

Todd County Fiscal Court  
Soccer Complex Project

**ADDENDUM No. 1**

April 7, 2025

This ADDENDUM to plans, specifications and bidding documents for the subject project modifies the referenced items to the extent described herein. Items not modified by this ADDENDUM remain unchanged and in full effect. Bidders are required to acknowledge receipt of this ADDENDUM on the Bid Form.

1. Technical Specifications: **Add** the following Technical Specifications;

- a. 15010 Basic Mechanical Requirements
- b. 15140 Supports and Anchors
- c. 15260 Piping Insulation
- d. 15410 Plumbing Piping
- e. 15762 Unit Heaters
- f. 15801 Air Distribution
- g. 16008 Excavation
- h. 16010 Basic Electrical Requirements
- i. 16100 Basic Materials & Methods
- j. 16116 Wireway with Hinged Cover
- k. 16134 Panelboards
- l. 16140 Switches & Receptacles
- m. 16160 Contractors
- n. 16170 Switches

(Attachments: Revised Technical Specifications, 91 pages)

2. Bid Documents (Article 3 – Bid Form): **Replace All Earlier Versions** Article 3.01 - “Bidder’s Representations” with the attached Bid Form to include the following:

- a. The addition of Item 3.01 L “The Bidder shall be aware that the field lighting post holes are expected to be primarily in limestone rock and the Bidder should bid accordingly.”

3. Bid Documents (Article 3 – Bid Form): **Replace All Earlier Versions** Article 3.01 - “Bidder’s Representations” with the attached Bid Form to include the following:

- a. The addition of Item 3.01 L “The Bidder shall be aware that the field lighting post holes are expected to be primarily in limestone rock and the Bidder should bid accordingly.”

(Attachments: Revised Bid Form, 4 pages)

4. Contract Drawings: **Replace All Earlier Versions** Contract Drawings revised to reflect the site grading and gravel entry and parking lot, which was previously completed by the Owner. This contract will not include any site grading. Revised Contract Drawings include revisions on Sheets C-001, C-100, and C-101 as described below;

- a. Sheet C-001 revised to show existing grading and gravel completed by Todd County Fiscal Court.
- b. Sheet C-100 revised to clarify existing gravel areas and remove any reference to asphalt paving of the parking area. The parking lot and drive will remain gravel.
- c. Sheet C-100 note revised to clarify the future bleachers are not to be included in this contract.
- d. Sheet C-100 revised to include sidewalk extensions at ADA parking aisles.
- e. Sheet C-101 various elevation and drainage callouts were removed as this is no longer a part of the contract.

(Attachments: Construction Plans, 9 pages)

END OF ADDENDUM NO. 1 TEXT  
This ADDENDUM consists of a total of 2 pages.

## BID FORM

Project Identification: Todd County Fiscal Court  
Todd County Soccer Complex Project

Contract Identification: Todd County Soccer Complex Project

### ARTICLE 1 – BID RECIPIENT

- 1.01 This Bid is Submitted to: Todd County Fiscal Court  
811 S. Main St.  
Elkton, Kentucky 42220
- 1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in the Bid and in accordance with the other terms and conditions of the Bidding Documents.

### ARTICLE 2 – BIDDER'S ACKNOWLEDGMENTS

- 2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for **90 days** after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

### ARTICLE 3 – BIDDER'S REPRESENTATIONS

- 3.01 In submitting this Bid, Bidder represents that:
- A. Bidder has examined and carefully studied the Bidding Documents, and any data and reference items identified in the Bidding Documents, and hereby acknowledges receipt of the following Addenda:  
  
Addendum No. 1 Dated April 7, 2025  
Addendum No.        Dated
  - B. Bidder has visited the Point of Destination and site where the Goods or Special Services will be provided and become familiar with and is satisfied as to the observable local conditions that may affect cost, progress, or the furnishing of Goods and Special Services, if required to do so by the Bidding Documents, or if, in Bidder's judgment, any local condition may affect cost, progress, or the furnishing of Goods and Special Services
  - C. Bidder is familiar with and has satisfied itself as to all Laws and Regulations that may affect cost, progress, performance of the Work.
  - D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.
  - E. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and any Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs.

- F. Bidder agrees, based on the information and observations referred to in the preceding paragraph, that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.
- G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
- H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and confirms that the written resolution thereof by Engineer is acceptable to Bidder.
- I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work.
- J. The submission of this Bid constitutes an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, and that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.
- K. **The Bidder shall be aware of the current KRS 139.480(34) regarding the tax exemption for building materials, fixtures, and supplies purchased by a construction contractor for a sewer or water project with a governmental agency. No sales tax shall be included in the stated bid prices for items related to water and sewer. The awarded contractor will be required to complete a Certificate of Exemption (see Appendix) with each vendor on the project.**
- L. **The Bidder shall be aware that the field lighting post holes are expected to be primarily in limestone rock and the Bidder should bid accordingly.**

#### ARTICLE 4 – BIDDER'S CERTIFICATION

##### 4.01 Bidder certifies that:

- A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;
- B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;
- C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and
- D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:
  - 1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process;
  - 2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
  - 3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and
  - 4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

## ARTICLE 5 – BASIS OF BID

5.01 Bidder will compete the Work in accordance with the Contract Documents for the lump sum base bid of:

**LUMP SUM BASE BID \$ \_\_\_\_\_**

5.02 **SUPPLEMENTAL UNIT PRICES:** The following Supplemental Unit Prices will apply in the event that additions to or deductions from the work required in the Bid are ordered. A single price shall be bid for each item. OWNER reserves the right to accept or reject these prices by inclusion in or omission from the Contract Documents to be executed after the award of the Contract.

Item	Type of Work	Unit	Supplemental Unit Price		
			(Words)		(Numbers)
1.	Unclassified undercut, where ordered by the Engineer.	CY	_____.	Dollars	\$_____.
2.	No. 57 aggregate refill, where ordered by the Engineer.	Ton	_____.	Dollars	\$_____.
3.	Class "B" concrete refill, where ordered by the Engineer	CY	_____.	Dollars	\$_____.
4.	Sodding of the primary soccer field with grass mix equal to the specified mix for seeding	SY	_____.	Dollars	\$_____.
5.	Soccer field irrigation system similar to Detail 5 on Plan Sheet C-201. Irrigation design to be correlated with approved manufacturer including Rain Bird, Hunter Irrigation Systems, Toro, or approved equal. Complete and ready for use.	LS	_____.	Dollars	\$_____.

## ARTICLE 6 – TIME OF COMPLETION

6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

## ARTICLE 7 – ATTACHMENTS TO THIS BID

7.01 The following documents are attached to and made a condition of the Bid:

- A. Required Bid security in the form of a Bid Bond (EJCDC No. C-430) or Certified Check (circle type of security provided);
- B. Statement of Experience

C. List of Subcontractors

**ARTICLE 8 – DEFINED TERMS**

8.01 The terms used in this Bid with the initial capital letters have the meanings indicated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

**ARTICLE 9 – BID SUBMITTAL**

9.01 This Bid submitted by:

Submitted by:

_____ Signature	_____ Business
_____ Printed or Typed Name	_____ Bidder's Business Address
_____ Title	_____ City, State, Zip Code
_____ Employer's Tax ID No.	_____ Business Phone No. Business Fax No.
_____ Business Email Address	_____ Cell Phone No. Other Contact No.

9.02 Bid submitted on \_\_\_\_\_, 2025.

Seal (if required)

**Todd County Fiscal Court  
Soccer Complex Project**

**Technical Specifications**

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02223	Backfill and Embankments	4
02224	Roadway Excavation	1
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**MECHANICAL SPECIFICATIONS**

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15010	Basic Mechanical Requirements	4
15140	Supports and Anchors	5
15260	Piping Insulation	3
15410	Plumbing Piping	5
15762	Unit Heaters	1
15801	Air Distribution	2

**ELECTRICAL SPECIFICATIONS**

<b>Section No.</b>	<b>Description</b>	<b>Pages</b>
16008	Excavation	1
16010	Basic Electrical Requirements	5
16100	Basic Materials & Methods	5
16116	Wireway with Hinged Cover	1
16134	Panelboards	2
16140	Switches & Receptacles	2
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16400	Electrical Service System	2
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Bound Separately

Construction Drawings



## SECTION 01-100

### SUMMARY OF WORK

#### 1.0 GENERAL

##### 1.01 WORK INCLUDED

- A. Construction of a new soccer complex including site grading, lighting, a restroom facility, entry drive and parking lot in Elkton, Kentucky.
- B. The Contractor shall include all materials, labor and equipment necessary for completion of the Project. The Contract Documents are intended to provide the basis for proper completion of the work suitable for the intended use of the Owner. Anything not expressly set forth but which is reasonably implied or necessary for proper performance of the Project shall be included.

##### 1.02 PATENTED OR PROPRIETARY MATERIALS

This Solicitation specifies requested items. It is not the intention of this Solicitation to eliminate Manufacturers or Contractors of similar or equal equipment of the types specified. It should be noted, however, that these requested items are written around specific requirements and needs of the Owner.

If discrepancies or ambiguities are found in the plans, specifications, contract documents or in any communication to the contractor regarding specified materials not compliant with the American Iron and Steel requirement, the contractor shall immediately notify the Engineer in writing.

##### 1.03 PERMITS

Contractor shall obtain all permits related to or required by the Work in this Contract.

##### 1.04 CODES

Comply with applicable codes and regulations of authorities having jurisdiction. Submit copies of inspection reports, notices, citations and similar communication to the Owner.

##### 1.05 EXISTING CONDITIONS AND DIMENSIONS

- A. The Work in this Contract will be performed on property owned by the City of Elkton in Elkton, Kentucky.
- B. The Contractor is responsible for verifying all existing conditions, elevations, dimensions, etc., and providing his finished work to accommodate existing conditions.

#### 2.0 CONTRACTOR'S DUTIES

##### 2.1 Construction and Related Activities

The Contractor shall provide and pay for all labor, materials, equipment, machinery, tools, superintendence, insurance, shipping, utilities, and other costs required for a complete and functioning lift station installation.

##### 2.2 Taxes

**The Bidder shall be aware of the current KRS 139.480(34) regarding the tax exemption for building**

**materials, fixtures, and supplies purchased by a construction contractor for a sewer or water project with a governmental agency. No sales tax shall be included in the stated bid prices. The awarded contractor will be required to complete a Certificate of Exemption (see Appendix) with each vendor on the project.**

2.3 Permits

The contractor shall secure and pay for all legally required permits, licenses and fees associated with the construction.

2.4 Notices

The Contractor shall provide all required notices, including notices to utility owners of intent to excavate in the vicinity of their utilities, notices to property owners of intent to enter their property for construction purposes, notices regarding the interruption of any utility service, as well as other notices required by the plans and contract documents. The Contractor shall provide traffic control equipment and flagman, as may be required by the Kentucky Department of Highways or by working conditions.

2.5 Laws

Contractor shall fully comply with all applicable laws, ordinances, rules, regulations, orders and other legal requirements, and shall bear the cost of such compliance.

2.6 Character of Workmen

Contractor shall employ workman and foremen with sufficient knowledge of and experience in the type of work proposed to assure satisfactory performance. Workman shall maintain a professional demeanor and appearance at all times on the project. Any workman on the project who performs work in an incompetent manner, or acts in a disorderly or intemperate manner shall be removed from the project, and may not be employed on any portion of the project unless approved by the Owner.

2.7 Notice of Discrepancies

If discrepancies or ambiguities are found in the plans, specifications, contract documents or in any communication to the contractor, the contractor shall immediately notify the Engineer in writing. Do not proceed with the affected work until clarification is received.

2.8 Inspection

Provide at all times, access to the work for inspection by representatives of the Owner, the Engineer, and regulatory authorities having jurisdiction over the project.

2.09 Contractor's Use of Premises

Contractor shall confine his operations to public right-of-way, easements and property obtained by the Owner for construction of the project, or to areas secured by the Contractor for his use. Contractor shall take precautions to minimize disruption to existing properties.

Stored materials, regardless of their location shall be protected by the Contractor from damage, theft or degradation at all times.

2.10 Existing Facilities

The existing and adjacent roadways will be in continuous operation during the construction of the Project. Contractor shall avoid disturbing existing streets, and any other utilities or structures encountered in the work, except as necessary for construction operations. Contractor shall give at least 48 hours prior notice to the Owner, or to any utility or other entity, of any necessary disruptions to service, or work affecting active lines.

## 2.11 Partial Owner Occupancy

The Owner may, at his discretion, place into service any or all portions of the completed work prior to final completion of all work on the project. Placing a portion of the work in service before final completion does not relieve the contractor of his obligation to complete all work associated with that portion of the work (i.e. clean-up, surface restoration, etc.), to perform maintenance for the required period, or to provide warranty for that portion of the work

## 3.0 MEASUREMENT & PAYMENT

### 3.1 General

The Contractor shall furnish all labor, tools, equipment and materials to construct the proposed improvements complete as shown on the plans and described in these Specifications. The work shall be measured for payment in accordance with applicable provisions of these Specifications and payment shall be made on the basis of the unit prices or lump sum prices bid. The sum of the payments for eligible pay items contained in the proposal form shall be the compensation to be paid for the completed project; provided however, that changes in the work covered by written change orders, properly executed, may result in additions or deductions from the contract price.

The Contractor's attention is called to the fact that although the pay items shown shall be the basis for establishing the contract price, the description of the pay items does not necessarily reflect the full extent of work to be performed. The cost of the incidental work which is necessary but which is not specifically listed as one of the pay items, shall be included in the prices bid for the pay items to which the incidental work is most closely related.

END OF SECTION 01-100

## SECTION 01-300

### SUBMITTALS

#### 1.0 GENERAL

##### 1.01 WORK INCLUDED

Shop drawing, descriptive literature, project data and samples (when samples are specifically requested) for all manufactured or fabricated items shall be submitted by the Contractor to the Engineer for examination and review in the form and in the manner required by the Engineer. All submittals shall be furnished in a sufficient quantity to allow at least three (3) copies to be retained by the Engineer and shall be checked and reviewed by the Contractor before submission to the Engineer. The review of the submittal by the Engineer shall not be construed as a complete check, but will indicate only that the general method of construction and detailing is satisfactory. Review of such submittal will not relieve the Contractor of the responsibility for any errors that may exist, as the Contractor shall be responsible for the dimensions and design of adequate connections, details, and satisfactory construction of all work.

##### 1.02 DEFINITIONS

The term "submittals" shall mean shop drawings, manufacturer's drawings, catalog sheets, brochures, descriptive literature, diagrams, schedules, calculations, material lists, performance charts, test reports, office and field samples, and items of similar nature which are normally submitted for the Engineer's review for conformance with the design concept and compliance with the Contract Documents.

##### 1.03 GENERAL CONDITIONS

Review by the Engineer of shop drawings or submittals of material and equipment shall not relieve the Contractor from the responsibilities of furnishing same of proper dimension, size, quantity, materials and all performance characteristics to efficiently perform the requirements and intent of the Contract Documents. Review shall not relieve the Contractor from responsibility for errors of any kind on the shop drawings. Review is intended only to assure conformance with the design concept of the Project and compliance with the information given in the Contract Documents. Review of shop drawings shall not be construed as releasing the Contractor from the responsibility of complying with the Specifications.

##### 1.04 GENERAL REQUIREMENTS FOR SUBMITTALS

- A. Shop drawings shall be prepared by a qualified detailer. Details shall be identified by reference to sheet and detail numbers shown on Contract Documents. Where applicable, show fabrication, layout, setting and erection details. Shop drawings are defined as original drawings prepared by the Contractor, subcontractors, suppliers, or distributors performing work under this Contract. Shop drawings illustrate some portion of the work and show fabrication, layout, setting or erection details of equipment, materials and components. The Contractor shall, except as otherwise noted, have prepared the number of reviewed copies required for his distribution plus three (3) which will be retained by the Engineer and Owner. Shop drawings shall be folded to an approximate size of 8-1/2 inch x 11 inch and in such manner that the title block will be located in the lower right-hand corner of the exposed surface.
- B. Project data shall include manufacturer's standard schematic drawings modified to delete information which is not applicable to the Project, and shall be supplemented to provide additional information applicable to the Project. Each copy of descriptive literature shall be clearly marked to identify pertinent information as it applies to the Project.
- C. Where samples are required, they shall be adequate to illustrate materials, equipment or workmanship, and to establish standards by which completed work is judged. Provide sufficient size and quantity to clearly illustrate functional characteristics of product and material, with integrally related parts and attachment devices, along with a full range of color samples.

- D. All submittals shall be referenced to the applicable item, section and division of the Specifications, and to the applicable Drawing(s) or Drawing schedule(s) and shall be with transmittal forms and format provided by the Engineer.
- E. The Contractor shall review and check submittals, and indicate his review by initials and date.
- F. If the submittals deviate from the Contract Drawings and/or Specifications, the Contractor shall advise the Engineer, in letter of transmittal of the deviation and the reasons therefore. All changes shall be clearly marked on the submittal with a bold mark other than red. Any additional costs for modifications shall be borne by the Contractor.
- G. In the event the Engineer does not specifically reject the use of material or equipment at variance to that which is shown on the Drawings or specified, the Contractor shall, at no additional expense to the Owner, and using methods reviewed by the Engineer, make any changes to structures, piping, controls, electrical work, mechanical work, etc., that may be necessary to accommodate this equipment or material. Should equipment other than that on which design drawings are based be accepted by the Engineer, shop drawings shall be submitted detailing all modification work and equipment changes made necessary by the substituted item.
- H. Additional information on particular items, such as special drawings, schedules, calculations, performance curves, and material details, shall be provided when specifically requested in the technical Specifications.
- I. Submittals for all electrically operated items (including instrumentation and controls) shall include complete wiring diagrams showing lead, runs, number of wires, wire size, color coding, all terminations and connections, and coordination with related equipment.
- J. Equipment shop drawings shall indicate all factory or shop paint coatings applied by suppliers, manufacturers and fabricators; the Contractor shall be responsible for insuring the compatibility of such coatings with the field-applied paint products and systems.
- K. Fastener specifications of manufacturer shall be indicated on equipment shop drawings.
- L. Where manufacturer's brand names are given in the Specifications for building and construction materials and products, such as grout, bonding compounds, curing compounds, masonry cleaners, waterproofing solutions and similar products, the Contractor shall submit names and descriptive literature of such materials and products he proposes to use in this Contract.
- M. No material shall be fabricated or shipped unless the applicable drawings or submittals have been reviewed by the Engineer and returned to the Contractor.
- N. All bulletins, brochures, instructions, parts lists, and warranties packaged with and accompanying materials and products delivered to and installed in the Project shall be saved and transmitted to the Owner through the Engineer.
- O. All submittals shall be made by the use of a multi-copy transmittal form supplied by the Engineer. All applicable blanks on the form shall be filled in with the appropriate data.

#### 1.05 CONTRACTOR RESPONSIBILITIES

- A. Verify field measurements, field construction criteria, catalog numbers and similar data.
- B. Coordinate each submittal with requirements of Work and Contract Documents.
- C. Notify Engineer, in writing at time of submission, of deviations in submittals from requirements of Contract Documents.

- D. Begin no work, and have no material or products fabricated or shipped which required submittals until return of submittals with Engineer's stamp and initials or signature indicating review and acceptance.

END OF SECTION 01-300

## **EROSION AND SEDIMENT CONTROL**

### **1.0 GENERAL**

#### **1.01 WORK INCLUDED**

- A. The Contractor shall do all Work and take all measures necessary to control soil erosion resulting from construction operations, shall prevent the flow of sediment from the construction site, and shall contain construction materials (including excavation and backfill) within his protected working area so as to prevent damage to the adjacent wetlands and water courses.
- B. The Contractor shall not employ any construction method that violates a rule, regulation, guideline or procedure established by Federal, State or local agencies having jurisdiction over the environmental effects of construction.
- C. Pollutants such as chemicals, fuels, lubricants, bitumen, raw sewage and other harmful waste shall not be discharged into or alongside of any body of water or into natural or man-made channels leading thereto.
- D. If required by regulatory authorities, Contractor shall prepare a Storm Water Pollution Prevention Plan (SWPPP) for the project, obtain all necessary approvals and comply with the plan for the duration of construction.

### **2.0 PRODUCTS**

#### **2.01 MATERIALS**

Bales may be hay or straw, and shall be reasonably clean and free of noxious weeds and deleterious materials. Filter fabric for sediment traps shall be of suitable materials acceptable to the Engineer.

### **3.0 EXECUTION**

#### **3.01 METHODS OF CONSTRUCTION**

- A. The Contractor shall use any of the acceptable methods necessary to control soil erosion and prevent the flow of sediment to the maximum extent possible. These methods shall include, but not be limited to, the use of water diversion structures, diversion ditches and settling basins.
- B. Construction operations shall be restricted to the areas of work indicated on the Drawings and to the area which must be entered for the construction of temporary or permanent facilities. The Engineer has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and fill operations and to direct the Contractor to provide immediate permanent or temporary pollution control measures to prevent contamination of the wetlands and adjacent watercourses. Such work may involve the construction of temporary berms, dikes, dams, sediment basins, slope drains, and use of temporary mulches, mats, or other control devices or methods as necessary to control erosion.
- C. Excavated soil material shall not be placed adjacent to the wetlands or watercourses in a manner that will cause it to be washed away by high water or runoff. Earth berms or diversions shall be constructed to intercept and divert runoff water away from critical areas. Diversion outlets shall be stable or shall be stabilized by means acceptable to the Engineer. If for any reason construction materials are washed away during the course of construction, the Contractor shall remove those materials from the fouled areas as directed by the Engineer.

- D. For Work within easements or rights-of-way, all materials used in construction such as excavation, backfill, roadway, and pipe bedding and equipment shall be kept within the limits of these easements or rights-of-way.
- E. The Contractor shall not pump silt-laden water from trenches or other excavation into the wetlands, or adjacent watercourses. Instead, silt-laden water from his excavations shall be discharged within areas surrounded by baled hay or into sediment traps or ensure that only sediment-free water is returned to the watercourses. Damage to vegetation by excessive watering or silt accumulation in the discharge area shall be avoided.
- F. Prohibited construction procedures include, but are not limited to the following:
  - 1. Dumping of spoil material into any streams, wetlands, surface waters, or unspecified locations.
  - 2. Indiscriminate, arbitrary, or capricious operation of equipment in wetlands or surface waters.
  - 3. Pumping of silt-laden water from trenches or excavations into surface waters, or wetlands.
  - 4. Damaging vegetation adjacent to or outside of the construction area limits.
  - 5. Disposal of trees, brush, debris, paints, chemicals, asphalt products, concrete curing compounds, fuels, lubricants, insecticides, wash water from concrete trucks or hydro seeders, or any other pollutant in wetlands, surface waters, or unspecified locations.
  - 6. Permanent or unauthorized alteration of the flow line of any stream.
  - 7. Open burning of debris from the construction work.
- G. Any temporary working roadways required shall be clean fill approved by the Engineer. In the event fill is used, the Contractor shall take every precaution to prevent the fill from mixing with native materials of the site. All such foreign fill materials shall be removed from the site following construction.

### 3.02 EROSION CHECKS

The Contractor shall furnish and install baled hay or straw erosion checks surrounding the base of all deposits of stored excavated material outside of the disturbed area, and where indicated by the Engineer. Checks located surrounding stored material shall be located approximately 6 feet from that material. Bales shall be held in place with two 2 inch by 2 inch by 3 feet wooden stakes. Each bale shall be butted tightly against the adjoining bale to preclude short-circuiting of the erosion check.

END OF SECTION 01-565



## **CLEARING, GRUBBING AND STRIPPING**

- 1.1 **SCOPE OF WORK:** The work to be performed under this section includes all clearing, grubbing, and stripping necessary to properly prepare the project area on which work is to be done according to plans and specifications. Scarifying of all areas specified or shown on the plans to receive backfill, pavement and other construction shall be performed in accordance with the applicable sections.
- 2.1 **MATERIALS AND EQUIPMENT:** The Contractor shall use equipment and/or materials necessary to accomplish the intent and work described herein in an efficient and complete manner.
- 3.1 **CLEARING AND GRUBBING:** Areas to be excavated or on which fills are to be placed shall be cleared of trees, down timber, brush, rubbish, debris and other objectionable material. Other areas designated to be cleared of underbrush shall be cleared of all trees under 6-in. caliper except as directed by Engineer.
- Grubbing of roots within limits of excavation and fill operation shall consist of removal of stumps and roots having diameter larger than 3 inches so that no part shall extend nearer than 18 inches of finish construction subgrade.
- In areas of partial clearing (underbrush only) remove roots, stumps and other impediments sufficiently to permit light disking of soil for lawn seeding.
- In areas to receive paving, walks or structures, all stump holes or other excavation below subgrade shall be filled with selected earth fill and compacted to 95% of maximum density at optimum moisture.
- Burning of timber and debris from clearing and grubbing operations will not be permitted on the site. All debris, brush or rubbish removed shall be disposed of off the site by the Contractor.
- 3.2 **STRIPPING:** In all areas where construction of any type is to be performed, the top 2 inches of soil shall be stripped off and salvaged. This material may be used for top soil dressing on side slopes of swales, ramps, and yard areas.
- 3.3 **REMOVING MATERIAL:** Unless otherwise specified, cleared and grubbed material becomes property of the contractor, to be removed from the work site or disposed of in manner not to damage the owner.

END OF SECTION 02 102

## SECTION 02-222

### EXCAVATION

#### 1.0 GENERAL

##### 1.01 WORK INCLUDED

- A. Structure excavation.
- B. Utility excavation.

##### 1.02 RELATED REQUIREMENTS

- A. Section 02-225: Excavating, Backfilling and Compacting for Utilities.

##### 1.03 PROTECTION

- A. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in or loose soil from falling into excavation.
- B. Underpin adjacent structures that may be damaged by excavation work, including service utilities and pipe chases.
- C. Notify Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.
- D. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.
- E. Grade excavation top perimeter to prevent surface water run-off into excavation.
- F. Contractor shall provide ample means and devices with which to intercept any water entering the excavation area.

##### 1.04 ROCK EXCAVATION

Any rock encountered within foundation excavations for recommended soil bearing elements should be removed to a depth sufficient to provide a minimum 24-inch soil cushion between the bottom of the footing and the top of rock. The soil cushion should be constructed of properly compacted on-site soils free of organics and deleterious materials. All excavation is unclassified; no additional payment will be made based on the type of material to be excavated.

##### 1.05 PAYMENT

- A. General excavation shall include all excavation specified, undercutting, fill, backfill, grading, and rock excavation except unsuitable foundation material, as hereinafter described.
- B. All general excavation shall be included in the Lump Sum Bid. Changes that require additions to or deductions from the excavation will be adjusted on the basis of the unit price for changes contained in the Contract.

#### 2.0 PRODUCTS

##### 2.01 MATERIALS

- A. Excavated material: Soil or rock free of lumps larger than 6 inches, rocks larger than 6 inches, and debris.

- B. Stone or Aggregate: Mineral aggregate graded to meet the requirements set forth on the plans, and meeting Kentucky Department of Highways specifications.

### 3.0 EXECUTION

#### 3.01 PREPARATION

Identify required lines, levels, contours, and datum.

#### 3.02 EXCAVATION

- A. Excavate subsoil required for structure foundations, construction operations, and other work.
- B. Contractor is responsible to adequately brace open cuts and protect workmen and equipment from cave-in.
- C. Remove lumped subsoil, boulders, and rock up to 1/3 Cu. yd., measured by volume.
- D. Correct unauthorized excavation at no Cost to Owner.
- E. Fill over-excavated areas under structure bearing surfaces in accordance with direction by Engineer.
- F. Stockpile excavated material in area designated on site.

#### 3.03 EXCAVATION FOR STRUCTURES

- A. For structures, excavate to elevations and dimensions indicated, plus ample space for construction operations and inspection of foundations.
  - 1. Excavate to the depth and grade required for subgrade preparation and bridge course construction as indicated on the Drawings. Structure foundations shall bear entirely on prepared subgrade.
  - 2. Structure foundations shall be installed immediately after subgrade preparation is completed. In no case should foundations be installed in excavations which contain water. Any soft, saturated areas in the bottom of excavations shall be removed or stabilized using granular material.
  - 3. Make no excavation to the full depth indicated when freezing temperatures may be expected unless foundations can be installed after the excavation has been completed. Protect the bottom so excavated from frost if foundation installation is delayed.

#### 3.04 REMOVAL OF WATER

- A. The Contractor, at his own expense, shall provide adequate facilities for promptly and continuously removing water from all excavation.
- B. To ensure proper conditions at all times during construction, the Contractor shall provide and maintain ample means and devices (including spare units kept ready for immediate use in case of breakdowns) with which to remove promptly and dispose properly of all water entering trenches and other excavations. Such excavation shall be kept dry until the structures, pipes, and appurtenances to be built therein have been completed to such extent that they will not be floated or otherwise damaged.
- C. All water pumped or drained from the Work shall be disposed of in a suitable manner without undue interference with other work, damage to pavements, other surfaces, or property. Suitable temporary pipes, flumes, or channels shall be provided for water that may flow along or across the site of the Work.

- D. If necessary, the Contractor shall dewater the excavations by means of an efficient drainage wellpoint system that will drain the soil and prevent saturated soil from flowing into the excavation. The wellpoints shall be designed especially for this type of service. The pumping unit shall be designed for use with the wellpoints, and shall be capable of maintaining a high vacuum and of handling large volumes of air and water at the same time.
- E. The installation of the wellpoints and pump shall be done under the supervision of a competent representative of the manufacturer. The Contractor shall do all special work such as surrounding the wellpoints with sand or gravel or other work, which is necessary for the wellpoint system to operate for the successful dewatering of the excavation.

### 3.05 UNAUTHORIZED EXCAVATION

If the bottom of any excavation is taken out beyond the limits indicated or prescribed, the resulting void shall be backfilled at the Contractor's expense with thoroughly compacted aggregate material.

### 3.06 ELIMINATION OF UNSUITABLE MATERIAL

- A. If material unsuitable for foundation (in the opinion of the Engineer) is found at or below the grade to which excavation would normally be carried in accordance with the Drawings and/or Specifications, the Contractor shall remove such material to the required width and depth and replace it with thoroughly compacted, screened gravel, select bank-run gravel, fine aggregate or concrete as directed.
- B. No excavated materials shall be removed from the site of the work or disposed of by the Contractor except as directed or permitted.
- C. Surplus excavated materials suitable for backfill shall be used to backfill normal excavations in rock or to replace other materials unacceptable for use as backfill; shall be neatly deposited and graded so as to make or widen fills, flatten side slopes, or fill depressions. All work shall be as directed or permitted and without additional compensation.

### 3.07 EXCESS MATERIAL

Excess material may be disposed of on City property in areas as designated by the Owner. Contractor shall be responsible for transporting material to the disposal site, placing material in a manner that facilitates drainage and maintenance of the site, and seeding the area to establish erosion control.

