
 - 4. Standard Mechanical Code, Latest Edition.
 - 5. UL 343 - "Standard for Pumps for Oil Burning Appliances", for oil transfer pumps.
 - 6. UL 567 - "Pipe Connections for Flammable and Combustible Liquids and LP-Gas"
 - 7. General Services Administration, Public Building Service Guide Specification, PBS: 1568.
 - 8. ANSI B31.4 - Liquid Petroleum Transportation Piping System
- B. Double Wall Fiberglass Underground Storage Tank and Piping:

1. American Petroleum Institute Publication 1615 Installation of Underground Petroleum Storage System.
2. ASTM Specification D4021-810, Standard Specification for Glass Fiber Reinforced Polyester Underground Petroleum Storage Tanks
3. U.L. 1316, "Standard for Glass Fiber Reinforced Plastic Underground Storage Tanks for Petroleum Products."
4. Factory Mutual File OFGA8.AF.
5. Military Specification MIL-T-52777A, dated July 6, 1978, Tanks, Storage, Underground, Glass Fiber Reinforced Plastic
6. UL 971, UL Listed non-metal pipe.

1.4 SUBMITTALS

A. Product data for the following products but limited to:

1. Tank fittings and accessories.
2. Inventory control and monitoring system
3. Oil transfer pumps. Include performance curves, electrical characteristics, and specified accessories
4. Oil piping specialties
5. Signed and Sealed Engineering Drawings consisting of but not limited to tank location (horizontal and vertical), concrete details, jointing plan, site drainage, gravity sewer, electrical, structural, bollards.
6. Signed and Sealed Structural engineering drawings and details for canopy.
7. Construction Products and manufactures for approval
8. Surveyor Signed and Sealed and Engineer Certified As-Builts (Electronic and hard copies including finished grades, underground piping and tanks, sewer piping and structures. As-Builts should be OCU datum requirements and to RSH requirements as noted on GN-001)
9. Concrete mix design
10. Concrete reinforcement design and layout.
11. Finished Paint Specifications for Ferrous Metal Coating per Specification 9960
12. Record Drawings: All record drawings shall be in accordance with Orange County Utilities Department Construction Standards 01720 and per record drawing criteria stated in RSH construction documents.
13. Contractor shall be in accordance with the phase sequence stated in RSH documents and specifications.
14. Contractor shall follow all standards and procedures stated in RSH documents including technical provisions for Pre-engineered Metal Buildings PEMB Package section 1300 and drawings.

B. Shop drawings detailing fabrication and installation of canopies, drainage, gravity sewer, fuel storage tanks and accessories. Detail equipment assemblies and indicating dimensions, weights, loadings, required clearances, method of field assembly, components and location and size of each field connection.

C. Wiring diagrams detailing wiring for power and control systems; differentiating between manufacturer-installed wiring and field-installed wiring.

D. Maintenance data for oil transfer equipment, for inclusion in Operating and Maintenance Manual

1.5 CATHODIC PROTECTION INSPECTIONS

- A. Upon completion of installation and prior to obtaining a certificate of use, the contractor shall test the cathodic protection system for adequacy in accordance with the National Association of Corrosion Engineers Standard RP-02-85. "Control of external corrosion on metallic buried, partially buried or submerged liquid storage systems". This shall not apply to aboveground tanks

1.6 FEDERAL DEMONSTRATION OF FINANCIAL RESPONSIBILITY

- A. Supplier of the UST shall provide evidence of financial responsibility in accordance with State and Federal requirements

1.7 NOTIFICATION

- A. Orange County Risk Management will coordinate with the tank contractor and provide all FDEP notifications and, schedule all required inspections.

PART 2 – PRODUCTS

2.1 The following items and manufacturers are intended as an outline of services required and shall not be considered all-inclusive. The Fuel Facility Contractor shall include the following elements as minimum requirements in the design and installation of the diesel and gasoline underground storing and dispensing system or submit information proving equivalency. Refer to the bid documents for submittal of substitution.

1. Operation & Maintenance Manual: Submit a complete manual for review prior to final project completion.
2. Diesel Fuel Storage Tank: One packaged underground 20,000-gallon UL 58 fiberglass exterior coated carbon steel, horizontal, double walled, tank Modern Welding Co Glasteel GS-16 DW Type 1. With 42" Fiberglass sump collar fibreglassed to tank and 24" bolted access manway. Specific testing requirements are required. See attached exhibit.
3. Unleaded Gasoline Fuel Storage Tank: One packaged underground 15,000-gallon UL 58 fiberglass exterior coated carbon steel, horizontal, double walled, tank Modern Welding Co Glasteel GS-16 DW Type 1. With 42" Fiberglass sump collar fibreglassed to tank and 24" bolted access manway. Specific testing requirements are required. See attached exhibit.
4. Tank Dimensions: 120-inches diameter x manufacturer's standard length.
5. Accessories: Tank shall incorporate but not limited to tie-down straps, fittings, gaskets, pump platforms, vent and filling piping.
6. Manhole Covers: Provide a rain tight cover, OPW 110/120.
7. Transition Box: 36-inch diameter x 42-inches deep x length as required, fiberglass, watertight seal with removable gasketed cover. Locate box in non-traffic area.

8. Fill Box/Cover: Provide HL93 load rated water tight cover, OPW EQ 224.
9. Tanker Truck Transition: Supply a separate piping location that extends into the tank that can support a tanker pumping from the underground storage tank. The transition shall include a down tube into the tank with fitting to fit 2" cam lock from tanker and a 4" vent tube or as recommended from Tank Supplier. Both shall be extended to grade and incorporated into a Box/Cover: Provide HL93 load rated water tight cover, OPW EQ 224.
10. Finishes. Tank shall have exterior coating that is Corrosion-Resistant per all code requirements including UL 1746.
11. Tank Backfill: Tanks shall be backfilled per manufacturer's recommendations using #89 Pearock per FDOT specifications 901-1.4 and pearock shall be wrapped (encasing on all sides) with Mirafi 140 geotextile fabric or equivalent.
12. Tank supports and anchors: Engineer of Record shall specify tie-down straps, anchors and necessary hardware based on calculations.
13. Compliance: Tank shall have UL 58 label and Tightness testing certification for "Interstitial Tightness Test Method", Tank must be on FDEP approved product list. In accordance with NFPA 30, the tank will be required to be tested on-site once it is set in its final location.
14. Emergency Shutoff: Specified by engineer per code requirements located on engineer site plan based on site conditions
15. Tank Ventilation: Specified by engineer per code requirements located on engineer site plan based on site conditions out of traffic pattern.
16. Overflow Prevention Valve: Installation per code requirements, OPW Fueling Components Division
17. Overflow Protection with Alarm: The system shall be equipped with overflow protection per all code requirements, Morrison Brothers Co.
18. Interstitial Monitor: Leak detection shall be required per all code requirements, Krueher Sentry Type K leak gauge.
19. Tanks Pumps: Engineer of record to size all pumps accordingly, Red Jacket Turbine Submersible
20. Tank Gauge: Veeder Root TLS-350 Automatic Gauge System
21. Dispenser: Gasboy 9800 Series with Gilbaco meters and twin super flow hoses.

22. Dispenser Sump: OPW Flexworks to match dispenser.
23. Piping: Piping to be in accordance with all codes and jurisdiction. Shall be double walled in accordance with UL 971. Engineer of record to size all piping accordingly and show on engineering plans. Piping shall be sloped to drain accordingly, Amerom Dualoy 3000/LCX fiberglass pipe. Provide separate receiving, storage and distribution systems for each grade or type of fuel. Prevent misfueling (transferring a type of fuel other than the type intended) by using different size piping, valves, adaptors, nozzles, etc.
24. Nozzles: Nozzles shall be specified by the engineer of record in accordance with code requirements and required flow rates. EMCO Wheaton Retail
25. Hose Retriever: Engineer of record to show location on engineering plans, Pemco
26. Hoses: Engineer of record to size hoses accordingly. All hoses to be UL listed, Goodyear Flexsteel min. 12 feet in length.
27. Fuel Dispensing Island: Four-feet wide x 38-feet long x six-inches high concrete slab. Enclose slab with 114 -inch thick x six-inch high type 304 stainless steel with round edges. Provide a minimum 6-inchs radius at all slab comers.
28. Fuel Island Area: Engineer shall coordinate with RSH permitted design plans for the site improvements phase 1 and SFWMD Permit No. 48-00756-S. Refer to Division 3 for additional information. Engineer of record shall specify required thickness and reinforcing necessary for HL93 loading. Concrete shall be jointed accordingly for crack protection and joint plan shall be submitted to NCRMA for jointing plan design. The subgrade shall be prepared per the engineer of record and shall be covered with 6mil vapor barrier. All reinforcing shall be placed on plastic chairs. Concrete blocks shall not be permitted to support reinforcing. All edges shall have ½” tooled edge and the finish shall be of medium broom. The slab shall be sloped to drain and to meet the RSH design elevations. Concrete paving shall be per ACI 330. Refer to Division 3 for additional details. Contractor shall coordinate with the General Contractor if additional area is required to construct the fuel facility. The site plan shall be submitted to Orange County Utilities Department for approval prior to commencement of work. Refer to RSH Technical Provisions for Pre-Engineered Meat Buildings for specifications associated with fuel island canopy and for other information associated with design and construction of fuel facility.
29. Steel Bollards: Provide concrete foundations to embed 5-inches steel pipe, "U" shaped bollards two (2) feet below grade at both ends of island. Finish with one (1) coat of primer, corrosion- resistant, and two (2) coats of factory finish paint, weather-resistant, latex enamel, safety yellow per section 09960

30. Metal Canopy Structure System at Fuel Island: Refer to RSH Technical Provisions for Pre-Engineered Metal Buildings for specifications associated with fuel island canopy and for other information associated with design and construction of fuel canopy. Provide a 46-foot length x 36 width, 17-foot clear height, pre-engineered and pre-fabricated Metal Building System of 20 gauge Galvalume pre-fab deck to include structural framing, roof canopy, fascia, and totally enclosed soffit with recessed lighting. Factory finishes matching the proposed building addition in color. Canopy shall be a standing seam metal roof with same trim to match proposed building addition. AU steel panels shall have factory Kynar paint finish. All exposed steel shall be in accordance with Section 09960, color to match adjacent material. Refer to Division 13 and Section 09960 for additional information..
31. Canopy Draining System: Provide integral metal rain gutters and roof drain leaders to internal roof drains in the columns to provide positive water flow and to drain water to the East, away from the fuel island. Conceal downspouts in columns and fuel island slab and discharge through face of island curb. Direct rain leader out flow as required by Code. AU exposed metal shall be finished with weatherproof paint, color to match adjacent material.
32. Safety Signage: Provide safety/hazard signs with required labels and text, brackets and hangars as required per State of Florida, Department of Transportation all local codes.
33. Fire Extinguishers: Provide wall-mounted fire extinguishers at each column. Fire extinguishers shall be Ansul Sentry, A# I 0. (No Substitutions)
34. Card Reader: EJ Ward Card Reader, Model Next Generation, four (4) hose control terminals. Locate the card reader in center of the fuel dispensing island.
35. Lighting System: General area under canopy:. Electrical shall be supplied by engineer and contractor to the latest codes and shall be permitted to all necessary local and state agencies. Lights shall be controlled by a local photocell and a 7-day programmable timer. Timer shall be locally mounted at least 7 feet above ground and in a lockable NEMA 3R enclosure. Photometric plan to be submitted for review prior to commencement. Based on sketch showing 9 fixtures equally spaced per Hubbell FLEDR-24-7-XX-CVQ-5-WH
36. Power System: Provide complete power supply and grounding for the fueling system including emergency power
 - a. Underground conduits, boxes, etc.: nonmetallic, water-tight joints
 - b. Aboveground conduits, boxes, etc.: metallic, water-tight joints
 - c. Conductors: copper.
37. Lightning Protection System: Provide a complete lightning protection system for the project specifically including, but not limited to structural framing and

canopy, tank, card reader, etc. per NFPA No. 780 - Standard for the Installation of Lightning Protection Systems and agencies having jurisdictions.

38. Approved petroleum contractors must prove previous fuel facility work history with 12,000 gal underground fuel tanks with fully operational components listed above. Contractor must be Pollutant Certified Contractor with experience working within the State of Florida and Orange County. Engineer must be a licensed professional engineer with the State of Florida. Approved Fuel Facility contractors:
39. Existing Power: Control and Data Communication: Sources are located at the sanitary sewer lift station and is the responsibility of contractor and engineer to supply proposed fuel facility with all applicable power, and communication utilities. Refer to provided sketch and Division 16 for additional information.
40. Tests: Provide tests and submit test certificates for the following.
 - a. Concrete and sub-grade compaction.
 - b. Tank and piping per all agencies having jurisdiction.
 - c. Electrical system grounding.
 - d. Pumping and dispenser flow rate
41. Tank registration shall be obtained and payment shall be made to the Department of Environmental Protection. Orange County Risk Management will prepare the tank registration once the tanks are installed and Orange County Utilities will be required to pay registration fees.
42. Warranties:
 - a. Fuel Facility Contractor shall provide one (1) year labor and parts, or as extended by other standard manufacturer(s) warranties/guarantees.
 - b. Refer to PEMB Division 13 for warranty information of the canopy. Warranties shall be in accordance with PEMB Section 13120
43. Truck Washout Area: Consist of concrete pavement approximately 30 feet by 30 feet that is sloped to a drain in the concrete. The drain shall be an FDOT Type C ditch bottom inlet (approximately 3 ft depth) with approximately 100 LF of 8" PVC C900 effluent pipe per Orange County Utilities specifications sloped to an existing manhole stub out with depth of less than 8 ft. The effluent pipe shall have an 8" plug valve in a valve box. Drain to slope to existing manhole located on east side of Operations Building. Location of the valve shall be field coordinated with Orange County Inspectors. Pipe installation shall be per Orange County Standards and

details. Pipe shall be as-built by a State of Florida licensed surveyor. Refer to RSH Technical Provisions for Pre-Engineered Metal Buildings for additional specifications associated with design and construction of truck wash.

44. For information not included in this specification, contractor shall follow all standards and procedures stated in RSH documents including technical provisions for Pre-engineered Metal Buildings PEMB Package and drawings.

2.2 FABRICATION - UST

A. Double Wall Fiberglass Underground Fuel Storage Tank:

1. Loading Conditions: Tank shall meet the following conditions:
 - a. External hydrostatic pressure. Buried in ground with 7' of overburden over the top of the tank. The hole fully flooded and a safety factor of 5:1 against general buckling
 - b. Surface loads: When installed according to manufacturer's installation instructions tanks will withstand surface H-20 axle loads (32,000 lbs./axle).
 - c. Internal load: Primary tank and annular space shall withstand pressure test of 5 psi. A 5 to 1 safety factor against local buckling
 - d. Tanks designed to support accessory equipment
2. Product Storage Requirements:
 - a. All tanks must be vented. Tanks are designed for operation at atmospheric pressure.
 - b. Tanks shall be capable of storing liquids with specific gravity up to 1.1.
 - c. Maximum temperature. Tanks shall be listed by a nationally recognized laboratory and capable of storing gasoline, gasohol (90% gasoline and 10% ethanol mixture), 90.5% gasoline and 9.5% Oxinol-50 (4.75% methanol and 4.75% GTBA mixture), gas, jet fuel, diesel fuel, motor oil or oil at temperatures not to exceed 150 deg F at the tank interior surface.
 - d. Tanks shall be chemically inert to petroleum products.
3. Monitoring Capabilities:
 - a. Tanks shall have a space between the primary and secondary shell walls to allow for the free flow of liquid media and containment of all leaked product from the primary tank.
 - b. The following continuous monitoring conditions shall be compatible with the cavity between the inner and outer tanks:

1. Vented to atmosphere
 2. Sealed tank cavity
 3. Vacuum - 3" mercury maximum
 4. Positive Air Pressure - 3 PSI maximum
 5. Hydrostatic pressure - 7 foot maximum groundwater head pressure over tank top
- c. Tanks shall have an integrally mounted reservoir installed on the tank for hydrostatic monitoring. The reservoir shall be constructed of fiberglass reinforced plastic materials and warranted for 30 years against failure due to internal/external corrosion and, when properly installed, against structural failure (same as tank warranty).
 - d. Tank shall be designed with access to the tank bottom between the primary and secondary walls (annular space). All tanks shall have one 4" NPT monitoring fitting in the reservoir. Tanks 4,000 gallon capacity and larger shall also have one 4" NPT monitoring fitting located on each end of the tank.
 - e. The double-wall tank monitor shall be capable of detecting a breach in the inner and/or outer tank under the following installed conditions:
 1. When the inner tank is empty.
 2. When the inner tank is partially or completely full and the ground water table is below the tank bottom
 3. When the inner tank is partially or completely full and the tank is partially or completely submerged in groundwater
 - f. The tank detection performance of the monitoring system shall be tested and verified by a qualified independent consultant to detect leaks as small as .05 gallons per hour with a 99% probability of detection and less than a 1% probability of a false alarm.
 - g. All monitoring equipment, including FRP reservoirs and electronic control shall be UL listed
 - h. If hydrostatically monitored, any solution used in the tank annular space shall have UL approval for compatibility with the tank
4. Accessories:
- a. Anchor straps to be specified and supplied by the tank manufacturer.
 - b. Underwriters' Laboratory label shall be permanently affixed to each tank.
 - c. Flanged Manways:
 1. All manways will be furnished complete with UL listed gaskets, bolts and covers.
 2. Location – Based on engineer's design.

- d. Fill tubes shall be fiber glass reinforced plastic, factory installed, 4" diameter, and shall include a 6" steel fitting with a double tapped reducer bushing to 4" diameter. Tubes shall be standard items as manufactured and installed by the tank manufacturer.
- e. Fiberglass Tank Bottom Sumps:
 - 1. Sumps shall be factory installed at the tank bottom directly under the center of manway.
 - 2. Sump will include a tank bottom deflector plate within the sump at the bottom.
- f. Fittings - Threaded - NPT: All threaded fittings on U.L. labeled tanks for storage of petroleum products shall be of a material of construction consistent with the requirements of the U.L. label. All fittings to be supplied with threaded plugs. Thread Standards: All threaded fittings shall have machine tolerances in accordance with the ANSI standard for each fitting size. Strength: NPT fittings will withstand a minimum of 150 foot pounds of torque and 1,000 foot pounds of bending, both with 2:1 factor of safety.
- g. 6" secondary containment coupling surface mounted on tank. Monitoring by means of a "T" fitting and grade level monitoring. Both supply and return container couplings manifolded for monitoring by a single sensor.
- h. Switch Panel: The switch panel is pre-assembled and ready to wire. All electrical components shall be UL listed NEMA 4X. The electrical box shall be nonmetallic.
- i. Manway Interface Ring: Shall be constructed of minimum 1/4" thick steel plate. The interface ring shall include welded studs, bolts, washers, and cork gaskets to mount the interface ring and manway cover to the tank manway. The outer bolt pattern on the interface ring shall include welded nuts, bolts, washers, and compression ring (minimum 1/4" thick) to fasten the secondary containment membrane (contractor supplied) for the piping system to the interface ring.
- j. Steel Compression rings: Shall be constructed of minimum 1/4" thick carbon steel with bolt holes in a bolt hole circle to be compatible with the manway cover bolt patterns.
- k. Ladders: Shall be standard carbon steel supplied by the tank manufacturer. Refer to drawings for location. Access ladder shall be provided for manhole extension. Ladders shall meet OSHA requirements.
- l. Heating Coils: Shall be standard item as manufactured and/or supplied by the tank manufacturer including 22" manway.
- m. Tank Lifting Lugs: Provide lifting lug(s) on all tanks. Lugs shall be capable of withstanding weight of tank with a safety factor of 3 to 1.

- n. Overfill Spill Container: Provide sufficient capacity to contain delivery hose contents if tank is overfilled.
- o. Provide overfill alarm switch in the vent line to alarm in the event of the overfill.

B. Hydrostatic Tank Leak Detection System:

1. Propylene Glycol Antifreeze: Solution Designation Dowfrost, Chemical Composition 35% propylene glycol in water. Visual Appearance Colorless
2. Tank reservoir sensor shall be based on Owens- Corning Model RS-10, with high and low level alarms.
3. Piping sump sensor consisting of normally closed float switch housed in a protective plastic casing which is activated after a 2" accumulation of liquid in the bottom of the sump.
4. Electronic control panel shall be UL listed and shall operate on 120V ac. The sensor monitoring circuit shall be intrinsically safe (incapable of releasing sufficient electrical or thermal energy to cause ignition of flammable materials under "normal" or "fault" operating conditions). A contact closure shall be provided to allow for external alarm monitoring. Suitable for up to four monitoring circuits including overfill alarm and with separate detector for monitoring piping system.
5. The double wall tank monitor shall be capable of detecting a breach in the inner and/or outer tank under the following installed conditions:
 - a. When the inner tank is empty.
 - b. When the inner tank is partially or completely full and the ground water table is below the tank bottom.
 - c. When the inner tank is partially or completely full and the tank is partially or completely submerged in groundwater.
6. The leak detection performance of the monitoring system shall be tested and verified by a qualified independent consultant to detect leaks as small as .05 gallons per hour with a 99% probability of detection and less than a 1% probability of a false alarm.
7. All monitoring equipment, including FRP reservoirs and electronic control shall be U.L. listed.
8. All control panels include:
 - a. Panel lights for each circuit.
 - b. Alarm test button for each circuit.

- c. Warning bell.
- d. Transmission contacts (normally closed) for phone dialer. (Not provided by Owens-Corning).
- e. Panel Housing Materials: Fiberglass
- f. Two spare light bulbs.
- g. Wall mounted hardware.
- h. Alarm bell silence switch.
- i. Hasp for padlock.

Note: All wiring materials are provided by the contractor. Wiring is required from the power source to the control panel and from the control panel to the probe assembly.

OR

C. Inventory Control and Leak Detection System:

1. General: A system with combined inventory control in-tank leak detection, in-line leak detection, Interstitial leak sensing and vapor sensing capabilities. The system shall be of a modular design that allows it to be configured with monitoring input and output capabilities, as required to suit the following requirements:
2. Wall Mounted Console with the following:
 - a. A 2-line, 20 character illuminated display for on-site viewing of all inventory, leak detect, alarm, and diagnostic information.
 - b. A 16-button front panel keyboard with control and numeric functions for programming, operating, testing, and reporting.
 - c. Three front panel LEDs to provide a visual indication of normal operation, trouble, and alarm conditions.
 - d. An internal 90db audible alarm and trouble indicator.
 - e. Intrinsically safe Tank Level Monitor Probes and Leak Sensors.
 - f. Underwrite Laboratory (UL) listed.
 - g. Three Levels of diagnostic: Power up/System test, Continuous Functional test, and Service tests, Comprehensive reporting codes for hardware problems.

- h. 250 Event History Log to record Alarms, Troubles, AC power Off and On and changes to System setup.
 - i. An integral report printer for hard copy documentation of inventory, leak detect and alarm conditions. Printer shall use Non-Thermal Paper.
 - j. RS-232 communications interface module providing data transmission via Local Port, Modem Port, and Pass Through Port (allows connection of modem port data to a second RS-232 serial device) Provide necessary protocol to allow remote monitoring by the Central Building Automation System.
 - k. Two 4-relay output modules programmable to alarm limits, and alarm functions capable of actuating up to 10 amp alarm and control devices.
 - l. An 8-input in-tank probe module compatible with magnetostrictive probes.
 - m. A 4-input interface module compatible with thermistor liquid sensors used in sumps and interstitial space.
 - n. A 4-input interface module compatible with adsorption vapor sensors used in monitoring wells.
3. Tank Level Monitor with Magnetostrictive Probe:
- a. Belden 8760 (or equivalent) twisted pair with shield data cable for runs up to 500 feet (or) Belden 9182 (or equivalent) twisted pair with shield data cable for runs up to 2500 feet.
 - b. Leak detection capability of 0.2 and 0.1 GPH.
 - c. Third-party certification according to the U.S. EPA's "Standard Test Procedure for Evaluating Leak Detection Methods: Automatic Tank Gauging Systems". (0.2 GPH Leak Test)
 - d. Third-party certification according to the U.S. EPA's "Standard Test Procedure for Evaluating Leak Detection Methods: Volumetric Tank Tightness Testing Method". (0.1 GPH Leak Test)
 - e. 5 RTD's to measure product temperature.
4. Sensors:
- a. Thermistor liquid sensors for sump and interstitial space.
 - b. Adsorptive vapor sensors for each monitoring well.
5. Operating Capabilities:

- a. The ability to monitor inventory in up to eight tanks and produce a combination of automatic and manual reports which include the following information:
 1. Fuel Volume, Gross
 2. Fuel Volume
 3. Fuel Height
 4. Water Volume
 5. Water Height
 6. Fuel Temperature
 7. Fillage to 95%
 8. Last inventory amount
 9. Last Water removal amount
 10. Time and Date
 11. Tank identification
 12. Fuel identification
- b. The ability to perform both automatic and manually activated leak detection tests in compliance with Federal EPA regulations 40 CFR Part 280, which includes a leak analysis report. This leak analysis report must indicate tanks failing a test, tanks passing a test and tanks invalidated from a test, as well as the reasons for the invalidation.
- c. The ability to monitor up to 16 interstitial areas and/or containment sumps.
- d. The ability to monitor up to 8 line leak detector sensors.
- e. A line leak detector interface module compatible with a line leak detector sensor that performs a positive displacement volumetric line test.
- f. A line leak detector that in most applications uses the pump power wires for connection between the LLD interface with the LLD sensor.
- g. Four programmable automatic reports for time of report, destination (printer, local port, modem port), and report contents.
- h. Programmable fuel thermal Coefficient of Expansion.
- i. Programmable alarm limits to warn of:
 1. High Product Level
 2. High Water Level
 3. Low Inventory
 4. Leaks
 5. Thefts
- j. System must have continuously running diagnostics to detect equipment malfunctions. Trouble Codes and Alarm conditions must be displayed

until the operator acknowledges the alarm/trouble and the condition is corrected.

- k. System must be capable of the following performance specifications:
 - 1. Relative Height of Fuel +/- 0.02
 - 2. Level Precision +/- .00075"
 - 3. Relative Temperature of Fuel +/- 0.5 deg F
 - 4. Temperature Precision +/- 0.0021 deg F
 - 5. Leak Detection Rate of 0.1 GPH
 - 6. Time +/- 1 minute/month
 - 7. Height of Water 0.659 " up to diameter (at probe location)
- l. Store in memory at least ten delivery reports per tank.
- m. Provide alarm history reports on demand, locally or remotely.
- n. Provide flexible console profile setup with U.S. or metric measurements.
- o. System must store up to 250 history events.
- p. Provides and declares self-diagnosed troubles via trouble codes visible on the display.

D. Liquid Level Indicator:

- 1. Hydrostatic type with integral hand pump as source of air.
- 2. Read actual amount of fuel in tank directly in gallons on circular gage with minimum 15" pointer travel.
- 3. Include all accessories and tubing. Based on Preferred - Rimcor TG-HP-15.

E. Vent Cap:

- 1. Mushroom type, cast iron galvanized, 2" female pipe threaded, with screen. Based on General Tanks.

F. Fill or Sounding Line Cap: Flush lock type fill box with brass plug, 2" female pipe threads and overflow spill container sufficient to hold contents of delivery hose if the tank is overfilled. Based on General Tanks.

G. Fuel Oil Pump:

- 1. General Description: Single-stage, direct drive, close coupled, positive displacement rotary type, with the following features and accessories: foot-mounted, cast-iron housing, close grain, cast iron rotors, hardened steel guided roller bearings, steel shaft, standard mechanical seals, build-in pressure relief bypass, steel base, and drive coupling. Provide pumps with capacities and electrical characteristics as scheduled for number 2 fuel oil. Pumps shall be constructed in accordance with UL 343 and be UL listed and bear the UL label.

H. Manhole and Cover:

1. Type: Cast iron, round solid cover with brass lifting handle, flanged rim, 22'-4" clear opening. Type of storage tank below cast in cover.

I. Fuel Filter:

1. Type: Replaceable cartridge.
2. Construction: Cast iron steel covered and coated with an impervious epoxy coating. Threaded inlet and outlet with air vent.
3. Cartridge: Wood felt element designed to remove both solids and moisture.
4. Capacity: 24 GPH.

Based on General Oil Filter.

J. Dual or Single Slip Tank Fitting

1. Brass bushing 2" mat, brass tubing compression fittings, suitable for copper tubing.

Based on General Tank

K. Overflow Prevention Valve:

1. Aluminum drop tube with integral float activated shut-off valve to reduce flow to the tank to 5 GPM when the liquid level reaches 95% of the tank capacity and stop flow into the tank if the liquid level reaches 98% of the tank capacity.

L. Liquid and Vapor Monitoring Wells:

1. Monitoring pipes shall be constructed of Schedule 40 PVC, a minimum of 4" in diameter and shall extend to a minimum depth of 2' below the bottom of the tank. The monitoring pipes shall have a minimum/maximum slot size of .020/.025" and be screened from the bottom to within 2' of the ground surface
2. The monitoring pipes shall be capped and protected from traffic with a Emco Wheaton Model A722-001 12" diameter manhole and clearly identified "monitoring well" to avoid confusion with product fill

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Improvements: The Fuel Facility Contractor shall include the following elements in the design and construction of the Presidents Drive Fuel Facility:

1. Permits and Codes: Contractor is responsible for obtaining all necessary permits/certifications for the improvements including but not limited to Orange County Building Permit, Dewatering Permit, FDEP Underground Storage Tank registration. Contractor and engineer are responsible to meet all necessary code requirements for design, construction and service of the fuel

facility. Orange County Risk Management will be responsible for the tank registration with FDEP.

2. Geotechnical Engineer: Contractor is responsible for procuring an engineer for all geotechnical requirements to design, bid, and construct all improvements.
3. Surveyor: Contractor is responsible to retain a Florida registered surveyor to establish topographic data to design and construct all improvements. Also, surveyor is required to provide a certified as-built survey for all new improvement.
4. Utilities: Provide utility feeds to all the new work and maintain existing utilities to existing site not included in the work Coordinate with utility companies providing the services. Utility feeds may include, but are not limited to, electric, natural gas, water, sewer, fire protection, communication, etc.
5. Site Improvement Plans: Engineer must supply signed and sealed engineering drawings for the all components of the site improvements including but not limited to Lighting/Photometric, Electrical and Data utilities, Paving and Grading design to meet site requirements and coordination of site grades by Reynolds Smith and Hill design drawings, Structural Design, Fuel Facility Site Plan and elevations for the purpose of permitting and construction. Engineer is responsible for the final site plan and component layout for the project.
6. Site and Staging Plan: Provide a Site and Staging Layout for the Work. The County must approve this plan before any work is to commence.
7. Signage: Design must include all applicable signage to meet site requirements, and all federal and local ordinances

B. Demolition

The Fuel Facility Contactor shall include the following elements in the demolition of the existing site area:

1. Where pavement is to be removed the Contractor my saw-cut existing pavement.
2. Any vegetation that is within the work area the Contractor will be responsible to remove all required vegetation and roots prior to installation and backfill.
3. All unsuitable material must be removed in a lawful manner. Contractor is responsible for all cut and fill calculations associated with the project.
4. Contractor is responsible for all demolition, clearing, and grubbing within the proposed site area as well as finished grading. Refer to Orange County Utilities specifications Division 2 for additional information.

5. Pervious areas disturbed by construction shall be solid sodded using type of existing sod
6. Contractor is responsible for coordinating and providing necessary cover and clearances of existing utilities.