### 3.08 EXISTING UTILITIES AND OTHER OBSTRUCTIONS

Prior to the commencement of construction on the project, the Contractor shall contact the utility companies whose lines, above and below ground, may be affected during construction and verify the locations of the utilities as shown on the Contract Drawings. The Contractor shall ascertain from said companies if he will be allowed to displace or alter, by necessity, those lines encountered or replace those lines disturbed by accident during construction, or if the companies themselves are only permitted by policy to perform such work. If the Contractor is permitted to perform such work, he shall leave the lines in as good condition as were originally encountered and complete the Work as quickly as possible. All such lines or underground structures damaged or molested in the construction shall be replaced at the Contractor's expense, unless in the opinion of the Engineer, such damage was caused through no fault of the Contractor.

### 3.09 FIELD QUALITY CONTROL

Allow time for inspection of excavated areas by the Engineer prior to placement of any backfill.

END OF SECTION 02-222

## **BACKFILL AND EMBANKMENTS**

### **1.0 GENERAL**

#### **1.01 WORK INCLUDED**

- A. Structure perimeter backfilling to subgrade elevations.
- B. Site backfilling.
- C. Compaction requirements.
- D. Access road subgrade preparation.

#### **1.02 RELATED WORK**

- A. Section 02-222: Excavation.
- B. Section 02-225: Excavation, Backfilling and Compacting for Utilities.

#### **1.03 REFERENCES**

- A. Commonwealth of Kentucky, Standard Specifications for Road and Bridge Construction.
- B. ANSI/ASTM D698 - Moisture-Density Relations of Soils and Soil-Aggregate Mixture Using 5.5 lb Rammer and 12 inch Drop.
- C. ANSI/ASTM D1556 - Density of Soil in Place by the Sand-Cone Method.
- D. ASTM 2922 - Density of Soil and Soil-Aggregate in Place by Nuclear Methods.
- E. ASTM 3017 - Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

#### **1.04 TESTS**

- A. Tests and analysis of fill materials will be performed in accordance with ANSI/ASTM D698. Tests shall include but not be limited to gradation analysis and moisture/density relationships.
- B. Test will be performed by an approved independent testing laboratory and shall be the responsibility of the Contractor at no additional cost to the Owner.
- C. Density test shall be performed in sufficient number to insure the specified densities are being obtained.
- D. When ASTM D2922 is used, the calibration curves shall be checked and adjusted if necessary by the procedure described in ASTM D2922, paragraph ADJUSTING CALIBRATION CURVE. ASTM D2922 results in a wet unit weight of soil; and when using this method, ASTM D3017 shall be used to determine content of the soil. The calibration checks of both the density and moisture gages shall be made at the beginning of a job on each different type of material encountered and at intervals as directed by the testing laboratory.

#### **1.05 SUBMITTALS**

Results of soil moisture and density tests by an approved testing laboratory shall be submitted to the Engineer for review.

## 2.0 PRODUCTS

### 2.01 SELECT FILL MATERIALS

- A. The on-site residual soils are considered suitable for use as compacted fill. Fill that will support foundation elements should be placed in 6- to 8-inch loose lifts and compacted to a minimum of 100 percent of its maximum dry density and within plus or minus 2 percent of optimum moisture content as determined by standard Proctor moisture density test. A minimum of 95 percent of the maximum dry density and plus or minus 2 percent of optimum moisture content should be obtained for fill soils supporting floor slabs, sidewalks or pavements. Field density tests should be performed on each lift placed to determine if proper compaction is being achieved. If sufficient suitable material is not available from the excavations, the backfill material shall be screened gravel, crushed stone or selected borrow as directed.
- B. Frozen material shall not be placed in the backfill nor shall backfill be placed upon frozen material. Previously frozen material shall be removed or shall be otherwise treated as required before new backfill is placed.
- C. All material, whether from the excavations or from borrow, shall be of such nature that after it has been placed and properly compacted, it will make a dense, suitable fill. It shall not contain vegetation, masses of roots, individual roots more than 18 inches long or more than 1/2-inch in diameter, stones over 6 inches in diameter, or porous matter.

### 2.02 COMPACTED FILL

- A. Soil used for compacted fill should be inorganic clayey soils free of deleterious debris or rocks whose largest dimension is no larger than 3-inches. The soil should have a liquid limit (LL) of less than 50, a plasticity index (PI) of less than 30, and a maximum dry density according to the standard Proctor compaction test of at least 100 pcf. The fill should be compacted to at least 95 percent of the SPMDD. The top foot of structural fill shall be compacted to 100 percent of the SPMDD.
- B. The moisture content of the compacted fill material shall be within 2% of the optimum moisture content as determined by ASTM D-698.

### 2.03 STRUCTURAL BACKFILL

- A. All structures shall be supported on a bearing pad consisting of at least 6-inches of crushed stone aggregate placed over sound subgrade.
- C. Crushed stone used as a bearing medium should be placed in uniform, loose lifts not exceeding 8 inches in thickness. It is recommended that each lift be compacted by a minimum of five (5) passes of a smooth drum vibratory roller having a total static weight of not less than 20,000 pounds. The diameter of the drum should be between 5.0 and 5.5 feet and 6.0 and 6.5 feet wide.
- D. Walls below final grade should be backfilled with a minimum 12-inch thick layer of free draining material up to two feet below final grade. The two feet above this free draining material should be backfilled with an impervious material that would retard surface water infiltration. The free draining material should extend down to a rock blanket beneath the bottom slab.

### 3.0 EXECUTION

#### 3.01 INSPECTION

- A. Verify that subgrade has been inspected by the Geotechnical Engineer.
- B. Verify areas to be backfilled are free of debris, snow, ice, or water, and ground surfaces are not frozen.

#### 3.02 PREPARATION

- A. When necessary, compact subgrade surfaces to density requirements for the backfill material and prepare subgrade or previous layer of compacted fill prior to placement of additional fill by scarifying or disking.
- B. Cut out soft areas of subgrade not readily capable of in situ compaction. Backfill with subsoil and compact to density equal to requirements for subsequent backfill material.

#### 3.03 BACKFILLING - GENERAL

- A. Backfill areas to contours and elevations. Use unfrozen materials. The Contractor shall keep the foundation and subgrade free from water or unacceptable materials after the fill operations have started.
- B. Backfill systematically, as early as possible, to allow maximum time for natural settlement. Do not backfill over porous, wet, or spongy subgrade surfaces.
- C. Place and compact fill materials in continuous layers not exceeding 8 inches loose depth. Field density tests shall be performed on each lift.
- D. Employ a placement method so not to disturb or damage foundation drainage.
- E. Maintain optimum moisture content of backfill material to attain required compaction density as specified. Material deposited on the fill that is too wet shall be removed or spread and permitted to dry, assisted by disking or blading, if necessary, until the moisture content is reduced to the specified limits.
- F. All crushed stone fill and crushed stone backfill under structures and pavements adjacent to structures shall be DGA per crushed stone per Kentucky Highway Department Standard Specifications for Road and Bridge Construction, unless indicated otherwise. Fill and backfill materials shall be placed in layers not exceeding six (6) inches in thickness and compacted to 95 percent of maximum dry density.
- G. Backfill shall not be placed against or on structures until they have attained sufficient strength to support all loads to which subjected without distortion, cracking, or damage. Deposit soil evenly around the structure.
- H. Slope grade away from structures minimum 2 inches in 10 feet, unless noted otherwise.
- I. Make changes in grade gradual. Blend slopes into level areas.
- J. Remove surplus excavation materials to designated areas.

#### 3.04 TOLERANCES

Top Surface of Backfilling: Plus or minus 1 inch.

### 3.05 FIELD QUALITY CONTROL

- A. Compaction testing will be performed in accordance with ASTM D1556 or ASTM D2922 and under provisions of Sections 01-400.
- B. Tests shall be performed on each 100 square feet of surface area and on each lift of the surface area, where more than one lift is required to achieve the required bearing or backfill surface.
- C. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to Owner.

END OF SECTION 02-223



## SECTION 02-224

### ROADWAY EXCAVATION

- 1.1 SCOPE: Roadway excavation consists of excavating, hauling, shaping, compacting and satisfactorily manipulating material within the project limits to required cross sections.
- 2.1 PRODUCTS: Specific products are not required. Equipment and materials necessary to properly complete roadway excavation shall be used.
- 3.1 GRADING: Grading shall be the entire length of the project to required lines and grades. Mud or spongy material shall be removed to the depth required. The space shall be refilled with suitable material which is free of vegetation, humus or debris. Compaction shall be to a minimum density of 95 percent at optimum moisture content as determined by ASTM D698.
- 3.2 DISPOSAL OF MATERIAL: Suitable excavated material shall be used for compacted fills or backfills. Unsuitable excavated material and any surplus material not required for fill with other waste materials shall be disposed of by the Contractor at his expense.

## **SURFACE RESTORATION AND SEEDING**

### **1.0 WORK INCLUDED**

#### **1.01 CLEAN-UP**

Upon completion of the Project, the Contractor shall remove all debris and surplus construction materials resulting from his work. The Contractor shall grade the ground along each side of the pipe trenches and/or structures in a uniform and neat manner leaving the construction area in a shape as near as possible to the original ground line, or as shown on the Drawings.

### **2.0 PRODUCTS**

#### **2.01 SEED**

Grass seed, with the exception of seed used on the soccer field, shall be mixed and guaranteed by the supplier to consist of the following:

Annual Ryegrass	40 percent
Kentucky 31 Fescue	60 percent

Grass seed for the soccer field shall be determined by the City of Elkton.

#### **2.02 TOPSOIL**

Topsoil shall be material stripped and stored for reuse in the finished work. It shall not contain subsoil material and shall be clean and free of clay lumps, roots, stones or similar substances more than 2 inches in any dimension, debris, discarded fragments of building materials or weeds and weed seeds.

#### **2.03 SOIL IMPROVEMENTS**

- A. Commercial fertilizers shall have a guaranteed analysis of 10-10-10. Fertilizer shall be uniform in composition, dry and free flowing, and shall be delivered to the site in the original, unopened containers, each bearing the manufacturer's guaranteed analysis. Any fertilizer that becomes caked or otherwise damaged, making it unsuitable for use, will not be accepted.
- B. Lime shall be ground limestone (Dolomite) containing not less than 85 percent of total carbonates, and shall be ground to such fineness that 50 percent will pass through a 100-mesh sieve, and 90 percent will pass through a 20-mesh sieve. Coarser material shall be acceptable provided that required rates of application are increased proportionally on the basis of quantities passing the 100-mesh sieve.

### **3.0 EXECUTION**

#### **3.01 SEEDING AND SODDING**

- A. After installation of the Project, topsoil shall be spread evenly to a minimum 4-inch depth and lightly compacted. No topsoil shall be spread in a frozen or muddy condition. The Contractor as directed by the Engineer shall dispose of any stored topsoil remaining after work is in place.
- B. Soil improvement shall be made prior to seeding.
  - 1. Ground limestone shall be applied at the rate of 20 pounds per thousand square feet and shall be thoroughly mixed into the topsoil.
  - 2. Fertilizer shall be applied at a rate of 10 pounds per thousand square feet.
- C. Immediately before any seed is to be sown, the ground shall be scarified as necessary and shall

be raked until the surface is smooth, friable and of a uniformly fine texture. Areas shall be seeded evenly with a mechanical spreader at a rate of 5 pounds per 1,000 square feet, lightly raked to incorporate seed into the soil, and watered with a fine spray.

- D. After seed has been distributed, the Contractor shall cover all seeded areas with wheat straw to a depth of 2-3 inches.
- E. Seeded areas shall be protected and maintained by watering, regular mowing and reseeding as may be necessary to produce a uniform stand of grass. Maintenance shall continue throughout the guarantee period until a dense, uniform turf is established.
- F. All paved streets, roads, sidewalks, curbs, fences, stonewalls, lawns, etc., disturbed during construction shall be restored, repaired, or replaced to as good a condition as existed prior to construction. All materials and workmanship shall conform to standard practices and specifications of the Owner and/or the Kentucky Department of Highways, whichever applies.
- G. The Contractor shall remove from the site all equipment, unused materials and other items at his expense. The construction site shall be left in a neat, orderly condition, clear of all unsightly items, before the Work is finally accepted.
- H. Seeding of the soccer field shall comply with methods preferred by the City of Elkton, and may differ from seeding elsewhere on the project site.

END OF SECTION 02-930

## CONCRETE FORMWORK

### 1.0 GENERAL

#### 1.01 WORK INCLUDED

- A. Formwork for cast-in-place concrete, with shoring, bracing, and anchorage.
- B. Openings for other affected work.
- C. Form accessories.
- D. Stripping forms.

#### 1.02 REFERENCES

- A. ACI 301 - Specifications for Structural Concrete for Buildings.
- B. ACI 347 - Recommended Practice for Concrete Formwork.
- C. PS 1 - Construction and Industrial Plywood.
- D. ACI 318 - Building Code Requirements for Reinforced Concrete.
- E. ACI 350 R - Environmental Engineering Concrete Structures.

#### 1.03 SYSTEM DESCRIPTION

Design, engineer and construct formwork, shoring, and bracing to meet design and code requirements so that resultant concrete conforms to required shapes, lines, dimensions and tolerances.

#### 1.04 QUALITY ASSURANCE

Construct and erect concrete formwork in accordance with ACI 301 and 347, latest revisions.

### 2.0 PRODUCTS

#### 2.01 FORM MATERIALS

- A. Plywood; Douglas Fir species; medium density overlaid one side grade; sound, undamaged sheets with straight edges.
- B. Glass fiber fabric reinforced plastic forms; matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to structural tolerances and appearance of finished concrete surface.
- C. Forms shall be sufficiently rigid to prevent displacement or sagging between supports and so constructed that the concrete will not be damaged by their removal. The Contractor shall be entirely responsible for their adequacy.
- D. For surfaces to be given a rubbed finish, the form surface in contact with the concrete shall be made of heavy gage metal, new plywood (used plywood may not be used), tempered wood fiberboards with smooth surface, or similar material. Metal forms or form linings shall have square edges so that the concrete will not have fins or fluting. Forms shall not be pieced out by use of material different from those in the adjacent form or in such manner as will detract from the uniformity of the finished surface.

- E. For surfaces other than those to be given a rubbed finish, forms shall be made of wood, metal, or other acceptable material. Wooden forms shall be constructed of sound lumber or plywood of suitable dimensions, free from knotholes and loose knots. Plywood shall be reasonably good as accepted. Metal forms shall be of an acceptable type for the work involved. Edges of forms in contact with concrete shall be flush within 1/16-inch.
- F. Forms for walls, columns, or piers shall have removable panels at the bottom for cleaning, inspection, and scrubbing in of bonding grout. Forms for thin sections (such as walls or columns) of considerable height shall be arranged with suitable openings so that the concrete can be placed in a manner that will prevent segregation and accumulations of hardened concrete on the forms or reinforcement above the fresh concrete, unless special spouts are used to place concrete, and so that construction joints can be properly keyed and treated.
- G. Forms for exposed surfaces shall be built with 3/4-inch chamfer strips attached to produce smooth, straight chamfers at all sharp edges of concrete.
- H. All forms shall be oiled with an acceptable nonstaining oil or liquid form coating before reinforcement is placed.
- I. Before form material is reused, all surfaces that are in contact with the concrete shall be thoroughly cleaned, all damaged places repaired, and all projecting nails withdrawn.

## 2.02 FORMWORK ACCESSORIES

- A. Form ties to be encased in concrete shall not be made of through bolts or common wire, but shall be made and installed as to embody the following features:
  - 1. After removal of the protruding part of the tie, there shall be no metal nearer than 1 inch to the face of the concrete.
  - 2. That part of the tie which is to be removed shall be at least 1/2-inch in diameter, or if smaller, it shall be provided with a wood or metal cone 1 inch long placed against the inside of the forms. Cones shall be carefully removed from the concrete after the forms have been stripped.
  - 3. Ties that pass through walls subject to hydrostatic pressure shall be provided with acceptable water stops, such as washers, securely fastened to the ties.
- B. Form Release Agent: Colorless material which will not stain concrete, absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete. Form oil shall be placed prior to reinforcing steel when possible and surplus oil on form surfaces or reinforcing steel shall be removed.
- C. Fillets for Chamfered Corners: Wood strip type to the size and shape as shown on the Drawings (or 3/4-inch if not shown).
- D. Dovetail Anchor Slots: Minimum 10 gage thick galvanized steel; foam filled; release tape sealed slots; bent tab anchors securable to concrete formwork.
- E. Nails, spikes, lag bolts, through bolts, anchorages: Sized as required of strength and character to maintain formwork in place while placing concrete.

## 3.0 EXECUTION

### 3.01 INSPECTION

Verify lines, levels and measurements before proceeding with formwork.

### 3.02 PREPARATION

Earth forms not permitted except for continuous strip footings of buildings.

### 3.03 ERECTION

- A. Provide bracing to ensure stability of formwork. Strengthen formwork liable to be overstressed by construction loads.
- B. Camber slabs and beams to achieve ACI 301 tolerances.
- C. Provide temporary ports in formwork to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain. Close ports with tight fitting panels, flush with inside face of forms, neatly fitted so that joints will not be apparent in exposed concrete surfaces.
- D. Concrete surfaces not exposed to view shall be formed with sound tight lumber or other material producing equivalent finish.
- E. Concrete surfaces to be exposed to view shall be formed with material that is not reactive with concrete surfaces and shall be equivalent in smoothness and appearance to that produced by new plywood panels conforming to PS 1, exterior type Grade B-B.

### 3.04 APPLICATION OF RELEASE AGENT

Apply form release agent on formwork in accordance with manufacturer's instructions. Apply prior to placing reinforcing steel, anchoring devices, and embedded items.

### 3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Provide formed openings where required for work embedded in or passing through concrete.
- B. Coordinate work of other sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.
- C. Install accessories in accordance with manufacturer's instructions, level and plumb. Ensure items are not disturbed during concrete placement.

### 3.06 FORM REMOVAL

- A. Do not remove forms and bracing until concrete has sufficient strength to support its own weight and construction and design loads which may be imposed upon it. Remove load-supporting forms when concrete has attained 75 percent of required 28-day compressive strength, provided construction is reshored.
- B. Reshore structural members due to design requirements or construction conditions to permit successive construction.
- C. Remove formwork progressively so that no unbalanced loads are imposed on structure.
- D. Do not damage concrete surfaces during form removal.

### 3.07 CLEANING

- A. Clean forms to remove foreign matter as erection proceeds.
- B. Ensure that water and debris drain to exterior through clean out ports.
- C. During cold weather, remove ice and snow from forms. Do not use deicing salts. Do not use water to clean out completed forms unless formwork and construction proceed within heated enclosure. Use compressed air to remove foreign matter.

END OF SECTION 03-100

## SECTION 03-210

### REINFORCING STEEL

#### 1.0 GENERAL

##### 1.01 WORK INCLUDED

- A. Reinforcing steel.
- B. Shop Drawings.

##### 1.02 RELATED WORK

- A. Section 03-100: Concrete Formwork.
- B. Section 03-251: Expansion and Contraction Joints.
- C. Section 03-310: Structural Concrete.

##### 1.03 REFERENCES

- A. ASTM A-615.
- B. ASTM A-616.
- C. ASTM A-617.
- D. ACI 351.
- E. ASTM A-120.
- F. ASTM A-185.

##### 1.04 SUBMITTALS

- A. Shop Drawings: The Contractor shall submit a complete set of shop drawings including schedules and bending drawings for all reinforcement used in the work in accordance with the "Manual of Standard Practice for Detailing Concrete Structures" (ACI 351).
- B. Submittals: The Contractor shall submit the shop drawings in accordance with Section 01-300.

##### 1.05 SUPPLEMENTAL UNIT PRICE

The CONTRACTOR shall fill in a unit price for "Reinforcing" in the blank space provided in the Bid to apply in the event of any deletions from or additions to the work. All reinforcement shown or specified shall be included in the Lump Sum bid. The unit prices shall include all elements of work specified in this section.

#### 2.0 PRODUCTS

##### 2.01 MATERIALS

- A. The minimum yield strength of the reinforcement shall be 60,000 pounds per square inch. Bar reinforcement shall conform to the requirements of ASTM A-615, A-616, or A-617. All bar reinforcement shall be deformed.

- B. Smooth dowels shall be plain steel bars conforming to ASTM A-615, Grade 40, or steel pipe conforming to ASTM A-120, Schedule 80. Pipe, if used, shall be closed flush at each end with mortar or metal or plastic cap.
- C. Welded wire fabric shall conform to ASTM 185, welded steel wire fabric for concrete reinforcement.
- D. Reinforcement supports and other accessories in contact with the forms for members which will be exposed to view in the finished work shall have approved high density polyethylene tips so that the metal portion shall be at least 1/4-inch from the form or surface. Supports for reinforcement, when in contact with the ground or stone fill, shall be precast stone concrete blocks.

## 2.02 FABRICATION

- A. Reinforcement shall be bent cold. It shall be bent accurately to the dimensions and shapes shown on the plans and to within tolerances specified in the CR51 Manual of Standard Practice.
- B. Reinforcing shall be shipped with bars of the same size and shape, fastened securely with wire and with metal identification tags giving size and mark.

## 3.0 EXECUTION

### 3.01 PLACING AND FASTENING

- A. Before being placed in position, reinforcement shall be cleaned of loose mill and rust scale, dirt and other coatings that will interfere with development of proper bond.
- B. Reinforcement shall be accurately placed in positions shown on the Drawings and firmly held in place during placement and hardening of concrete by using annealed wire ties. Bars shall be tied at all intersections except where spacing is less than 1 foot in both directions, and then alternate intersections may be tied.
- C. Distance from the forms shall be maintained by means of stays, blocks, ties, hangers or other approved supports. If fabric reinforcement is shipped in rolls, it shall be straightened into flat sheets before being placed.
- D. **Before any concrete is placed, the Engineer shall have inspected the placing of the steel reinforcement and given permission to deposit the concrete. Concrete placed in violation of this provision will be rejected and thereupon shall be removed.**
- E. Unless otherwise specified, reinforcement shall be furnished in the full lengths indicated on the Drawings. Splicing of bars, except where shown on the Drawings, will not be permitted without the approval of the Engineer. Where splices are made, they shall be staggered insofar as possible.
- F. Wire mesh reinforcement shall be continuous between expansion joints. Laps shall be at least one full mesh plus 2 inches, staggered to avoid continuous lap in either direction and securely wired or clipped with standard clips.
- G. Dowels shall be installed at right angles to construction joints and expansion joints. Dowels shall be accurately aligned parallel to the finished surface, and shall be rigidly held in place and supported during placing of the concrete. One end of dowels shall be oiled or greased and have a plastic expansion end cap.

END OF SECTION 03-210



## **EXPANSION AND CONTRACTION JOINTS**

### **1.0 GENERAL**

#### **1.01 WORK INCLUDED**

- A. Forming integral contraction and control joints in concrete.

#### **1.02 RELATED WORK**

- A. Section 03-100: Concrete Formwork.
- B. Section 03-310: Structural Concrete.
- C. Section 01-300: Submittals.

#### **1.03 SUBMITTALS**

The Contractor shall submit shop drawings and/or cut sheets for review in accordance with Specification Section 01-300.

### **2.0 PRODUCTS**

#### **2.01 JOINT MATERIALS**

- A. Mastic Waterstop: One-component self sealing mastic water stop equal to Greenstreak Lockstop.
- B. PVC Waterstop: PVC, minimum 1750 PSI tensile strength, -51 degrees F to + 175 degrees F working temperature range; flat profile; corrugated flaps, large split center bulb, equal to Greenstreak Style 705.
- C. Joint Filler: Flexible polysulfide rubber equal to Olympic Thermolastic.

### **3.0 EXECUTION**

#### **3.01 INSTALLATION**

- A. Locate and form expansion control and contraction joints.
- B. Install waterstops continuous without displacing reinforcement. All joints between adjacent continuing and intersecting sections of waterstop including butt joints, tee joints, and other angled joints shall be fused to form a watertight seal. Waterstops shall not be lapped. Apply primer as recommended by manufacturer of mastic waterstop.
- C. Place formed construction joints in slabs or walls as detailed on the Drawings or as directed by the Engineer. Set top screed to required elevations. Secure to resist movement of wet concrete.
- D. Install joint cover anchorage in accordance with manufacturer's instructions. Set cover as detailed in the Drawings or as directed by the Engineer.
- E. Install joint fillers and sealants in accordance with manufacturer's instructions. Use primers of type recommended by joint filler and sealant manufacturer.
- F. Apply sealants in accordance with Section 07-900.

**END OF SECTION 03-251**

## SECTION 03-310

### CAST-IN-PLACE STRUCTURAL CONCRETE

#### 1.0 GENERAL

##### 1.01 WORK INCLUDED

The work in this section shall include all formwork, shoring, bracing, anchorage, concrete reinforcement and accessories for cast-in-place concrete.

##### 1.02 GENERAL REQUIREMENT

All concrete construction shall conform to all applicable requirements of ACI 301, ACI 318 and ACI 350 R, except as modified by the supplemental requirements specified herein.

##### 1.03 RELATED WORK

- A. Section 02-222: Excavation.
- B. Section 03-100: Concrete Formwork.
- C. Section 03-370: Concrete Curing.
- D. Section 04-200: Unit Masonry.
- E. Section 05-500: Miscellaneous Metals, Fasteners, and Special Finishes.

##### 1.04 REFERENCES

- A. The Contractor shall conform to the recommendations of the following references:
  - 1. Specifications for Structural Concrete for Building ACI 301 (latest revision).
  - 2. Field Reference Manual: Specifications for Structural Concrete for Buildings ACI Sp-15 (88).
  - 3. Manual of Standard Practice - CRSI (latest revision).
  - 4. Placing Reinforcing Bars - CRSI (latest revision).
  - 5. Building Code Requirements for Reinforced Concrete ACI 318.
  - 6. Environmental Engineering Concrete Structures ACI 350R.
- B. The following standard shall also apply to this work:

1. ASTM C-143.	9. ASTM D-570.
2. ASTM C-150.	10. ASTM D-1252.
3. ASTM C-33.	11. ASNI A-116.1.
4. ASTM C-260.	12. ASTM A-120.
5. ASTM C-494.	13. ASTM C-94.
6. ASTM A-615.	14. ASTM D-2146.
7. ASTM D-638.	15. Federal Specifications FF-S-325.
8. ASTM D-695.	

##### 1.05 SUBMITTALS

- A. The Contractor shall submit the following data to the Engineer for review:
  - 1. Proposed mix designs, test results, plotted curves and all other substantiating data as required by Sections 3.8 and 3.9 of ACI 301.
  - 2. Mix designs for all mixes proposed or required to be used, including all mixes containing admixtures.
  - 3. A certified copy of the control records of the proposed production facility establishing the standard deviation as defined in Section 3.9 of ACI 301.

- B. Certification attesting that admixtures equal or exceeds the physical requirements of ASTM C-494 for Type A admixture and when required, for Type D admixture.
- C. Notarized certifications by the manufacturer that epoxy bonding adhesive meets the specification contained herein.
- D. Drawings showing locations of all proposed construction joints.
- E. Shop drawing for reinforcing steel showing bar schedules, location, and splices.

#### 1.06 QUALITY ASSURANCE

- A. Consistency:
  - 1. Concrete shall be of such consistency that it can be worked readily into all parts of the forms and around embedded work, without permitting the materials to segregate, or free water to collect on the surface. Consistency shall be measured by the ASTM Standard Test Method for Slump of Portland Cement Concrete, Designation C143-78. The consistency of concrete shall be as given in Table I.
  - 2. Slump tests shall be made in the field by the Contractor.
- B. Compression Tests:
  - 1. During the progress of the work, at least one set of four compression test cylinders shall be made for each 50 cubic yards of concrete or major fraction thereof, and not less than one such set for each type of concrete for each days' pouring. Cylinders made in the field shall be made and cured in accordance with ASTM Standard Method of Making and Curing Concrete Test Specimens in the Field, Designation C31-69, except that wherever possible molds shall be left on cylinders until they have reached the laboratory.
  - 2. One (1) cylinder of each set shall be broken in accordance with ASTM C-39 at seven (7) days and two (2) at twenty-eight (28) days. Two (2) copies of these test results shall be submitted to the Engineer on the same day of the tests. The remaining cylinder shall be reserved for future testing if required.
  - 3. On evidence of these tests, any concrete that fails to meet the specified strength requirements shall be strengthened or replaced as directed by the Engineer at the Contractor's expense.
- C. Inserts in Concrete by Other Trades:
  - 1. All trades shall be notified, at the proper time, to install items to be embedded in concrete.
  - 2. All castings, inserts, conduits, and other metalwork shall be accurately built into or encased in the concrete by the Contractor as directed and all necessary precautions shall be taken to prevent the metalwork from being displaced or deformed.
  - 3. Anchor bolts shall be set by means of substantial templates.
  - 4. The Contractor shall build into new concrete against which facing brick or tile is to be laid, suitable, acceptable, non-corrodible metal, dovetail grooves for ties for securing the brickwork to the concrete.
- D. Testing:
  - 1. All testing shall be in accordance with provisions of ACI 301.
  - 2. Testing services listed in ACI 301 Sections 16.3, 16.4 and 16.5 shall be performed by a testing agency acceptable to the Engineer. Testing services to meet the requirements of ACI shall be paid for by the Contractor at his expense. Test shall be made for each 50 cubic yards of concrete and/or each day concrete is placed.
- E. Additional Requirements:
  - 1. Unless otherwise directed by the Engineer, the vertical surfaces of all footings shall be formed. Excavations and reinforcement for all footings shall have been inspected by the Engineer before any concrete is placed.
  - 2. The installation of underground and embedded items shall be inspected before slabs are placed. Pipes and conduits shall be installed below the concrete unless otherwise

indicated. Fill required to raise the subgrade shall be placed as specified in Division 2. Unless shown otherwise, porous fill not less than 6 inches in compacted thickness shall be installed under all slabs, tank bottoms, and foundations. The fill shall be leveled and uniformly compacted to a reasonably true and even surface. The surfaces shall be clean, free from frost, ice, mud and water. Where indicated, waterproof paper, polyethylene sheeting of nominal 4-mil minimum thickness, or polyethylene coated burlap shall be laid over surfaces receiving concrete.

- F. Hot Weather Requirements: Placing of concrete under conditions of high temperatures, low humidity or wind shall be done in accordance with the American Concrete Institute "Hot Weather Concreting" (ACI 305R-77).
- G. Cold Weather Requirements: Cold weather concreting procedures and precautions shall conform to American Concrete Institute "Cold Weather Concreting" (ACI 306 R-78).