C. Underground Storage Tanks General Requirements

1. Install all items in strict accordance with the manufacturers written installation instructions
 2. Submit after completion, a copy of the installation checklist accompanying the storage tank
 3. Marker tape should be installed above fuel oil supply, return and vent pipes. Locate tape 6" below finished grade
 4. Excavate to a sufficient depth for a minimum of 3 foot earth cover from top at tank to grade; allowing for cast-in-place, reinforced concrete ballast pad, plus 6 inches of sand or pea gravel between ballast pad and tank. Excavation shall extend one foot around the perimeter of the tank. Should rock be present at the proposed elevation of the hold-down pad, excavate the rock a minimum of 12" below the pad elevation and backfill with crushed stone to achieve the elevation required for the hold-down pad
 5. Set tie down eyelets for hold-down straps in concrete ballast pad and tie to reinforcing steel
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6. Set tie down eyelets for hold-down straps in concrete ballast pad and tie to reinforcing steel.
 7. Place 6 inches of clean sand or pea gravel on top of ballast pad.
 8. An air test of the tank is required prior to installation in excavation. Pressure should be in accordance with manufacture's specifications any defects shall be corrected in accordance with the tank manufacturer.
 9. Set tank on fill materials.
 10. Install hold down straps. Exercise special care to install in strict accordance with manufacturer's recommendation.
 11. Backfill excavation with clean pea gravel. Tamp backfill to consolidate. Take special care when installing backfill along bottom sides of tank to assure the bottom quadrant of the tank is fully supported by backfill.
 12. Installation shall be by a contractor trained by the tank manufacturer in the installation of fiberglass tanks.
 13. The underground tank shall be protected from damage by overloading during construction.
 14. Water shall not be allowed in tank at any time and the tank shall be protected from flotation.

15. Slope tank as required for leak detection system to properly operate.
16. The plugs at unused tank openings shall be removed, a pipe compound shall be added and the plugs shall be reinstalled in the unused openings.
17. Suction Line and Return Line: Shall be installed on site by the contractor.
18. Tank shall be filled with fuel by Orange County Utilities as soon as it is anchored and backfilled and, the FDEP approved of all aspects of the tank (tank tightness, piping testing and proper working condition of monitoring equipment).
19. Complete all work listed in the manufacturer's checklist and obtain a certificate of use in accordance with Code.
20. All rigid piping shall be terminated a minimum of 4" from the bottoms of four, six, eight and ten foot diameter tanks and 6" from the bottom of 12 ft. O.A. tanks.
21. Inventory Control and Tank Leak Detection System with Remote Electronic Panel: Install in accordance with manufacturer's written installation instructions.
22. Locate remote panel as indicated on engineering drawings.
23. Provide 115 V power supply to console from adjacent 115 V source provided by Division 16. Coordinate electrical service and control monitoring interface with electrical and controls sub-contractors.
24. Provide necessary conduit and accessories for low voltage connection to probes. See Division 16 for material specification.
25. Liquid Level Indicator: Install in location as indicated on engineering drawings. Transmission tubing shall be installed in 3/4" conduit with sweep elbows or long radius bends.
26. Vent Cap to be installed per engineering drawings
27. Fill or Sounding Line Cap: Set cap in concrete slab, as detailed on drawings. Slab shall be crowned to assure water will run away from the cap.
28. Label cap for proper usage, i.e., "Sounding Line", "Fill Cap".
29. Fuel Oil Pump:
 - a. Install on concrete base weighing a minimum of 2-1/2 times the weight of the pump.
 - b. Install a stainless steel pan between pump and base a minimum of 1" high and suitable for catching any oil spillage which might occur at pump connections.

- c. Install manual air vent at top of volute casing.
 - d. Provide suction strainer and discharge check valve.
30. Manhole and Cover: Install as indicated by engineering drawings.
 31. Fuel Filter Install as indicated on by engineering drawings.
 32. Dual or Single Slip Tank Fittings: Install as indicated on engineering drawings.
 33. Overflow Prevention Valve: Install in accordance with manufacturer's written instructions.
 34. Piping Installed per manufacturer's specifications as indicated on engineering drawings:
 35. Liquid and Vapor Monitoring Wells: Provide two permanent monitoring wells on opposite corners of tank installation.
 36. Provide 115 V power supply to console from adjacent 115 V source provided by Division 16.
 37. Provide necessary conduit and accessories for low voltage connection to probes.

END OF SECTION

09060A-- POLISHED CONCRETE FLOORING

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes: Products and procedures for bonded abrasive polishing concrete floors using multi-step wet/dry mechanical process, and accessories indicated, specified, or required to complete polishing.
- B. This section shall be in accordance with the Technical Specifications for Pre-Engineered Metal Buildings – PEMB Package, By Reynolds Smith and Hills. Refer to this package for additional information associated with Division 1, General Requirements. .
- C. The phasing and scheduling of this work shall be coordinated with the Interior Renovation Contractor. The sequence of the work shall be coordinated and the floor finishing shall not commence until the Interior Contractor has demolished the existing floor and repaired all necessary floor damage.
- D. Refer to the exhibit associated for locations of the proposed concrete refurbishing. The work will consist of approximately 23,700 square feet of existing concrete. Approximately 13,200 square feet of high bay workshop space that is mostly painted or sealed concrete. Approximately 10,500 square feet of proposed low bay workshop space that is currently office space with mostly carpet and vinyl tile.
- E. Contractor is responsible for verifying all dimensions and areas.

1.2 DEFINITIONS

- A. Terminology: As defined by CPAA.
- B. Polished Concrete: The act of changing a concrete floor surface, with or without aggregate exposure, to achieve a specified level of gloss.
- C. Bonded Abrasive Polished Concrete: The multi-step operation of mechanically grinding, honing, polishing of a concrete floor surface with bonded abrasives to cut a concrete floor surface and to refine each cut to the maximum potential to achieve a specified level of finished gloss as defined by the CPAA.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's technical literature for each product indicated, specified, or required. Include manufacturer's technical data, application instructions, and recommendations.
- B. Installer Qualifications: Data for company, principal personnel, experience, and training.
- C. Maintenance Data:
 - 1. Include instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated use.
 - 2. Include precautions against cleaning products and methods which may be detrimental to finishes and performance.
- D. This section shall be in accordance with the Technical Specifications for Pre-Engineered Metal Buildings – PEMB Package, By Reynolds Smith and Hills. Refer to this package for additional information associated with Division 1, General Requirements

1.4 QUALITY ASSURANCE

- A. Polisher Qualifications:
 - 1. Experience: Company experienced in performing specified work similar in design, products, and extent to scope of this Project; with a record of successful in-service performance; and with sufficient production capability, facilities, and personnel to produce specified work.
 - 2. Supervision: Maintain competent supervisor who is at Project during times specified work is in progress.
 - 3. Manufacturer Qualification: Approved by manufacturer to apply liquid applied products.
- B. Walkway Auditor: Certified by CPAA or NFSI to test bonded abrasive polished concrete floors for dynamic and static coefficient of friction according to ANSI B101.1 and B101.3.
- C. Coefficient of Friction: Achieve following coefficient of friction by field quality control testing in accordance to the following standards:
 - 1. ANSI B101.1 Static Coefficient of Friction - Achieve a minimum of .42 for level floor surfaces.

2. ANSI B101.3 Dynamic Coefficient of Friction - Achieve a minimum of .35 for level floor surfaces.

PART 2 – PRODUCTS

2.1 LIQUID APPLIED PRODUCTS

- A. Liquid Densifier - Retro Plate 99®: A chemically reactive stabilizer which enhances concrete density and hardness, allowing the concrete to be finished to a high cosmetic, marble like sheen. May be used in conjunction with the Retro Plate Concrete Polishing System.
- B. Sealer - RetroGuard™: A modified acrylic sealer yielding high reflectivity which will penetrate into the polished and densified concrete leaving a protective surface film of less than .05 mils which meets the OSHA requirements for slip resistance as tested by ASTM D 2047 and stain resistance of ASTM D 1308

2.2 ACCESSORIES

- A. Repair Material: A product that is designed to repair cracks and surface imperfections.

The specified material must have sufficient bonding capabilities to adhere after the polishing to the concrete surface and provide abrasion resistance equal to or greater than the surrounding concrete substrate.

- B. Grout Material: A thin mortar used for filling spaces. Acceptable products shall be:
 - a. Epoxy, urethane, polyurea, or polyaspartic resins.
 - b. Latex or acrylic binders mixed with cement dust from previous grinding steps.
 - c. Silicate binders mixed with cement dust from previous grinding steps.

2.3 POLISHING EQUIPMENT

- A. Field Grinding and Polishing Equipment:
 1. A multiple head, counter rotating, walk behind or ride on machine, of various size and weights, with diamond tooling affixed to the head for the purpose of grinding concrete.
 2. If dry grinding, honing, or polishing, use dust extraction equipment with flow rate suitable for dust generated, with squeegee attachments.
 3. If wet grinding, honing, or polishing, use slurry extraction equipment suitable for slurry removal and containment prior to proper disposal.

- B. Edge Grinding and Polishing Equipment: Hand-held or walk-behind machines which produces same results, without noticeable differences, as field grinding and polishing equipment.
- C. Burnishing Equipment: High speed walk-behind or ride-on machines capable of generating 1000 to 2000 revolutions per minute and with sufficient head pressure of not less than 20 pounds to raise floor temperature by 20 degrees F.
- D. Diamond Tooling: Abrasive tools that contain industrial grade diamonds within a bonded matrix (such as metallic, resinous, ceramic, etc.) that are attached to rotating heads to refine the concrete substrate.
 - 1. Bonded Abrasive: Abrasive medium that is held within a bonding that erodes away to expose new abrasive medium as it is used.
 - 2. Metal Bond Tooling: Diamond tooling that contains industrial grade diamonds with a metallic bonded matrix that is attached to rotating heads to refine the concrete substrate used in the grinding and early honing stages of the polishing process.
 - 3. Resin Bond Tooling: Diamond tooling that contains industrial grade diamond within a resinous bonded matrix (poly-phenolic, ester-phenolic, thermoplastic-phenolic) that is attached to rotating heads to refine the concrete substrate used for the later honing and polishing stages of the polishing process.
 - 4. Hybrid Tooling: Diamond tooling that combines metal bond and resin bond that has the characteristics of both types of tooling used as either transitional tooling from metal bond tools to resin bond tools or as a first cut tool on smooth concrete surfaces.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Acceptance of Surfaces and Conditions:

- 1. Examine substrates to be polished for compliance with requirements and other conditions affecting performance. Starting work within a particular area will be construed as acceptance of surface conditions.

3.2 POLISHING CONCRETE FLOORS

- A. Perform all polishing procedures to ensure a consistent appearance from wall to wall. Control dust from floor polishing operations using full containment procedures and equipment necessary to keep surrounding air clean.
- B. Initial Grinding:

1. Use grinding equipment with metal or semi-metal bonded tooling.
2. Begin grinding in one direction using sufficient size equipment and diamond tooling to meet specified aggregate exposure class.
3. Make sequential passes with each pass perpendicular to previous pass using finer grit tool with each pass, up to 100 grit metal bonded tooling.
4. Achieve maximum refinement with each pass before proceeding to finer grit tools.
5. Clean floor thoroughly after each pass using dust extraction equipment properly fitted with squeegee attachment or walk behind auto scrubber suitable to remove all visible loose debris and dust.

C. Treating Surface Imperfections:

1. Fill surface imperfections including, but not limited to, holes, surface damage, small and micro cracks, air holes, pop-outs, and voids with grout to eliminate micro pitting in finished work.

D. Liquid Densifier Application: Apply undiluted to point of rejection, remove excess liquid, and allow curing according to manufacturer's instructions.

E. Grout Grinding:

1. Use grinding equipment and appropriate grit and bond diamond tooling.
2. Apply grout, forced into the pore structure of the concrete substrate, to fill surface imperfections.
3. Clean floor thoroughly after each pass using dust extraction equipment properly fitted with squeegee attachment or walk behind auto scrubber suitable to remove all visible loose debris and dust.

F. Honing:

1. Use grinding equipment with hybrid or resin bonded tooling.
2. Hone concrete in one direction starting with a 100 grit tooling and make as many sequential passes as required to remove scratches, each pass perpendicular to previous pass, up to 400 grit tooling reaching maximum refinement with each pass before proceeding to finer grit tooling.
3. Clean floor thoroughly after each pass using dust extraction equipment properly fitted with squeegee attachment or walk behind auto scrubber suitable to remove all visible loose debris and dust.

G. Polishing:

1. Use polishing equipment with resin-bonded tooling.

2. Begin polishing in one direction starting with 800 grit tooling.
3. Make sequential passes with each pass perpendicular to previous pass using finer grit tooling with each pass until the specified level of gloss has been achieved.
4. Achieve maximum refinement with each pass before proceeding to finer grit pads.
5. Clean floor thoroughly after each pass using dust extraction equipment properly fitted with squeegee attachment or walk behind auto scrubber suitable to remove all visible loose debris and dust.
6. Stain Protection: Uniformly apply and remove excessive liquid according to manufacturer's instructions. Final film thickness should be less than .05 mils after cure.
7. Final Polish: Using burnishing equipment and finest grit abrasive pads, burnish to uniform reflective sheen matching approved field mock-up.

H. COLORATION SYSTEM:

1. Ameripolish®, JCPenney Grey.

I. Final Polished Concrete Floor Finish:

1. Aggregate Exposure Class A – Surface Cream Finish: Remove very little of concrete surface by grinding and polishing resulting in appearance of little aggregate exposure.
2. Finished Gloss Level 3 – High Sheen Gloss Appearance (800-grit):
 - a. Procedure: Recommended not less than 6 step process with full refinement of each diamond tool with one application of densifier.
 - b. Gloss Measurement: Determine the specular gloss by incorporating the following:
 - 1.) Reflective Clarity Reading: Not less than 65 according to ASTM D5767 prior to the application of sealers.
 - 2.) Reflective Sheen Reading: Not less than 60 according to ASTM D523 prior to the application of sealers.

3.3 FIELD QUALITY CONTROL

- A. Field Testing: Engage a qualified walkway auditor to perform field testing to determine if polished concrete floor finish complies with specified coefficient of friction;
 - 1. ANSI B101.1 for static coefficient of friction
 - 2. ANSI B101.3 for dynamic coefficient of friction

3.4 STAGING AND ACCESS

- A. Access to construction area and locations of areas to store tools and materials will be discussed at the mandatory walk-through.

**Report of Subsurface Exploration
And Geotechnical Engineering Evaluation
Orange County Utilities Field
Operation Center Improvements
Orange County, Florida
Contract No. Y8-906A**

January 19, 2010
Project No. 01-08-0335-110A

Mr. Mike Hicks
Orange County Utilities
9150 Curry Ford Road
Orlando, Florida 32825

Report of Subsurface Exploration and Geotechnical Engineering Evaluation
Orange County Utilities Field Operation Center Improvements
Orange County, Florida
Contract No. Y8-906A

Dear Mr. Hicks:

Nodarse & Associates, Inc. (N&A) is pleased to present you with this report of subsurface exploration and geotechnical engineering evaluation for the above-referenced project. The purpose of the exploration was to evaluate subsurface conditions at the site related to structural slab, parking, and stormwater pond additions at the site. This report describes our understanding of the project, presents the results of the field exploration, and provides our geotechnical engineering evaluations and recommendations for the proposed development.

PROJECT DESCRIPTION

The project site is located on the west side of Presidents Drive, south of Sand Lake Road and east of Florida's Turnpike in Orange County, Florida. The site is the location of the existing Orange County Utilities Field Operations Center building, with both paved and unpaved parking and driveway areas and two (2) wet-bottom stormwater ponds. Proposed improvements consist of conversion of current unpaved parking areas into paved parking and driveway areas, expansion of the northern wet-bottom stormwater pond to the southeast, and a structural slab for material storage.

Based on review of aerial photography and the USGS quadrangle map containing the site the following site conditions are offered:

- The site is relatively flat with ground surface elevations near +95 feet.

- A drainage ditch parallel to Florida's Turnpike is located along the western boundary of the site.
- Wet stormwater ponds are present on the northwestern and southern portions of the site.
- The proposed location of the additional stormwater ponds are currently lower-lying depressional areas.

The USDA NRCS Soil Survey for Orange County indicates that the predominant soil type present on the site is *Smyrna fine sand*. This soil type typically has a seasonal high groundwater table within 1 foot of natural grade. *Basinger fine sand, depressional* is mapped in the southern portion of the site. Under natural conditions, this soil type contains standing water for most of a typical rainfall year. Due to significant development in the project area, seasonal high groundwater levels have likely been affected by established drainage systems.

SUBSURFACE CONDITIONS

The field exploration performed for this study included one (1) Standard Penetration Test (SPT) boring (TB-1) to a depth of 15 feet in the approximate location of the proposed material storage area and four (4) auger borings (AB-1 through AB-4) to a depth of 15 feet in the proposed pavement and stormwater pond locations. The borings were performed at approximate locations specified by Reynolds, Smith, and Hills, Inc. (RS&H). However, the location of TB-1 was moved at the request of the maintenance yard personnel. The borings were located in the field by referencing prominent site features and measuring from these features. The approximate boring locations are presented on **Figure 1**.

Generally, soil conditions observed in the borings were as follows:

- Light gray-brown to gray-brown fine sand and slightly silty fine sand (SP, SP-SM/Stratum 1) at the existing ground surface to depths of 5 to 15 feet.
- Gray-brown to brown silty fine sand and silty to clayey sand (SM, SM-SC/Stratum 2) to the boring termination depths of 15 feet.
- SPT blow counts in TB-1 ranged from 11 to 18 indicating a relative density of medium dense. However, the upper 4 feet of the boring was hand augered due to concerns for buried utilities.

The subsurface conditions observed at each boring location are presented in profile form on **Figure 1**.

Groundwater levels measured in the open boreholes during our field exploration (January 13, 2010) indicate that groundwater ranged from 2.5 to 5 feet below the existing ground surface. Groundwater levels will fluctuate with the amount of local rainfall and with site development and, therefore, may be different at other times. Typical estimated seasonal high groundwater levels for the site in its present condition are expected to be about 1.5 to 3 feet higher than those recorded during our field exploration. Estimated of seasonal high groundwater levels at each boring location are presented adjacent to the profiles on **Figure 1**. However, changes in drainage characteristics due to site development or the installation and operation of irrigation systems may cause significant deviations from these anticipated estimated seasonal high groundwater levels.

EVALUATIONS AND RECOMMENDATIONS

The following conclusions and recommendations are based on the project characteristics previously described, the data obtained in our field exploration and our experience with similar subsurface conditions and construction types. If the final structural slab, pavement, or pond locations or grades are significantly different from those previously described in this report, or if subsurface conditions different from those disclosed by the borings are encountered during construction, we should be notified immediately so that we might review and modify, if necessary, the following recommendations in regards to such changes.

In summary, it appears the subsurface conditions observed are suitable for the proposed improvements to the site. Routine or normal site preparation, including clearing, grubbing, and proofrolling, will be required to provide adequate support of the structural slab and pavement areas. Due to relatively high groundwater conditions at the site, proposed grades are assumed to be at or slightly above existing grades.

Foundation Design: Once the existing subgrade and/or new fill soils in the proposed structure area have been prepared in accordance with the recommendations in this report, the proposed slab can be constructed on a system of conventional shallow spread or strip footings bearing at minimum depths below the finished floor elevations. Footings which bear in densified existing soils or in new structural fill may be designed based on a maximum allowable bearing pressure of 2,000 pounds per square foot. Minimum footing dimensions of 18 inches should be used even though the maximum allowable bearing pressures may not be fully developed in all cases. Footings should bear at least 16 inches below finished exterior grades. Footing subgrade soils should be approved by the Geotechnical Engineer prior to placement of concrete and steel. As a minimum acceptance criterion, the footing subgrade soils should be compacted to a minimum density of 95% of the soils modified Proctor maximum dry density for a depth of 12 inches.

Pavement Section Recommendations: Heavy truck traffic is anticipated in the parking and driveway areas. For the driveways and parking areas, the following typical pavement section is recommended:

- 2 inches of asphaltic concrete;
- 8 inches of limerock base; and,
- 12 inches of stabilized subgrade (min. LBR = 40). Stabilizing agents to consist of coarse granular admixtures such as limerock screenings crushed shell, recycled concrete, etc. Fine admixtures, such as silty and/or clayey soils are not permitted.

Use of a soil cement base in lieu of limerock is an acceptable alternative. However, it should be noted that cracking typical of a soil cement pavement section may not provide as an aesthetically pleasing pavement surface. If soil cement is substituted for the limerock base, a compacted subgrade to a minimum of 95 percent of the soil's modified Proctor maximum dry density to a depth of at least 12 inches below the pavement base can be used instead of a stabilized subgrade.

Use of a concrete pavement section is also an acceptable alternative. For the parking and driveway areas, a 6-inch concrete pavement (with a 28-day compressive strength of 4,000 psi) is recommended. The subgrade beneath the concrete should be compacted to a minimum of 98 percent of the soil's modified Proctor to a depth of at least 24 inches. Expansion joints should be placed at normal spacing for the recommended thickness of concrete.

Regardless of the pavement section selected the subgrade to at least 24 inches below the pavement base should consist of well-draining, inorganic, non-cohesive sand with less than 12 percent fines content by weight. In-situ soils of Stratum 1 are suitable for use as pavement subgrade.

A minimum of 12 inches between the estimated seasonal high groundwater table and the bottom of a pavement base or concrete pavement section should be maintained. If a limerock pavement base is used, a minimum separation of 18 inches is recommended.

Stormwater Ponds: We understand two (2) wet bottom stormwater ponds are proposed in the northern portion of the site. Generally, soil conditions observed in the proposed pond locations consisted of fine sand to slightly silty fine sand (Stratum 1) to depths of 5 to 10 feet followed by silty to clayey sand (Stratum 2) to the boring termination depths of 15 feet.

Groundwater levels were observed at depths of 2.5 to 4 feet below existing grade. For pond design, a seasonal low groundwater table 0.5 to 1 foot below those observed during the exploration is recommended. Estimated seasonal high groundwater levels are expected to be 1.5 to 3 feet above those observed during the exploration. Estimated seasonal high groundwater levels are presented adjacent to the soil profiles on **Figure 1**.

Borrow Suitability: The following recommendations are offered for re-use of soils excavated from stormwater ponds as fill material:

- Stratum 1 is fine sand and slightly silty fine sand and is suitable for use as fill in the structural slab and pavement areas, following adequate stripping. Due to low fines content this material is suitable for use as pavement subgrade.
- Stratum 2 is silty to clayey fine sand. Due to higher fines content and lower permeability properties of this material, use of this material as fill is not recommended in pavement and open space areas. This material will be more difficult to dry and compact than Stratum 1 and additional efforts should be anticipated if this material is used as fill in deeper fill areas.

Elevated Berms: Elevated berms should be constructed in accordance with the following steps:

- Clear and grub the berm site to remove vegetation, debris and highly organic topsoil and other deleterious materials encountered.
- Proofroll the berm location with a loaded dump truck, static roller or other appropriate compaction equipment. These operations should be observed by a representative of the Geotechnical Engineer. Soils which yield excessively in the judgment of the geotechnical engineer's representative should be undercut and replaced with clean soil compacted to 95 percent of the soil's modified Proctor maximum dry density (ASTM D-1557). The proofrolled or compacted surface should be lightly scarified prior to addition of the next lift of fill.
- Construct the berm in level lifts compacted to 95 percent of the modified Proctor maximum density (ASTM D-1557) of the fill materials. Clean sand fill with less than 12 percent fines (Stratum 1) may be placed in loose lifts up to 12 inches in thickness. Sands with higher fines content should be limited to loose lift thicknesses of 8 inches or less. The surface should be lightly scarified between each lift. Compaction testing should be performed for each lift at a frequency not less than one (1) test for each 10,000 square foot of berm placed per lift of fill.
- The exterior berm surface should be sodded after construction.

Assuming the berms are constructed in accordance with the above recommendations, side slopes of 4 horizontal to 1 vertical (4H:1V) or flatter should be stable. If steeper slopes or large differences between the pond stage levels and surrounding groundwater levels are anticipated, N&A should be provided the opportunity to review the berm sections for potential clay core or synthetic liner requirements.

General Site Preparation: The following recommendations are offered with regards to site preparation:

- The initial step in routine site preparation should be the complete removal of all topsoil, trees, major root systems, pavement sections, structures and other deleterious materials from beneath and to 5 feet beyond proposed structure and pavement areas. Based on the boring results, maximum stripping thicknesses are expected to be about 12 inches at this site, or enough to remove existing pavement.
- After this initial stripping process, the entire site should be inspected by a Geotechnical Engineer. At that time, the site should be proofrolled using a large roller. Vibratory compaction is not recommended due to nearby structures.
- Proofrolling of the structural slab and pavement areas should be observed by a Geotechnical Engineer. The purposes of the proofrolling will be to detect any areas where unsuitable soils are present as well as to densify the near-surface loose soils for support of shallow foundations and pavement.
- Materials which yield excessively during the proofrolling should be undercut and replaced with well-compacted structural fill. The Geotechnical Engineer, based on observations at the site, can recommend the nature and extent of any remedial work. Based on our exploration, no major remedial work is anticipated at this site.
- Proofrolling of the structural slab and pavement areas should continue for the required number of passes and until the soil at a depth of 12 inches below the compaction surface has attained a minimum of 95 percent of the soil's modified Proctor maximum dry density as determined by ASTM Specification D-1557.
- In-place density tests should be performed by an experienced Geotechnical Engineering Technician working under the direction of a registered Geotechnical Engineer to verify the required degree of compaction. A test frequency of one (1) test per 2,500 square feet of structural area proofrolled and one (1) test per 5,000 square feet of pavement area proofrolled is recommended.

Fill Placement: After the site has been proofrolled and accepted by the Geotechnical Engineer, fill required to bring the site to final grade may be placed and properly compacted.

- Fill should be inorganic, non-plastic, granular soil (clean sands). Soils of Stratum 1 are suitable for use as fill. The fill should be placed in level lifts not to exceed 12 inches loose thickness if a large compactor is used to compact the fill.

- The fill should be compacted to a minimum of 95 percent of the soil's modified Proctor maximum dry density as determined by ASTM Specification D-1557.
- In-place density tests should be performed on each lift by an experienced Engineering Technician working under the direction of a registered Geotechnical Engineer to verify that the recommended degree of compaction has been achieved. We suggest a minimum testing frequency of one (1) test per lift per 2,500 square feet of area within structural limits and for every 5,000 square feet of area in proposed pavement areas.
- Fill should extend a minimum of 5 feet beyond building lines to prevent possible erosion or undermining of footing bearing soils. Further, fill slopes should not exceed 2 horizontal to 1 vertical.
- Fill placed in utility line trenches and adjacent to footings beneath slabs on grade should also be properly placed and compacted to the specifications stated above. However, in these restricted working areas, compaction should be accomplished with lightweight, hand-guided compaction equipment and lift thicknesses should be limited to a maximum of 4 inches loose thickness.

CLOSURE

N&A appreciates the opportunity to be of service to you on this project. If you should have any questions concerning the contents of this report, or if we may be of further assistance, please do not hesitate to contact us.

Sincerely,

NODARSE & ASSOCIATES, INC.

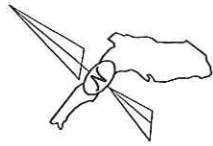


Shenna McMaster, P.E.
Senior Geotechnical Engineer
FL Registration No. 57537

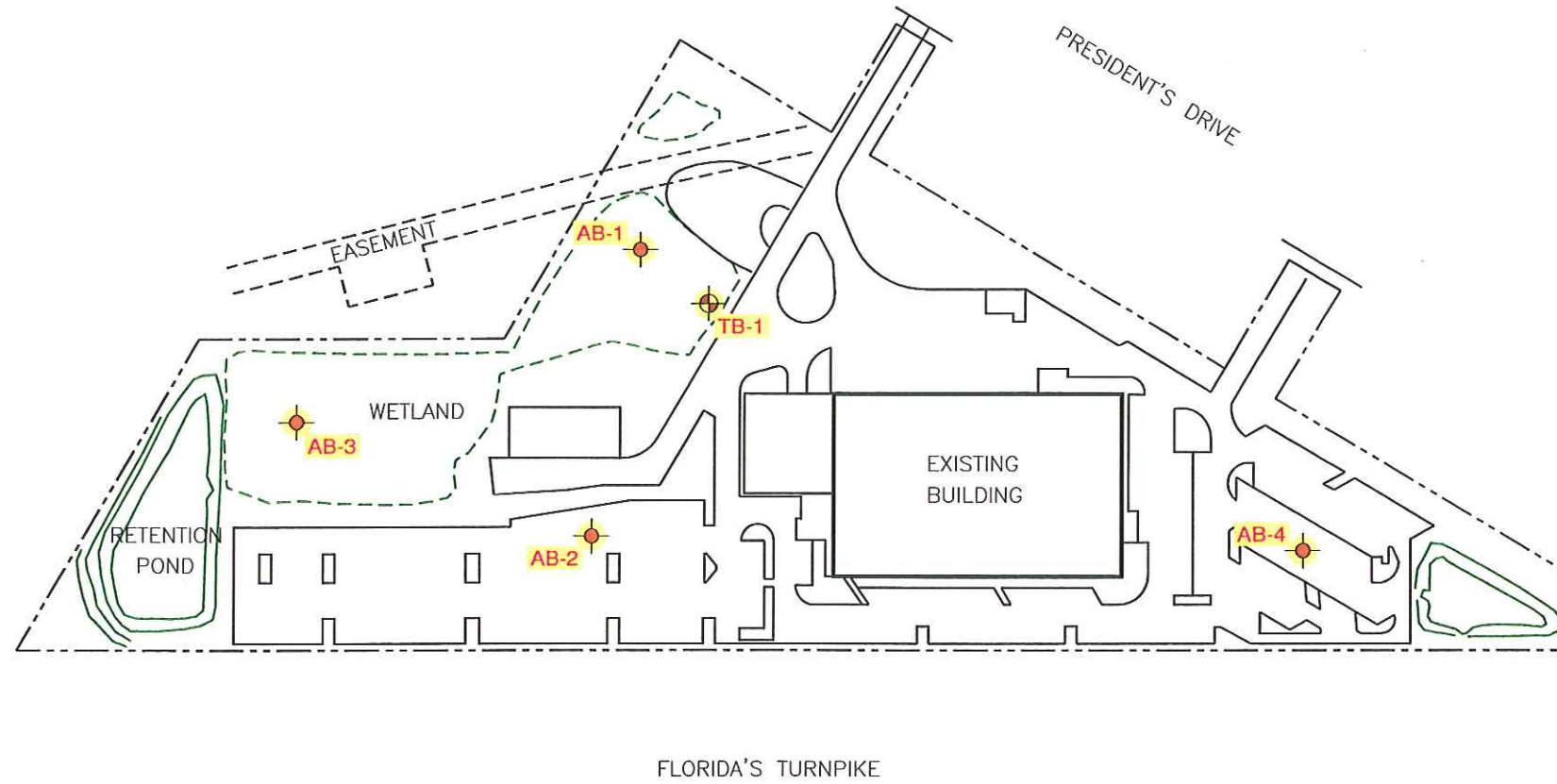
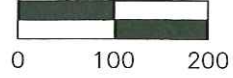


Richard G. Acree, P.E.
Geotechnical Department Manager/VP
FL Registration No. 53962

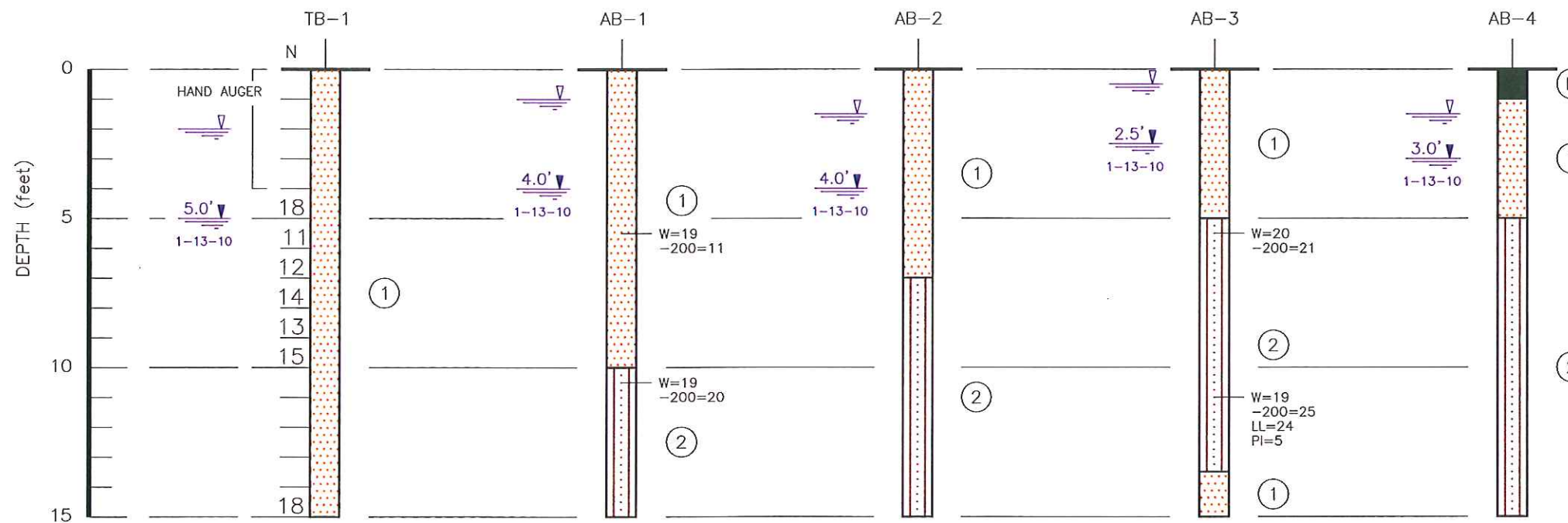
FIGURE



APPROX. SCALE IN FEET



FLORIDA'S TURNPIKE



- APPROXIMATE LOCATION OF STANDARD PENETRATION TEST BORING
- APPROXIMATE LOCATION OF AUGER BORING

- (P) PAVEMENT
- (1) LIGHT GRAY-BROWN TO GRAY-BROWN FINE SAND AND SLIGHTLY SILTY FINE SAND (SP)(SP-SM)
- (2) GRAY-BROWN TO BROWN SILTY FINE SAND AND SILTY TO CLAYEY FINE SAND (SM)(SM-SC)