## 2.0 PRODUCTS

2.01 Contractor shall supply concrete only from an approved ready mixed concrete supplier.

### 2.02 CONCRETE MIX WITHOUT FLY ASH

Structural concrete of the various classes required shall be proportioned by Section 3.9 of ACI 301 to produce the following 28-day compressive strengths:

- A. Selection of Proportions for Class A Concrete:
  - 1. 4,000 psi compressive for strength at 28 days.
  - 2. Type II cement plus water reducing, dispersing agent and air. Type IP cement may be used in place of Type II.
  - 3. Maximum water/cement plus water reducing dispersing agent ratio = 0.50.
  - 4. Minimum cement content = 564 pounds (6.0 bags)/cubic yards concrete.
  - 5. Nominal maximum size coarse aggregate = No. 67 (3/4-inch maximum) or No. 57 (1-inch maximum).
  - 6. Air content = 6 percent plus or minus 2 percent by volume.
  - 7. Slump = 2 inches to 3 inches in accordance with ASTM C-143.
- B. Selection of proportions for Class B concrete:
  - 1. 3,000 psi compressive strength at 28 days.
  - 2. Type I cement plus water reducing dispersing agent and air.
  - 3. Maximum (water)/(cement plus water reducing dispersing agent) ratio = 0.56.
  - 4. Minimum cement content = 432 pounds (4.5 bags)/cubic yards concrete.
  - 5. Nominal maximum size coarse aggregate = No. 67 (3/4-inch maximum) or No. 57 (1-inch maximum).
  - 6. Air content = 6 percent plus or minus 2 percent by volume.
  - 7. Slump = 3 inches to 4 inches in accordance with ASTM C-143.

### 2.03 OPTIONAL CONCRETE MIX USING FLY ASH

- A. Selection of Proportions for Class A Concrete:
  - 1. 4,000 psi compressive for strength at 28 days.
  - 2. Type II cement plus water reducing dispersing agent and air.
  - 3. Maximum (water)/(cement plus water reducing dispersing agent) ratio = 0.50.
  - 4. Minimum cement content = 517 pounds (5.5 bags)/cubic yards concrete.
  - 5. Maximum Fly Ash Content = 71 pounds/cubic yards
  - 6. Nominal maximum size coarse aggregate = No. 67 (3/4-inch maximum) or No. 57 (1-inch maximum).
  - 7. Air content = 6 percent plus or minus 2 percent by volume.
  - 8. Slump = 2 inches to 3 inches in accordance with ASTM C-143.
- B. Selection of Proportions for Class B Concrete:

1. 3,000 psi compressive strength at 28 days.
  2. Type I cement plus water reducing dispersing agent and air.
  3. Maximum (water)/(cement plus water reducing dispersing agent) ratio = 0.56.
  4. Minimum cement content = 432 pounds (4.5 bags)/cubic yards concrete.
  5. Maximum Fly Ash Content = 71 pounds/cubic yards.
  6. Nominal maximum size coarse aggregate = No. 67 (3/4-inch maximum) or No. 57 (1-inch maximum).
  7. Air content = 6 percent plus or minus 2 percent by volume.
  8. Slump = 3 inches to 4 inches in accordance with ASTM C-143.
- C. Applicable Standards:
1. ANSI C 311-77 "Standard Methods of Sampling and Testing Fly Ash for Use as an Admixture in Portland Cement Concrete".
  2. ANSI C 618-80 "Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete".
- D. Concrete shall be used as follows:
1. Class A concrete for all concrete work except as noted below.
  2. Class B concrete for fill concrete, thrust blocks, post setting, and where indicated on the Drawings.
- E. All testing shall be or have been performed by an approved independent testing laboratory.
- F. Cement for exposed concrete shall have a uniform color classification.
- G. Type II cement conforming to ASTM C-150 shall be used in all structural concrete. The alkali content shall not exceed 0.6 percent calculated as sodium oxide. Type IP Cement may be used in place of Type II cement.
- H. Coarse aggregate shall conform to all requirements of ASTM C-33.
- I. Manufactured sand shall not be used as fine aggregate in concrete.

## 2.04 FLY ASH CONCRETE

- A. In the absence of a verified and acceptable history of fly ash concrete mixes, the following procedure is required to establish the quality of the concrete mix.
- B. Trial batches must be made starting thirty (30) days ahead of initial concrete pour. Four (4) mixes shall be designed and produced at no cost to the Owner or the Engineer as follows:
1. Mix using Type II cement with water reducing admixture for normal temperatures (Class A).
  2. Mix using Type II cement with water reducing admixture for cold weather temperatures (Class A).
  3. Mix using Type II cement with water reducing admixture for hot weather temperatures (Class A).
  4. Mix using Type I cement with water reducing admixture for normal weather temperatures (Class B).
- C. Four (4) test cylinders shall be cast for each of the four (4) mixes. Two (2) cylinders shall be broken at 7 days, and two (2) cylinders shall be broken at 28 days, for each of the four (4) mixes. The trial batch design report shall include strength breaks at 7 days and 28 days, air content, etc.
- D. The water-reducing, cement dispersing admixture (such as Master Builders Pozzolith 344-N, Nox-Crete Plastiflow, Plastocrete 161 by Sika Chemical Company, or approved equal) used in fly ash concrete, shall be a normal, accelerated, or retarded hardening admixture. The admixture shall be used at optimum dosage to offset the slow strength development and setting characteristics of the fly ash. Only those brands of admixture that can provide readily available field service on short notice to provide field services, inspection, and assistance, will be acceptable.

- E. Prior to the use of fly ash concrete, recent mill reports shall be submitted on a regular basis during the project. Maximum loss of ignition (LOI) shall be 6 percent.
- F. Tests for air content shall be made twice a day at the jobsite prior to pouring, for all mixes containing fly ash.

## 2.05 ADMIXTURES

- A. An air-entraining admixture shall be used on all concrete and shall be the neutralized vinsol resin type such as Master Builders MB-VR, or Euclid Chemical Co. AIR-MIX or equal. The admixture shall meet the requirements of ASTM C-260. Certification attesting to the percent of effective solids and compliance of the material with ASTM C-260 shall be furnished, if requested.
- B. A water reducing, set-controlling admixture (non-lignin type) shall be used in all concrete. The admixture shall be a combination of polyhydroxylated polymers including catalysts and components to produce the required setting time based on job site conditions, specified early strength development, finishing characteristics required, and surface texture, as determined by the Engineer.
- C. Certification shall be furnished attesting that the admixture exceeds the physical requirements of ASTM C-494, Type A, water reducing and normal setting admixture, and when required, for ASTM C-494, Type D, water reducing and retarding admixture when used with local materials with which the subject concrete is composed.
- D. The admixture manufacturer, when requested, shall provide a qualified concrete technician employed by the manufacturer to assist in proportioning concrete for optimum use. He also will be available when requested to advise on proper addition of the admixture to the concrete and on adjustment of the concrete mix proportions to meet changing job conditions.
- E. The use of admixtures to retard setting of the concrete during hot weather, to accelerate setting during cold weather, and to reduce water content without impairing workability will be permitted if the following conditions are met.
- F. The admixture shall conform to ASTM C-494 except that the durability factor for concrete containing the admixture shall be at least 100 percent of control, the water content a maximum of 90 percent of control and length change shall not be greater than control, as defined in ASTM C-494.
- G. Where the Contractor finds it impractical to employ fully the recommended procedures for hot weather concreting, the Engineer may at his discretion require the use of a set retardant admixture for mass concrete greater than 2.5 feet thick and for all concrete whenever the temperature at the time concrete is cast exceeds 80 degrees F. The Contractor subject to the review of the Engineer shall select the admixture. The admixture and concrete containing the admixture shall meet all the requirements of these Specifications. Preliminary tests of this concrete shall be required at the Contractor's expense.
- H. Admixtures shall be used in concrete design mixes in the same manner and proportions as in the field so that the effects of the admixtures are included in preliminary tests submitted to the Engineer for review prior to the start of construction.
- I. When more than one admixture is used, all admixtures shall be compatible. They should preferably be by the same manufacturer.
- J. Calcium chloride will not be permitted as an admixture in any concrete.

## 2.06 WATER

The mix water for concrete shall be potable.

## 2.07 AGGREGATES

- A. Fine aggregates shall be natural sand having clean, hard, uncoated grains, free from injurious amounts of clay, dust, organic matter or other deleterious substances, and shall conform to ASTM C-33.
- B. Coarse aggregates shall be crushed stone having clean, hard, uncoated particles, and shall be free from injurious amounts of soft, friable, thin, elongated or laminated pieces. Shale may not be used as aggregate. Coarse aggregates shall conform to ASTM C-33 and shall not exceed the following maximum sizes:
  - 1. 3/4-inch for slabs, beams, girders, and walls.
  - 2. 1-inch for all other concrete.

## 2.08 TESTING AGGREGATES AND DETERMINING PROPORTIONS

- A. No concrete shall be used in the work until the Engineer has accepted the materials and mix design.
- B. The conformity of aggregates to the specifications hereinbefore given shall be demonstrated and determined by tests per ASTM C-33 made with representative samples of the materials to be used on the work.
- C. The actual proportions of cement, aggregates, admixtures and water necessary to produce concrete conforming to the requirements set forth shall be determined by making test cylinders using representative samples of the materials to be used in the work. A set of four (4) standard 6-inch cylinders shall be made and cured per ASTM C-31. Two (2) shall be tested at 7 days and two (2) at 28 days per ASTM C-39. The slump shall not be less than the greatest slump expected to be used in the work.
- D. Reports on the tests and a statement of the proportions proposed for the concrete mixture, shall be submitted in triplicate to the Engineer for review as soon as possible, but not less than five (5) days prior to the proposed beginning of the concrete work. If the Contractor furnishes in writing, similar, reliable detailed information from an acceptable source, and of date not more than four (4) months prior to the time when concrete will be used on this project, the above requirements for laboratory tests may be modified by the Engineer. Such data shall derive from mixtures containing constituents, including the admixtures where used, of the same types and from the same sources as will be used on this project.
- E. The Engineer shall have the right to make check tests of aggregates and concrete, using the same materials, and to order changes as may be necessary to meet the specified requirements.
- F. The Contractor may request permission to add water at the job site, and when the addition of water is permitted by the Engineer, the quantity added shall be the responsibility of the Contractor and in no case shall the total water per bag of cement exceed that determined by the designed mix.
- G. All concrete exposed to weather, such as foundations, walls, exterior steps and retaining walls, etc. shall be air entrained.
- H. If concrete of the required characteristics is not being produced as the work progresses, the Engineer may order such changes in proportions or materials, or both, as may be necessary to secure concrete of the specified quality. The Contractor shall make such changes at his own expense and no extra compensation will be allowed because of such changes.

## 2.09 MIXING

All central plant and rolling stock equipment and methods shall conform to the Truck Mixer and Agitator Standards of the Truck Mixer Manufacturers' Bureau of the National Ready Mixed Concrete Assn., as well as the ACI Standards for Measuring, Mixing and Placing Concrete (ACI 614), and with Sections 7 to 14, inclusive, of the ASTM Standard Specification for Ready Mixed Concrete, Designation C94-78a, insofar as applicable.

## 2.10 WATERSTOPS

See Section 03251 - Expansion and Contraction Joints.

## 3.0 EXECUTION

### 3.01 PLACING AND COMPACTING CONCRETE

- A. At least 20 hours before the Contractor proposes to make any placement of concrete, he shall notify the Engineer of his intention and planned procedure. Unless otherwise permitted, the work shall be so executed that a section begun on any day shall be completed during daylight of the same day.
- B. Ready mixed concrete shall be transported to the site in watertight agitator or mixer trucks. The quantity of concrete to be mixed or delivered in any one batch shall not exceed the rated capacity of the mixer or agitator for the respective conditions as stated on the nameplates.
- C. Central mixed concrete shall be plant mixed a minimum of 1-1/2 minutes per batch, and then shall be truck mixed or agitated a minimum of 8 minutes. Agitation shall begin immediately after the premixed concrete is placed in the truck and shall continue without interruption until discharge. For transit mixed concrete, the major portion of the mixing water shall be added and mixing started immediately after the truck is charged.
- D. The amount of water initially added shall be recorded on the delivery slip for the Engineer's information; no additional water shall be added, either in transit or at the site, except as directed. Mixing (at mixing speed) shall be continued for at least 10 minutes followed by agitation without interruption until discharge. Concrete shall be discharged at the site within 1-1/2 hours after water was first added to the mix, and shall be mixed at least 5 minutes after all water has been added.
- E. Concrete that has become compacted or segregated during transportation to or on the site of the work shall be satisfactorily remixed just prior to being placed in the forms.
- F. Partially hardened concrete shall not be deposited in the forms. The retempering of concrete which has partially hardened (that is, the remixing of concrete with or without additional cement, aggregate, or water) will not be permitted.
- G. The concrete shall be mixed only in the quantity required for immediate use. Concrete that has developed an initial set shall not be used. The Contractor shall have sufficient plant capacity and transporting apparatus to insure continuous delivery at the rate required.
- H. The temperature of the concrete mixture immediately before placement shall be between 50 degrees F and 90 degrees F.
- I. Concrete mixed in stationary mixers and transported by nonagitating equipment shall be placed in the forms within 45 minutes from the time ingredients are charged into the mixing drum. Concrete that is truck mixed or transported in truck mixers or truck agitators shall be delivered to the site of the work and discharge completed in the forms within the time specified in paragraph 10.7 of ASTM C-94, except that when the concrete temperature exceeds 85 degrees F, the time shall be reduced to 30 minutes. Transit mixed concrete that is completely mixed at the site of concrete placement or batched cement and aggregates transported to mixers shall be placed in the forms within 1-1/2



hours after cement has been added. Concrete shall be placed in the forms within 15 minutes after discharge from the mixer at the job site.

- J. If concrete is placed by pumping, no aluminum shall be used in any parts of the pumping system that contact or might contaminate the concrete. Aluminum chutes and conveyors shall not be used.
- K. No concrete shall be placed on frozen subgrade or in water, or until the subgrade, forms, and preliminary work have been accepted. No concrete shall be placed until all materials to be built into the concrete have been set and have been accepted by the various trades and by the Engineer. All such materials shall be thoroughly clean and free from rust, scale, oil, or any other foreign matter.
- L. Forms and excavations shall be free from water and all dirt, debris, and foreign matter when concrete is placed. Except as otherwise directed, wood forms and embedded wood called for or allowed shall be thoroughly wetted just prior to placement of concrete.
- M. Concrete placed at air temperatures below 40 degrees F shall have a minimum temperature of 50 degrees F and a maximum of 70 degrees F when placed.
- N. Chutes for conveying concrete shall be metal or metal lined and of such size, design, and slope as to ensure a continuous flow of concrete without segregation. The slope of chutes shall have approximately the same slope. The discharge end of the chute shall be provided with a baffle, or if required, a spout and the end of the chute. The spout shall be kept as close as practicable to, but in no event more than 5 feet above the surface of the fresh concrete. When the operation is intermittent, the chute shall discharge into a hopper.
- O. In thin sections of considerable height (such as walls and columns), concrete shall be placed in such manner as will prevent segregation and accumulations of hardened concrete on the forms or reinforcement above the mass of concrete being placed. To achieve this end, suitable hoppers spouts with restricted outlets, etc. shall be used as required or permitted unless the forms are provided with suitable openings.
- P. Chutes, hoppers, spouts, etc. shall be thoroughly cleaned before and after each run and the water and debris shall not be discharged inside the form.
- Q. For any one placement, concrete shall be deposited continuously in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams and planes of weakness within the section, and so as to maintain until the completion of the unit, an approximately horizontal plastic surface.
- R. No wooden spreaders shall be left in the concrete.
- S. During and immediately after being deposited, concrete shall be thoroughly compacted by means of suitable tools and methods, such as internal type mechanical vibrators operating at not less than 5,000 rpm or other tool spading to produce the required density and quality of finish. Vibration shall be done only by experienced operators and shall be carried in such manner and only long enough to produce homogeneity and optimum consolidation without permitting segregation of the solid constituents, "pumping" of air, or other objectionable results.
- T. The concrete shall be thoroughly rodded and tamped about embedded materials so as to secure proper adhesion and prevent leakage. Care shall be taken to prevent the displacement of such materials during concreting.
- U. The distance between construction joints shall not exceed 25 feet for all concrete construction and not less than 48 hours shall elapse between casting of adjoining units unless the Engineer waives these requirements. Provision shall be made for jointing successive units as indicated or required. Where joints are not shown on the Drawings, they are required to be made at a spacing of approximately 25 feet. Additional construction joints required to satisfy the 25 foot spacing requirement shall be located by the Contractor subject to the review of the Engineer. The Contractor

shall submit for review Drawings separate from the steel reinforcing Drawings, showing the location of all proposed construction joints. All construction joints shall be prepared for bonding as specified in paragraph 6.1.4.3 of ACI Standard 301 and Section 3.02 Bonding Concrete at Construction Joints. Joints in walls and columns shall be maintained level.

- V. Formwork for beam soffits and slabs and other parts that support the weight of concrete shall remain in place until the concrete has reached its specified 28-day strength, unless otherwise specified or permitted.

### 3.02 BONDING CONCRETE AT CONSTRUCTION JOINTS

- A. In order to secure full bond at construction joints, the surface of the concrete previously placed (including vertical, inclined, and substantially horizontal areas) shall be thoroughly cleaned of foreign materials and laitance, if any, and then roughened.
- B. The previously placed concrete at the joint shall be free of standing water.
- C. Waterstops shall be used on all construction joints below water level.

### 3.03 CURING AND PROTECTION

- A. All concrete, particularly slabs and including finished surfaces, shall be treated immediately after concreting or cement finishing is completed, to provide continuous moist curing for at least seven days, regardless of the adjacent air temperature. Walls and vertical surfaces may be covered with continuously saturated burlap, or kept moist by other acceptable means. Horizontal surfaces, slabs, etc., shall be ponded to a depth of 1/2-inch wherever practicable, or kept continuously wet by the use of lawn sprinklers, a complete covering of continuously saturated burlap, or by other acceptable means.
- B. For at least seven days after having been placed, all concrete shall be so protected that the temperature at the surface will not fall below 45 degrees F. The methods of protecting the concrete shall be as specified in that section of the General Specifications titled "Precautions During Adverse Weather" and shall be subject to the review of the Engineer.
- C. The above-mentioned 7-day periods may be reduced to 3 days in each case if high-early-strength cement is allowed to be used in the concrete.
- D. Wherever practicable, finished slabs shall be protected from the direct rays of the sun to prevent checking and crazing.

### 3.04 TRIMMING AND REPAIRS

- A. The Contractor shall use suitable forms, mixture of concrete, and workmanship so that concrete surfaces, when exposed, will not require patching. Concrete which, in the opinion of the Engineer has excessive honeycomb, aggregate pockets, or depressions will be rejected and the Contractor shall, at his own expense remove the entire section containing such defects and replace it with acceptable concrete.
- B. As soon as the forms have been stripped and the concrete surfaces exposed, fins and other projections shall be removed, recesses left by the removal of form ties shall be filled and surface defects which do not impair structural strength shall be repaired.
- C. Defective concrete shall be cut perpendicular to the surface until sound concrete is reached, but not less than 1-inch deep. The remaining concrete shall be thoroughly roughened and cleaned. Concrete around the cavity or the form tie recess shall be thoroughly wetted and promptly painted with a 1/16-inch brush coat of neat cement mixed to the consistency of thick paint. The hole shall then be filled with mortar.
- D. Mortar shall be 1:1-1/2 cement and sand mix with sufficient white cement, or fine limestone

screening in lieu of sand, to produce a surface matching the adjoining work. Cement and sand shall be from the same sources as in the parent concrete.

- E. Mortar in patches shall be applied so that after partial set it can be compressed and rubbed to produce a finish flush and uniform in texture with the adjoining work. All patches shall be warm-moist cured as above specified.
- F. The use of mortar patching as above specified shall be confined to the repair of small defects in relatively green concrete. If substantial repairs are required, the defective portions shall be cut out to sound concrete and the defective concrete replaced by means of a cement gun, or the structure shall be taken down and rebuilt, all as the Engineer may decide or direct.

### 3.05 FINISHES

- A. Exposed to View Concrete Surfaces:
  - 1. All concrete exposed to view in the completed structure shall be produced using materials and workmanship to such quality that only nominal finishing will be required. The provisions of paragraphs 13.3, 13.4, and 13.6 of ACI shall apply to all exposed to view concrete surfaces (limited to 1 foot below grade and 1 foot below the minimum liquid level for structures that will contain liquids).
  - 2. Forms for exposed concrete surfaces shall be exterior grade, high density overlay plywood, steel, or wood forms with smooth tempered hard board form liners.
  - 3. Forms shall be coated with Nox-Crete Form Coating Release Agent, Debond Form Coating by L & M Construction Chemicals, Inc. or an approved equal, before initial pour and between subsequent pours, in accordance with the manufacturer's printed instructions. Form boards shall not be wet with water prior to placing concrete.
  - 4. Recessed joints in concrete shall be formed using lacquer coated wooden battens or forms, milled to indicated profiles. Battens and corner strips shall be carefully inspected before concrete is placed and damaged pieces replaced.
  - 5. Chamfer strips shall be 1-inch radius with leg, polyvinyl chloride strips by Gateway Building Products, Saf-T-Grip Specialties Cor., Vinylex Corp., or equal.
  - 6. Particular attention is directed to the requirements of paragraphs 10.2.2 and 13.3 of ACI 301. Form panels shall be provided in the maximum form joints. Wherever practicable, form joints shall occur at recessed joints. All form joints in exterior exposed to view surfaces shall be carefully caulked with an approved nonstaining caulking compound. Joints shall not be taped. Form oil or other material that will impart a stain to the concrete shall not be allowed to contact concrete surfaces.
  - 7. Care shall be taken to prevent chipping of corners or other damage to concrete when forms are removed. Exposed corners and other surfaces that may be damaged by ensuing operations shall be protected from damage by boxing, corner boards or other approved means until construction is completed.
  - 8. Form ties shall remain in the walls and shall be equipped with a waterseal to prevent passage of water through the walls. Particular care shall be taken to bend tie wire ends away from exposed faces of beams, slabs and columns. In no case shall ends to tie wires project toward or touch formwork. Minimum set back of form ties shall be 1 inch from faces of wall. The hole left by removal of tie ends shall be sealed and grouted as per ACI Par. 9.3 and in accordance with procedure described hereinafter in Par. 3.04.E. Form ties will be permitted to fall within as cast areas of architecturally treated wall surfaces (ACI Chapter 13); this does not apply to walls receiving textured decorative waterproof masonry coating.
  - 9. All formed exposed to view concrete shall be prepared as paragraph 3.04 B, then rubbed and coated with Thoroseal or another Engineer approved product. The manufacturer's recommendations for surface preparation, application procedures and rates, and temperature and moisture conditions shall be followed. Exterior vertical surfaces shall be finished to one foot below grade. Interior exposed to view vertical surfaces of dry pits shall be finished full height, interior vertical surfaces of liquid containers shall be finished to one foot below the minimum liquid level that will occur during normal operations.
  - 10. Slope all slabs to prevent water pocketing.
- B. All vertical surfaces below minimum liquid level in liquid containing structures shall have a smooth

form finish.

- C. All smooth form concrete vertical surfaces shall be true plane within 1/4-inch in 10 feet as determined by a 10 foot straight edge place anywhere on the surface in any direction. Abrupt irregularities shall not exceed 1/8-inch.
- D. Basin and tank floors shall have a "troweled" finish unless shown otherwise on Drawings.
- E. Weirs and overflow surfaces shall be given a troweled finish.
- F. Exterior platforms, steps and landings shall be given a broom finish. Broom finish shall be applied to surfaces which have been steel troweled to an even smooth finish. The troweled surface shall then be broomed with a fiber bristle brush in the direction transverse to that of the main traffic.
- G. Walking surfaces of slabs shall have a troweled finish unless shown otherwise on Drawings.
- H. Patching of holes due to removal of tie ends and other repairable defective areas shall be as follows: Entire contact area of hole shall be coated with two part moisture insensitive epoxy bonding compound in accordance with manufacturer's specifications, and prior to placing of freshly mixed patching mortar. Patching mortar shall be mixed and placed in general accordance with ACI Par. 9.2.2, 9.2.3, and 13.6.
- I. Nox-Crete Harbeton, Chem Hard by L & M Construction Chemicals hardener treatment, or an approved equal shall be applied to all exposed concrete floors in occupied spaces. The floors shall be thoroughly cured, cleaned, and perfectly dry with all work above them completed. The hardener shall be applied evenly and freely and in conformance with manufacturer's instructions, using not less than three (3) coats, allowing 24 hours between coats. One gallon of hardener shall cover not more than 100 square feet. After the final coat is completed and dry, surplus hardener shall be removed from the surface of the concrete by scrubbing and mopping with water.

### 3.06 CONCRETE WALKS AND CURBS:

- A. Subgrade shall be true and well compacted at the required grades. Spongy and otherwise unsuitable material shall have been removed and replaced with properly compacted stone.
- B. Concrete walks shall be not less than 4 inches in thickness. Walks shall have contraction joints every 4 linear feet in each direction, formed in the fresh concrete by cutting a groove in the top surface of the slab to a depth of at least one-fourth the slab thickness with a jointing tool. Transverse expansion joints shall be installed at driveways, and opposite expansion joints in adjacent curbs. Where curbs are not adjacent, transverse expansion joints shall be installed at intervals of approximately 24 feet. Sidewalks shall receive a broomed finish. Scoring shall be in a transverse direction. Edges of the sidewalks and joints shall be edged with a tool having a radius not greater than 1/4-inch. Sidewalks adjacent to curbs shall have a slope of 1/4-inch per foot toward the curb. Sidewalks not adjacent to curbs shall have a transverse slope of 1/4-inch per foot or shall be crowned as directed by the Engineer. The surface of the concrete shall show no variation in cross section in excess of 1/4-inch in 5 feet. Concrete walks shall be reinforced with 6 x 6 - W1.4 x W1.4 welded wire fabric unless noted otherwise on the Drawings.

### 3.07 WATERTIGHTNESS

- A. The structures that are intended to contain liquids and/or will be subjected to exterior hydrostatic pressures shall be so constructed that when completed and tested, there shall be no loss of water and no wet spots shall show.
- B. As soon as practicable after the completion of the structures, the Contractor shall fill such structures with water and if leakages develop or wet spots show, the Contractor shall empty such structures and correct the leakage in an approved manner. Any cracks that appear in the concrete shall be dug out and suitably repaired. Temporary bulkheads over pipe openings in walls shall be provided as required for the testing.

- C. After repairs, if any are required, the structures shall be tested again and further repaired if necessary until satisfactory results are obtained. All work in connection with these tests and repairs shall be at the expense of the Contractor.
- D. Waterstops shall be placed in all locations as indicated on the Drawings and as may be required to assure the watertightness of all containers of liquids. Special shop fabricated ells, tees and crosses shall be provided at junctions. Waterstops shall be extended at least 6 inches beyond end of placement in order to provide splice length for subsequent placement. In slabs and tank bottoms, waterstops shall be turned up to be made continuous with waterstops at bottom of walls or in walls. All joints between adjacent, continuing, and intersecting sections of waterstop including butt joints, tee joints, and other angled joints shall be heat fused to form a watertight seal. Waterstops shall not be lapped. Waterstops shall be secured in place to maintain proper position during placement of concrete. Care shall be taken to avoid folding while concrete is being placed and to prevent voids in the concrete surrounding the waterstop. All materials shall be installed in accordance with the manufacturer's recommendations.
- E. Joints between pipe (except cast iron wall pipe) and cast-in-place concrete walls shall be sealed as required by the Drawings.
- F. The top surface of all concrete decks (except slabs on grade) shall be coated with Sikagard-70 water-repellant penetrating sealer as manufactured by the Sika Corporation, Nox-Crete Stifel, or another approved equal. The manufacturer's recommendations shall be followed in all areas of application.

### 3.08 GROUTING BASE PLATES, BEARING PLATES AND MACHINE BASES

- A. Column base plates, bearing plates for beams and similar structural members, machinery and equipment bases shall, after being plumbed and properly positioned, be provided with full bearing on epoxy nonshrink grout. Concrete surfaces shall be rough, clean, free of oil, grease and laitance and shall be moistened thoroughly immediately before grout is placed. Metal surfaces shall be clean and free of oil, grease and rust. Mixing and placing shall be in conformance with the material manufacturer's printed instructions.
- B. Grout fill that is formed in place by using rotating equipment as a screed, such as for clarifiers and similar types of equipment, shall be mixed in proportions and consistencies as required by the manufacturer or supplier of the equipment.

### 3.09 EQUIPMENT PADS

Unless otherwise shown or directed, all equipment and items such as lockers, motor control centers, etc., shall be installed on concrete bases. The bases shall be constructed to the dimensions shown on the Drawings or as required to meet plan elevations. Where no specific plan elevations are required, the bases shall be 6 inches thick and shall extend 3 inches outside the equipment base. In general, the concrete bases shall be placed up to 1-inch below the base. The equipment shall then be properly slimmed to grade and the 1-inch void filled with nonshrink epoxy grout.

END OF SECTION 03-310

## SECTION 03-370

### CONCRETE CURING

#### 1.0 GENERAL

##### 1.01 WORK INCLUDED

Concrete curing materials and methods.

##### 1.02 RELATED WORK

Section 03-310: Structural Concrete.

##### 1.03 REFERENCES

- A. ACI 301 - Specifications for Structural Concrete Buildings.
- B. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
- C. ASTM D2103 - Polyethylene Film and Sheeting.
- D. FS TT-C-800 - Curing Compound, Concrete for New and Existing Surfaces.

##### 1.04 QUALITY ASSURANCE

Conform to requirements of ACI 301.

##### 1.05 SUBMITTALS

Submit manufacturer's product data and installation instruction in accordance with the requirements of Section 01-300.

#### 2.0 PRODUCTS

##### 2.01 MATERIALS

- A. Water: Clean and not detrimental to concrete curing.
- B. Absorptive Mat: Burlap fabric of clean, roll goods.
- C. Membrane Curing Compound: Clear finish, conforming to ASTM C-309, Type 1-D, Class A or B.
- D. Impervious sheet conforming to ASTM C-171, polyethylene film shall be white opaque.

#### 3.0 EXECUTION

##### 3.01 GENERAL

Protect freshly placed concrete from premature drying and excessive temperatures. Begin curing immediately after free water has disappeared from exposed surface. Keep exposed surface continuously moist for not less than seven (7) days.

##### 3.02 MEMBRANE CURING COMPOUND

- A. Apply curing compound in two (2) coats with second coat at right angles to the first.

- B. Apply in accordance with manufacturer's instructions.

### 3.03 SPRAYING

Spray water over slab areas; maintain continuously moist for seven (7) days.

### 3.04 ABSORPTIVE MAT

Spread absorptive mat over slab areas. Lap edges and ends 12 inches. Spray with water until mat saturation. Maintain saturation for seven (7) days.

### 3.05 CURING COMPOUNDS

- A. Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within three (3) hours after initial application. Maintain continuity of coating and repair damage during curing period.
- B. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.
- C. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of appropriate curing compound.

END OF SECTION 03-370

## **SECTION 15-010**

### **BASIC MECHANICAL REQUIREMENTS**

#### **PART 1 GENERAL**

##### **1.1 WORK INCLUDED**

- A. Plumbing System.

##### **1.2 RELATED WORK**

- A. Division 1 - General Requirements: All applicable requirements apply to the Work of this Section unless otherwise amended.
- B. Plumbing System: As described by the following sections.
  - 1. Section 15140 - Supports and anchors.
  - 2. Section 15260 - Piping Insulation.
  - 3. Section 15410 - Plumbing Piping.