(SP) UNIFIED SOIL CLASSIFICATION GROUP SYMBOL

5.0' ENCOUNTERED GROUNDWATER LEVEL (feet)
1-13-10 DATE NOTED DURING DRILLING

ESTIMATED SEASONAL HIGH GROUNDWATER LEVEL

N STANDARD PENETRATION TEST BORING
RESISTANCE REPORTED AS BLOWS PER FOOT

W NATURAL MOISTURE CONTENT (%)
-200 FINES PASSING No. 200 SIEVE (%)
LL LIQUID LIMIT (%)
PI PLASTICITY INDEX

GEOTECHNICAL ENGINEERING EVALUATION
ORANGE COUNTY UTILITIES
FIELD OPERATIONS CENTER
ORANGE COUNTY, FLORIDA

DRAWN: SW
CHKD: SM
SCALE: NOTED
DATE: 1-20-10



PROJ. No. 01-08-0335-110A FIGURE: 1

Hydrant Flow Test Report

Date: **18-Jan-13** Time: **7:59 a.m.** Operator: **T.PALERMO**

Temp Conditions

Test Hydrant Information:

Weather: Partly Cloudy

Hydrant Number: **PRES 2** Address: **8100 PRESIDENTS DRIVE**
 N.F.P.A. Colour Code: **BLUE** across from Willis shop

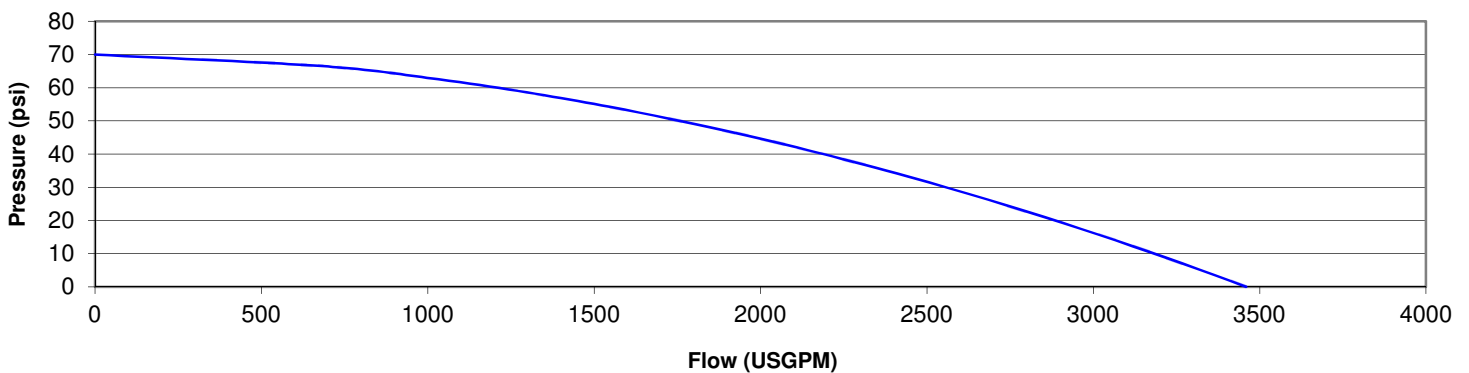
STATIC PRESSURE: **70** psi Pipe Material: _____
 RESIDUAL PRESSURE: **64** psi Pipe Diameter: _____
 Elevation: _____ n/a

Available Flow At Test Hydrant at 20 psi 2885 USGPM 2384 IGPM
 Available Flow At Test Hydrant at 10 psi 3183 USGPM 2631 IGPM

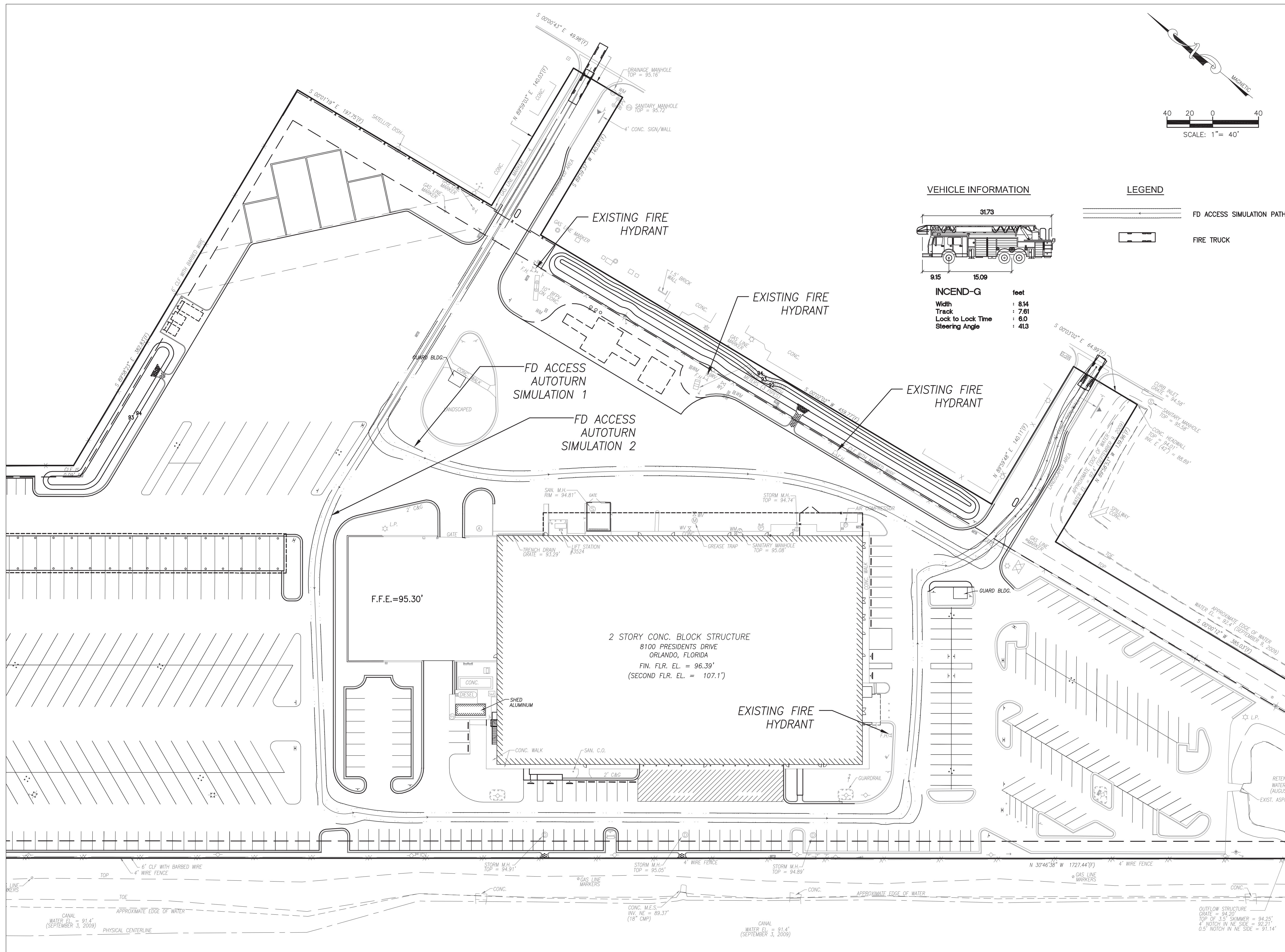
Flow Hydrants Information:

Hydrant No.	Gauge No.	Outlet Dia (in.)	Coefficient (~0.9)	Pitot Gauge Reading (psi)	Flow USGPM
PRES 1		2.5	0.9	30	918.12
		2.5	0.9		
Total Flow (USGPM)					918.12

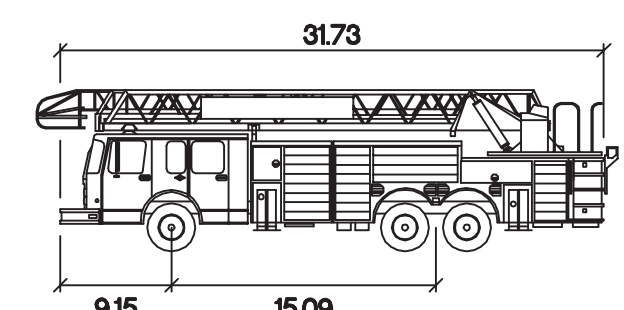
Test Hydrant Flow Data



Comments: **FLOW HYDRANT ADDRESS - 8100 PRESIDENTS DRIVE - BEHIND MASTER METER**
 START CL2 - did not check per Brent
 END CL2 - did not check per Brent
 master meter did not register when flowing this hydrant



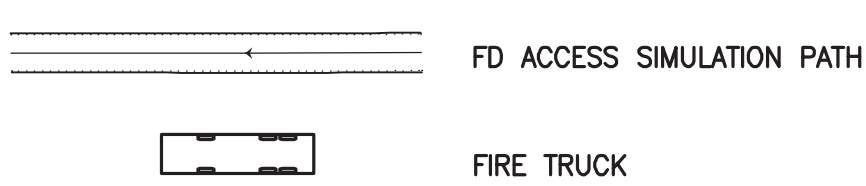
VEHICLE INFORMATION



INCEND-G

Width	: 8.14
Track	: 7.61
Lock to Lock Time	: 6.0
Steering Angle	: 41.3

LEGEND



Reynolds, Smith and Hills, Inc.
 1000 LEGION PLACE, SUITE 800
 ORLANDO, FL 32801
 407-893-5800 FAX 407-648-2128
 www.rsandh.com
 FL.Cert.Nos. AAC001886 - EB0005620 - LCC000210



ORANGE COUNTY UTILITIES
 OPERATIONS CENTER
 8100 PRESIDENTS DRIVE
 ORLANDO, FLORIDA

REVISIONS

NO.	DESCRIPTION	DATE

DATE ISSUED: APRIL 12, 2013
 REVIEWED BY: M. COFFEY, P.E.
 DRAWN BY: D. STALEY
 DESIGNED BY: M. COFFEY, P.E.

AEP PROJECT NUMBER
 107-0745-000

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SHEET TITLE

FIRE TRUCK MANEUVERABILITY EXHIBIT

SHEET NUMBER

EX-1

SITE DATA TABLE	
PROJECT DATA	
OWNER:	ORANGE COUNTY GOVERNMENT
ADDRESS:	301 S. JOSEPH AVENUE ORLANDO, FLORIDA 32802
PHONE:	(407) 838-1000
CONTACT:	WILLIAM W. HERS
AGENCY:	
DESIGNER:	REYNOLDS, SMITH & HILLS, INC.
ADDRESS:	10748 REDWOOD PARK BOLLINGER SOUTH JACKSONVILLE, FLORIDA 32226
PHONE:	(904) 256-2500
CONTACT:	MICHAEL A. COFFEY, P.E.
PROJECT NAME:	
ADDRESS:	ORANGE COUNTY UTILITIES OPERATIONS CENTER 8100 PRESIDENT'S DRIVE ORLANDO, FL
PANEL NUMBER:	33-23-214-7289-05-102
DATE:	07/12/2016
NUMBER OF STOREYS:	2 STORY
HEIGHT:	VARIABLE (MAX. HT. 25')
EXISTING BUILDING SQUARE FOOTAGE:	79,899
PROPOSED BUILDING SQUARE FOOTAGE:	19,899
TYPE OF CONSTRUCTION:	RE
NUMBER OF EMPLOYEES:	177

PRE-DEVELOPMENT LOT DATA:		
ITEM	S.F. (AC)	PERCENT (%)
TOTAL LOT AREA	630,899 (14.489)	100
BUILDING AREA (FOOTPRINT)	63,162 (1.45)	10
TOTAL PAVED AREA	256,133 (6.88)	40
TOTAL IMPERVIOUS AREA **	269,241 (8.27)	56
TOTAL POND AREA	133,823 (3.4)	4

POST-DEVELOPMENT LOT DATA:		
ITEM	S.F. (AC)	PERCENT (%)
TOTAL LOT AREA	630,899 (14.489)	100
BUILDING AREA (FOOTPRINT)	77,036 (1.75)	12
TOTAL PAVED AREA	145,947 (3.34)	23
TOTAL IMPERVIOUS AREA **	446,825 (10.26)	70
TOTAL POND AREA	47,490 (1.09)	7

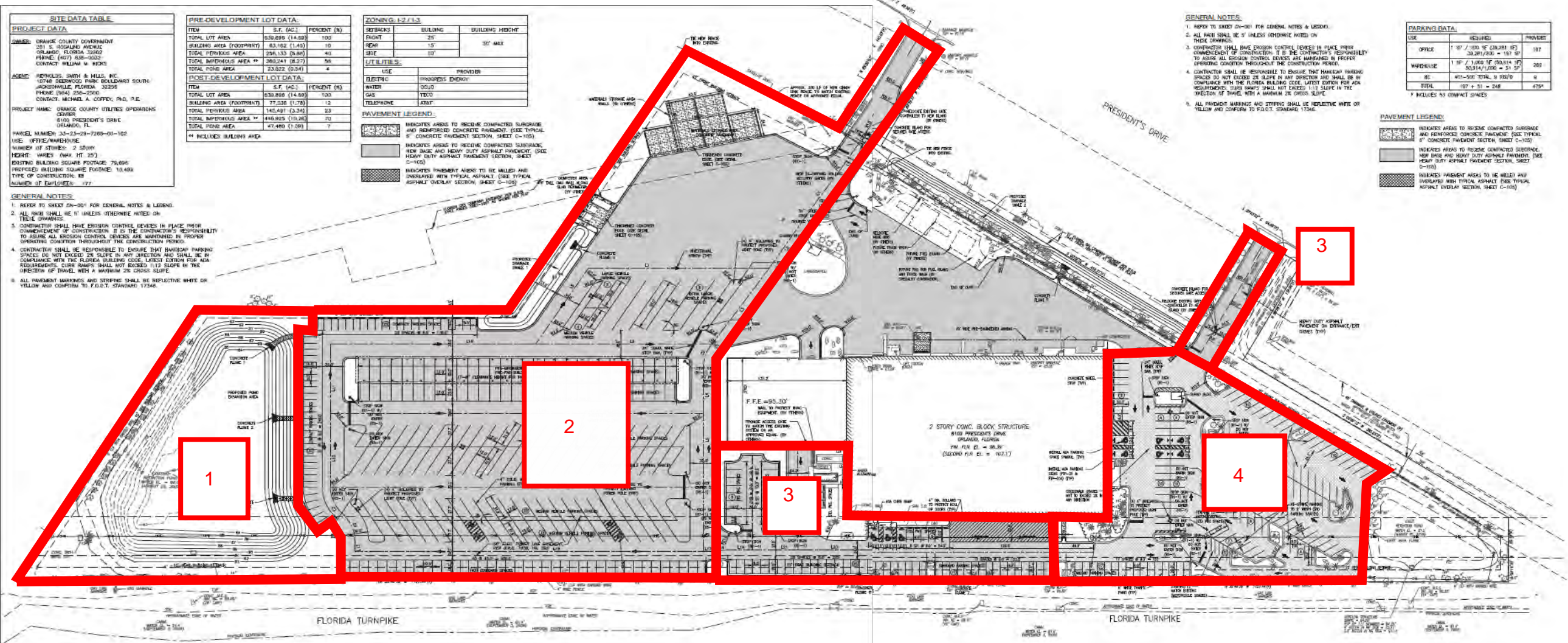
ZONING: L2 / L3	
SETBACKS	BUILDING BUILDING HEIGHT
FRONT	25'
REAR	15'
SIDE	10'
MAX	30' MAX