##### **1.3 PLUMBING SYSTEM DESCRIPTION**

- A. Provide complete operational plumbing system as follows:
  - 1. Domestic water
  - 2. Sanitary sewer

##### **1.4 HEATING, VENTILATING, AND AIR CONDITIONING SYSTEM DESCRIPTION**

Not used

##### **1.5 FIRE PROTECTION SYSTEM DESCRIPTION**

Not used

##### **1.6 TESTING**

- A. Provide analysis and testing required by the individual respective Sections.

##### **1.7 SUBMITTALS**

- A. All equipment shall be submitted, with descriptive data, to the Designer for approval or rejection. All equipment shall be submitted in an indexed, bound brochure with six copies. All items shall be submitted at one time. Partial pre-submittals will be considered only as an expediency upon special request.
- B. Each submittal brochure shall be signed, on the index page by Contractor. This signature shall indicate the Contractor has examined all data therein and found same to be in order.
- C. All items submitted that are not as specified shall have any and all characteristics that differ clearly highlighted.

##### **1.8 COORDINATION**



- A. For purposes of clearness and legibility, drawings are essentially diagrammatic, and although size and location of equipment are drawn to scale wherever possible, the Contractor shall make use of all data in all of the contract documents and shall verify this information at the building site. **THE DESIGN DRAWINGS ARE NOT INTENDED AS SHOP DRAWINGS AND THE CONTRACTOR SHALL VERIFY ALL SPACE REQUIREMENTS AND CLEARANCES FOR THE INSTALLATION OF THE MECHANICAL WORK WITH THE WORK OF ALL OTHER TRADES PRIOR TO BEGINNING ANY DUCT OR PIPE FABRICATION OR INSTALLATION.** Failure to properly coordinate all work prior to installation shall result in the Contractor correcting all misplaced work at no cost to the Owner.
- B. The drawings indicate required size and points of termination of pipes and ducts, and suggest proper routes of pipe to conform to structure, avoid obstructions and preserve clearances. However, it is not intended that drawings indicate all necessary offsets, and it shall be the work of this section to install piping and ducts in such a manner as to conform to structure, avoid obstructions, preserve headroom, and keep openings and passageways clear without further instruction or cost to the Owner.
- C. Shop drawings shall be furnished by this section, indicating all changes to meet space requirements, code requirements, and as necessary to resolve all space conflicts.
- D. It is intended that all apparatus be located symmetrical with architectural elements, and shall be installed at exact height and locations as shown on the architectural drawings.
- E. The Contractor shall fully inform himself regarding any and all peculiarities and limitations of the space available for the installation of all work and materials furnished and installed under the Contract. He shall exercise due and particular caution to determine that all parts of his work are made quickly and easily accessible.
- F. The Contractor shall be guided by the architectural details and conditions existing at the job, correlating this work with that of the other trades, and report to the Architect any discrepancies or interferences that are discovered. Failure to report such discrepancies and interferences shall result in the correcting of these errors or omissions by the Contractor at his own expense. All work installed under this division which deviates from the drawings and specifications without prior approval of the Architect shall be altered by the Contractor at his own expense to comply with the drawings and specifications as directed by the Architect.
- G. It is intended all domestic water piping be installed in areas not subject to freezing temperatures. The Contractor shall fully inform himself regarding the locations of such areas and provide adequate freeze protection. If the construction documents denote piping in areas subject to freezing conditions, and no provisions for freeze protection are indicated, he shall immediately notify the Architect/Engineer for direction.
- H. The HVAC contractor shall coordinate with structural to install the duct work in the locations shown. Field coordinate and provide transitions as necessary for duct work.

#### 1.9 REGULATORY REQUIREMENTS

- A. All work shall be executed and inspected in accordance with all local or state codes, laws, ordinances, rules and regulations applicable to the particular class of work. The Contractor shall include in his quotation all applicable service charges, fees, permits, royalties, and other similar costs in connection therewith. If, to the knowledge of the Contractor, the drawings or specifications are at variance with the above mentioned laws, rules, and regulations, he shall promptly notify the Architect in writing so any necessary changes can be provided for in his contract. If the Contractor performs any work without notice as required above, he shall bear all costs arising therefrom.

1.10 PROJECT RECORD DOCUMENTS

- A. Plumbing System: Provide record As built drawings indicating final plumbing system. Indicate exact location of exterior lines, cleanouts, etc.
- B. Heating, Ventilating, and Air Conditioning System: provide record As built drawings indicating final heating, ventilating, and air conditioning system.

1.11 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 01705 - Project Closeout.
- B. Submit data as required by each respective section.

1.12 GUARANTEE

- A. Contractor shall guarantee all work performed under this contract to be free from defects in materials and workmanship for a period of one year from the general contractor's date of substantial completion. Latent defects arising during this period shall, upon notification by the owner and architect, be promptly corrected by the contractor at no additional cost to the Owner.

**PART 2 PRODUCTS**

2.1 MATERIALS AND EQUIPMENT

- A. Use only new and undamaged materials as specified in the respective related sections.

2.2 EQUIPMENT FURNISHED BY OTHERS

- A. Make final connections to all equipment as indicated on the drawings. Coordinate with the equipment supplier. Make all final connections per the manufacturer's installation instructions.

2.3 SUBSTITUTIONS

- A. Submit only materials which meet or exceed all requirements of those specified.

**PART 3 EXECUTION**

3.1 EXECUTION

- A. Execute all work in accordance with the requirements of the Contract Documents.
- B. Install all equipment, devices, accessories, etc. in strict accordance with the Manufacturer's installation guidelines and recommendations.

3.2 WORKMANSHIP

- A. All work required by the respective related sections shall be performed by a mechanic or craftsman with a demonstrated ability to perform the work required.
- B. Perform all work to local established trade standards.

### 3.3 STARTERS

Not used.

### 3.4 SITE REVIEWS

- A. No piping APlumbing, Gas or Drainage@ shall be covered or concealed until reviewed by the Architect or Engineer. If the work is concealed without their approval it shall be uncovered at the expense of the Contractor.
- B. The Contractor shall notify the Architect when the work is at a point to be observed.

### 3.5 SERVICE CONNECTIONS

- A. Extend and connect to sanitary sewer outside building as indicated on the drawings. **Field verify exact size and location and depth prior to construction.**
- B. Extend and connect to storm drain piping outside building as indicated on the drawings. **Field verify exact size and location prior to construction.**
- C. Extend and connect to new domestic water meter at property line as indicated on the drawings. **Field verify exact size and location prior to construction.**

### 3.6 SEISMIC RESTRAINTS FOR MECHANICAL

- A. Provide seismic restraints in accordance with the requirements of the Standard Building Code, for the following:
  - 1. All natural gas piping.
  - 2. All other piping 2-1/2" diameter and larger and all conduits 2-1/2" diameter or larger. Exception: Piping suspended by individual hangers 12" or less in length, as measured from the top of the pipe to the bottom of the support where the hanger is attached, need not be braced.
  - 3. All rectangular ducts with cross-sectional area 6 square foot or larger. Exception: No bracing is required if the duct is suspended by hangers 12" or less in length, as measured from the top of the duct to the bottom of the support where the hanger is attached. Hangers must be positively attached to the duct within 2" of the top of the duct with a minimum of two #10 sheetmetal screws.
  - 4. All mechanical and plumbing equipment, control panels, specialties, expansion tanks, etc. All items must be securely bolted to concrete pads and braced to resist lateral loads.
  - 5. All suspended mechanical equipment shall be restrained to resist lateral seismic forces using four slack aircraft cables anchored to the structure and splayed at 45E from the connection point to the top chord of structural members. Cable shall not short circuit vibration isolators.
- B. Restraints for ductwork and piping (where required) shall be in accordance with S.M.A.C.N.A. Seismic Restraint Manual as applicable for each portion of the work.
- C. Where possible, hangers and supports for ducts and pipes shall not exceed a length of 12".
- D. All seismic bracing components and devices shall be by a single manufacturer. Components shall be MASON Industries or approved equivalent.

### END OF THIS SECTION

## **SECTION 15-140**

### **SUPPORTS AND ANCHORS**

#### **PART 1 - GENERAL**

##### **1.01 SECTION INCLUDES:**

- A. Pipe and equipment hangers and supports.
- B. Equipment bases and supports.
- C. Sleeves and seals.
- D. Flashing and sealing equipment and pipe stacks.

##### **1.02 RELATED SECTIONS:**

- A. Section 15260 - Piping Insulation.
- B. Section 15410 - Plumbing Piping.

##### **1.03 REFERENCES:**

- A. ASME B31.1 - Power Piping.
- B. ASME B31.2 - Fuel Gas Piping.
- C. ASME B31.5 - Refrigeration Piping.
- D. ASME B31.9 - Building Services Piping.
- E. ASTM F708 - Design and Installation of Rigid Pipe Hangers.
- F. MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
- G. MSS SP69 - Pipe Hangers and Supports - Selection and Application.
- H. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

#### **PART 2 - PRODUCTS**

##### **2.01 PIPE HANGERS AND SUPPORTS:**

- A. Manufacturers:
  - 1. a) Grinnel.
  - b) Or Equal.
- B. Plumbing Piping - DWV:
  - 1. Conform to ASME B31.9.
  - 2. Hangers for Pipe Sizes 2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.
  - 3. Hangers for Pipe Sizes 2 inches and over: Carbon steel, adjustable, clevis.
  - 4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
  - 5. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.
  - 6. Wall Support for Pipe Sizes to 4 inches and Over: Welded steel bracket and wrought steel clamp.
  - 7. Vertical Support: Steel riser clamp.

8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

#### C. Plumbing Piping - Water, Gas

1. Conform to ASME B31.9.
2. Hangers for Pipe Sizes 2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.
3. Hangers for Cold Pipe Sizes 2 inches and over: Carbon steel, adjustable, clevis.
4. Hangers for Hot Pipe Sizes 2 to 4 inches: Carbon steel, adjustable, clevis.
5. Hangers for Hot Pipe Sizes 6 inches and Over: Adjustable steel yoke, cast iron roll, double hanger.
6. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
7. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 inches and Over: Steel channels with welded spacers and hanger rods, cast iron roll.
8. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.
9. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.
10. Wall Support for Hot Pipe Sizes 6 inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.
11. Vertical Support: Steel riser clamp.
12. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
13. Floor Support for Hot Pipe Sizes to 4 inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
14. Floor Support for Hot Pipe Sizes 6 inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
15. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
16. Roof Support: Polycarbonate pipe stand, Micro Industries Model 24R or Equal.

#### 2.02 ACCESSORIES:

- A. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

#### 2.03 INSERTS:

- A. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

#### 2.04 FLASHING:

- A. Metal Flashing: 26 gage galvanized steel.
- B. Metal Counter flashing: 22 gage galvanized steel.
- C. Lead Flashing:
  1. Waterproofing: 5 lb/ft<sup>2</sup> sheet lead.
  2. Soundproofing: 1 lb/ft<sup>2</sup> sheet lead.
- D. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.
- E. Caps: Steel, 22 gage minimum; 16 gage at fire resistant elements.

#### 2.05 EQUIPMENT CURBS:

- A. Fabrication: Welded 18 gage galvanized steel shell and base, mitered 3 inch cant, pitched to match roof slope, 1-1/2 inch thick insulation, factory installed wood nailer.

## 2.06 SLEEVES:

- A. Sleeves for Pipes Through Non-fire Rated Floors: 18 gage galvanized steel.
- B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe of 18 gage galvanized steel.
- C. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed.
- D. Sleeves for Round Duct work: Galvanized steel.
- E. Sleeves for Rectangular Duct work: Galvanized steel.
- F. Fire stopping Insulation: Glass fiber type, non-combustible.
- G. Sealant: Acrylic.

## PART 3 EXECUTION

### 3.01 INSTALLATION:

- A. Install in accordance with manufacturer=s instructions.

### 3.02 INSERTS:

- A. Provide inserts for placement in concrete form work.
- B. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
- D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

### 3.03 PIPE HANGERS AND SUPPORTS:

- A. Support horizontal piping as scheduled.
- B. Install hangers to provide minimum 2 inch space between finished covering and adjacent work.
- C. Place hangers within 12 inches of each horizontal elbow.
- D. Use hangers within 1-1/2 inch minimum vertical adjustment.
- E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.
- F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.
- G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

- H. Support riser piping independently of connected horizontal piping.
- I. Design hangers for pipe movement without disengagement of supported pipe.
- J. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
- K. All duct work and piping shall be provided with seismic restraints in accordance with The Seismic Restraint Manual: Guidelines for Mechanical Systems dated 1991, as published by SMACNA and in accordance with local codes.

### 3.04 EQUIPMENT BASES AND SUPPORTS

- A. Provide housekeeping pads of concrete, minimum 4 inches thick and extended 6 inches beyond supported equipment.
- B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.
- C. Construct supports of steel members. Brace and fasten with flanges bolted to structure.
- D. Provide rigid anchors for pipes after vibration isolation components are installed.

### 3.05 FLASHING:

- A. Provide flexible flashing and metal Counter flashing where piping and duct work penetrate weather or waterproofed walls, floors, and roofs.
- B. Flash vent and soil pipes projecting 3 inches minimum above finished roof surface with lead worked one inch minimum into hub, 8 inches minimum clear on both sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counter flash, and seal.
- C. Seal drains watertight to adjacent materials.
- D. Provide curbs for mechanical roof installations 14 inches minimum height above roofing surface. Flash and counter flash with sheet metal; seal weather tight. Attach Counter flashing mechanical equipment and lap base flashing on roof curbs. Flatten and solder joints.
- E. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

### 3.06 SLEEVES:

- A. Set sleeves in position in form work. Provide reinforcing around sleeves.
- B. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- C. Extend sleeves through floors one inch above finished floor level. Caulk sleeves.
- D. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with fire stopping insulation and caulk. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- E. Install chrome plated steel escutcheons at finished surfaces.

### 3.07 SCHEDULES:

HANGER ROD (inches)	PIPE SIZE (inches)	HANGER SPACING (feet)
3/8	2 to 1-1/4	6.5
3/8	1-1/2 to 2	10
1/2	2-1/2 to 3	10
5/8	4 to 6	10
7/8	8 to 12	14
5/8	PVC (all sizes)	6
1/2	C.I. Bell and Spigot (or No-Hub) and at Joints	5

**END OF SECTION**



## **SECTION 15-260**

### **PIPING INSULATION**

#### **PART 1 - GENERAL**

##### **1.01 SECTION INCLUDES:**

- A. Piping insulation.
- B. Jackets and accessories.

##### **1.02 RELATED SECTIONS:**

- A. Section 15410 - Plumbing Piping

##### **1.03 REFERENCES:**

- A. ASTM C195 - Mineral Fiber Thermal Insulation Cement
- B. ASTM C335 - Steady-State Heat Transfer Properties of Horizontal Pipe Insulation
- C. ASTM C449 - Mineral Fiber and Hydraulic-setting Thermal Insulating and Finishing Cement.
- D. ASTM 534 - Performed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
- E. ASTM C547 - Mineral Fiber and Performed Pipe Insulation.

##### **1.04 QUALITY ASSURANCE:**

- A. Materials: Flame spread/smoke developed rating of 25/50 or less in accordance with ASTM E84.

##### **1.05 QUALIFICATIONS:**

- A. Applicator: Company specializing in performing the work of this section with a minimum of three years experience.

##### **1.06 DELIVERY, STORAGE, AND HANDLING:**

- A. Deliver, store protect and handle products to site under provisions of Section 15010.
- B. Deliver materials to site in original factory packaging, labeled with manufacture's identification, including product density and thickness
- C. Store insulation in original wrapping and protect from weather and construction traffic.
- D. Protect insulation against dirt, water, chemical, and mechanical damage.

##### **1.07 ENVIRONMENTAL REQUIREMENTS**

- A. Maintain ambient temperatures and conditions required by manufactures of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum of 24 hours.

#### **PART 2 - PRODUCTS**

##### **2.01 GLASS FIBER:**

- A. Manufacturers: Owen's -Corning, Manville, or equal.
- B. Installation: ASTM C547; rigid molded, noncombustible.
  - 1. 'K' ('ksi') value: ASTM C335, 0.24 at 75 degrees F.
  - 2. Minimum Service Temperature: -20 degrees F.
  - 3. Maximum Service Temperature: 300 degrees F.
  - 4. Maximum moisture absorption: 0.2 percent by volume.
- C. Vapor Barrier Jacket
  - 1. ASTM C921, White kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
  - 2. Moisture Vapor Transmission: ASTM E96; 0.02 perm inches.
  - 3. Secure with self sealing longitudinal laps and butt strips.
  - 4. Secure outward with outward clinch expanding staples and vapor barrier mastic.
- D. Tie Wire: 18 gage stainless steel with twisted ends on maximum 12 inch centers.
- E. Vapor Barrier Lap Adhesive
  - 1. Compatible with insulation.
- F. Insulating Cement/Mastic
  - 1. ASTM C185; hydraulic setting on mineral wool.

### **PART 3 EXECUTION**

#### **3.01 Examination:**

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

#### **3.02 INSTALLATION:**

- A. Install materials in accordance with manufacturer's instructions.
- B. On exposed piping, locate insulation and cover seams in least visible locations.
- C. Insulated cold pipes conveying fluids below ambient temperature:
  - 1. Provide vapor barrier jackets, factory applied or field applied.
  - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness of adjacent pipe.
  - 3. Finish with glass cloth and vapor barrier adhesive.
  - 4. PVC fitting covers may be used.
  - 5. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations.
  - 6. Insulate entire system including fittings, valves, unions, flanges, strainer, flexible connections, and expansion joints.
- D. For insulated pipes covering fluids above ambient temperature:
  - 1. Provide standard jackets, with vapor barrier, factory applied or field applied.

2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe.
3. Finish with glass cloth and adhesive.
4. PVC fitting covers may be used.
5. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but level and seal ends of insulation.
6. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

#### E. Inserts and Shields

1. Application: Piping 1-1/2 inches diameter or larger.
2. Shields galvanized steel between pipe hangers or pip hanger rolls and inserts.
3. Insert location: Between support shields and piping under the finish jacket.
4. Insert Configuration: Minimum of 6 inches long, of same thickness and contour as adjoining insulation; maybe factory fabricated.
5. Insert Materials: Hydrous calcium silicate insulation as manufactured by Pipe Shield Incorporated.

#### F. Finish insulation at supports, protrusions, and interruptions.

### 3.03 GLASS FIBER INSULATION SCHEDULE:

PIPING SYSTEMS	PIPE SIZE	THICKNESS (Inch)
Domestic Hot Water & Recirc	up to 1 1/2"	1"
	2" and larger	2"
Domestic Cold Water	All	1/2"

**END OF SECTION**

**SECTION 15410**  
**PLUMBING PIPING**

**PART 1 - GENERAL**

1.01 SECTION INCLUDES:

- A. Pipe and pipe fittings.
- B. Valves.
- C. Sanitary sewer piping system.
- D. Domestic water piping system.

1.02 RELATED SECTIONS:

- A. Section 15140 - Supports and Anchors.
- B. Section 15260 - Piping Insulation.

1.03 REFERENCES:

- A. ANSI B31.1 - Power Piping.
- B. ASME B16.18 - Cast Bronze Solder-Joint Pressure Fittings.
- C. ASME B16.22 - Wrought Copper and Bronze Solder-Joint Pressure Fittings.
- D. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
- E. ASTM A74 - Cast Iron Soil Pipe and Fittings.
- F. ASTM A120 - Pipe, Steel, Black and Hot-Dipped Zinc Coated (Galvanized), Welded and Seamless, for Ordinary Uses.
- G. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
- H. ASTM B42 - Seamless Copper Pipe.
- I. ASTM B75 - Seamless Copper Tube.
- J. ASTM B88 - Seamless Copper Water Tube.
- K. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe.
- L. AWWA C110 - Ductile-Iron and Gray-Iron Fittings 3 in. Through 48 in., for Water and Other Liquids.
- M. AWWA C111 - Rubber-Gasket Joints for Ductile Iron and Gray-Iron Pressure Pipe and Fittings.
- N. AWWA C651 - Disinfecting Water Mains.

- O. CISPI 310 - Joints for Hubless Cast Iron Sanitary Systems.

#### 1.04 QUALITY ASSURANCE:

- A. Valves: Manufacturer=s name and pressure rating marked on valve body.
- B. Welding Materials and Procedures: Conform to ASME Code.
- C. Welders Certification: In accordance with ASME Section VIII.

#### 1.05 REGULATORY REQUIREMENTS:

- A. Perform Work in accordance with applicable plumbing code.
- B. Conform to applicable code for installation of backflow prevention devices.
- C. Provide certificate of compliance from authority having jurisdiction.

#### 1.06 DELIVERY, STORAGE AND HANDLING:

- A. Deliver, store, protect and handle products to site under provisions of Section 15010.
- B. Accept valves on site in shipping containers with labeling in place.
- C. Provide temporary protective coating on cast iron and steel valves.
- D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

#### 1.07 ENVIRONMENTAL REQUIREMENTS:

- A. Do not install underground piping when bedding is wet or frozen.

#### 1.08 EXTRA MATERIALS:

- A. Furnish under provisions of Section 15010.
- B. Provide two re packing kits for each size valve.

### **PART 2 - PRODUCTS**

#### 2.01 SANITARY SEWER PIPING, BURIED BEYOND 5 FEET OF BUILDING:

- A. Cast Iron Pipe: ASTM A 74, service weight.
  - 1. Fittings: Cast Iron.
  - 2. Joints: ASTM C564, neoprene gasket system or lead and oakum.
- B. Schedule 40, PVC Pipe. ASTM D2665.
  - 1. Fittings: PVC.
  - 2. Joints: D2855, solvent weld with ASTM D2564 solvent cement.

## 2.02 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING:

- A. Cast Iron Pipe: ASTM A74 service weight.
  - 1. Fittings: Cast Iron.
  - 2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.
- B. Schedule 40, PVC Pipe. ASTM D2665.
  - 1. Fittings: PVC.
  - 2. Joints: D2855, solvent weld with ASTM D2564 solvent cement.

## 2.03 SANITARY SEWER PIPING, ABOVE GROUND:

- A. Schedule 40, PVC Pipe. ASTM D2665.
  - 1. Fittings: PVC.
  - 2. Joints: D2855, solvent weld with ASTM D2564 solvent cement.

## 2.04 WATER PIPING, ABOVE GROUND:

- A. Copper Tubing: ASTM B88, Type L, hard drawn.
  - 1. Fittings: ASME B16.18, cast bronze, or ASME B16.22, wrought copper and bronze.
  - 2. Joints: ASTM B32, solder, Grade 96TA.

## 2.06 FLANGES, UNIONS, AND COUPLINGS:

- A. Pipe Size 2 inches and Under:
  - 1. Ferrous Pipe: 150 psig malleable iron threaded unions.
  - 2. Copper Tube and Pipe: 150 psig bronze unions with soldered joints.
- B. Pipe Size over 2 inches:
  - 1. Ferrous Pipe: 150 psig forged steel slip-on flanges; 1/16 inch thick preformed neoprene gaskets.
  - 2. Copper Tube and Pipe: 150 psig slip-on bronze flanges; 1/16 inch thick preformed neoprene gaskets.
- C. Grooved and Shouldered Pipe End Couplings:
  - 1. Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.
  - 2. Sealing Gasket: AC@ shape composition sealing gasket.
- C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

## 2.10 GATE VALVES:

- A. Manufacturers: Milwaukee 105 or Equal.

- B. Up to and including 2 inches: Bronze body, bronze trim, non-rising stem, handwheel, inside screw, single wedge or disc, threaded ends.
- C. Over 2 inches: Iron body, bronze trim, rising stem, handwheel, OS&Y, single wedge, flanged ends.

#### 2.11 BALL VALVES:

- A. Manufacturers: Milwaukee BA-200 or Equal.
- B. Up to and including 2 inches: Bronze two piece body, stainless steel ball, Teflon seats and stuffing box ring, lever handle, threaded ends with union.

### **PART 3 EXECUTION**

#### 3.01 EXAMINATION:

- A. Verify that excavations are to required grade, dry, and not over-excavated.

#### 3.02 PREPARATION:

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on the inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

#### 3.03 INSTALLATION:

- A. Install in accordance with manufacturers' instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient.
- D. Install piping to conserve building space and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Provide clearance for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not exposed.
- I. Establish elevations of buried piping outside the building to ensure not less than three feet of cover.
- J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- K. Provide support for utility meters in accordance with the requirements of utility companies.
- L. Prepare support for fittings, supports and accessories not prefinished, ready for finish painting.

- M. Install bell and spigot pipe with bell end upstream.
- N. Install valves with stem upright or horizontal, not inverted.
- O. Slope piping and arrange to drain at low points. Use eccentric reducers to maintain top of pipe level.
- P. Install condensate drainage and water piping as to not restrict the routing of HVAC duct work.

#### 3.04 APPLICATION:

- A. Use grooved mechanical couplings and fasteners only in accessible locations.
- B. Install unions downstream of valves and at equipment or apparatus connections.
- C. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.
- D. Install gate valve for shut-off and to isolate equipment, part of system, or vertical risers.

#### 3.05 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM:

- A. Prior to starting work, verify system is complete, flushed and clean.
- B. Ensure PH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- C. Inject disinfectant, free chlorine in liquid, powder, tablet, or gas form, throughout system to obtain 50 to 80 mg/L residual.
- D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum of 15 percent of outlets.
- E. Maintain disinfectant in system for 24 hours.
- F. If final disinfectant residual test less than 25 mg/L, repeat treatment.
- G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

#### END OF SECTION



## SECTION 15762

### UNIT HEATER

#### A. GENERAL

1. Contractor shall supply and install wall mounted forced air electric heaters of the wattage, voltage and phase as indicated on the plans and specifications. The heater shall so be designed to provide an even distribution of heated air to the space to be heated by drawing return air in the peripheral area of the heater across and through the element which shall then be discharged from the center section of the heater by means of an electric motor and axial flow fan blade. Heaters shall be recessed type to extend no more than 4" from the finished wall.

#### B. ENCLOSURE

1. Heater front shall be splash proof construction with built-in thermostat.

#### C. MOTOR

1. Motor shall be a permanently lubricated unit bearing, totally enclosed shaded pole type with impedance protection. Motors shall operate at no more than 1400 RPM and shall be same voltage as the heater. A protective shield shall surround the motor to separate return air from heated air.

#### D. PERFORMANCE

- I. Heaters shall have a rating of 100 CFM at 660 F.P.M. with a maximum temperature rise of 50 degrees F.

#### E. ELEMENTS

1. Element assemblies shall consist of two or three corrosion resistant steel sheathed type elements mechanically bonded to common corrosion resistant steel fins.

#### F. APPROVAL

1. Heaters shall be Underwriters' Laboratories listed. Heaters shall conform to Underwriter's Laboratories, Inc standard 2021, and shall not be required to have any "CAUTION" marking on the front of the heater.

#### G. MANUFACTURERS

1. QMark.
2. Markel model 3310.
3. Preapproved equal.

#### H. WARRANTY

1. One (1) year full parts and labor with additional one (1) year full parts warranty.

END OF SECTION 15762

## SECTION 15801

### AIR DISTRIBUTION

#### A. GENERAL

1. Scope: This section includes but is not limited to the following:
  - a. Exhaust Fans
  - b. Duct Work
  - c. Diffusers, Registers, and Grilles

#### B. EXHAUST FANS

1. Refer to fan schedule shown on the plans. All exhaust fans to be Greenheck, Penn, Carnes, or equal, of size, type, and model shown. All fans to be equipped with disconnect, gravity type back-draft dampers and bird screens.
2. The General Contractor will provide prefabricated curbs. The Roofing Contractor will provide flashing for the roof-mounted fans and proper wall openings for wall-mounted fans. The Heating Contractor shall cooperate with the other contractors, providing all necessary dimensions, etc., as required in order that proper installation will be made. Provide roofcaps for ceiling mounted fans.

#### C. DUCTWORK

1. Low Pressure Duct
  - a. The mechanical contractor shall furnish and install all ductwork and plenums fabricated of the sizes as shown on the plans, of galvanized sheet metal in accordance with recommendations as outlined in A.S.H.R.A.E. Guide.
  - b. The following sheet metal gauges shall be used throughout:

<u>U.S. STD. GAUGES</u>	<u>MAXIMUM SIDE INCHES</u>
26	Up to 12"
24	13" to 30"
22	31" to 42"
  - c. Provide sheet metal sleeves and flanges for exposed ducts passing through walls to give a neat appearance.
  - d. All duct joints to be sealed with duct sealer compound.
2. Round Spiral Duct: To be Semco type "SR" rigid double wall spiral duct. United Sheetmetal, Monroe, Dixie or Eastern. Duct to have 1" insulation between inner and outer wall.
3. Flexible Unit Connections: The mechanical contractor shall furnish and

install on fan openings a flexible connection to eliminate vibration being transmitted from the blower to the ductwork, manufactured by Duro-Dyne, U.S. Rubber, or equal, neoprene coated glass fabric, secured with snap locks.

4. Flexible Duct: Furnish and install where shown on plans flexible duct with 1" thick, ¾ lbs. density insulation. Shall be UL listed. The flexible duct shall be capable of maintaining the shaping required by job conditions without sagging or drooping. Duct connections to collars shall be made in accordance with manufacturer's recommendations.

#### D. GRILLES, REGISTERS AND DIFFUSERS

1. All grilles, registers, diffusers shall be approved equal of the type and with accessories as shown on plans. They have been selected from the tables of Price. Pressure drop is critical and may not exceed that required or shown of the devices selected. Noise levels are also critical and the NC rating shall not exceed that for the devices selected. Titus is acceptable.
2. All diffusers shall be sized such that the downfall velocity of air measured 5' above the floor shall not exceed 50' per minute nor be less than 30' per minute.
3. Opposed blade volume controls shall be provided for each ceiling and sidewall diffuser and for each return air and exhaust grille where more than one is on a duct.
4. Defelectrols (rakeoffs) shall be provided at all 90 degrees takeoffs from supply air ducts to branch ducts or sidewall diffusers and to ceiling diffusers.
5. Finishes of all ceiling grilles, registers, and diffusers shall be off-white enamel and all sidewall devices shall be prime coat.

#### E. WALL/FLOOR FIRE DAMPERS

1. Furnish and install, at locations shown on plans, fire dampers constructed and tested in accordance with UL Safety Standard 555. Each fire damper shall have a 1 ½ hour fire protection rating, 212 degrees F fusible link, and shall include a UL label in accordance with established UL Labeling procedures. Damper manufacturer's literature submitted for approval prior to installation shall include comprehensive performance data developed from testing in accordance with AMCA Standard 500 and shall illustrate pressure drops for all sizes of dampers required at all anticipated air flow rates. Fire dampers shall be equipped for vertical or horizontal installation as required by the location shown. Fire dampers shall be installed in wall and floor openings utilizing steel sleeves, angles, other material, and practices required to provide an installation equivalent to that utilized by the manufacturer when dampers were tested at UL. Installation shall be in accordance with the damper manufacturer's instructions.
2. Fire dampers shall be Ruskin Model IBD, or equal units by Phillips, Cesco, United Aire or Louvers & Dampers will be acceptable.