PAVEMENT LEGEND:	
	INDICATES AREAS TO RECEIVE COMPACTED SUBGRADE AND REINFORCED CONCRETE PAVEMENT (SEE TYPICAL 8" CONCRETE PAVEMENT SECTION, SHEET C-105)
	INDICATES AREAS TO RECEIVE COMPACTED SUBGRADE, NEW BASE AND HEAVY DUTY ASPHALT PAVEMENT (SEE HEAVY DUTY ASPHALT PAVEMENT SECTION, SHEET C-105)
	INDICATES PAVEMENT AREAS TO BE MILLED AND OVERLAIN WITH TYPICAL ASPHALT (SEE TYPICAL ASPHALT OVERLAY SECTION, SHEET C-105)

- GENERAL NOTES:**
- REFER TO SHEET 33-23-214-7289-05-102 FOR GENERAL NOTES & LEGEND.
 - ALL DIMENSIONS SHALL BE 5' UNLESS OTHERWISE NOTED ON THESE DRAWINGS.
 - CONTRACTOR SHALL HAVE EROSION CONTROL DEVICES IN PLACE PRIOR TO COMMENCEMENT OF CONSTRUCTION. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ASSURE ALL EROSION CONTROL DEVICES ARE MAINTAINED IN PROPER OPERATING CONDITION THROUGHOUT THE CONSTRUCTION PERIOD.
 - CONTRACTOR SHALL BE RESPONSIBLE TO ENSURE THAT PARALLEL PARKING SPACES DO NOT EXCEED 2% SLOPE IN ANY DIRECTION AND SHALL BE IN COMPLIANCE WITH THE FLORIDA BUILDING CODE, LATEST EDITION FOR ADA REQUIREMENTS. CURB RAMP SHALL NOT EXCEED 1:12 SLOPE IN THE DIRECTION OF TRAVEL WITH A MAXIMUM 2% CROSS SLOPE.
 - ALL PAVEMENT MARKINGS AND STRIPS SHALL BE REFLECTIVE WHITE OR YELLOW AND CONFORM TO F.O.C.T. STANDARD 1734B.

PARKING DATA:		
USE	REQUIRED	PROVIDED
OFFICE	1 SP / 100 SF (26,281 SF)	187
WALKWAY	1 SP / 1,000 SF (20,814 SF)	280
RE	400-500 TOTAL @ 800/100	8
TOTAL	187 + 51 + 248	475*

PAVEMENT LEGEND:	
	INDICATES AREAS TO RECEIVE COMPACTED SUBGRADE AND REINFORCED CONCRETE PAVEMENT (SEE TYPICAL 8" CONCRETE PAVEMENT SECTION, SHEET C-105)
	INDICATES AREAS TO RECEIVE COMPACTED SUBGRADE, NEW BASE AND HEAVY DUTY ASPHALT PAVEMENT (SEE HEAVY DUTY ASPHALT PAVEMENT SECTION, SHEET C-105)
	INDICATES PAVEMENT AREAS TO BE MILLED AND OVERLAIN WITH TYPICAL ASPHALT (SEE TYPICAL ASPHALT OVERLAY SECTION, SHEET C-105)



- Phases of Construction:**
- Expansion of existing retention pond on north end of site.
 - Development of new pavement area on north end of site, north of existing building.
 - Development of new pavement area on west side of existing building.
 - Development of existing pavement on south end of site including south entrance drive.

**EXHIBIT:
SITE PHASING PLAN**

RSH
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**ORANGE COUNTY
FLORIDA**

**ORANGE COUNTY UTILITIES
OPERATIONS CENTER
8100 PRESIDENTS DRIVE
ORLANDO, FLORIDA**

REAR

MICHAEL A. COFFEY, P.E.
FL REGISTRATION NO. 57412

REVISIONS

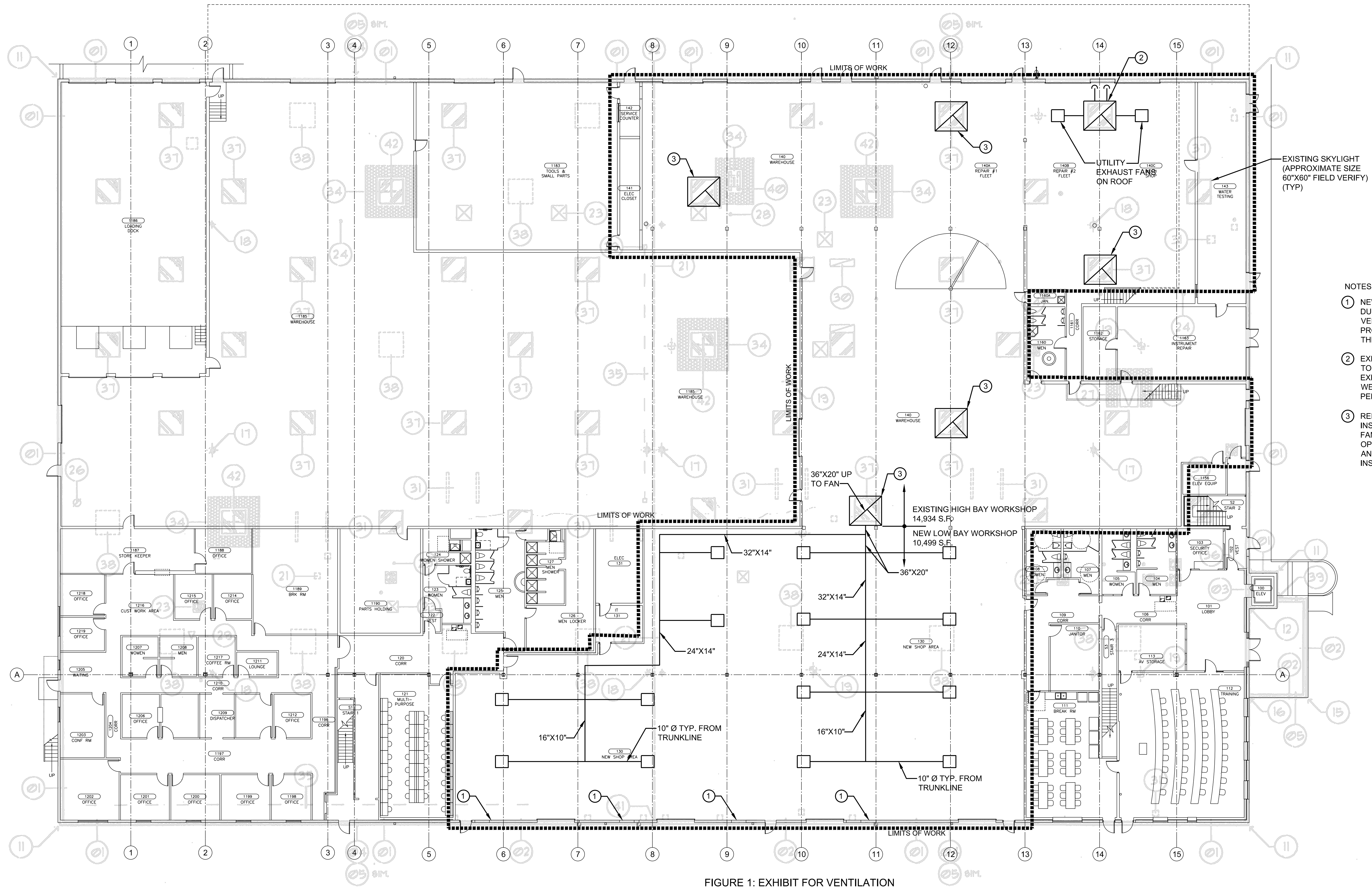
NO.	DESCRIPTION	DATE

DATE ISSUED: APRIL 12, 2016
REVIEWED BY: M. COFFEY, P.E.
DRAWN BY: D. STALBY
DESIGNED BY: M. COFFEY, P.E.
AEP PROJECT NUMBER
107-0748-000

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SHEET TITLE

SHEET NUMBER

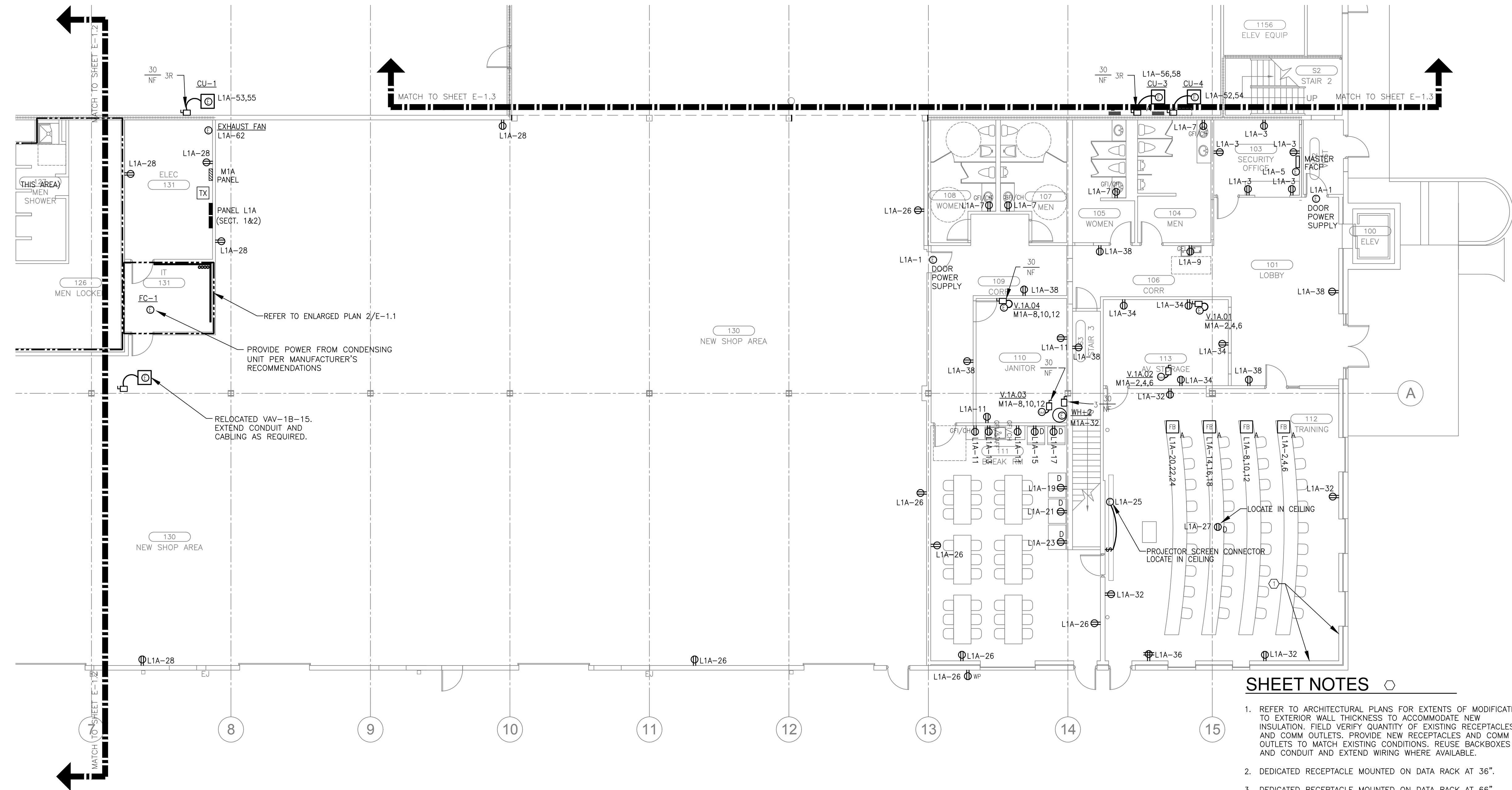
BID SET



NOTES:

- ① NEW WALL LOUVER 48"X48" INSTALLED DURING INTERIOR RENOVATION PHASE. VENTILATION CONTRACTOR TO PROVIDE BACKDRAFT DAMPERS IN THIS SCOPE OF SERVICES
- ② EXHAUST DUCT FROM (2) HOSE REELS TO (2) FANS ON ROOF. REMOVE EXISTING SKYLIGHT AND PROVIDE WEATHER PROOF DUCT PENETRATIONS THROUGH ROOF
- ③ REMOVE EXISTING SKYLIGHT AND INSTALL CURB MOUNTED EXHAUST FAN. MODIFY EXISTING SKYLIGHT OPENING AS REQUIRED TO MOUNT FAN AND PROVIDE WEATHER TIGHT INSTALLATION.

FIGURE 1: EXHIBIT FOR VENTILATION
 BASED ON FLOOR PLAN BY RSH CONFORMED DOCUMENTS FOR
 THE INTERIOR RENOVATION PROJECT.



- SHEET NOTES**
1. REFER TO ARCHITECTURAL PLANS FOR EXTENTS OF MODIFICATIONS TO EXTERIOR WALL THICKNESS TO ACCOMMODATE NEW INSULATION. FIELD VERIFY QUANTITY OF EXISTING RECEPTACLES AND COMM OUTLETS. PROVIDE NEW RECEPTACLES AND COMM OUTLETS TO MATCH EXISTING CONDITIONS. REUSE BACKBOXES AND CONDUIT AND EXTEND WIRING WHERE AVAILABLE.
 2. DEDICATED RECEPTACLE MOUNTED ON DATA RACK AT 36".
 3. DEDICATED RECEPTACLE MOUNTED ON DATA RACK AT 66".