END OF SECTION 15801

## SECTION 16008

### EXCAVATION

#### A. GENERAL

1. This section includes requirements for excavation of trenches and backfill for all underground conduits.

#### B. EXCAVATION

1. Dig trenches to the uniform width required for particular item to be installed, sufficiently wide to provide ample working room. Provide 6" to 9" clearance on both sides of pipe or conduit.
2. Excavate trenches to depth indicated or required. Carry depth of trenches for piping to establish indicated flow lines and invert elevations. Beyond building perimeter, keep bottoms of trenches sufficiently below finish grade.
3. For pipes or conduit 5" or less in nominal size and for flat bottomed multiple-duct conduit units, do not excavate beyond indicated depths. Hand excavate bottom cut to accurate elevations and support pipe or conduit on undisturbed soil.
4. Except as other wise indicated, excavate for exterior so top of piping is not less than 2'-0" below finished grade. For depth of trenching for primary, see Site Plan.
5. Grade bottoms of trenches as indicated, notching under pipe couplings to provide solid bearing for entire body of pipe.
6. Filling and Grading - Do all excavating, filling, backfilling, and rough grading to bring areas to required levels. Filling and grading to be in accordance with Section 02200.
7. Backfill trenches with concrete where trench excavations pass within 18" of column or wall footings and which are carried below bottom so such footings, or which pass under wall footings. Place concrete to level of bottom of adjacent footing. Backfill all trenches both inside and outside building with crushed stone. (2")
8. Concrete specifications shall be per manufacturer's recommendation. Submit specs for concrete to engineer for review prior to any concrete pours.
9. Do not backfill trenches until tests and inspections have been made and backfilling authorized by Architect/Engineer. Use care in backfilling to avoid damage or displacement of pipe systems.

END OF SECTION 16008

## SECTION 16010

### BASIC ELECTRICAL REQUIREMENTS

#### A. REFERENCES

1. All work included under this section is subject to the conditions listed at the beginning of these specifications.

#### B. QUALITY ASSURANCE

1. Manufacturers: Firms regularly engaged in manufacture of equipment of types and sizes required, whose products have been in satisfactory use in similar service for not less than ten (10) years.
2. Installer's Qualifications: Firm with at least 5 years of successful installation experience on projects with electrical equipment similar to that required for this project.
3. The technician in charge of installation shall be required to have not less than 5 years experience. The assistant installer or electrician shall have 3 years experience. Any helper used on the job must have 2 years of related experience.
4. The electrical firm will be required to furnish all documentation to substantiate each worker's qualifications.
5. The firm further agrees to submit the above information for approval prior to commencement of construction.
6. To insure continuity, the contractor shall agree to leave the main technician on the job for the entire duration of the electrical installation.

#### C. CODES AND FEES

1. Material and workmanship shall conform to the following list of codes and standards. Material shall bear Underwriters Label where such standard has been established and listed by Underwriters Laboratories, Inc.
2. American Society for Testing and Materials ASTM.
3. Electronic Industries Association EIA.
4. Institute of Electrical & Electronics Engineers IEEE
5. Illuminating Engineering Society IES.
6. National Electrical Manufacturer's Association NEMA
7. American National Standards Institute ANSI
8. NFPA 101 - Life Safety Code
9. Occupational Safety and Health Act

10. NFPA 70 - National Electrical Code
11. Installing Seismic Restraints for Electrical Equipment – FEMA 413/Dec. 2004
12. Kentucky Building Code
13. International Energy Conservation Code
14. ICC/ANSI A117.1 Accessible & Usable Building and Facilities
15. This installation shall comply with all National, State, and Local Electrical requirements.

#### D. TESTING

1. Prior to energizing the distribution system, building service switches shall be placed in open position and voltage tests on the line side of all building service switches shall be made.
2. Correct voltage errors and phase relations before placing building electrical system in service. Provide all testing equipment necessary to conduct tests.

#### E. IDENTIFICATION

1. Equipment, disconnect switches, motor starters, pushbutton stations, panels, switchgear, special device plates and similar material shall be clearly marked. Size of lettering and wording shall be approved by Engineer.
2. Mark panels giving panel designation in one-half inch letters and voltage in one-quarter inch letters centered above door on exterior trim. Mark equipment mounted remotely from source of power with equipment number, source of power, and starter location. Where starters are remotely mounted, marking shall include equipment name, number, and location.
3. Provide typewritten directories in panels and where otherwise required with clear plastic protection shields and mounted in cardholder. Directory must include actual room names/numbers and items served, receptacles, lights, etc.
4. All other marking shall be engraved Lamacoid plates having black background and white letters. Attach each plate with aluminum screws or an approved adhesive. Align plates on equipment being marked in center near top.
5. Contractor shall provide metallic detection tape 4" wide in all trenches one (1) foot above conduit indicating voltage. Ribbons must be color-coded and have voltage or utility stamped on them.

7200 V Yellow	Fiber Optic - Orange
480 V Yellow	Communications - Blue
240 V Yellow	Fire Alarm – Red

Underground open conduits for future shall have #10 pull wire.

6. Junction boxes and pull boxes shall be identified throughout building as noted. Fire alarm junction – red; Communications – blue; Telephone and Computer – pink; CATV –

yellow; Emergency – green. Color code all pull boxes above ceiling and paint conduits the same color of boxes within 3" of box.

#### F. SHOP DRAWINGS

1. Shop drawings shall be submitted at the Engineer's Office on all major items such as branch panels, terminal and service cabinets, lighting fixtures, special control panels, wiring devices, enclosures, etc.
2. A minimum of three (3) copies shall be submitted of such shop drawings and brochures, and they shall include all physical dimensions, wiring diagrams and performance data.
3. All shop drawings and brochures shall bear the approval of the Contractor before submittal. His approval shall verify that the equipment meets all of the requirements of the drawings and specifications and will fit in the available space as intended in the drawings and specifications.
4. The Engineer's approval of these shop drawings and brochures is for guidance only and shall not release the Contractor from his responsibility to comply with all requirements of the drawings and specifications. All shop drawings and brochures shall be as complete as possible; however, if any item is omitted, it shall be understood to be as specified.

#### G. SUBSTITUTIONS

1. Wherever a specific manufacturer's item is specified, it is intended as standard to be met and items superior or approved equal will be acceptable, provided approval is granted in writing (addendum) at least seven (7) days prior to bidding.

#### H. DRAWINGS

1. The Contractor shall note that the electrical Drawings are intended to indicate only the extent diagrammatically, general character and location of the work included.
2. Work, intended not having minor details obviously omitted shall be furnished and installed complete to perform the functions intended.
3. For building details, the architectural and structural drawings and specifications shall be followed and the work of the electrical drawings and specifications shall be coordinated and fitted thereto.

#### I. TEMPORARY UTILITIES

1. Contractor shall provide temporary power to the site as needed during construction.

#### J. OPERATION AND MAINTENANCE DATA

1. Refer to Division 1 Section: PROJECT CLOSEOUT or OPERATION AND MAINTENANCE DATA for procedures and requirements for preparation and submittal of maintenance manuals. (Three copies)
2. In addition to the information required by Division 1 for Maintenance Data, include the following information:

- a. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.
- b. Manufacturer's printed operating procedures to include start-up, break-in, routine and normal operating instructions; regulation control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
- c. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
- d. Servicing instructions and lubrication charts and schedules.

#### K. WARRANTIES

- 1. Refer to Division 1 Section: SPECIFIC WARRANTIES for procedures and submittal requirements for warranties.
- 2. Refer to individual equipment specifications for warranty requirements.
- 3. Compile and assemble the warranties specified in Division 16, into a separated set of vinyl covered, three ring binders, tabulated and indexed for easy reference.
- 4. Provide complete warranty information for each item of product or equipment to include date of beginning of warranty or bond; duration of warranty or bond; and names, addresses, and telephone numbers and procedures for filing a claim and obtaining warranty service.

#### L. CLEANING

- 1. After completion of all work and before final acceptance of the work, each trade shall thoroughly clean all equipment and materials, and shall remove all foreign matter such as grease, dirt, labels, stickers, etc., from the exterior of piping, fixtures, equipment, and all associated fabrication.

#### M. FIRE AND SMOKE STOPS

- 1. Provide approved fire or smoke stops around all electrical cables, cables and sleeves, conduits, and unused ferrules or around other electrical equipment which pass through walls, floors, and ceiling. Firestopping that will stop drafts up wire shafts, through conduit holes, etc., shall be fire-retardant compounds. (U.L. 1479.)

#### N. PENETRATION SEALANTS

- 1. Dow Corning "Firestop Foam" and "Firestop Sealant" Insta-Foam Products, Inc., "Insta-Fire Seal Silicone RTV Foam".  
3M Brand "Fire Barrier" Caulk  
3M Brand Moldable Putty "Pads" and Moldable Putty "Stix"
- 2. Intumescent Sealants for use in openings and sleeves involving plastic pipe, insulated pipe or flexible cable:
  - a. Dow Corning "Firestop Intumescent Wrap Strip" fox Coupling, Inc. "Cast-in-Place Firestop Coupling" 3M Brand "Fire Barrier" Caulk, with FS-195 Wrap Strip and CS-195 Composite Sheet.



#### O. SUMMARY OF WORK

1. Work includes furnishing all labor, materials, appliances, equipment, tools, transportation, superintendence and services required to construct and install complete and fully operative electrical systems as specified herein, as shown and elsewhere required.
2. Cutting and patching shall be held to an absolute minimum and such work shall be done only under the direction of the Architect or Engineer.
3. Where necessary for conduit to pass through concrete or steel beams, furnish and install sleeves through beams.
4. See Section General Provisions, Division 1.
5. Electrical trade to be responsible for his own cutting.
6. Protect all factory-finished equipment intended to be field painted. Clean, refinish or replace damaged equipment.
7. Treat galvanized metal with bonding primer before painting. Paint shall be applied in accordance with manufacturer's recommendations.
8. Each trade shall do all necessary excavating to receive any and all of his work and provide all necessary sheathing, planking and cribbing for his operation, same to be removed at completion.
9. All empty conduits shall have pull cords or rope.
10. Installation of a lighting system complete with electronic ballasts, fixtures, lamps, etc.
11. Scope of Work shall include:
  - a. Contractor shall extend existing underground conduit for the electrical primary to location of new pad-mounted transformer. Primary conductors furnished and installed by PRECC. Contractor shall include PRECC construction charges in bid. Coordinate requirements with Kyle Power of PRECC at 270-886-2555.
  - b. Contractor shall provide concrete pad for electrical transformer per PRECC requirements.
  - c. Contractor shall provide complete electrical service located in restroom building including electrical service entrance panel, lights, receptacles, etc.
  - d. Contractor shall provide electrical service and complete athletic field lighting for Soccer Field with average lighting level of 50 foot-candles to meet KHSAA lighting stand to host soccer tournaments.

END OF SECTION 16010

## SECTION 16100

### BASIC MATERIALS & METHODS

#### A. GENERAL

1. This section includes raceways, fittings, busways, conductors, connectors, supporting devices, open conduit and related items.

#### B. CONDUIT

1. Minimum conduit size shall be ½".
2. Rigid galvanized steel conduit (RGS) shall be used above grade outside. This includes RGS sweeping 90s at transition from below grade to above grade. All threaded conduit connections shall be neatly painted with joint compound before connecting to affect a watertight joint. Conduit shall be hacksaw cut and reamed smooth to remove burrs. Cutting by any other method that alters the cross sections of the conduit in any way will not be permitted. Where RGS is used below grade or in corrosive environments, it shall be PVC-coated.
3. Watertight couplings and connectors shall be used on these conduit installations.
4. Schedule 40 PVC to be used for underground and below slab wiring. Stub through slab with Schedule 80 PVC.
5. Schedule 80 PVC to be used for underground below blacktop and sidewalks and for stubs less than 24 inches high through slab.
6. Interior wiring, except as set out above, shall be in steel electric metallic tubing, galvanized or sheradized for sizes up to 2 inches diameter. IMC is required for interior conduits over 2 inches. Grounding bushings shall be used. This shall be done in accordance with the N.E.C.
7. Flexible conduit ( 3/8") with ground for light fixtures.
8. Flexible conduit seal-tite ( ½") for connections to motor and equipment.
9. Install expansion fittings for all conduits that occur at building expansion joints. (See architectural drawings.)

#### C. CONDUIT FITTINGS

1. Thinwall – die cast set screw.
2. Large sizes, Thomas and Betts, Efcor, Appleton, connector and couplings, with insulating bushings. (Threaded)
3. Watertight couplings and connectors for conduit run underground or in ground floor slab.

#### D. CONDUIT SUPPORTS

1. One-hole rust proof malleable iron pipe straps.

E. ENTRANCE CONDUIT

1. Standard galvanized conduit, Republic, Triangle or Youngstown.

F. ENTRANCE CONDUIT STRAPS

1. One hole malleable iron – Thomas and Betts, Efcor Burndy or equal.

G. INSTALLATION OF CONDUIT SYSTEM

1. Conduit sizes shown on contractor's drawings, conduit runs as indicated in legend.
2. All conduit shall be run concealed except in the Mechanical Rooms and unfinished areas.
3. Conduit shown run in ceiling shall be run above ceiling or in poured slab.
4. Exposed conduit runs shall be parallel to lines of building and shall be installed in a neat, workmanlike manner.
5. The Electrical Subcontractor shall support all overhead conduits, raceways, wireways, and wiring not run in conduit or raceways. Supports shall be from the building structure, independent of the ceiling grid and/or support wire system.
6. Additional pull boxes may be added as desired by contractor, for ease of pulling wire. (No run shall exceed 100' without a pull box).
7. Conduit and boxes shall be rigidly supported to building.
8. Conduit on exterior of building shall be waterproof and devices shall be NEMA 3R enclosures.
9. No pipe hangers or perforated straps shall be used for supports.
10. Conduit on ground floor grade to be run below slab.
11. All conduit below grade or outside of building or beneath concrete slab to be epoxy coated or approved protective material. All joints to be made watertight with pipe dope or ribbon dope thread sealant.
12. Provide expansion fittings at all building expansion joints.

H. WIRE AND CABLE

1. Building wires (Phelps Dodge, Paronite, General Cable, or Southwire) for general use in walls and ceilings shall be Type THHN, copper, minimum conductor size #12. Minimum neutral conductor size for circuits with combined neutral shall be #10 THHN. Conductors that are exposed to sunlight shall be UL listed as sunlight resistant (marked on cable). THWN required for wet locations.
2. Panel and motor feeders – Type THHN.
3. Panel and distribution feeders neutrals shall be increased one size.

4. Fixture wires shall be code Type PAF.
5. Color code as follows:  
  
Phase A – Black; Phase B – Red; Phase C – Blue; Insulated  
Neutral – White; Three and four-way travelers – Yellow  
One pole switch return – Orange; Equipment Ground – Green.
6. All conductors #6 and smaller shall be color-coded, all conductors #4 and larger shall be color taped or painted.
7. Conductor shall be identified with P & S CAB 3 cable-marking system. Markers shall have the following features:
  - a. Numbers are hot stamped for permanent identification.
  - b. Side slipping design to ensure perfect alignment.
  - c. Polyamid 6/6 material.
  - d. Color-coded for ease of identification.

I. GROUNDING CONDUCTOR

1. Bare stranded annealed copper cable.

J. CABLE INSTALLATION

1. No conductors shall be drawn into conduits until all work that may cause cable damage is completed. Only approved cable lubricants shall be used when necessary.
2. As far as practical, all feeder cables shall be continuous from origin to panel termination without running splices in intermediate pull boxes or splicing chambers. Sufficient slack shall be left at the terminations to make proper connection.
3. Where feeders consisting of more than one conductor per phase leg pass through pull boxes or panels, each conductor of the other two phases shall be grouped together with conductors of the other two phases to reduce reactance effect.

K. WIRING

1. Use solderless connectors on all wire sizes; must be used on stranded cable. T&B (Sta-Kon), or Scotchlok, Ideal. All fixture and branch circuit wiring joints, in junction and outlet boxes shall be made with U.L. approved connectors and listed for 600 volts, (1,000 volts when enclosed in fixture or sign) as a pressure cable approved connector.

Connector body shall consist of a cone-shaped, expandable coil spring insert, insulated with a color-coded nylon shell with two wings placed opposite each to serve as a built-in wrench. Shell to be molded of one piece.

2. Composition or porcelain wire nuts not permitted.

3. Maintain a continuous neutral. The system, all devices, and conduit shall be grounded as required by N.E.C.
4. Terminations for stranded THHN sizes #14, #12, #10, etc. shall be made with spade type connections.

#### L. OUTLET BOXES

1. Provide outlet box for each wiring device or group of devices as indicated. Provide fixture studs in center of boxes supporting fixtures. Provide recessed boxes in walls unless indicated otherwise.
2. Boxes
  - a. Concealed in walls: 4 inch or 4-11/16 inch square pressed galvanized steel with raised covers; covers to have square for masonry walls and rounded corners for plaster walls.
  - b. Boxes surface mounted on walls: Galvanized cast iron with threaded hubs, F.S. or F.D. condulets or aluminum bell boxes.
  - c. Boxes mounted on ceiling or in ceiling: 4 inch octagonal, square or 4-11/16 inch square pressed galvanized steel.
  - d. Boxes concealed in floor: Galvanized cast iron with adjusting screws, box cover and gasket, adjusting ring and sealing collar, carpet flange, floor plate with gasket and abandon plug. Boxes shall be as manufactured by Walker, Raco, Steel City Series 68 and 78 or T & B Series #1760. Steel City 664 CST Series and Hubbell 35FB-SS with 35FB-CGY cover for power and data.

#### M. SWITCHES AND RECEPTACLES

1. Galvanized steel wall boxes for both single and gang boxes.

#### N. JUNCTION BOXES, PULL BOXES AND AUXILIARY GUTTERS

1. Boxes installed in sidewalks, pavements, in grade and other exterior and wet locations shall be galvanized cast iron with threaded hubs as manufactured by Appleton, Russell and Stoll, equal to Crouse-Hinds Type WJBF. Other boxes and gutters shall be custom built (standard knock-out type boxes not acceptable).
2. Construct custom built boxes and gutters of not less than 12-gauge galvanized steel; boxes larger than 1500 square inches or containing 2 ½" or larger conduits, 10-gauge. Continuous weld seams ground smooth. Provide barriers and racks where indicated or required. Secure covers with screws of non-corrosive material (cadmium).
3. Color code all pull boxes above ceiling and paint conduits the same color of boxes within 3" of box:
  - a. Fire Alarm – Red
  - b. Communications – Blue
  - c. CATV – Yellow

- d. Emergency Power – Green
- e. Telephone/Computer – Pink

O. SWITCHES AND RECEPTACLES (Wiring Devices)

- 1. Switch and receptacle shall be installed at standard mounting height from floor, unless otherwise directed, 40" and 16" to bottom of outlet.
- 2. The Owner reserves the right to shift outlet locations as may be required during construction if this shift is made before rough-in work is started for outlet in question.

P. SUPPORTING DEVICES

- 1. Inserts
  - a. Furnish and install adjustable concrete hanger inserts like Truscon, Elcen, or Grable.
- 2. Expansion Bolts
  - a. Expansion bolts and screw anchors to be Ackerman Johnson, Elcen, or Grable with malleable shield lead on small screws.
- 3. Anchors
  - a. Install anchors where shown on plans and as required to prevent pipe movement. Anchors to be pipe clamps welded, bolted to steel members, or otherwise fastened to building structure.

END OF SECTION 16100

## SECTION 16116

### WIREWAY WITH HINGED COVER

#### A. GENERAL

1. Furnish and install lay-in type wireway as shown on the plans. Wireway shall be Underwriters Laboratories listed as wireway or auxiliary gutter.

#### B. CONSTRUCTION

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

#### C. CONNECTORS

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

#### D. FINISH

1. All sheet metal parts shall be provided with a corrosion resistant phosphatizing primer and ASA-49 gray epoxy finish. All hardware shall be plated to prevent corrosion. All screws installed toward the inside shall be protected by spring nuts or otherwise guarded to prevent wire insulation damage.

#### E. INSTALLATION

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

#### F. UL LISTING

1. All lengths, connectors and fittings shall be Underwriters Laboratories labeled and installed in accordance with the National Electric Code and as shown on these plans. Underwriters Laboratories listing of lengths without listing of connectors or fittings is not acceptable. Wireway shall be Square D SQUARE-DUCT combination. General Electric and Siemens shall be considered.

END OF SECTION 16116

## SECTION 16134

### PANELBOARDS

#### A. GENERAL

1. Furnish and install circuit breaker panelboards as indicated in the panelboard schedule and where shown on plans.
2. Panelboards shall be of a dead-front safety type, equipped with thermal-magnetic molded case circuit breakers with frame and trip ratings as shown on the schedule.
3. Include provisions for coordinating the actual room name/numbers selected for interior signage with the electrical panel designations.
4. Provide panel fronts with hinged (door-in-door) covers.
5. Provide (2) ¾" conduit stubbed out of all flush-mounted panels to above ceiling for future use.
6. Provide "flash protection" warning labels.

#### B. CIRCUIT BREAKERS

1. Circuit breakers shall be quick-make, quick-break, thermal-magnetic, trip indicating, and have common trip on all multi-pole breakers. Branch circuit breakers feeding convenience outlets shall have sensitive instantaneous trip settings of not more than 10 times the trip rating of the breaker in order to give "flash protection" for frayed stranded wire cords. Connections to the bus shall be Bolt On.

#### C. PANELBOARD BUS ASSEMBLY

1. Bus bar connections to the branch circuit breakers shall be the "distributed phase" or "phase sequence" type. Single-phase, three-wire panelboard bussing shall be such that any two adjacent single-pole breakers are connected to opposite polarities in such a manner that two-pole breakers can be installed in any location. All current-carrying parts of the bus assembly shall be plated. Mains rating shall be as shown in the panelboard schedule on the plans.

#### D. WIRING TERMINALS

1. Terminals for feeder conductors to the panelboard mains and neutral shall be UL listed as suitable for the type of conductor specified. Terminals for branch circuit wiring, both breaker and neutral, shall be UL listed as suitable for the type conductor specified.

#### E. CABINETS AND FRONTS

1. The panelboard bus assembly shall be enclosed in a steel cabinet. The size of the wiring gutters and gauge of steel shall be in accordance with NEMA Standards no. 67 for panel boards. The box shall be fabricated from galvanized steel or equivalent rust-resistant steel.
2. Fronts shall include doors and have flush, brushed stainless steel, cylinder tumbler-type locks with catches, and spring-loaded door pulls. Fronts shall have adjustable



indicating trim clamps which shall be completely concealed when the doors are closed. Completely concealed steel hinges shall mount doors. A circuit directory frame and card with a clear plastic covering shall be provided on the inside of the door.

F. UL LISTING

1. Panelboards shall be listed by Underwriters' Laboratories and bear the UL label.
2. Panelboards shall be G.E., Square D, Siemens and Eaton.

END OF SECTION 16134

## SECTION 16140

### SWITCHES & RECEPTACLES

#### A. GENERAL

1. This section includes the furnishing of all wiring devices and covers.

#### B. SWITCHES

1. Switches shall be the flush tumbler, heavy duty type, quiet operation, specification grade.
2. Switches shall be rated 20 amps, 120 volts, A.C.
3. Switches shall have the provisions for both side and back wiring.
4. The following type of switches shall be furnished for this project:

a. Switch, wall type single pole, double pole three-way and four-way	Hubbell Cat. No. 1221, 1222, 1223, 1224; Bryant Cat. No. 4901, 4902, 4903, 4904, Cooper 2221,2222,2223,2224, or approved equal.
b. Switch and pilot light combination single pole, double pole, and three-way	Hubbell Cat. No. 7739, 7953, Bryant Cat. No. 6405, 6408, or Cooper 2221PL, 2222PL.
c. Switch, wall type key operated with 2 keys per switch	Hubbell Cat. No. 4901-L or Cooper AH1191N.
5. Color to be selected by the Architect.

#### C. CONVENIENCE OUTLETS

1. Convenience outlets shall be three-wire, grounding type, parallel slots with U type ground blades, specification grade, polarized.
2. Convenience outlets shall be duplex or single and shall be current and voltage rated as indicated on the contract drawings and specified herein.
3. The following type receptacles shall be furnished for this project:

a. Convenience outlets duplex 15A, 125 volts, A.C.	Hubbell Cat No. 5262' Bryant Cat. No. 5262; or approved equal.
b. Convenience outlets duplex 20A, 125 volts, A.C.	Hubbell Cat No. 5362; Bryant Cat. No. 5362; Cooper 5362 or approved equal.

- |    |  |   |
|----|--|---|
| c. | Convenience outlets duplex, weatherproof, 15A, 125 volts, A.C. complete w/gasketed weatherproof plate.<br>*See Item 6 below. | Hubbell Cat. No. 5262-5206;<br>Bryant Cat. No. 5262-4550;<br>Cooper GF15 or approved equal. |
| d. | Surge suppression receptacles with audible/visual alarm  | Hubbell 5362IS-13/20A<br>Cooper 53625/20A<br>Hubbell 52621S-15/15A<br>Cooper 52625/15A      |
| e. | Isolated ground receptacle (Orange)  | Hubbell 1G252S-15/15<br>Cooper IG-5262  |

**NOTE:** G.F.I. receptacles to be used on all weatherproof outlets.  
G.F.I. receptacles to be used on all Kitchen 120V outlets.

4. Wiring devices shall be of one manufacturer insofar as possible.
5. Install all receptacles with grounding blade slot at top.
6. Receptacles in wet locations shall be installed with a hinged outlet cover/enclosure clearly marked "Suitable for Wet Locations While in Use" and UL Listed. There must be a gasket between the enclosure and the mounting surface and between the hinged cover and mounting plate/base to assure proper seal. TayMac or Intermatic; Specification Grade or equal.
7. Color to be selected by the Architect.

#### D. FINISHING PLATES

1. Finishing plates for all wall switches, convenience outlets, and telephone outlets shall be high impact thermoplastic, Lexan. Submit samples to the Architect for color selection. All plates shall be Midway size. Standard plates will not be acceptable.
2. Finishing plates shall be Hubbell, Bryant, Cooper (PJ Series) or approved equal. (Mid Size)
3. Finishing plates shall be one piece gangable type where switches, receptacles, etc., are shown located adjacent to one another.
4. Emergency receptacles shall have red plates and devices.

END OF SECTION 16140

## SECTION 16160

### CONTACTORS

#### A. GENERAL

1. The contactor shall switch a load at 480 or 250 volts, 60 hertz and shall have required number of poles. Furnish control transformers as required.
2. The contactor shall be continuously rated amperes as shown per pole for all types of ballast and tungsten lighting.
3. The contactor shall have totally enclosed, double-break silver-cadmium-oxide power contacts. Auxiliary arcing contacts are not acceptable. Contact inspection and replacement shall be possible without disturbing line or load wiring.
4. The contactor shall have straight-through wiring with all terminals clearly marked.
5. The contactor shall be approved per UL508 and /or CSA, and be designed in accordance with NEMA ICS2-211B. They shall be industrial-duty rated for applications to 600 volts maximum.
6. The contactor shall have provisions for field addition of :
  - a. Four (4) N.O. or N.C. auxiliary contacts rated 6 amperes continuous at 600 volts.
  - b. Single or double circuit, N.O. or N.C., 30 or 60 ampere 600 volt power-pole adder.
  - c. Control-circuit fuse holder, one or two fuses.
  - d. 0.2-60 second TDE or TDD timer attachment.
  - e. Transient suppression module for control circuit of 120 volts.
7. The contactor shall have a NEMA Type 1 and 3R enclosure.

#### B. MECHANICALLY HELD LIGHTING CONTACTORS

1. Coil-clearing contacts shall be supplied so that the contactor coils shall be energized only during the instance of operation. Both latch and unlatch coils shall be encapsulated.

#### C. COMBINATION LIGHTING CONTACTORS

1. In addition to the above specifications for lighting contactors, combination lighting contactors shall:
  - a. Have the disconnecting means, over-current protection, and lighting contactor mounted in one enclosure.
  - b. Have the disconnect operating handle in control of the disconnect switch with the enclosure door open or closed.

- c. Have a clearly marked operating handle to indicate "ON" and "OFF" positions. Handle to be capable of being padlocked in the "OFF" position.
  - d. Have a color-coded operating handle, with red indicating "ON" and black indicating "OFF".
  - e. Have safety interlocks to prevent the enclosure door from being open while the handle is in the "ON" position (unless deliberately defeated) and to prevent the handle from being turned to the "ON" position while the enclosure door is open (unless deliberately defeated).
2. The above shall be Square D class 8903 Type S, G.E., Siemens or Eaton.

END OF SECTION 16160

## SECTION 16170

### SWITCHES

#### A. GENERAL

1. Furnish and install safety switches as indicated on plans and specifications. All safety switches shall be NEMA General Duty Type GD and Underwriters' Laboratories listed.

#### B. SWITCH INTERIORS

1. All switches shall have switch blades which are fully visible in the OFF position with the door open. All current-carrying parts shall be plated through electrolytic processes to resist corrosion and promote cool operation.

#### C. SWITCH MECHANISM

1. Switches shall be quick-make and quick-break such that, during normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing or opening action of the contacts has started. The handle and mechanism shall be an integral part of the box, not the cover, with positive padlocking provisions in the OFF position.

#### D. ENCLOSURE

1. Switches shall be furnished in NEMA 1 general purpose enclosures or NEMA 3R (raintight) as required by N.E.C. Enclosures shall be code gauge (UL 98) galvanized steel (NEMA 3R) with a rust-inhibiting phosphate treatment and gray baked enamel finish.

#### E. RATINGS

1. Switches shall be horsepower rated for 240 volts and 600 volts ac.
2. Switches shall be Square D, G.E., Eaton, Siemens, NEMA 1 or NEMA 3R enclosures.

END OF SECTION 16170

## SECTION 16400

### ELECTRICAL SERVICE SYSTEM

#### A. GENERAL

1. This section includes grounding system and service entrance.

#### B. GROUNDING

1. All grounding shall be accomplished in accordance with Article 250 or the National Electrical Code. Ground connections are to be made from building grounding system to the power company's grounding mat, the main service equipment, the neutral of all four wire connected transformers and enclosures, building columns, across building expansion joints, domestic water piping, mechanical piping, and gas piping. The UFER grounding system shall be the preferred method.
2. The maximum resistance of the building grounding system shall not exceed 20 ohms under normal dry conditions. Additional rods shall be driven where this resistance is not achieved.
3. Conduit containing system ground wire shall be run exposed.
4. All conduits entering switchboards which are not directly connected to metal framework of switchboard shall be grounded by means of an insulating type grounding bushing with a No. 6 bare copper conductor directly connected to the ground bus.
5. Ground bus bars and associated terminals require no tape except where they are in close proximity to fuse posts or other line equipment that must be worked on with maintenance tools. In such cases insulate with tape that part of the ground bar or terminals as necessary to eliminate the probability of a short circuit.
6. The top of all ground rods and counterpoise ground wire shall be a minimum of 18" below grade.
7. Ground clamps for connecting conductors to piping system:
  - a. Thomas and Betts 035-71153 (1-9 size as required) for use with AWG-8 to 4/0 and 750 MCM. (above ¾" pipe)
  - b. Thomas and Betts 035-71459 (bronze) for use with AWG-8 to 4 (1/2" to ¾" pipe)
  - c. Thomas and Betts 035-71504 (copper) for use with AWG-14 to 8 (3/8" to 1" pipe)
  - d. Ground rods shall be 5/8" x 8' copper.
8. The Electrical contractor shall arrange with the Engineer for an inspection of the grounding system.

#### C. EQUIPMENT GROUND "GREEN WIRE CONCEPT"

1. All electrical equipment enclosures and conductor enclosure shall be grounded. This includes all metal raceways, outlet boxes, cabinets, switch boxes, motor frames, diesel engine frame, transformer cases, and metallic enclosures for all electrical equipment.

2. To insure adequate ground fault return path, a separate grounding conductor enclosed in a metallic raceway with the phase conductors shall be provided.
3. The green wire shall be secured to the equipment enclosure at the source of power and at the apparatus being served by the AC supply. Grounding conductors shall be insulated and shall be large enough to carry the ground fault current safely. The minimum size for the green wire grounding lead is shown in table or on drawings.
4. The current return conductors (neutrals) which are grounded at the source shall not be used for equipment grounding. Separate conductors (white or gray for neutrals and green for grounding conductors) shall be used for these functions. The common grounding lead must be connected on the supply side of the service disconnect unit. Extreme care must be exercised to insure that all interior AC distributing cabinets do not have their neutral bar bonded to the enclosure.
5. All AC distributing cabinets shall be equipped with a neutral bar (which is insulated from the enclosure) and a grounding bar (which is bonded to the enclosure). The grounding bar provides a means for terminating the green wires to the cabinet.
6. Under no circumstances shall a neutral conductor again be grounded after it has been grounded once at the service entrance. This requirement is necessary to avoid 60 Hz return current passing through framework, conduit, etc., thereby causing noise in susceptible circuits.
7. The electrical continuity of the conduit system shall continue to be maintained by threaded fittings with joints made up wrench tight, and insulated metal busing inside and a locknut outside and inside of all metal boxes and cabinets shall be installed on all terminating conduits.

#### D. SECONDARY SERVICE

1. Electrical service shall be as shown on contract drawings.
2. All conduit and wiring for secondary service shall be by Contractor.
3. Connections shall be made by this Contractor as recommended by the manufacturer of the equipment.

END OF SECTION 16400



## SECTION 16500

### LED INTERIOR LIGHTING

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, Standard General and Supplementary General Conditions, Division 1 Specification Sections, and other applicable Specification Sections.

##### 1.2 DEFINITIONS

- A. Night Lights: Light fixtures that are wired to the unswitched leg of the circuit. Night lights are not to be confused with emergency lights, which have a second source of power and may be switched.

##### 1.3 SUBMITTALS

- A. Product Data: Arrange in order of luminaire designation. The submittals shall include data on features, ratings, listings, certifications, accessories, finishes, dimensions, emergency components, photometric data, and luminaire efficiency data.
- B. Installation, Operation, and Maintenance Manuals.

##### 1.4 QUALITY ASSURANCE

- A. Lighting fixtures shall be of specification grade and listed or labeled by Underwriters Laboratories (UL) and DLC certified. Also, must be a part of the TVA Partner Network.
- B. LED fixtures shall comply with the following:
  - 1. UL Standard 8750 "Light Emitting Diode Equipment for Use in Lighting Products", IES Standard LM-79 "Electrical and Photometric Measurements of Solid-State Lighting Products", IES Standard LM-80 "Measuring Lumen Maintenance of LED Light Sources", and IES Standard TM-21 "Projecting Long Term Lumen Maintenance of LED Light Sources".
  - 2. ANSI C78.377 "Specifications for the Chromaticity of Solid State Lighting Products" with LEDs binned within a maximum three-step MacAdam Ellipse to ensure color consistency amongst luminaires of the same type.

##### 1.5 WARRANTY

- A. For non-LED lighting fixtures and components, provide a complete warranty for parts and labor for a minimum of one year from the date of Substantial Completion.
- B. For LED fixtures, lamps, drivers, and components, provide a complete unlimited warranty for parts and labor for a minimum of ten years from the date of Substantial Completion.

#### PART 2 - PRODUCTS

##### 2.1 LIGHTING FIXTURES

- A. Provide lighting fixtures in accordance with the Fixture Schedule.

Provide only LED fixtures with a DesignLights Consortium (DLC) listing, a U.S. Department of Energy (DOE) "LED Lighting Facts" label, or a U.S. Environmental Protection Agency (EPA) ENERGY STAR label, which have demonstrated third-party testing verification.

- B. Recessed lighting fixtures shall be thermally protected.
- C. LED fixtures shall be modular and allow for separate replacement of LED lamps and drivers. User serviceable LED lamps and drivers shall be replaceable from the room side. Minimum beam angle of 120 degrees.
- D. Dimmable LED fixtures shall have either a 0-10 volt, 3-wire dimming driver, or a two-step (50%-100%) line voltage, two switch controlled dimming driver, as shown on the drawings.

## 2.2 LAMPS

- A. LED lamps shall have a color temperature of 3500 degrees K, a CRI of 80 minimum, lumen maintenance L70 rating of 50,000 hours minimum, and minimum 120 lumens/watt. Flicker rate shall be less than 3% with input 120/277 VAC.

## 2.3 BALLASTS AND DRIVERS

- A. LED drivers shall be electronic-type, labeled as compliant with radio frequency interference (RFI) requirements of FCC Title 47 Part 15, and comply with NEMA SSL 1 "Electronic Drivers for LED Devices, Arrays, or Systems". LED drivers shall have a sound rating of "A", have a minimum efficiency of 85%, and be rated for a THD of less than 20 percent at all input voltages.  
  
Drivers shall be integrated, Type B (direct wire) with input range 120-277 VAC at 60 Hz.
- B. Dimmable LED drivers shall be 0-10V type. Dimmable LED drivers shall be capable of dimming without LED strobing or flicker across their full dimming range.
- C. Ballasts and drivers shall be rated for the ambient temperatures in which they are located. Outdoor fixtures shall be equipped with ballasts or drivers rated for reliable starting to -20 degrees F. Indoor fixtures located in areas with direct sunlight or above normal ambient temperatures shall have ballasts or drivers rated at 65 degrees C minimum.
- D. Individually fused ballasts and drivers shall have their fuses accessible from outside of the fixture chassis.

## 2.4 EMERGENCY LIGHTING

- A. Emergency lighting shall consist of normal lighting fixtures with generator or battery-inverter system backup, emergency lighting fixtures with individual battery backup, or sealed beam emergency lighting units in accordance with the Fixture Schedule.
  - 1. Battery-backed LED emergency lighting fixtures shall consist of a normal LED fixture with some or all of the LEDs connected to a battery and charger. The battery shall be nickel cadmium and sized for a minimum of 90 minutes of fixture operation. The charger shall be solid-state and provide overload, short circuit, brownout and low battery voltage protection. The battery and charger shall include self-diagnostic and self-exercising circuitry to exercise and test itself for 5 minutes every month and for 30 minutes every 6 months. The fixture shall include a test/monitor module with LED status indicating lights mounted so as to be visible to the public. The fixture shall not contain an audible alarm.

2. Sealed beam emergency lighting units shall consist of sealed beam LED lamps connected to an internally mounted battery and charger. The battery shall be nickel cadmium and sized for a minimum of 90 minutes of battery operation. The charger shall be solid-state and provide overload, short circuit, brownout and low battery voltage protection. The unit shall be suitable for wall or ceiling mounting as required. It shall include self-diagnostic and self-exercising circuitry to exercise and test itself for 5 minutes every month and for 30 minutes every 6 months. The unit shall include a test/monitor module with LED status indicating lights mounted so as to be visible to the public. The unit shall not contain an audible alarm.

## PART 3 - EXECUTION

### 3.1 INSTALLATION REQUIREMENTS

- A. Support recessed troffers independently of the ceiling grid system by using two safety wires minimum on diagonally opposite corners of the fixtures. Support recessed downlights by using safety wires or by rigidly attaching the fixtures to the building structure or ceiling grid system. Removable T-bar clips shall not be used to attach fixtures to the ceiling grid system.
- B. Install fixtures level, with no gaps between adjacent fixtures or between fixtures and surrounding surfaces. Lenses, reflectors, and trims of fixtures shall be properly and uniformly aligned.
- C. Where dimming or occupancy sensor-controlled fixtures are shown, control the fixtures in accordance with the appropriate wiring diagram or manufacturer's instructions.
- D. Connect night light fixtures and emergency lighting fixtures to the hot (unswitched) side of lighting circuits.
- E. Provide an individual feed with ground conductor from a junction box to each lighting fixture. Lighting fixtures shall not be daisy-chained.
- F. Drops to recessed fixtures may be flexible metallic conduit, or manufactured wiring systems may be used where accessible. Fixtures shall be provided with sufficient length to permit removal and lowering of the fixtures 12" below the ceiling.
- G. Provide green grounding conductors back to the panel ground for lighting circuits. Raceways shall not be used as grounding conductors.
- H. Fixtures shall have their exterior labels removed and shall be thoroughly cleaned.
- I. Locate emergency lighting remote battery packs and remote test/monitor modules identically so their status indicating lights are visible to the public and they form a straight line when viewed from the end of the corridor or room. Where a suspended ceiling exists, center the status indicating lights in adjacent ceiling tiles.
- J. Mount emergency lighting units where shown and aim their lamps to light the egress path as uniformly as possible.
- K. When emergency lighting fixtures contain audible alarms, disable the alarms in accordance with manufacturer's instructions.

### 3.2 FIELD QUALITY CONTROL

- A. A visual inspection shall be performed to verify cleanliness and alignment of the fixtures. Misalignment and light leaks shall be corrected, and rattles due to ventilation system vibration shall be eliminated.

- B. Perform an operational test to verify that all fixtures illuminate properly, dimming systems dim properly (i.e. no flicker), and lighting zones are switched according to the drawings.

### 3.4 TRAINING

- A. Provide a qualified service technician from the Manufacturer's staff to provide training.
- B. Train Owner's maintenance personnel on equipment operation, startup and shutdown, troubleshooting, servicing, and preventative maintenance procedures. Review the data contained in the Operating and Maintenance Manuals with Owner's personnel.

Training shall occur separate from startup activities and shall be conducted on-site.

END OF SECTION 16500

## SECTION 16550

### EXTERIOR ATHLETIC LIGHTING

#### **PART 1 – GENERAL**

##### **1.1 SUMMARY**

- A. Work covered by this section of the specifications shall conform to the contract documents, engineering plans as well as state and local codes.
- B. The purpose of these specifications is to define the lighting system performance and design standards for Elkton Soccer Field using an LED Lighting source. The manufacturer / contractor shall supply lighting equipment to meet or exceed the standards set forth in these specifications.
- C. The sports lighting will be for the following venues:
  - 1. Soccer Field
- D. The primary goals of this sports lighting project are:
  - 1. **Guaranteed Light Levels:** Light levels are guaranteed to not drop below specified target values for a period of 10 years.
  - 2. **Environmental Light Control:** It is the primary goal of this project to minimize spill light to adjoining properties and glare to the players, spectators and neighbors.
  - 3. **Cost of Ownership:** In order to reduce the operating budget, the preferred lighting system shall be energy efficient and cost effective to operate. All maintenance costs shall be eliminated for the duration of the warranty.
  - 4. **Control and Monitoring** – To allow for optimized use of labor resources and avoid unneeded operation of the facility, customer requires a remote on/off control system for the lighting system. Fields should be proactively monitored to detect luminaire outages.
    - a. Control and monitoring system shall provide contactor control of all circuits. Key switches shall be provided to provide field-level control of circuit groups.

##### **1.2 ONFIELD LIGHTING PERFORMANCE**

- A. **Illumination Levels and Design Factors:** Playing surfaces shall be lit to an average target illumination level and uniformity as specified in the chart below. Lighting manufacturers will provide a guarantee that light levels will be sustained over the life of the warranty period. Lighting calculations shall be developed and field measurements taken on the grid spacing with the minimum number of grid points specified below.

Manufacturers will provide lumen maintenance data of the LED luminaires used per TM-21-11 and will incorporate the lumen maintenance projections into the lighting designs to ensure target light levels are achieved throughout the guaranteed period of the system. Per IES guidelines, lumen maintenance hours should be reported based on the 6x multiplier of testing hours.

<b>Area of Lighting</b>	<b>Average Target Illumination Levels</b>	<b>Maximum to Minimum Uniformity Ratio</b>	<b>Grid Points</b>	<b>Grid Spacing</b>
Soccer Field	30fc	2.5:1	77	30' x 30'

- B. Color Temperature: The lighting system shall have a minimum color temperature of 5700K and a CRI of 75.
- C. Playability: Lighting design and luminaire selection should be optimized for playability by reducing glare on field.
  - 1. Aiming Angles: To reduce glare, luminaire aiming should ensure the top of the luminaire field angle (based on sample photometric reports) is a minimum of 10 degrees below horizontal.
  - 2. Glare Control Technology – Luminaires selected should have glare control technology including, but not limited to: external visors, internal shields and louvers. No symmetrical beam patterns are acceptable.
  - 3. Mounting Heights: To ensure proper aiming angles, minimum mountings heights shall be as described below. Higher mounting heights may be necessary for luminaire with lesser glare control to meet field angle requirements of section 1.2.C.1.

# of Poles	Pole Designation	Pole Height
4	S1-S4	70'

### 1.3 **ENVIRONMENTAL LIGHT CONTROL**

- A. Light Control Luminaires: All luminaires shall utilize spill light and glare control devices including, but not limited to, internal shields, louvers and external shields. No symmetrical beam patterns are accepted.
- B. Sample Photometry: The first page of a photometric report for all luminaire types proposed showing horizontal and vertical axial candle power shall be provided to demonstrate the capability of achieving the specified performance. Reports shall be certified by a qualified testing laboratory with a minimum of five years' experience or by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products. A summary of the horizontal and vertical aiming angles for each luminaire shall be included with the photometric report.

## **PART 2 – PRODUCT**

### 2.1 **SPORTS LIGHTING SYSTEM CONSTRUCTION**

- A. Manufacturing Requirements: All components shall be designed and manufactured as a system. All luminaires, wire harnesses, drivers and other enclosures shall be factory assembled, aimed, wired and tested.
- B. Durability: All exposed components shall be constructed of corrosion resistant material and/or coated to help prevent corrosion. All exposed carbon steel shall be hot dip galvanized per ASTM A123. All exposed aluminum shall be powder coated with high performance polyester or anodized. All exterior reflective inserts shall be anodized, coated, and protected from direct environmental exposure to prevent reflective degradation or corrosion. All exposed hardware and fasteners shall be stainless steel, passivated and coated with aluminum-based thermosetting epoxy resin for protection against corrosion and stress corrosion cracking. Structural fasteners may be carbon steel and galvanized meeting ASTM A153 and ISO/EN 1461 (for hot dipped galvanizing), or ASTM B695 (for mechanical galvanizing). All wiring shall be enclosed within the cross-arms, pole, or electrical components enclosure.
- C. System Description: Lighting system shall consist of the following:
  - 1. Galvanized steel poles and cross-arm assembly.
  - 2. Non-approved pole technology:
    - a. Direct bury steel poles which utilize the extended portion of the steel shaft for their foundation will not be accepted due to potential for internal and external corrosive reaction to the soils and long-term performance concerns.

3. Lighting systems shall use concrete foundations. See Section 2.4 for details.
  - a. For a foundation using a pre-stressed concrete base embedded in concrete backfill the concrete shall be air-entrained and have a minimum compressive design strength at 28 days of 3,000 PSI. 3,000 PSI concrete specified for early pole erection, actual required minimum allowable concrete strength is 1,000 PSI. All piers and concrete backfill must bear on and against firm undisturbed soil.
  - b. For anchor bolt foundations or foundations using a pre-stressed concrete base in a suspended pier or re-inforced pier design pole erection may occur after 7 days. Or after a concrete sample from the same batch achieves a certain strength.
4. Manufacturer will supply all drivers and supporting electrical equipment
  - a. Remote drivers and supporting electrical equipment shall be mounted approximately 10 feet above grade in aluminum enclosures. The enclosures shall be touch-safe and include drivers and fusing with indicator lights on fuses to notify when a fuse is to be replaced for each luminaire. Disconnect per circuit for each pole structure will be located in the enclosure. Integral drivers are not allowed.
  - b. Manufacturer shall provide surge protection at the pole equal to or greater than 40 kA for each line to ground (Common Mode) as recommended by IEEE C62.41.2\_2002.
5. Wire harness complete with an abrasion protection sleeve, strain relief and plug-in connections for fast, trouble-free installation.
6. All luminaires, visors, and cross-arm assemblies shall withstand 150 mi/h winds and maintain luminaire aiming alignment.
7. Control cabinet to provide remote on-off control, monitoring, and entertainment features of the lighting system. See Section 2.3 for further details.
8. Manufacturer shall provide lightning grounding as defined by NFPA 780 and be UL Listed per UL 96 and UL 96A.
  - a. Integrated grounding via concrete encased electrode grounding system.
  - b. If grounding is not integrated into the structure, the manufacturer shall supply grounding electrodes, copper down conductors, and exothermic weld kits. Electrodes and conductors shall be sized as required by NFPA 780. The grounding electrode shall be a minimum size of 5/8 inch diameter and 8 feet long, with a minimum of 10 feet embedment. Grounding electrode shall be connected to the structure by a grounding electrode conductor with a minimum size of 2 AWG for poles with 75 feet mounting height or less, and 2/0 AWG for poles with more than 75 feet mounting height.
- D. Safety: All system components shall be UL listed for the appropriate application.

## **2.2 ELECTRICAL**

- A. Electric Power Requirements for Sports Lighting Equipment:
  1. Electric power: 240 Volt, 1 Phase
  2. Maximum total voltage drop: Voltage drop to the disconnect switch located on the poles shall not exceed three (3) percent of the rated voltage.
- B. Energy Consumption: The kW consumption for the field lighting system shall be less than 33.84 kW.

## **2.3 CONTROL**

- A. Instant On/Off Capabilities: System shall provide for instant on/off of luminaires.
- B. Lighting contactor cabinet(s) constructed of NEMA Type 4 aluminum, designed for easy installation with contactors, labeled to match field diagrams and electrical design. Manual off-on-auto selector switches shall be provided.
- C. Contactor control of lights: To minimize wear on drivers and other electrical components and prevent lights from turning on due to communication loss, circuits must be controlled via contactor switching, not dimming driver output to zero.

- D. Dimming: System shall provide for 3-stage dimming (high-medium-low). Dimming will be set via scheduling options (Website, app, phone, fax, email).
- E. Remote Lighting Control System: System shall allow owner and users with a security code to schedule on/off system operation via a web site, phone, fax or email up to ten years in advance. Manufacturer shall provide and maintain a two-way TCP/IP communication link. Trained staff shall be available 24/7 to provide scheduling support and assist with reporting needs.

The owner may assign various security levels to schedulers by function and/or fields. This function must be flexible to allow a range of privileges such as full scheduling capabilities for all fields to only having permission to execute "early off" commands by phone. Scheduling tool shall be capable of setting curfew limits.

Controller shall accept and store 7-day schedules, be protected against memory loss during power outages, and shall reboot once power is regained and execute any commands that would have occurred during outage.
- F. Remote Monitoring System: System shall monitor lighting performance and notify manufacturer if individual luminaire outage is detected so that appropriate maintenance can be scheduled. The controller shall determine switch position (manual or auto) and contactor status (open or closed).
- G. Management Tools: Manufacturer shall provide a web-based database and dashboard tool of actual field usage and provide reports by facility and user group. Dashboard shall also show current status of luminaire outages, control operation and service. Mobile application will be provided suitable for IOS, Android and Blackberry devices.

Hours of Usage: Manufacturer shall provide a means of tracking actual hours of usage for the field lighting system that is readily accessible to the owner.

  - 1. Cumulative hours: shall be tracked to show the total hours used by the facility
  - 2. Report hours saved by using early off and push buttons by users.
- H. Communication with luminaire drivers: Control system shall interface with drivers in electrical components enclosures by means of powerline communication.

## **2.4 STRUCTURAL PARAMETERS**

- A. Wind Loads: Wind loads shall be based on the 2015 International Building Code. Wind loads to be calculated using ASCE 7-10, an ultimate design wind speed of 115 and exposure category C.
- B. Pole Structural Design: The stress analysis and safety factor of the poles shall conform to 2013 AASHTO Standard Specification for Structural Supports for Highway Signs, Luminaires, and Traffic Signals (LTS-6).
- C. Foundation Design: The foundation design shall be based on soil parameters as outlined in the geotechnical report. If no geotechnical report is available, the foundation design shall be based on soils that meet or exceed those of a Class 5 material as defined by 2015 IBC Table 1806.2.
- D. Foundation Drawings: Project specific foundation drawings stamped by a registered engineer in the state where the project is located are required. The foundation drawings must list the moment, shear (horizontal) force, and axial (vertical) force at ground level for each pole. These drawings must be submitted at time of bid to allow for accurate pricing.

## **PART 3 – EXECUTION**

### **3.1 SOIL QUALITY CONTROL**

- A. It shall be the Contractor's responsibility to notify the Owner if soil conditions exist other than those on which the foundation design is based, or if the soil cannot be readily excavated. Contractor may issue a change order request / estimate for the Owner's approval / payment for additional costs associated with:
  - 1. Providing engineered foundation embedment design by a registered engineer in the State of Kentucky for soils other than specified soil conditions.
  - 2. Additional materials required to achieve alternate foundation.



3. Excavation and removal of materials other than normal soils, such as rock, caliche, etc.

### **3.2 DELIVERY TIMING**

- A. Delivery Timing Equipment On-Site: The equipment must be on-site 8-12 weeks from receipt of approved submittals and receipt of complete order information.

### **3.3 FIELD QUALITY CONTROL**

- A. Illumination Measurements: Upon substantial completion of the project and in the presence of the Contractor, Project Engineer, Owner's Representative, and Manufacturer's Representative, illumination measurements shall be taken and verified. The illumination measurements shall be conducted in accordance with IESNA LM-5-04.
- B. Field Light Level Accountability
  1. Light levels are guaranteed not to fall below the target maintained light levels for the entire warranty period of 10 years. These levels will be specifically stated as "guaranteed" on the illumination summary provided by the manufacturer.
  2. The manufacturer shall be responsible for conducting initial light level testing and an additional inspection of the system, in the presence of the owner, one year from the date of commissioning of the lighting.
  3. The contractor/manufacturer will be held responsible for any and all changes needed to bring these fields back to compliance for light levels and uniformities. Contractor/Manufacturer will be held responsible for any damage to the fields during these repairs.
- C. Correcting Non-Conformance: If, in the opinion of the Owner or his appointed Representative, the actual performance levels including footcandles, uniformity ratios, and offsite candela readings are not in conformance with the requirements of the performance specifications and submitted information, the Manufacturer shall be required to make adjustments to meet specifications and satisfy Owner.

### **3.4 WARRANTY AND GUARANTEE**

- A. 10-Year Warranty: Each manufacturer shall supply a signed warranty covering the entire system for 10 years from the date of shipment. Warranty shall guarantee specified light levels. Manufacturer shall maintain specifically funded financial reserves to assure fulfillment of the warranty for the full term. Warranty does not cover weather conditions events such as lightning or hail damage, improper installation, vandalism or abuse, unauthorized repairs or alterations, or product made by other manufacturers.

## **PART 4 – DESIGN APPROVAL**

### **4.1 SUBMITTAL REQUIREMENTS**

- A. Design Approval: The owner / engineer will review submittals from all the manufacturers to ensure compliance to the specification. If the design meets the design requirements of the specifications, an email will be issued to the manufacturer indicating approval for the specific design submitted.
- B. Approved Manufacturers are Musco, Ephesus and Spartan.
- C. Bidders are required to bid only products that have been approved by this specification or addendum by the owner's representative. Bids received that do not utilize an approved system/design, will be rejected.

**END OF SECTION 16550**

# CONSTRUCTION PLANS

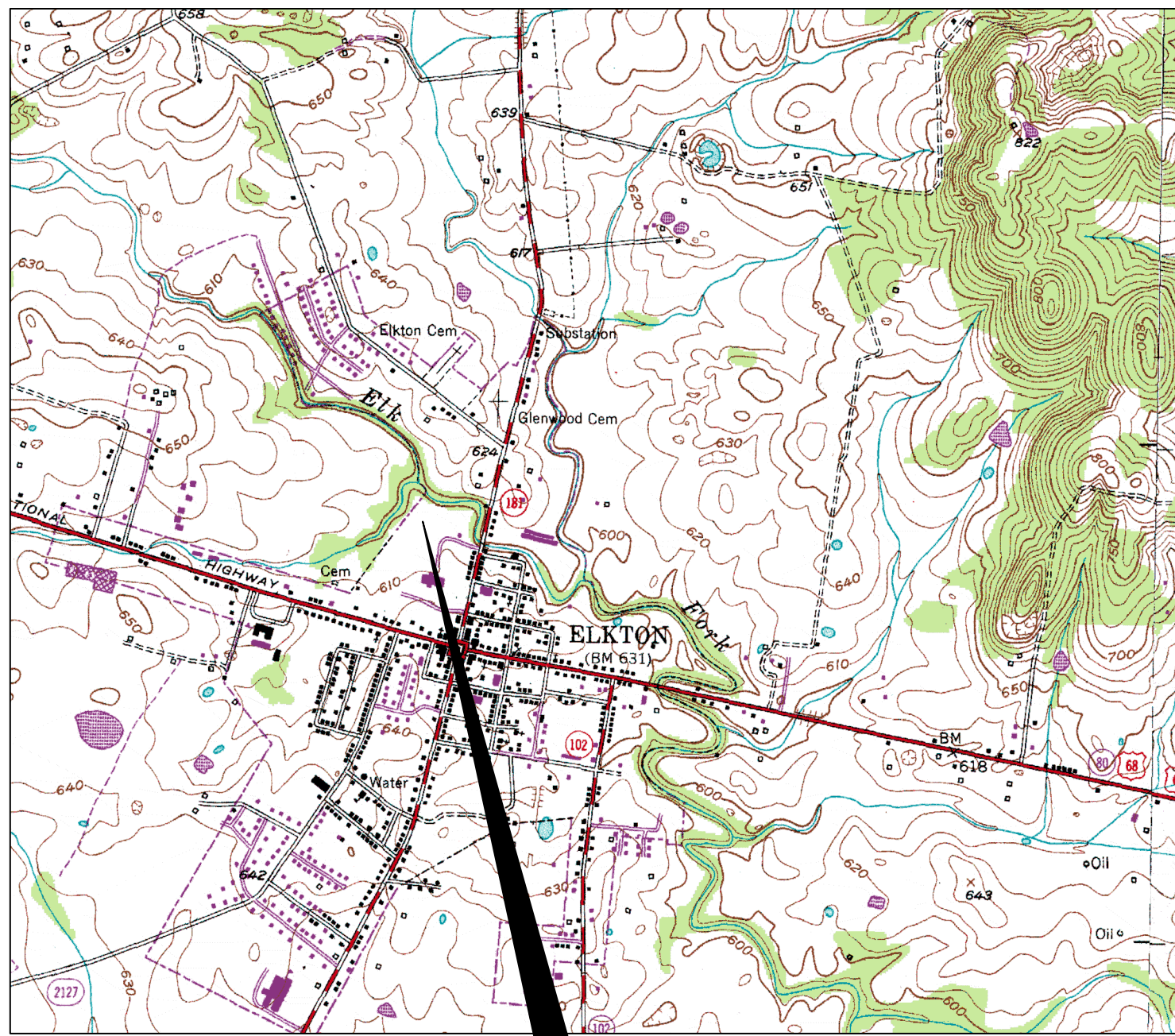
for

## TODD COUNTY SOCCER FIELD Elkton, Todd County, Kentucky

for

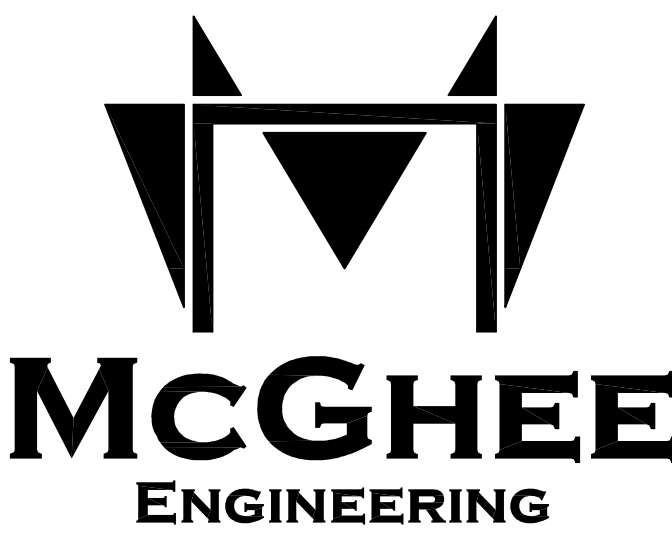
### TODD COUNTY FISCAL COURT

OWNERS



PROJECT

prepared by

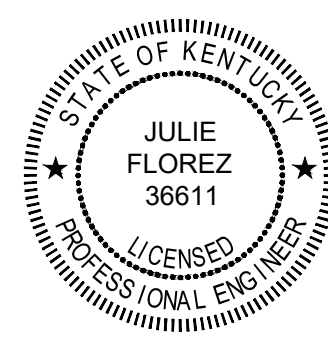


202 Ewing Street  
Guthrie, KY 42234  
(270) 483-9985

SHEET NO.	DRAWING	DESCRIPTION
CIVIL DRAWINGS		
01	C-001	EXISTING SITE CONDITIONS
02	C-100	SOCCER FIELD SITE LAYOUT
03	C-101	PROPOSED GRADING PLAN
04	C-200	PROPOSED RESTROOM PLAN
05	C-201	STANDARD DETAILS AND NOTES
ELECTRICAL DRAWINGS		
06	E-100	ELECTRICAL PLAN - RESTROOMS
07	UE-100	ELECTRICAL PLAN - SITE
08	M-100	HVAC PLAN
PLUMBING DRAWINGS		
09	P-100	PLUMBING PLAN
10	P-200	PLUMBING DETAILS