1 FIRST FLOOR PARTIAL ELECTRICAL POWER PLAN - AREA 'A'
 E-1.1 SCALE: 1/8"=1'-0"
 SCALE: 1/8"=1'-0"

2 FIRST FLOOR I.T. ROOM 131
 E-1.1 SCALE: 1/4"=1'-0"
 SCALE: 1/4"=1'-0"

FIGURE 2: ELECTRICAL PANEL LOCATIONS (INTERIOR)

ARCHITECT/ENGINEER OF RECORD

RS&H
 IMPROVING YOUR WORLD

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CLIENT

ORANGE COUNTY GOVERNMENT
 FLORIDA

PROJECT

Orange County Utilities
 Operations Center
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INTERIOR RENOVATION PACKAGE

REVISIONS

NO.	DESCRIPTION	DATE

DATE ISSUED: MAY 17, 2013
 REVIEWED BY: JPC
 DRAWN BY: RNS
 DESIGNED BY: GJS

AEP PROJECT NUMBER
 107-0745-001

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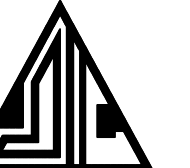
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FIRST FLOOR PARTIAL ELECTRICAL POWER PLAN AREA 'A'

SHEET NUMBER

E-1.1

CONSTRUCTION DOCUMENTS

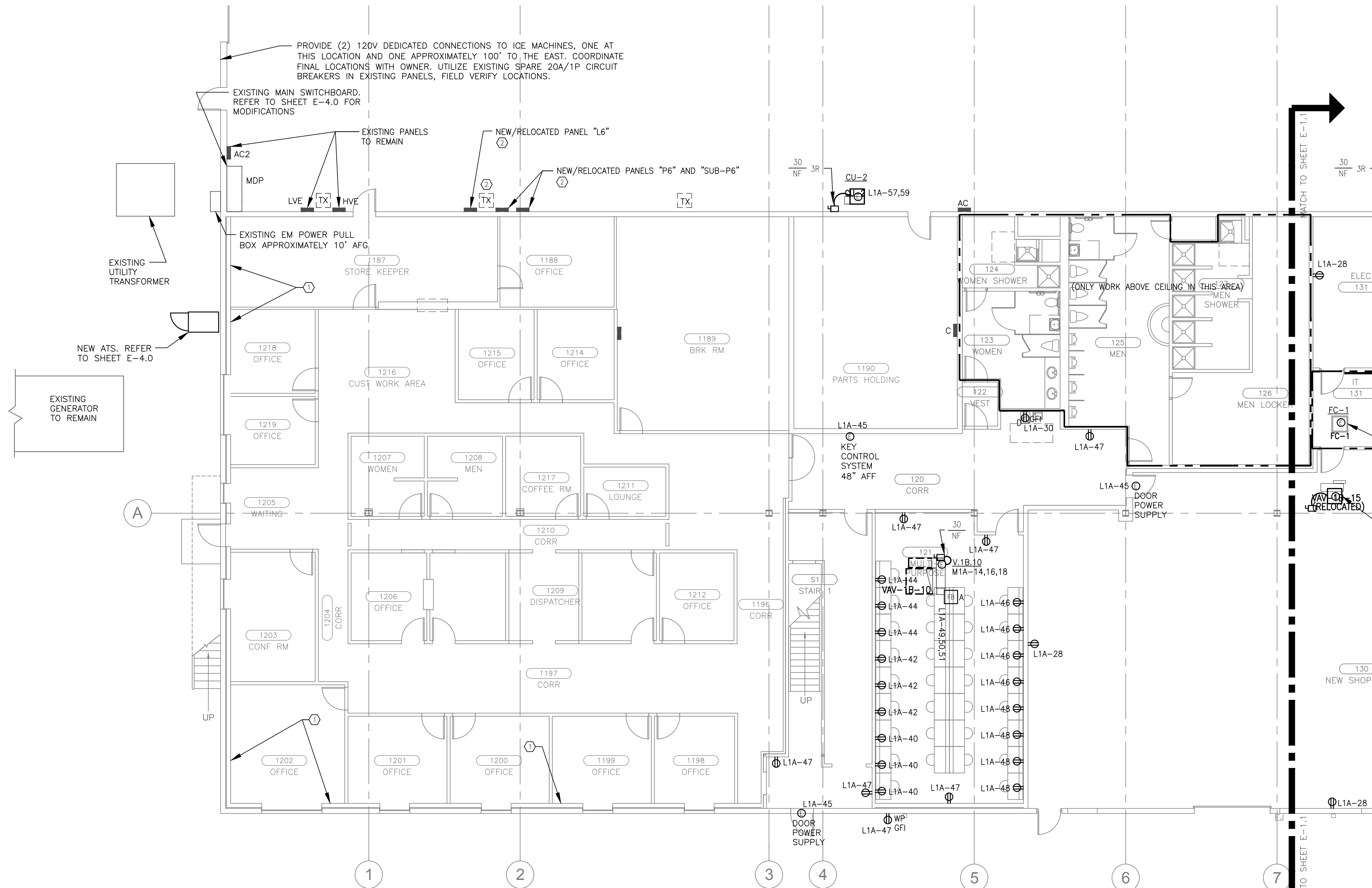


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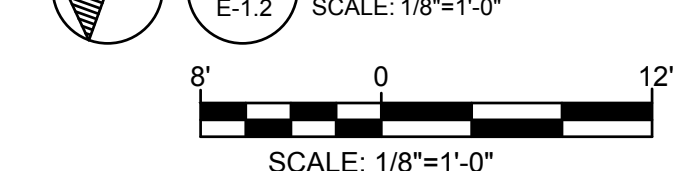
DATE ISSUED: MAY 17, 2013
REVIEWED BY: RNS
DRAWN BY: RNS
DESIGNED BY: GJS

AEP PROJECT NUMBER
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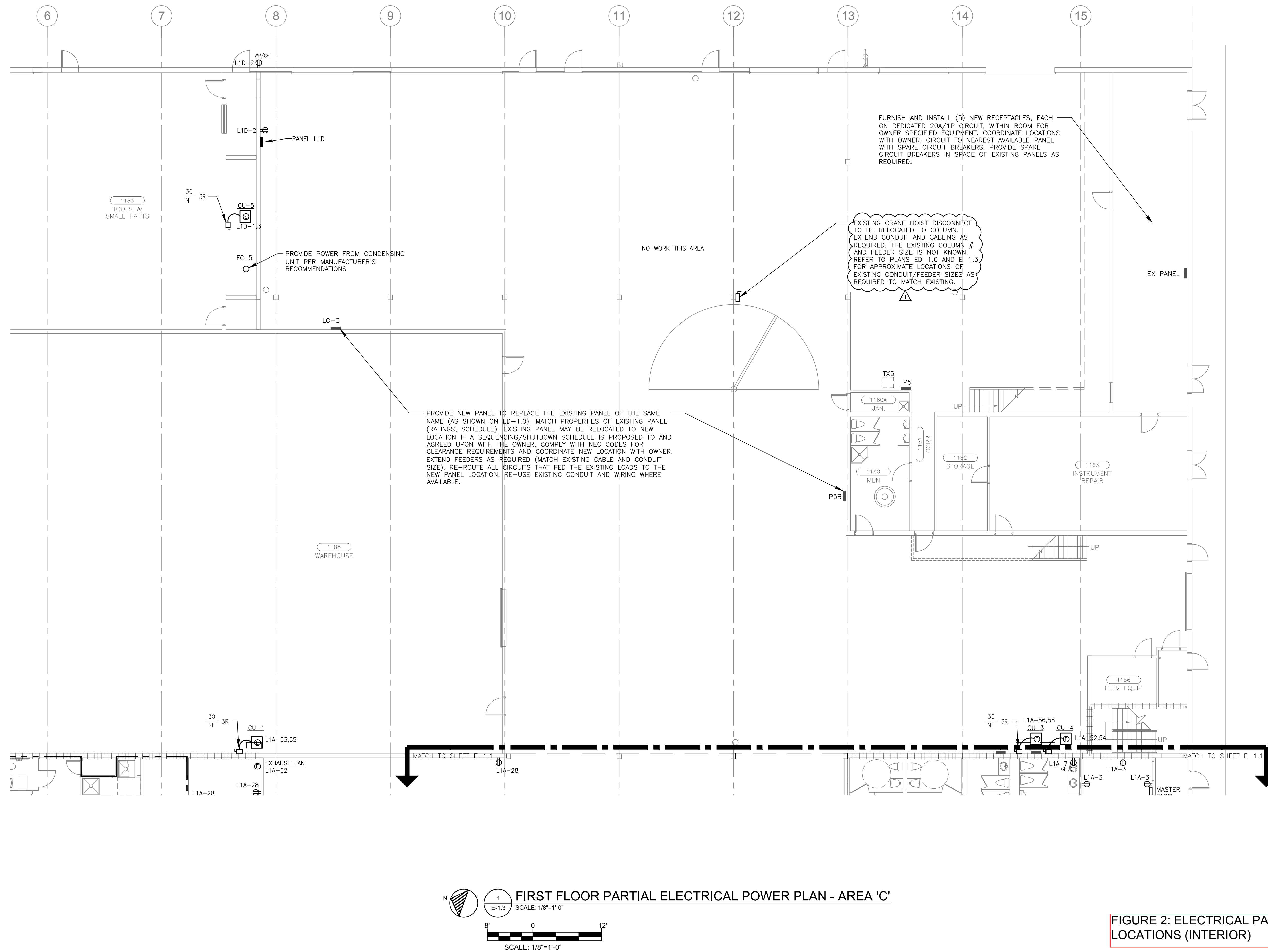
1 FIRST FLOOR PARTIAL ELECTRICAL POWER PLAN - AREA 'B'



SHEET NOTES

- ① REFER TO ARCHITECTURAL PLANS FOR EXTENTS OF MODIFICATIONS TO EXTERIOR WALL THICKNESS TO ACCOMMODATE NEW INSULATION. FIELD VERIFY QUANTITY OF EXISTING RECEPTACLES AND COMM OUTLETS. PROVIDE NEW RECEPTACLES AND COMM OUTLETS TO MATCH EXISTING CONDITIONS. REUSE BACKBOXES AND CONDUIT AND EXTEND WIRING WHERE AVAILABLE.
- ② PROVIDE NEW PANELS AND TRANSFORMER TO REPLACE THE SECOND FLOOR PANELS AND TRANSFORMER OF THE SAME NAME (AS SHOWN ON ED-2.0). MATCH PROPERTIES OF EXISTING PANEL (RATINGS, SCHEDULE). EXISTING PANELS MAY BE RELOCATED TO NEW LOCATION IF A SEQUENCING/SHUTDOWN SCHEDULE IS PROPOSED TO AND AGREED UPON WITH THE OWNER. COMPLY WITH NEC CODES FOR CLEARANCE REQUIREMENTS AND COORDINATE NEW LOCATION WITH OWNER. EXTEND FEEDERS FROM SECOND FLOOR (MATCH EXISTING CABLE AND CONDUIT SIZE). RE-ROUTE ALL CIRCUITS THAT FED THE FIRST FLOOR LOADS TO THE NEW PANEL LOCATIONS ON THE FIRST FLOOR. RE-USE EXISTING CONDUIT AND WIRING WHERE AVAILABLE.

FIGURE 2: ELECTRICAL PANEL LOCATIONS (INTERIOR)



1
E-1.3
SCALE: 1/8"=1'-0"

8' 0 12'
SCALE: 1/8"=1'-0"

FIRST FLOOR PARTIAL ELECTRICAL POWER PLAN - AREA 'C'

FIGURE 2: ELECTRICAL PANEL LOCATIONS (INTERIOR)



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CLIENT

ORANGE COUNTY
GOVERNMENT
FLORIDA

PROJECT

Orange County Utilities
Operations Center
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INTERIOR
RENOVATION
PACKAGE

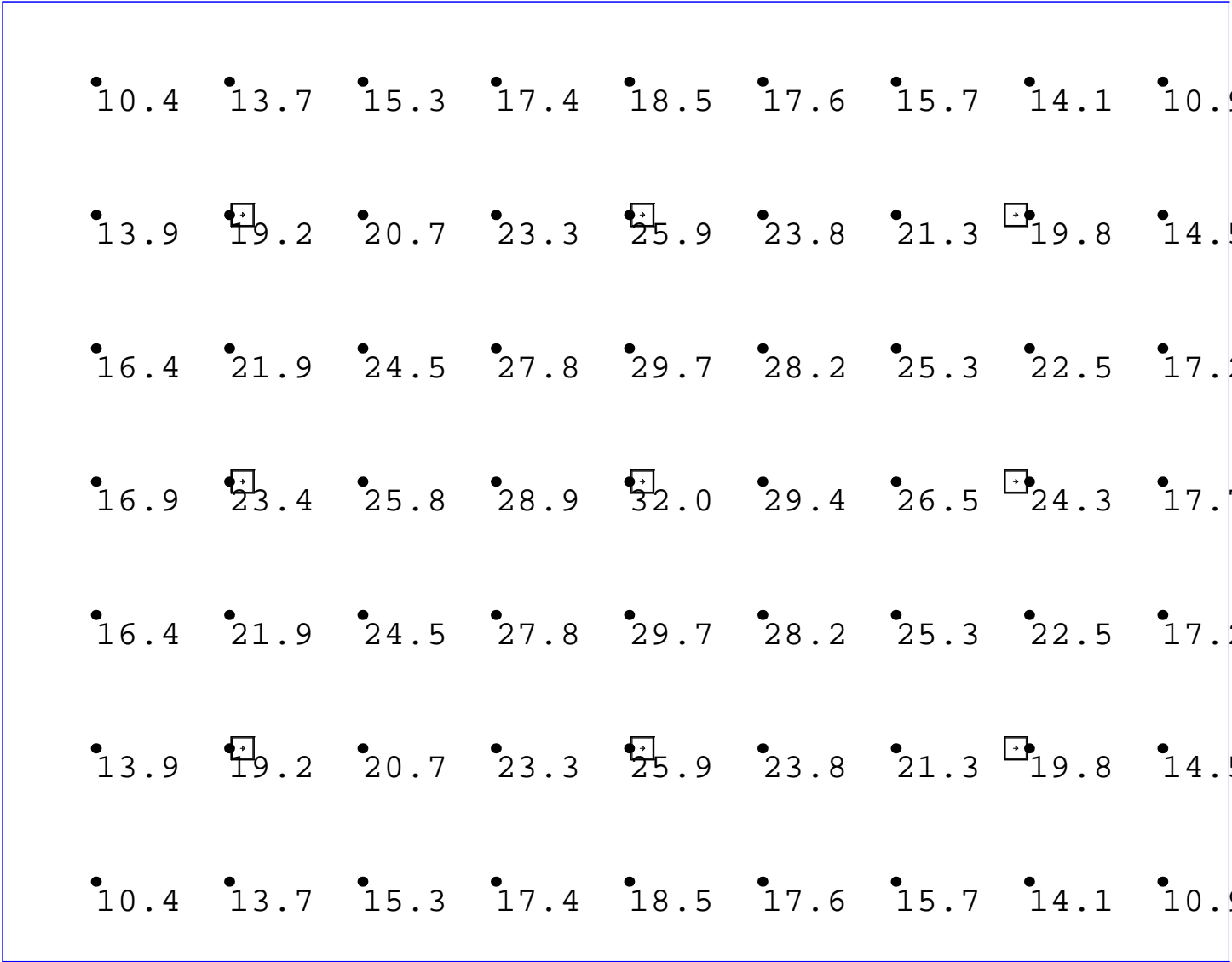
REVISIONS

NO.	DESCRIPTION	DATE
Δ	ADD. NO. 4	10/4/13

DATE ISSUED: MAY 17, 2013
REVIEWED BY: RNS
DRAWN BY: RNS
DESIGNED BY: GJS
AEP PROJECT NUMBER
107-0745-001

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SHEET TITLE
FIRST FLOOR
PARTIAL
ELECTRICAL
POWER PLAN
AREA 'C'
SHEET NUMBER
E-1.3

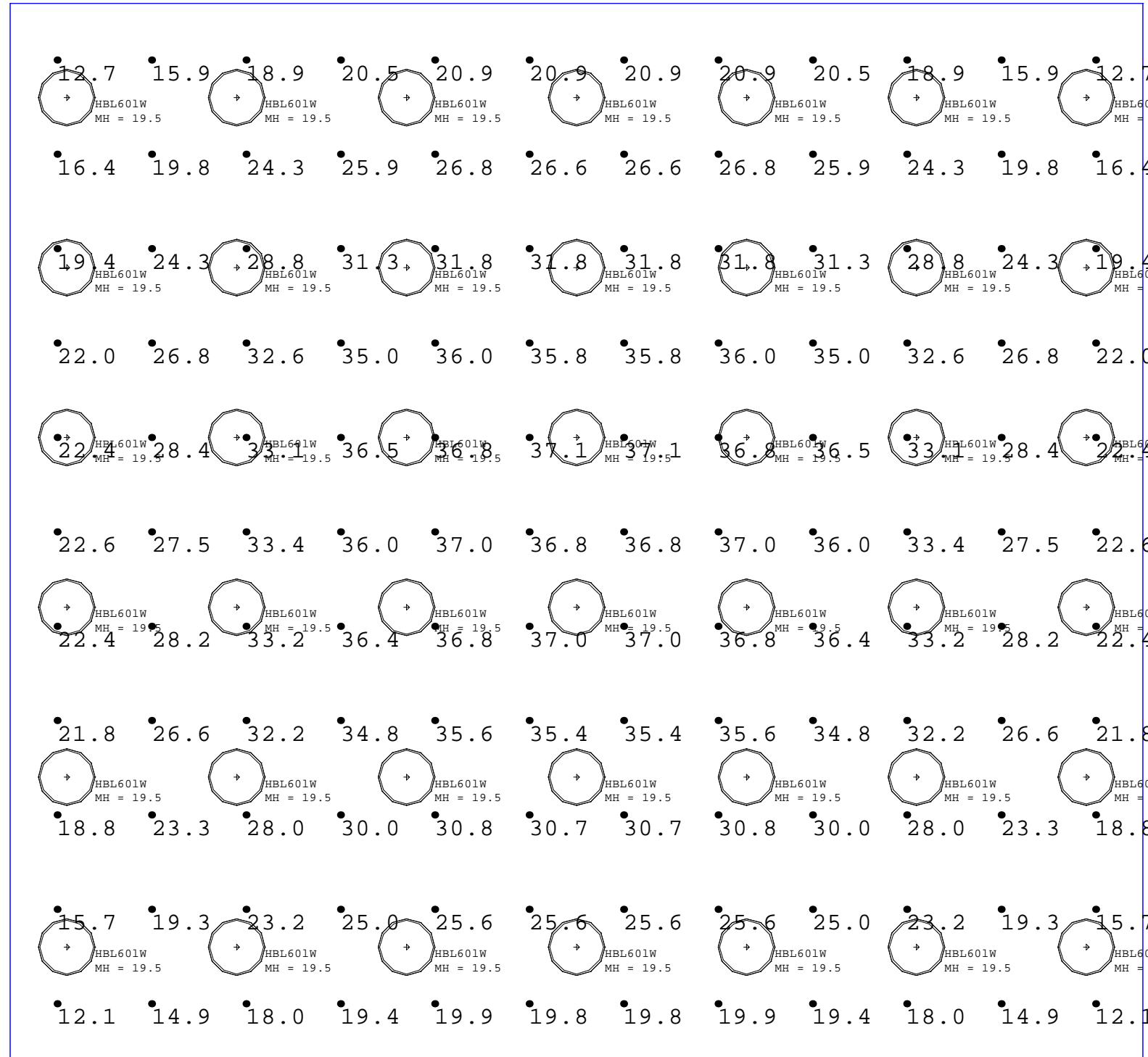
CONSTRUCTION DOCUMENTS



Luminaire Schedule									
Symbol	Qty	Label	Arrangement	Total Lamp Lumens	LLF	Description	Lum. Watts	Arr. Watts	Total Watts
☐	9	FLED-24	SINGLE	N.A.	0.900	FLEDR-24-7-UNIV-CVQ-5-WH	57.87	57.87	520.83