APRIL 2025





NO.	REVISIONS	DATE:
2	GRADING REVISION	04-07-25
1	JANITORIAL CLOSET REVISION	11-01-24
0	PRELIMINARY PLAN SET	07-20-23

SHEET  
C-001

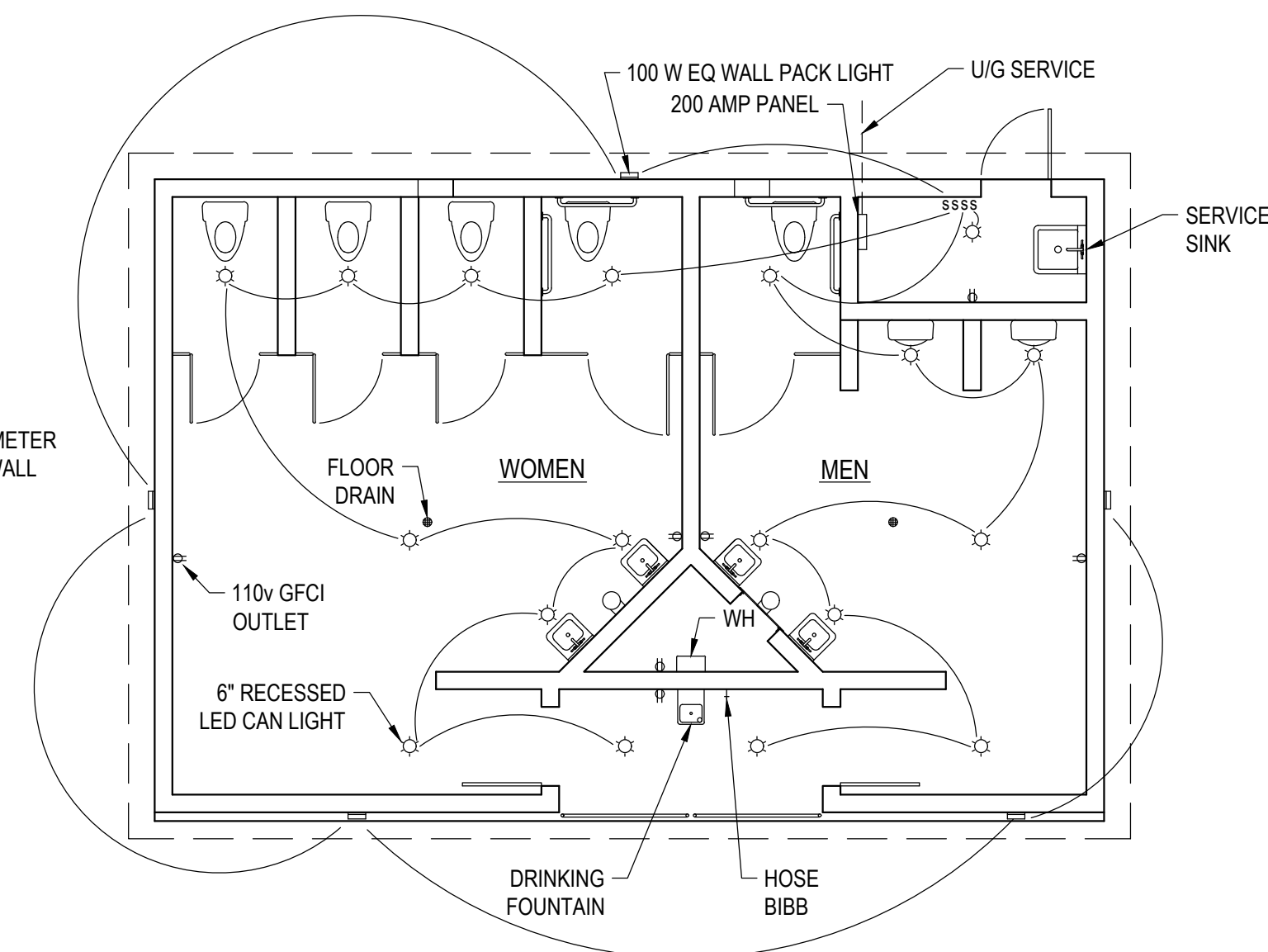












FOUNDATION PLAN

SCALE:  $\frac{3}{16}"=1'-0"$

2

ELECTRICAL &amp; PLUMBING

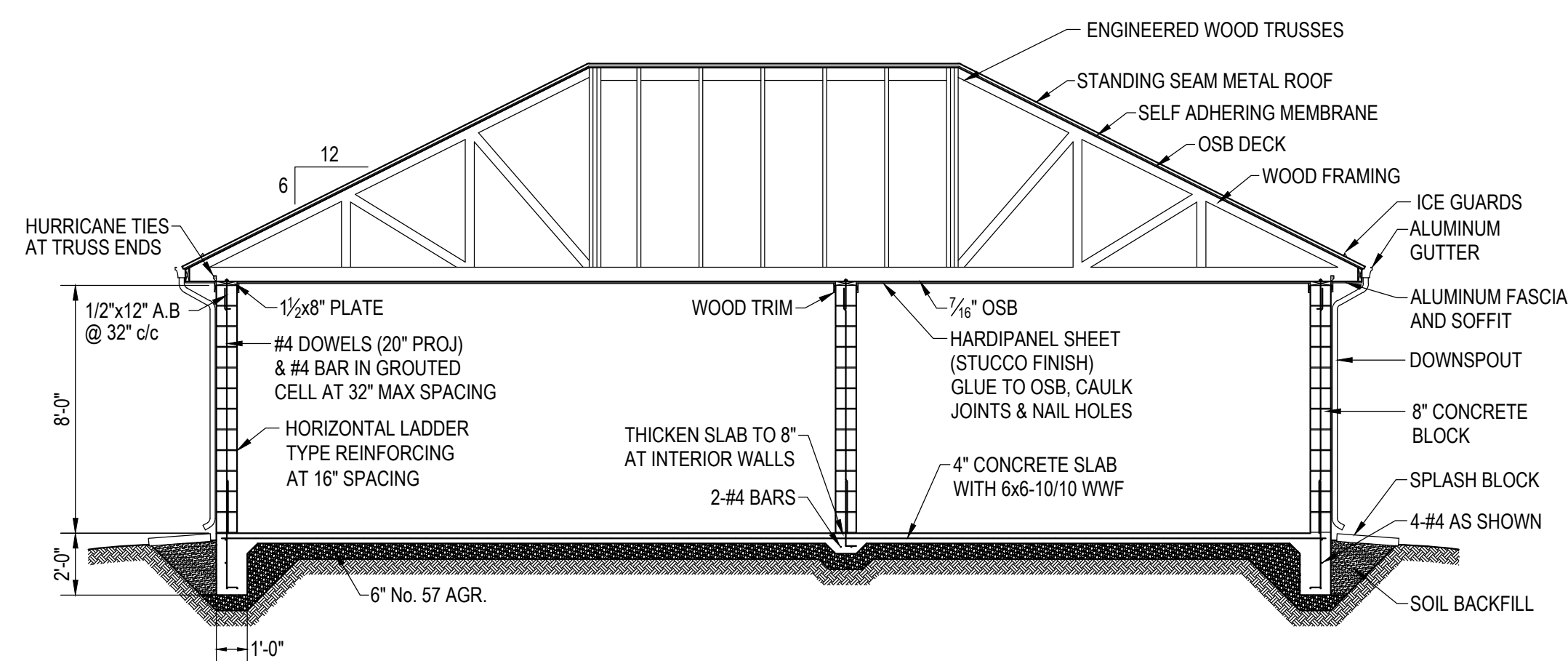
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3

## FLOOR PLAN

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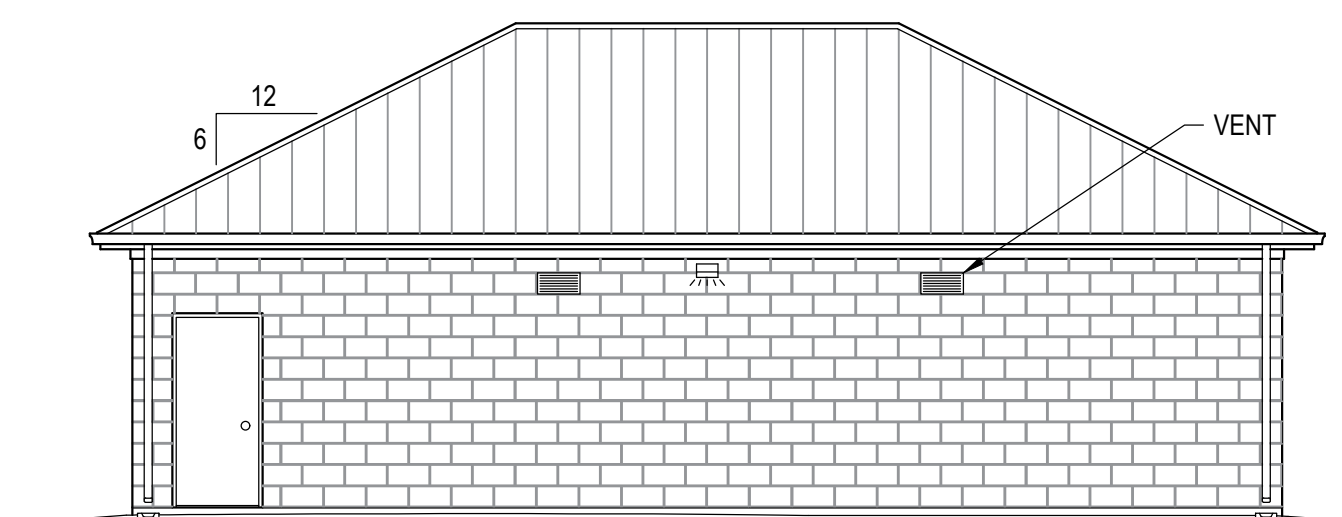
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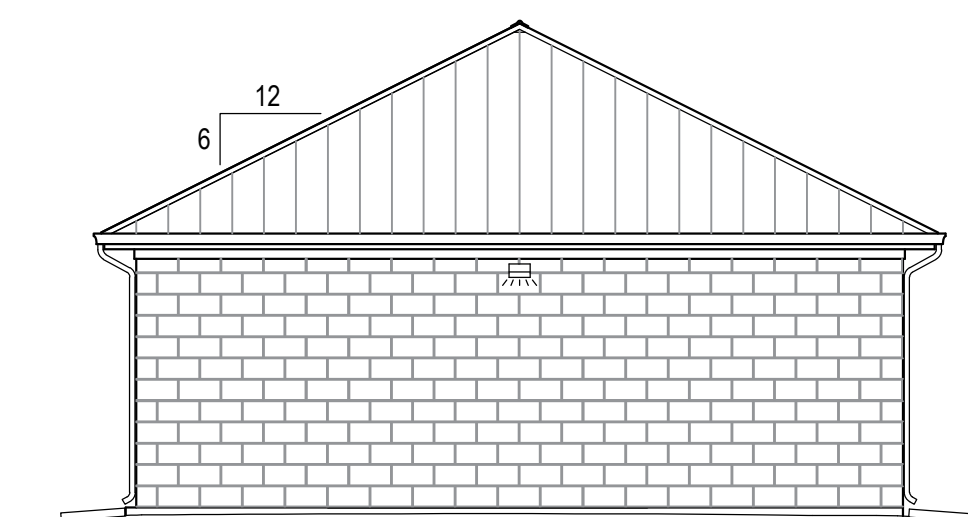
CROSS-SECTION

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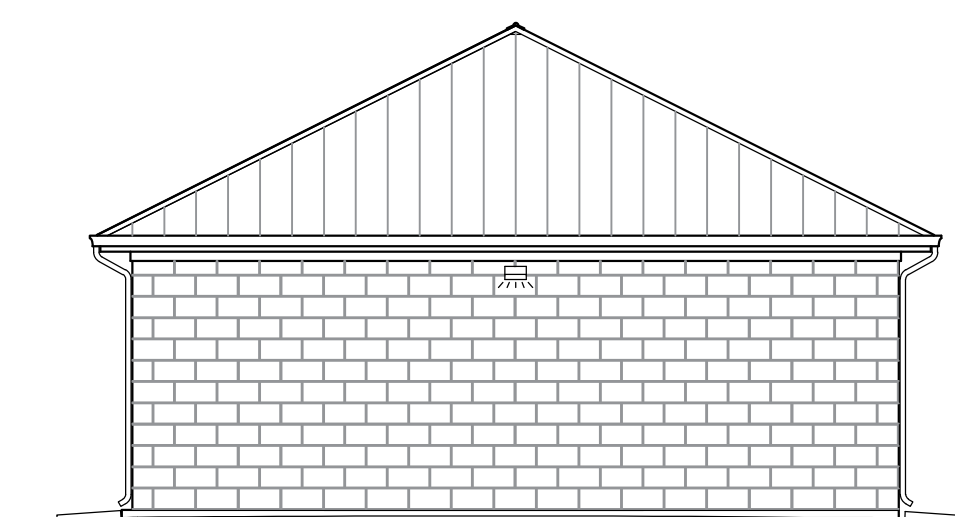
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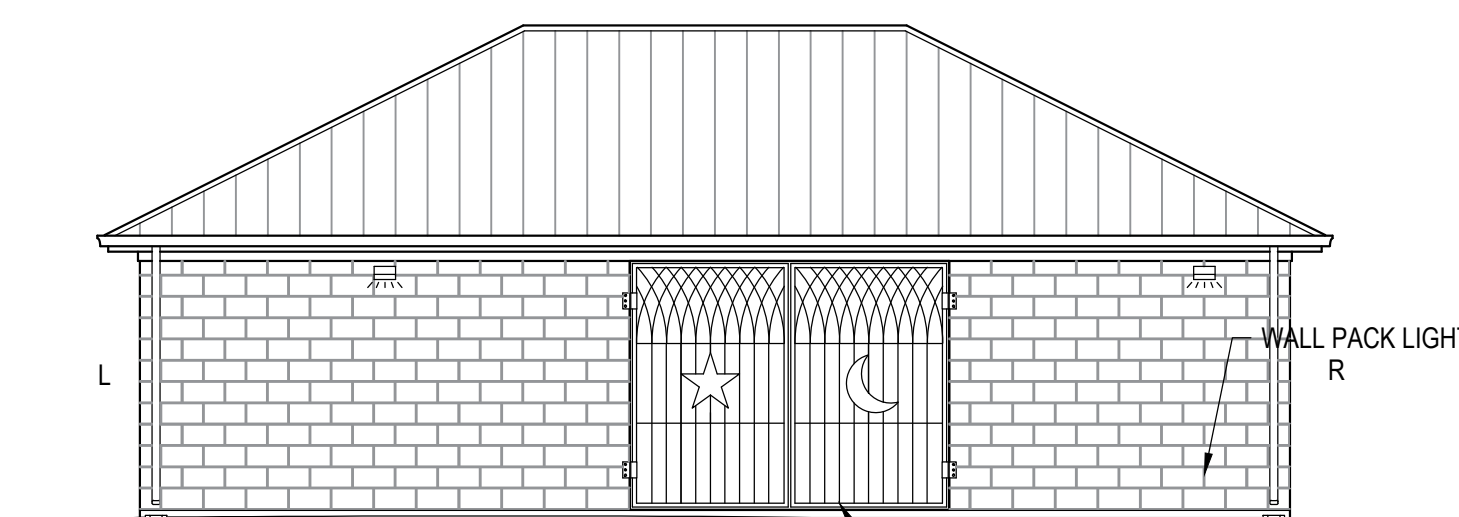
[BACK](#)



LEFT SIDE



RIGHT SIDE



FRONT

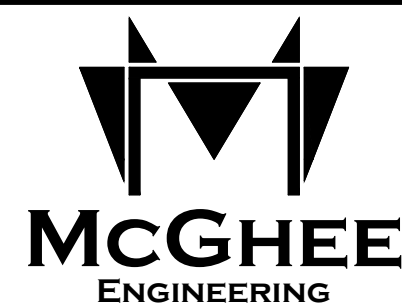
## ELEVATIONS

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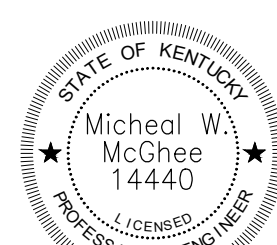
### GENERAL NOTES

- |  |  |   |   |
|--|--|---|---|
| 1. ALL CONSTRUCTION SHALL CONFORM TO LOCAL AND STATE BUILDING CODES.   | INSTALLATION. RESTROOM DOORS SHALL HAVE 18"x24" LOUVERED VENTS IN THE BOTTOM OF THE DOORS, AND SHALL BE EQUIPPED WITH THRESHOLDS, FILLS, PUSH PLATES, AND CLOSERS. STORAGE ROOM DOOR SHALL BE SOLID EQUIPPED WITH PASSAGE SET AND KEYS DEADBOLT LOCK.      | STAINLESS STEEL, NSF CERTIFIED.   | EQUAL TO ACQUAD UFG-5000 ( <a href="http://WWW.ACQUADCSG.COM">WWW.ACQUADCSG.COM</a> )   |
| 2. ALL WORK SHALL COMPLY WITH AMERICANS WITH DISABILITIES ACT.   | 3. WOOD TRIM SHALL BE CLEAR POPLAR.  | 15. TOILETS SHALL BE ADA COMPLIANT, FLOOR MOUNT STANDARD WITH 18"X24" PORCELAIN, WITH MANUAL FLUSH AND SEAT EQUAL TO AMERICAN STANDARD MADDERA.           | 23. VENTS SHALL BE EQUAL TO LOREN COOK CO. MODEL CFB WITH 18"X24" PORCELAIN, WITH MANUAL FLUSH AND SEAT EQUAL TO AMERICAN STANDARD MADDERA.   |
| 3. OBTAIN ALL REQUIRED PERMITS BEFORE CONSTRUCTION.  | 4. WOOD TRUSSES SHALL BE DESIGNED AND DRAWINGS STAMPED BY A LICENSED BY ENGINEER.  | 16. URINALS SHALL BE WALL MOUNT STANDARD WHITE PORCELAIN, WASHOUT TYPE WITH MANUAL FLUSH VALVE, EQUAL TO AMERICAN STANDARD MADDERA.                       | 24. DRINKING FOUNTAIN SHALL BE VANDAL RESISTANT, STAINLESS STEEL, REFRIGERATED TYPE WITH INTEGRAL BOTTLE FILLER, EQUAL TO ELKAY E2H2O VCRWSK. |
| 4. CONCRETE SHALL HAVE A 28-DAY COMPRESSIVE STRENGTH OF 3,500 PSI.   | 5. SECURITY DOORS SHALL BE FABRICATED FROM WILDED CARBON STEEL STOCK AND SUPPLIED WITH HINGES, BOLTS, LATCHES, HOLD-OPEN, AND LOCK HASPS. DOORS SHALL BE BLAST CLEANED AFTER FABRICATION, PRIMERED AND COATED WITH TWO COATS OF POLYURETHANE ENAMEL PAINT. | 17. MIRRORS SHALL BE 24"x36" METAL FRAMED WALL MOUNT TYPE.  | <b>FINISH SCHEDULE</b>  |
| 5. REINFORCING STEEL SHALL BE ASTM A511 - GRADE 60.  | 6. PLUMBING SHALL BE INSTALLED WITH STOP AND WASTE VALVES TO ALLOW IT TO BE FULLY DRAINED FOR FREEZE PROTECTION.   | 18. HAND TOWEL DISPENSERS SHALL BE CENTER PULL TYPE EQUAL TO GEORGIA PACIFIC.   | 1. FLOORS - TWO COATS POPEL COAT COATING APPLIED TO DIAMOND GRADING SURFACE AT LEAST 90 DAYS AFTER CONCRETE PLACEMENT.                        |
| 6. ROOF SHALL BE STANDING SEAM TYPE WITH FULLY CONCEALED FASTENERS APPLIED OVER SELF-ADHERING MEMBRANE. ROOFING SHALL BE 24 GAUGE GALVANIZED STEEL WITH KYNAR 505 COATING WITH MATCHING FLASHINGS AND TRIM. COLOR TO BE SELECTED FROM STANDARD COLOR OPTIONS BY THE OWNER. | 7. HAND SINKS SHALL BE STAINLESS STEEL WALL MOUNT TYPE, NSF APPROVED, 18"X15" WITH HOT AND COLD FAUCET AND ALL SUPPLY AND DRAIN ACCESSORIES.   | 19. GRAB BARS, TOILET PAPER DISPENSERS AND OTHER BALANCEANCE HARDWARE SHALL BE HEAVY-DUTY COMPLYING WITH ADA.   | 2. INTERIOR WALLS - BLOCK FLOOR AND TWO COATS POPEL PAINT.  |
| 7. THE BUILDING SHALL BE FURNISHED WITH GUTTERS AND DOWNSPOUTS FABRICATED FROM THE SAME MATERIAL AS ALL SUPPLY AND DRAIN ACCESSORIES.  |  | 20. TOILET PARTITIONS SHALL BE POWDER COATED GALVANIZED STEEL WITH CONCEALED HARDWARE AND BARRIER FREE LATCH.   | 3. CEILING - TWO COATS POPEL PAINT.   |
|  |  | 21. WATER HEATER SHALL BE ELECTRIC, TANKLESS TYPE RATED FOR A MINIMUM OF 1.5 GPM AT 151° TEMPERATURE RISE, SELF-MODULATING, FLAME TO REMAIN EXTINGUISHED. | 4. EXTERIOR WALLS - BLOCK FLOOR AND TWO COATS ACRYLIC LATCH PAINT.  |
|  |  |   | 5. DOORS - PRIMER AND TWO COATS POLYURETHANE ENAMEL, PAINT.   |



202 S EWING STREET  
GUTHRIE, KY 42234  
(270) 483-9985

November 1, 2024



Michael W. Melus



FIRM: MCGHEE ENGINEERING  
DES BY: MWM CHK BY: JEF  
DWN BY: MWM

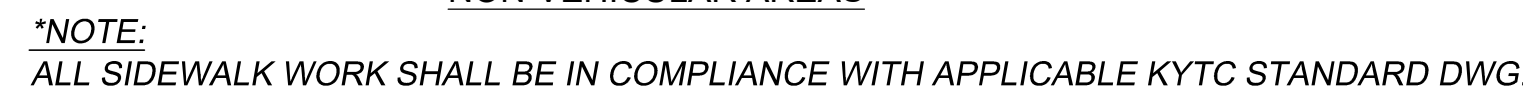
NO.	REVISIONS	DATE:
2	GRADING REVISION	04-07-25
1	JANITORIAL CLOSET REVISION	11-01-24
6	PRELIMINARY PLAN SET	07-20-23









TODD COUNTY FISCAL COURT  
SOCCER FIELD  
ELKTON, KY

**CIVIL DRAWINGS**  
**PROPOSED RESTROOM DETAILS**

SHEET  
C-200





		QUANTITY		
	BACKFLOW PREVENTION DEVICE	1		MAINLINE PIPE: CLASS 200 PVC (2 1/2-INCH SIZE)
	MAIN SHUT-OFF VALVE	1		LATERAL PIPE: CLASS 200 PVC (SIZED AS SHOWN)
	RAIN BIRD PGA OR PEB REMOTE CONTROL VALVE (SIZED AS SHOWN)	3		
	RAIN BIRD 5LRC QUICK COUPLING VALVE	2	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> <b>A1</b>  <b>58</b>  <b>2"</b>  <b>-</b> </div>	INDICATES CONTROLLER AND CONTROLLER STATION NUMBER
	RAIN BIRD 5505 W/8 NOZZLE PRESSURE = 50 PSI RADIUS = 49 FEET FLOW = 7.3 GPM	24		INDICATES LATERAL DISCHARGE IN GPM
	RAIN BIRD ESP-LX MODULAR OR ESP-MC IRRIGATION CONTROLLER W/8 STATIONS	1		INDICATES REMOTE CONTROL VALVE SIZE

## SOCCKER FIELD IRRIGATION DETAIL

- ### GENERAL NOTES

1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH KYTC STANDARDS & DETAILS.
2. THE CONTRACTOR SHALL KEEP THE WORK AREA CLEAN AND ORDERLY AT ALL TIMES. ALL TRASH AND DEBRIS SHALL BE PICKED UP AND REMOVED FROM THE JOB SITE AT THE END OF EACH DAY.
3. DRIVEWAYS OR OTHER ACCESSWAYS REQUIRING EXCAVATION SHALL BE BACKFILLED COMPLETELY WITH GRAVEL AND SHALL BE COMPLETED WITHIN ONE WORKING DAY. IN NO EVENT SHALL SUCH AREAS REMAIN IMPASSABLE OVERNIGHT.
4. CONTRACTOR SHALL COORDINATE WORK ON PRIVATE PROPERTY WITH THE PROPERTY OWNER, DISTURBANCE OF EXISTING FENCES SHALL BE HELD TO A MINIMUM, AND ANY FENCE DAMAGED BY CONSTRUCTION SHALL BE REPLACED IN KIND AT THE CONTRACTOR'S EXPENSE.
5. CONTRACTOR SHALL CONTACT KY. UNDERGROUND PROTECTION, INC. AT (811), AS WELL AS OTHER UTILITIES, PIPELINE COMPANIES, ETC. POTENTIALLY HAVING UNDERGROUND LINES, UTILITIES, STRUCTURES, ETC. IN THE AREA FOR VERIFICATION AND LOCATION PRIOR TO EXCAVATION.
6. THE UTILITY/CITY SHALL BE RESPONSIBLE FOR OBTAINING AND RECORDING ALL EASEMENTS PRIOR TO CONSTRUCTION ON ANY PRIVATE PROPERTIES. CONTRACTOR SHALL VERIFY EASEMENTS AND RIGHT OF ENTRY BEFORE BEGINNING CONSTRUCTION.
7. SCALE IS SHOWN FOR CONVENIENCE ONLY. DO NOT SCALE DRAWINGS TO OBTAIN DIMENSIONS FOR CONSTRUCTION.










ENVIRONMENTAL NOTE:

THE CONTRACTOR SHALL BE RESPONSIBLE FOR CUTTING, REMOVING AND DISPOSING OF TREES, BRUSH, STUMPS, ROOTS, AND WEEDS WITHIN THE CONSTRUCTION AREA AS REQUIRED FOR CONSTRUCTION OF THE PIPELINE. AVOID CUTTING OF, OR DAMAGE TO MATURE TREES (DBH>5"), AND TREES NOT IN THE CONSTRUCTION AREA. THE CONTRACTOR WILL BE RESPONSIBLE FOR THE REPLACEMENT OF TREES, SHRUBS, ETC. UNNECESSARILY DAMAGED OR REMOVED.

## BASEMAP &amp; SCALE NOTE

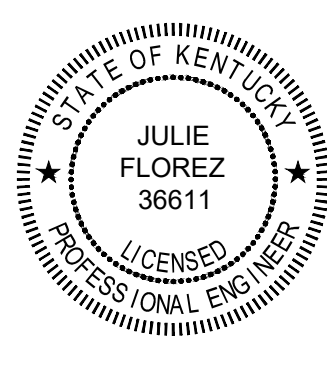
THE LOCATIONS OF EXISTING TOPOGRAPHIC FEATURES AND UTILITIES ARE APPROXIMATE. THE CONTRACTOR SHALL FAMILIARIZE HIMSELF WITH THE PROJECT SITE PRIOR TO CONSTRUCTION. UNDER NO CIRCUMSTANCES SHALL THE CONTRACTOR ASSUME THAT ALL FEATURES ARE IDENTIFIED AND INDICATED IN THEIR EXACT LOCATION. THE CONTRACTOR SHALL CONTACT 'KENTUCKY UNDERGROUND PROTECTION, INC.', AS WELL AS OTHER UTILITIES, PIPELINE COMPANIES, ETC. POTENTIALLY HAVING UNDERGROUND LINES, UTILITIES, STRUCTURES, ETC.. IN THE AREA FOR VERIFICATION AND LOCATION PRIOR TO EXCAVATION.

### LEGEND

	EXIST. GRAVITY SEWER
	EXIST. WATER MAIN
	PROP. WATER MAIN
	PROPERTY BOUNDARY
	FENCE LINE
	MANUAL VALVE (GATE, BFLY, ETC.)
	FIRE HYDRANT
	POWER POLE
	GUY WIRE

## UTILITY CONTACTS

Ky. Underground Protection	(800) 752-6007
AT&T/Bellsouth Repair	(877) 737-2478
Pennyrile Rural Electric Coop.	(270) 265-2545
Mediacom Cable	(800) 444-5353
Atmos Energy	(270) 772-2816
City of Elkon	(270) 265-9877



FIRM: MCGHEE ENGINEERING  
DES BY: JEF CHK BY: MWM  
DWN BY: JEF

NO.	REVISIONS	DATE:
2\	GRADING REVISION	04-07-25
1\	JANITORIAL CLOSET REVISION	11-01-24
6\	PRELIMINARY PLAN SET	07-20-23

TODD COUNTY FISCAL COURT  
SOCCER FIELD  
ELKTON, KY

# CIVIL DRAWINGS

## STANDARD DETAILS AND NOTES

SHEET  
C-201

**ELECTRICAL GENERAL NOTES**

1. ALL CONDUIT FOR PANEL FEEDERS, EQUIPMENT FEEDERS & TRANSFORMER FEEDERS SHALL HAVE INSULATED GROUNDING BUSHINGS EQUAL TO O. Z. TYPE "BL" WHERE ENTERING & / OR LEAVING ENCLOSURES, BONDING JUMPERS, SIZE AS REQ'D. BY N.E.C. (#6 AWG MIN.) SHALL BE INSTALLED FROM BUSHING TO ENCLOSURES. ALL CONDUIT TO MAIN SWITCHGEAR SHALL BE BONDED TOGETHER & TO SYSTEM GROUND.

2. ALL MOTORS 1/2 HP OR LESS SHALL BE PROTECTED BY BUSSMANN "SSU" UNIT FUSED AS REQUIRED BY N.E.C.

3. PROVIDE SEPARATE NEUTRALS FOR EACH CIRCUIT.

4. THE CONTRACTOR SHALL NOTE THAT THE DRAWINGS INDICATE ONLY THE EXTENT DIAGRAMMATICALLY OF THE WORK INTENDED TO BE PERFORMED. WORK INTENDED, HAVING MINOR DETAILS OBVIOUSLY OMITTED SHALL BE FURNISHED & INSTALLED COMPLETE TO PERFORM THE FUNCTIONS OF THE ELECTRICAL SYSTEMS AS INTENDED.

5. IT SHALL BE THE RESPONSIBILITY OF EACH CONTRACTOR TO COORDINATE W/ ALL OTHER TRADES ANY CHANGES TO THE ORIGINAL DRAWINGS OR SPECS. THIS SHALL INCLUDE No. of OR SIZE of , STARTERS, DISCONNECT SWITCHES, FUSES, BREAKERS, CONDUCTORS, & CONDUIT. IF A CONTRACTOR SUBSTITUTES A MANUFACTURE WHICH CAUSES SUCH A CHANGE, THE EXPENSE OF THOSE CHANGES SHALL BE THE RESPONSIBILITY OF THAT CONTRACTOR.

6. THE ELECTRICAL CONTR. SHALL REMOVE ANY EXISTING ELECTRICAL ITEMS, WIRING, CONDUIT, ETC. WHICH CONFLICTS W/ NEW CONSTRUCTION. ANY OF THESE ITEMS WHICH ARE TO REMAIN AS A PERMANENT PART OF THE SYSTEM SHALL BE RELOCATED &/OR RECONNECTED. INSTALL BLANK COVERS WHERE EXISTING SWITCHES, OUTLETS, LIGHT FIXTURES, ETC. ARE ABANDONED. REMOVED ITEMS SHALL BE OFFERED TO THE OWNER, W/ ANY DISCARDED ITEMS BEING REMOVED FROM JOB SITE BY THE ELECTRICAL CONTRACTOR.

7. CATALOG NUMBERS SHOWN ON DRAWINGS ARE FOR DESIGN PURPOSES TO ESTABLISH A MINIMUM ACCEPTABLE QUALITY. SEE SPECIFICATIONS FOR ADDITIONAL MANUFACTURERS WHO HAVE APPROVABLE EQUIPMENT.