Calculation Summary							
Label	CalcType	Units	Avg	Max	Min	Avg/Min	Max/Min
CalcPts	Illuminance	Fc	20.38	32.0	10.4	1.96	3.08

FIGURE 3A LIGHTING FIXTURE LOCATION FOR FUEL CANOPY



Luminaire Schedule									
Symbol	Qty	Label	Arrangement	Total Lamp Lumens	LLF	Description	Lum. Watts	Arr. Watts	Total Watts
⊙	42	HBL601W	SINGLE	N.A.	0.900	HBL-60LU-5K-W-070-WH	136	136	5712

Calculation Summary							
Label	CalcType	Units	Avg	Max	Min	Avg/Min	Max/Min
CalcPts	Illuminance	Fc	26.87	37.1	12.1	2.22	3.07

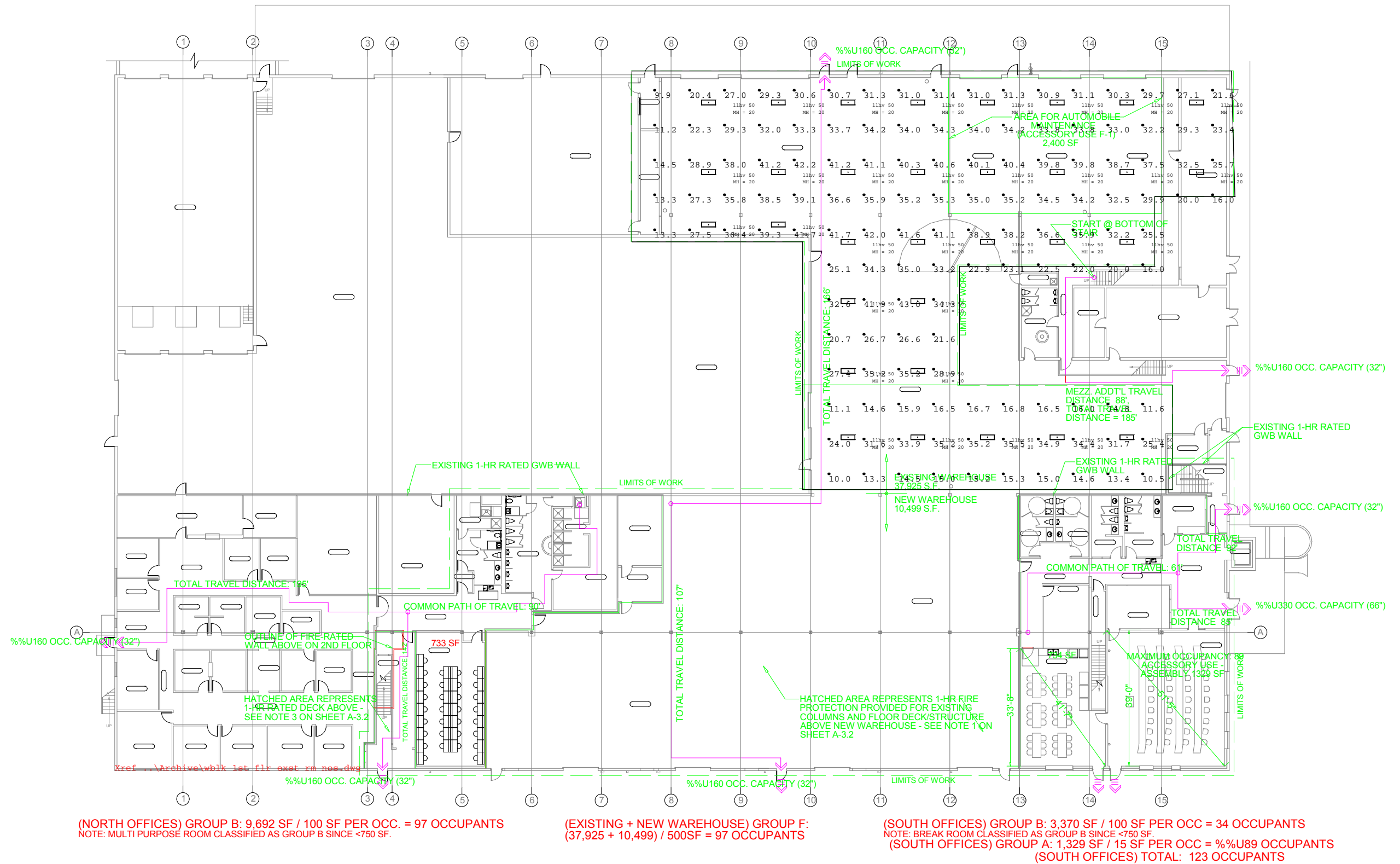
FIGURE 3B LIGHTING FIXTURE LOCATION FOR NORTH CANOPY

8.5	15.4	14.7	16.6	19.0	18.9	15.5	16.9	19.2	19.0	15.5	16.9	19.2	19.0	15.5	17.0	19.2	19.0	15.5	17.0	19.3	19.0	15.5	17.0	19.3	19.0	15.5	17.0	19.3	19.0	15.5	17.0	19.3	19.0	15.5	16.9	19.2	19.0	15.5	16.9	19.1	18.7	15.1	15.4
11.9	14.7	19.4	19.8	26.5	21.7	20.7	20.2	26.7	21.8	20.7	20.3	26.7	21.8	20.7	20.3	26.7	21.8	20.7	20.3	26.7	21.8	20.7	20.3	26.7	21.8	20.7	20.3	26.7	21.8	20.7	20.3	26.7	21.8	20.7	20.2	26.5	21.5	20.2	17.9				
13.0	14.6	22.1	21.5	26.6	22.4	24.5	21.9	26.9	22.6	24.6	22.0	26.9	22.6	24.6	22.0	26.9	22.6	24.6	22.0	26.9	22.6	24.6	22.0	26.9	22.6	24.6	22.0	26.9	22.6	24.6	22.0	26.9	22.6	24.6	22.0	26.9	22.5	24.5	21.9	26.7	22.2	24.0	22.0
9.3	15.8	15.2	16.7	24.1	20.5	16.0	17.0	24.3	20.6	16.1	17.1	24.3	20.6	16.1	17.1	24.3	20.6	16.1	17.1	24.3	20.6	16.1	17.1	24.3	20.6	16.1	17.1	24.3	20.6	16.1	17.1	24.3	20.6	16.1	17.1	24.3	20.6	16.1	17.0	24.1	20.3	15.6	15.0

Calculation Summary							
Label	CalcType	Units	Avg	Max	Min	Avg/Min	Max/Min
CalcPts	Illuminance	Fc	20.44	26.9	6.5	3.14	4.14

Luminaire Schedule									
Symbol	Qty	Label	Arrangement	Total Lamp Lumens	LLF	Description	Lum. Watts	Arr. Watts	Total Watts
□	14	HBL601A	SINGLE	N.A.	0.900	HBL-60LU-5K-A-070	136.9	136.9	1916.6

FIGURE 3C LIGHTING FIXTURE LOCATION FOR EAST CANOPY



Calculation Summary							
Label	CalcType	Units	Avg	Max	Min	Avg/Min	Max/Min
Warehouse Area	Illuminance	Fc	29.03	43.0	9.9	2.93	4.34

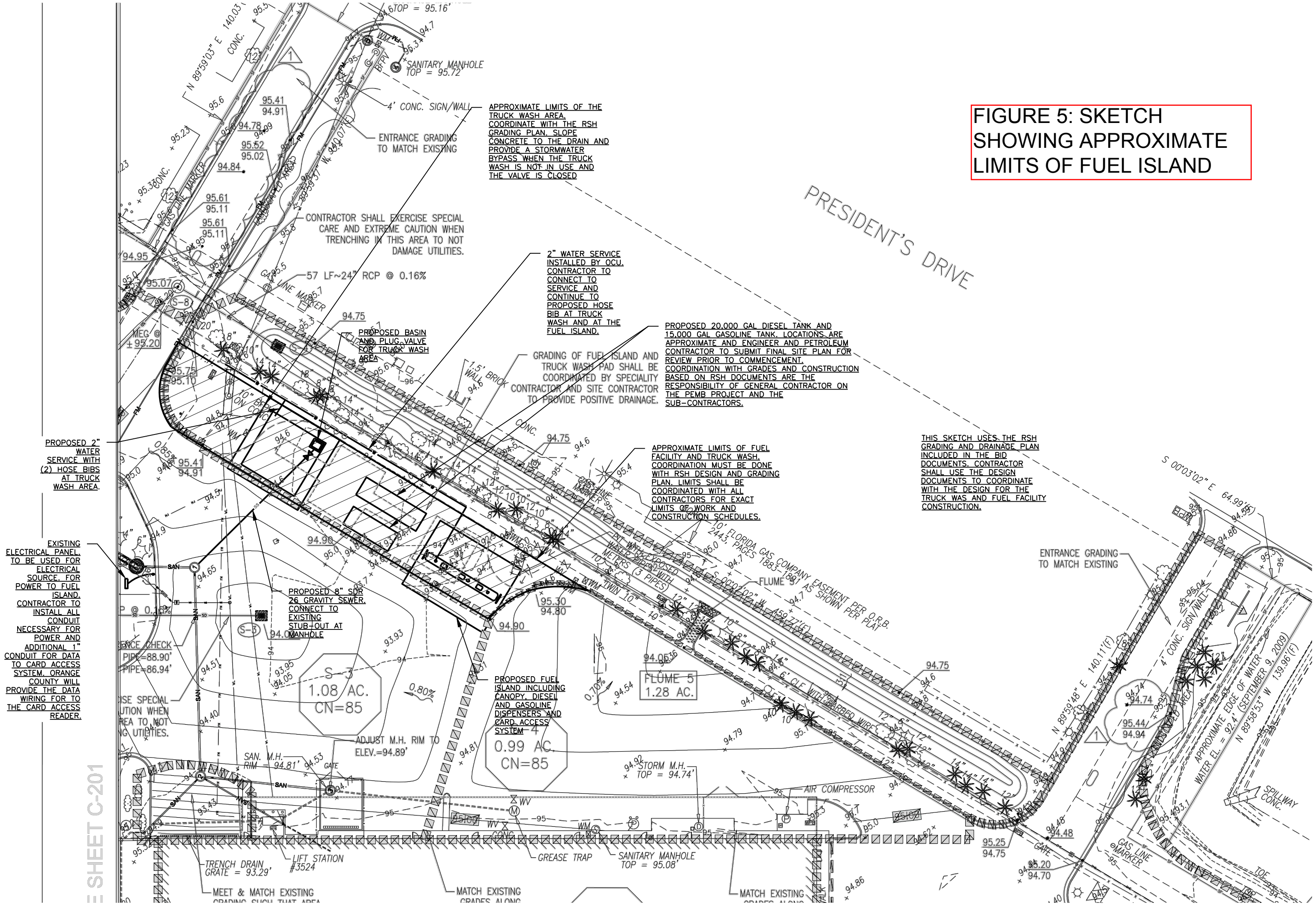
**FIGURE 3D LIGHTING
FIXTURE LOCATION HIGH BAY
WORKSHOP**

Luminaire Schedule										
Symbol	Qty	Label	Arrangement	LLF	Description	Lum. Watts	Arr. Watts	Total Watts	Lum. Lumens	
•	32	1lhv 50	SINGLE	0.900	LLHV4-50M-NST-EDU	155.1	155.1	4963.2	17442	



FIGURE 4: EXHIBIT FOR FLOOR POLISHING
 BASED ON FLOOR PLAN BY RSH CONFORMED DOCUMENTS FOR
 THE INTERIOR RENOVATION PROJECT.

**FIGURE 5: SKETCH
SHOWING APPROXIMATE
LIMITS OF FUEL ISLAND**



APPROXIMATE LIMITS OF THE TRUCK WASH AREA. COORDINATE WITH THE RSH GRADING PLAN. SLOPE CONCRETE TO THE DRAIN AND PROVIDE A STORMWATER BYPASS WHEN THE TRUCK WASH IS NOT IN USE AND THE VALVE IS CLOSED.

CONTRACTOR SHALL EXERCISE SPECIAL CARE AND EXTREME CAUTION WHEN TRENCHING IN THIS AREA TO NOT DAMAGE UTILITIES.

2" WATER SERVICE INSTALLED BY OCU. CONTRACTOR TO CONNECT TO SERVICE AND CONTINUE TO PROPOSED HOSE BIB AT TRUCK WASH AND AT THE FUEL ISLAND.

PROPOSED 20,000 GAL DIESEL TANK AND 15,000 GAL GASOLINE TANK. LOCATIONS ARE APPROXIMATE AND ENGINEER AND PETROLEUM CONTRACTOR TO SUBMIT FINAL SITE PLAN FOR REVIEW PRIOR TO COMMENCEMENT. COORDINATION WITH GRADES AND CONSTRUCTION BASED ON RSH DOCUMENTS ARE THE RESPONSIBILITY OF GENERAL CONTRACTOR ON THE PEMB PROJECT AND THE SUB-CONTRACTORS.

GRADING OF FUEL ISLAND AND TRUCK WASH PAD SHALL BE COORDINATED BY SPECIALITY CONTRACTOR AND SITE CONTRACTOR TO PROVIDE POSITIVE DRAINAGE.

APPROXIMATE LIMITS OF FUEL FACILITY AND TRUCK WASH. COORDINATION MUST BE DONE WITH RSH DESIGN AND GRADING PLAN. LIMITS SHALL BE COORDINATED WITH ALL CONTRACTORS FOR EXACT LIMITS OF WORK AND CONSTRUCTION SCHEDULES.

THIS SKETCH USES THE RSH GRADING AND DRAINAGE PLAN INCLUDED IN THE BID DOCUMENTS. CONTRACTOR SHALL USE THE DESIGN DOCUMENTS TO COORDINATE WITH THE DESIGN FOR THE TRUCK WAS AND FUEL FACILITY CONSTRUCTION.

PROPOSED 2" WATER SERVICE WITH (2) HOSE BIBS AT TRUCK WASH AREA.

EXISTING ELECTRICAL PANEL TO BE USED FOR ELECTRICAL SOURCE. FOR POWER TO FUEL ISLAND. CONTRACTOR TO INSTALL ALL CONDUIT NECESSARY FOR POWER AND ADDITIONAL 1" CONDUIT FOR DATA TO CARD ACCESS SYSTEM. ORANGE COUNTY WILL PROVIDE THE DATA WIRING FOR TO THE CARD ACCESS READER.

PROPOSED 8" SDR 26 GRAVITY SEWER. CONNECT TO EXISTING STUB-OUT AT MANHOLE.

PROPOSED FUEL ISLAND INCLUDING CANOPY, DIESEL AND GASOLINE DISPENSERS AND CARD ACCESS SYSTEM.

FLUME 5
1.28 AC.

SHEET C-201