**ELECTRICAL SYMBOL LEGEND**

S ..... SINGLE POLE SWITCH.  
S<sub>3</sub> ..... THREE WAY SWITCH.  
⊕ ..... DUPLEX RECEPTACLE, WALL MTD. 16" A. F. F.  
⊕<sub>GFI</sub> ..... 115 VOLT GROUND FAULT RECEPTACLE.  
⊕<sub>WP</sub> ..... DUPLEX RECEPTACLE WITH WEATHERPROOF COVER.  
⊙ ..... JUNCTION BOX WITH COVER.  
⊙ ..... MOTOR OUTLET, HORSEPOWER INDICATED ON PLAN.  
⊠ ..... FUSED DISCONNECT SWITCH, SIZED PER N.E.C.  
—|—|—| ..... CONDUIT RUN CONCEALED IN WALLS OR CLG. HATCHMARKS INDICATE No. OF # 12THHN CONDUCTORS, UNLESS NOTED.  
-|-|- ..... CONDUIT RUN IN GROUND OR FLOOR. SAME AS ABOVE.  
-|-|- ..... FLEXIBLE CONDUIT.  
A-2 ..... HOME RUN TO PANEL. ARROW INDICATES No. OF CIRCUITS, "A" INDICATES PANEL, & "2" INDICATES CIR. No.  
N.I.C. .... NOT IN CONTRACT.  
WP ..... WEATHER-PROOF, NEMA 3R  
E.C. .... EMPTY CONDUIT WITH PULL CORD OR CABLE.  
A.F.F. .... ABOVE FINISHED FLOOR.

**ELECTRICAL IDENTIFICATION DETAIL**

**SAMPLE ONLY**

**PANEL "AR"**

120/208 V 4 WIRE 3 PHASE  
FED BY D.P.B.#1, BRK'R. #2

PHASE A - BLACK  
PHASE B - RED  
PHASE C - BLUE  
NEUTRAL - WHITE

1. ALL PANELS, SWITCHGEAR, TRANSFORMERS, DISCONNECTS, CABINETS, & OTHER LARGE ELEC. EQUIP. SHALL BE LABELED PER DETAIL. USE LAMACOID PLATES W/ BLACK BACKGROUND & WHITE LETTERS. CENTER ABOVE THE CABINET DOOR W/ ALUMINUM SCREWS.

2. MARK ROOF MTD. EXHAUST FANS, ROOF TOP UNITS, & OTHER SIMILAR EQUIP. W/ ALUM. TAPE, USING DYNO-MITE HAND EMBOSING TOOL. FASTEN W/ ALUMINUM SHEET METAL SCREWS.

3. SHOW PROPER ELECTRICAL INFORMATION ON ALL EQUIPMENT.

4. PANEL INDEXES SHALL BE TYPED & SHALL INDICATE EQUIPMENT SERVED & LOCATION.

**WIRING DEVICE GROUNDING DETAIL**

WIRING DEVICE

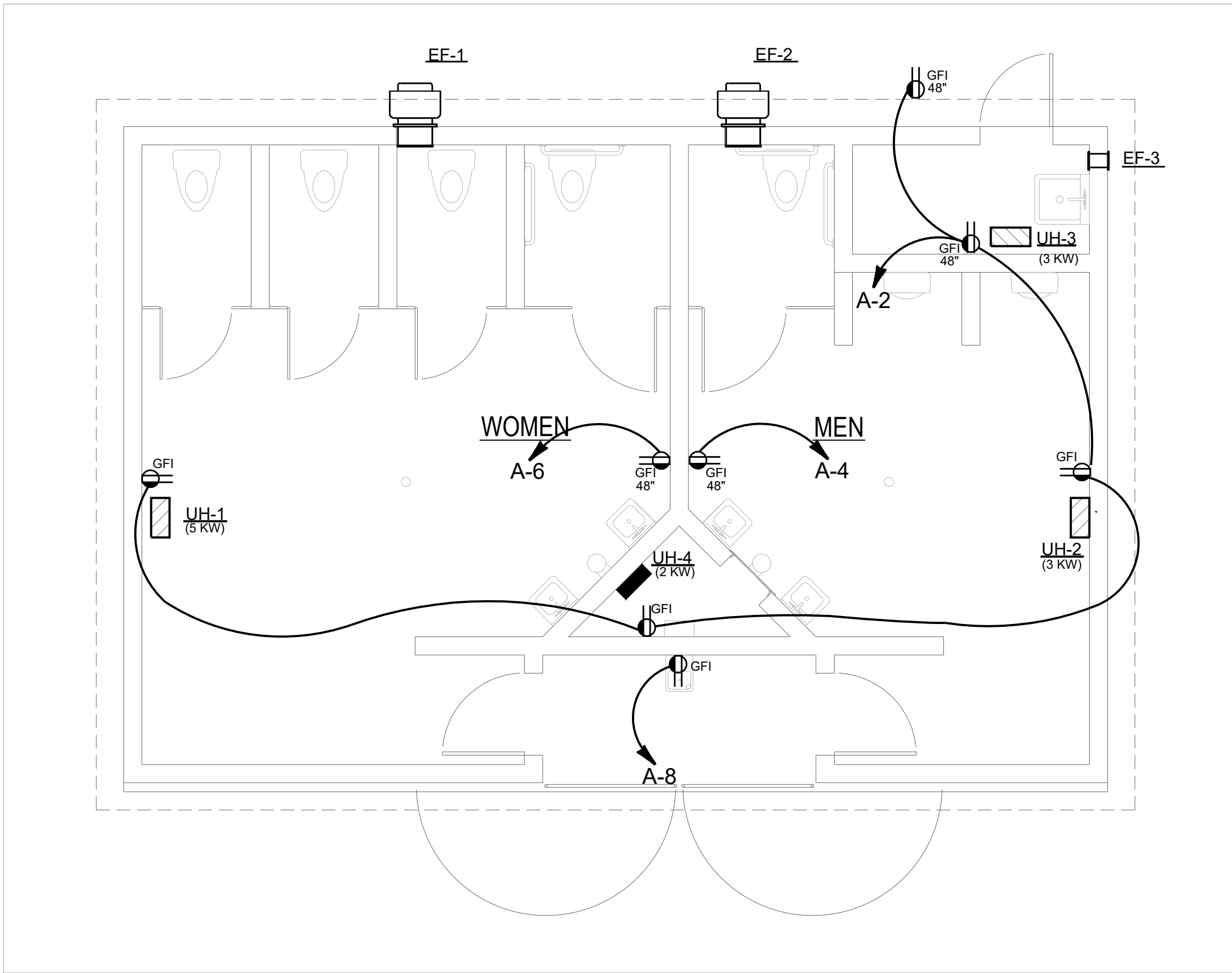
OUTLET BOX

GROUND

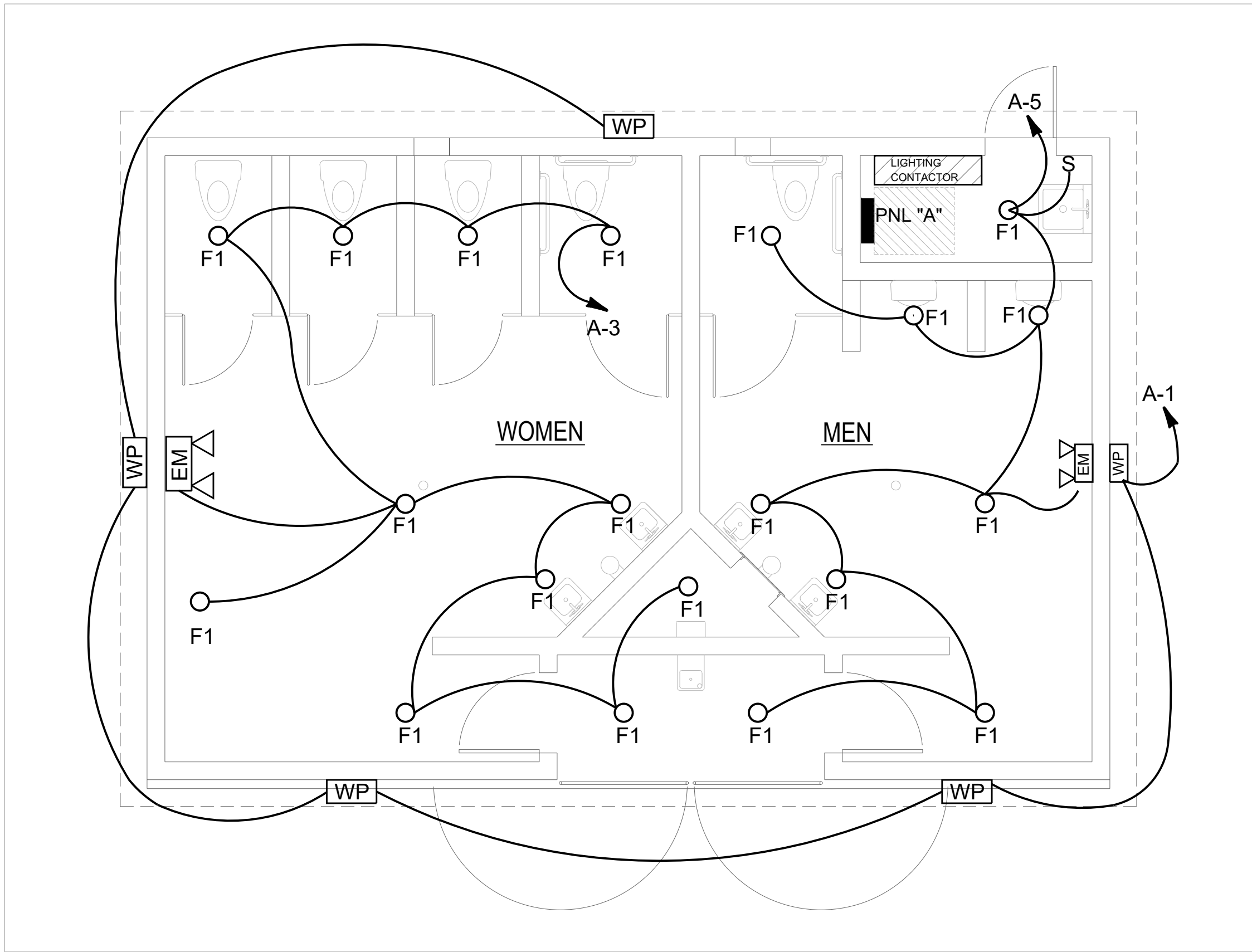
WIRE NUT

CONDUIT

THREE WIRE w/ GROUNDING CONDUCTOR



**2 EQUIPMENT FLOOR PLAN**  
1/4" = 1'-0"



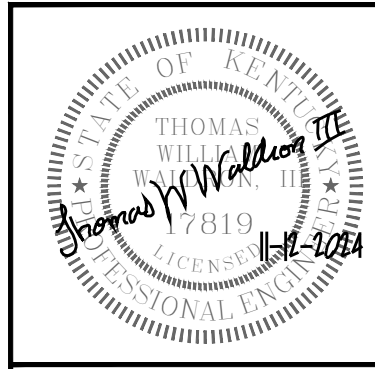
**1 LIGHTING FLOOR PLAN**  
1/4" = 1'-0"

LIGHTING FIXTURE SCHEDULE					
Type	Wattage / Lamp	Manufacturer	Catalog Number	Mounting	Description
F1	31W / LED	HALO	HLB8LS9FSE010MWVR	SURFACE	DOWNLIGHT 90 CRI; 2352 LUMENS; LUMEN SELECTABLE
EM	1.1W / LED	SURE-LITES	SEL25	SURFACE	EMERGENCY - 25 FT. COVERAGEE -108 LUMENS
WP	20.7W / LED	LUMARK	AXCS2A	MOUNTED	EXTERIOR WALLPACK - 2561 LUMENS

HVAC ELECTRICAL SCHEDULE					
MARK	F.L.A.	VOLT / PHASE	WIRE / CONDUIT	DISC. / FUSE	BREAKER / CIRCUIT
UH-1	20.8	240/1	2 #10, #10 G., 3/4" C.	30A /2P F30	A-23,25
UH-2	12.5	240/1	2 #12, #12 G. 3/4" C.	30A /2P F20	A-27,29
UH-3	12.5	240/1	2 #12, #12 G. 3/4" C.	30A /2P F20	A-31,33
UH-4	8.3	240/1	2 #12, #12 G. 3/4" C.	30A /2P F20	A-35,37
EF-1	1.5	120/1	1 #12, #12 G. 3/4" C.	30A /2P F20	CONNECT TO LIGHTING CKT. A-3
EF-2	1.5	120/1	1 #12, #12 G. 3/4" C.	30A /2P F20	CONNECT TO LIGHTING CKT. A-5
EF-3	0.5	120/1	1 #12, #12 G. 3/4" C.	30A /2P F20	CONNECT TO LIGHTING CKT. A-5

PANEL "A" LOCATION RESTROOM BLDG.											
120/240 VOLT 1 Ø 3 W				TYPE NEMA 1							
225 AMP				MAIN BRK'R.		SERVICE ENTRANCE RATED					
No	LOAD	TRIP AMP	W O. C.	WATTAGE Aφ	WATTAGE Bφ	W O. C.	TRIP AMP	LOAD			
1	EXT. LTS.	20A	1P	105	1000		1P	20A	5 RCPT.		2
3	WOMEN LTS.	20A	1P		350	200	1P	20A	MEN OUTLET		4
5	MEN LTS.	20A	1P	290	200		1P	20A	WOMEN OUTLET		6
7	SPARE	20A	1P		-	800	1P	20A	DRINKING FOUNTAIN		8
9	SPARE	20A	1P	-	-		1P	20A	SPARE		10
11	SOCCER FIELD	30A	2P		2460	2460	2P	30A	SOCCER FIELD		12
13	POLE 1	-	-	2460	2460		-	-	POLE 3		14
15	SOCCER FIELD	30A	2P		2460	2460	2P	30A	SOCCER FIELD		16
17	POLE 2	-	-	2460	2460		-	-	POLE 4		18
19	WATER HTR.	30A	2P		2250	-	1P	20A	SPARE		20
21	4500 WATTS	-	-	2250	-		1P	20A	SPARE		22
23	UNIT HTR. #1	30A	2P		2500	-	1P	20A	SPARE		24
25	5KW 230 VAC	--	--	2500	-		1P	20A	SPARE		26
27	UNIT HTR. #2	20A	2P		1500	-	1P	20A	SPARE		28
29	3KW 230 VAC	--	--	1500	-		1P	20A	SPARE		30
31	UNIT HTR. #3	20A	2P		1500	-	1P	20A	SPARE		32
33	3 KW 230 VAC	--	--	1500	-		1P	20A	SPARE		34
35	UNIT HTR. #4	20A	2P		1000	-	1P	20A	SPARE		36
37	2KW 230 VAC	--	--	1000	-		1P	20A	SPARE		38
39	SPARE	20A	2P		-	729	2P	20A	PARKING LOT LIGHTING		40
41	----	--	--	-	729		----	----	----		42
WATT TOTALS :				13,960	6,849	14,020	6,649	WATTAGE F.L.A.			
TOTAL WATTS PER PHASE :				20,809	-	20,669	=	41,478	:	173	

3 - #4 /0, #6 GRD., 4 INCH CONDUIT TO PAD MTD. TRANSFORMER. CONDUIT SHALL BE BURIED 24" TO TOP. PROVIDE NON-FERROUS DETECTABLE WARNING TAPE IN TRENCH 12" BELOW GRADE. PROVIDE CONDUIT WITH GALVANIZED SWEEPING 90's (24" RADIUS). CONDUIT ABOVE GRADE SHALL BE IMC OR RGS.



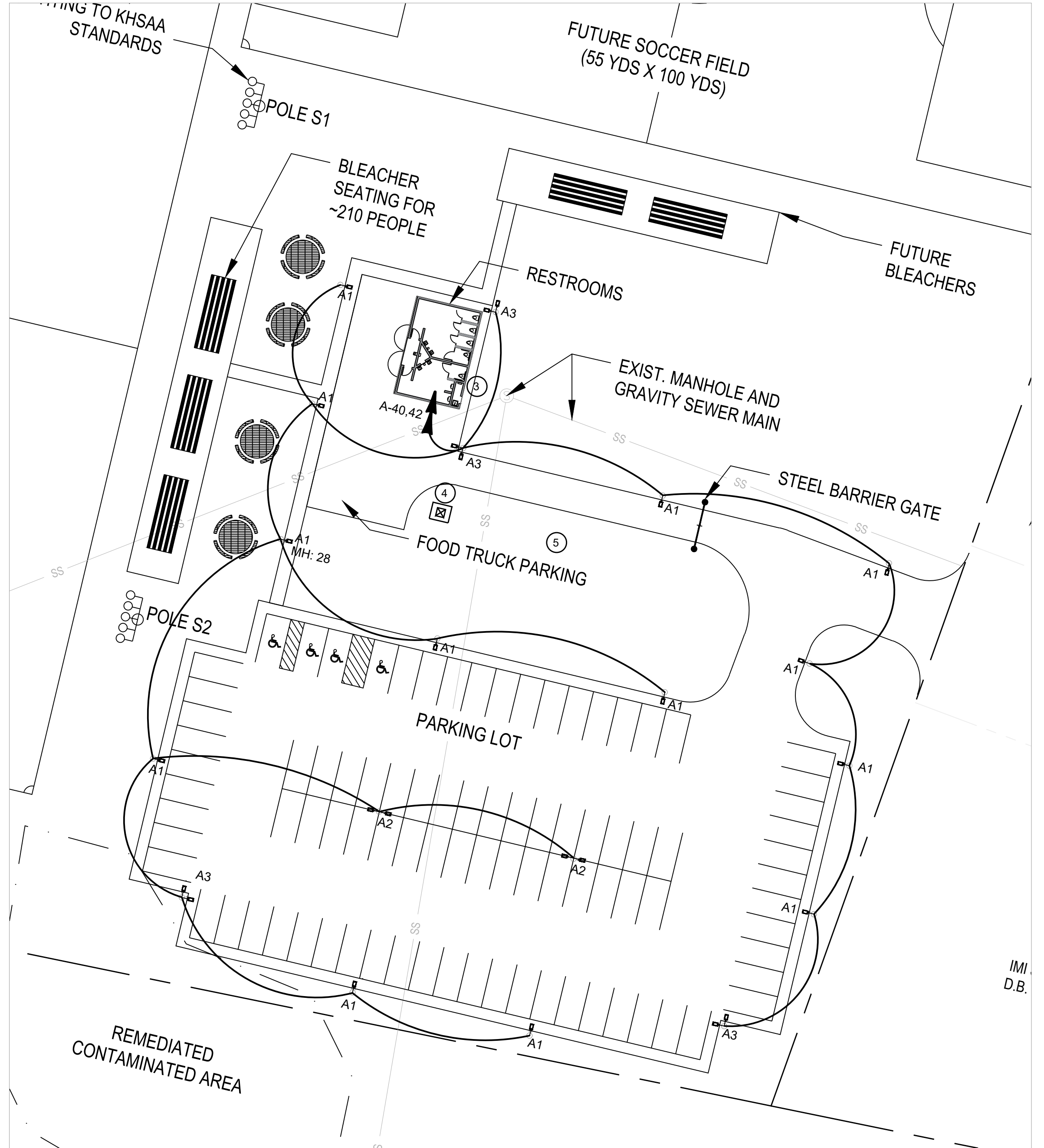
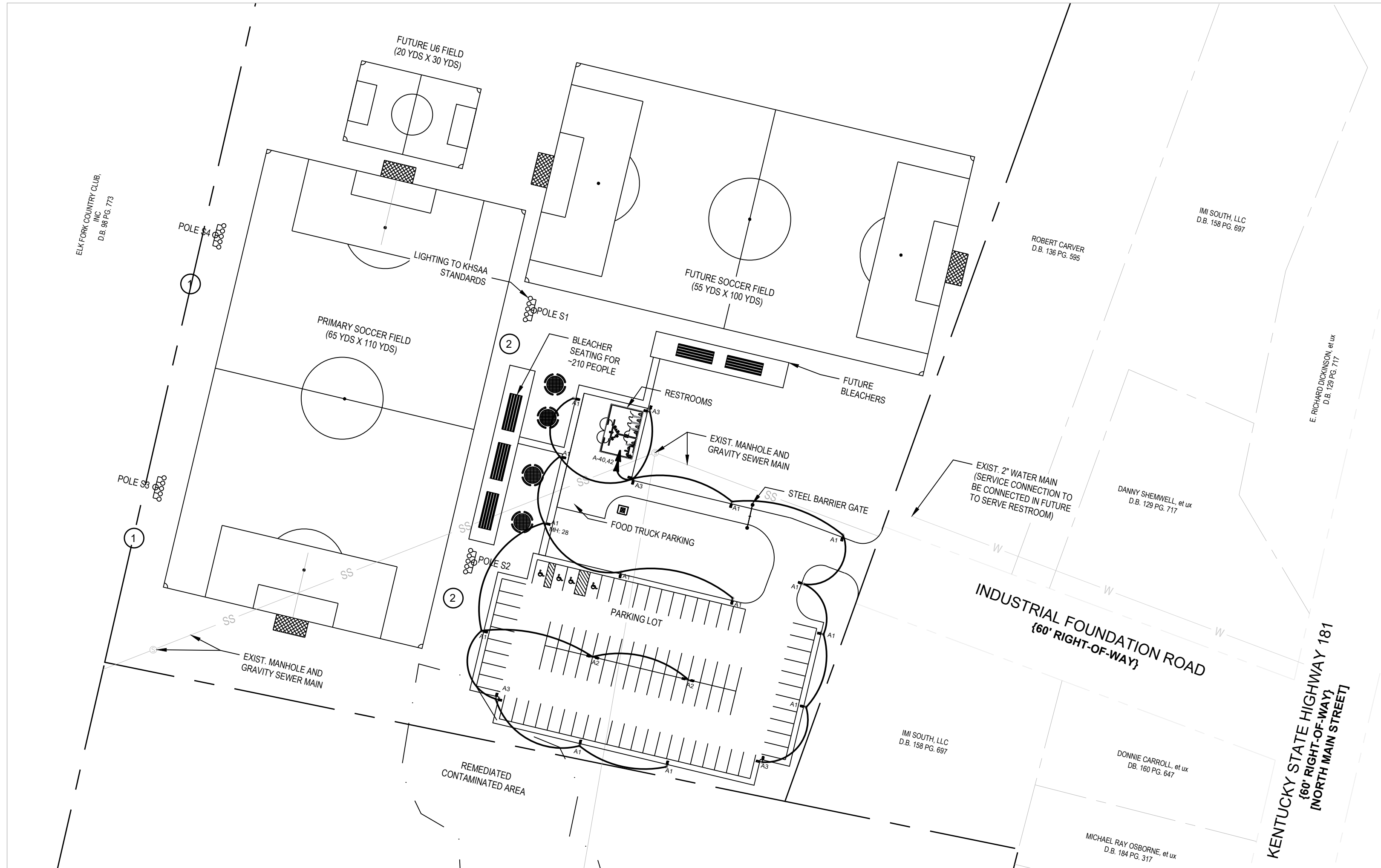
**ELECTRICAL PLAN - RESTROOMS**

**WBW**Engineering, Inc.  
3000 Canton Street, Hopkinsville, KY 42240  
Phone: 270-886-2536 Fax: 270-885-7978 mail@wbwengr.com

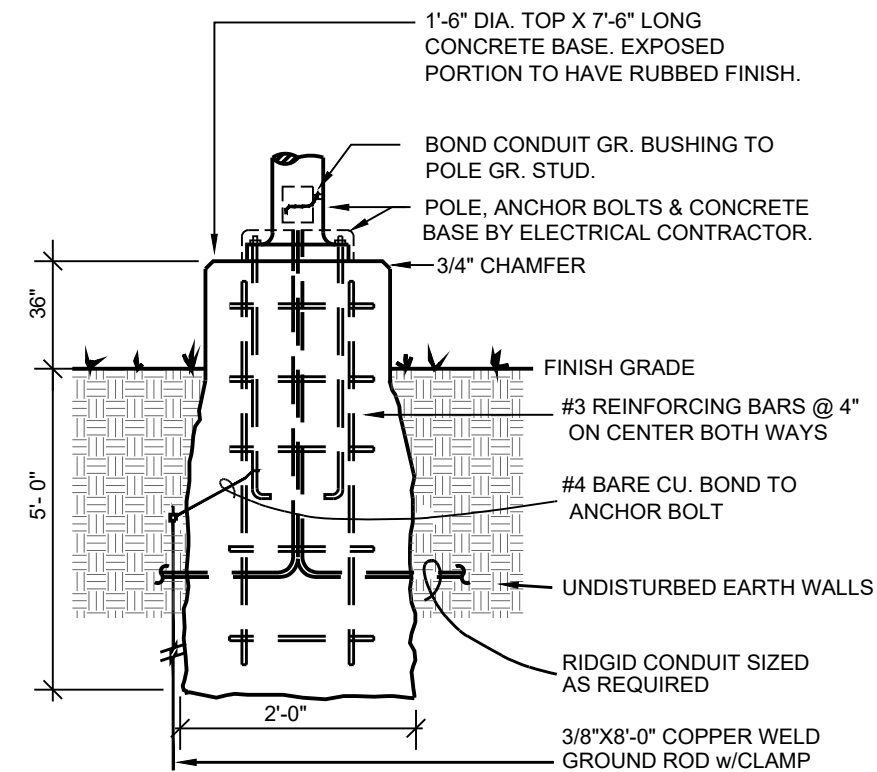
TODD CO. SOCCER FIELD  
RESTROOM BUILDING & LIGHTING  
N MAIN ST., ELKTON, KY 42220

Drawn by: GC  
Checked by: TW  
Scale: 1/4" = 1'-0"  
Date: 11-12-2024  
Revised: ---  
Sheet: E100





#### PARKING LOT POLE BASE DETAIL



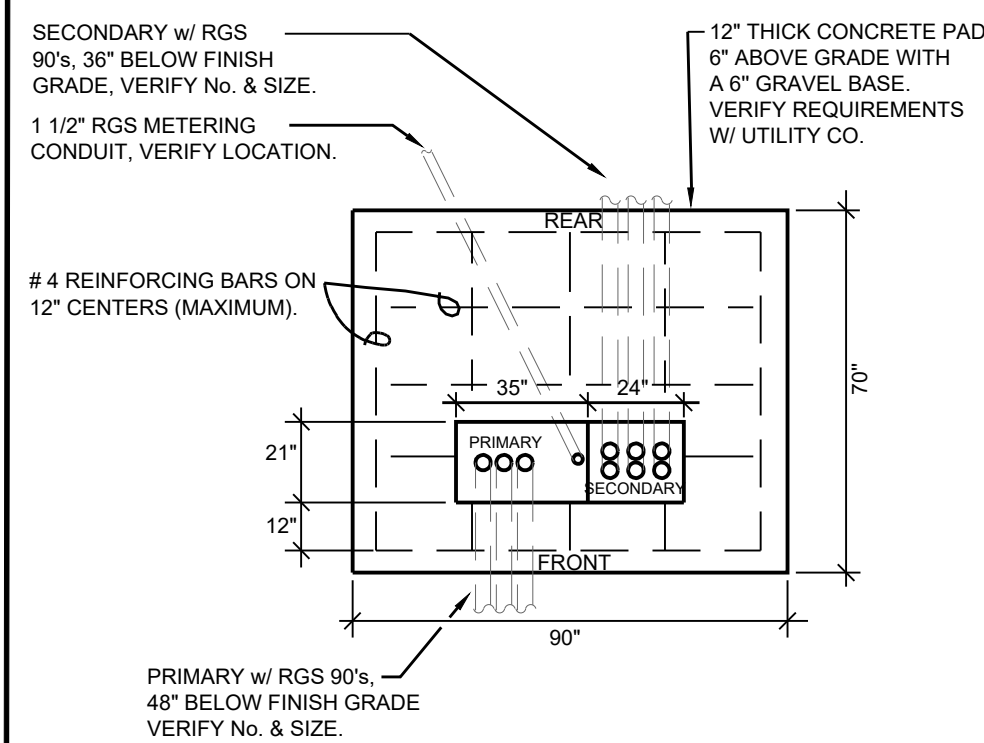
#### OVERALL SITE ELECTRIC PLAN

SCALE: 1" = 60'

#### ENLARGED SITE ELECTRIC PLAN

SCALE: 1" = 30'

#### ELECTRICAL TRANSFORMER PAD DETAIL



#### ELECTRICAL GENERAL NOTES

CONTRACTOR SHALL PROVIDE POLE BASE DESIGN FOR SOCCER FIELD LIGHTING. DESIGN SHALL BE PROVIDED AND STAMPED BY AN ENGINEER LICENSED IN KENTUCKY.

CONTRACTOR SHALL PROVIDE COMPLETE ELECTRICAL SECONDARY FROM ELECTRICAL PANEL LOCATED IN RESTROOM BUILDING TO PAD MOUNTED TRANSFORMER PROVIDED BY PENNYRILE ELECTRIC. REFER TO DRAWING E101 FOR LOCATION OF THE ELECTRICAL PANEL.

CONTRACTOR SHALL COORDINATE LOCATION OF UNDERGROUND ELECTRICAL CONDUITS WITH OTHER BURIED UTILITIES. BURIED ELECTRICAL CONDUCTORS SHALL BE ENCLOSED IN CONDUIT.

CONTRACTOR SHALL PROVIDE COMPLETE LIGHTING SYSTEM FOR SOCCER FIELD. AVERAGE FOOTCANDLE LEVEL MEASURED ON 3 FT SPACING SHALL AVERAGE 30 FOOTCANDLES. POLE LOCATIONS INDICATED ON THIS DRAWING ARE THE DESIRED LOCATIONS TO PREVENT POLES FROM BEING LOCATED TOO CLOSE TO THE ADJACENT SOCCER FIELD.

CONTRACTOR CABINET FOR ATHLETIC FIELD LIGHTING IS INTENDED TO BE INSTALLED INSIDE THE RESTROOM BUILDING. 36 INCH CLEARANCE REQUIRED IN FRONT OF CABINETS.

CONTRACTOR SHALL COORDINATE LOCATION OF TRANSFORMER AND METERING WITH MCGHEE ENGINEERING, WBW ENGINEERING AND PENNYRILE ELECTRIC.

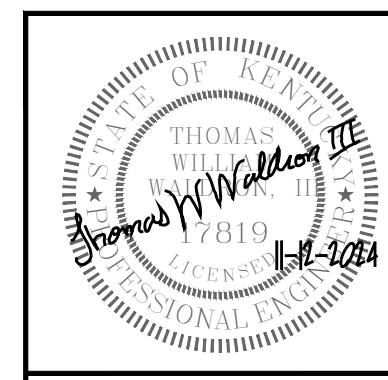
#### ELECTRICAL KEYED NOTES

- PROVIDE 240 VAC SINGLE PHASE POWER TO SOCCER FIELD LIGHTING POLES - 2 #3, #6 GRD., 1 1/2 INCH CONDUIT AT 24 INCHES DEEP.
- PROVIDE 240 VAC SINGLE PHASE POWER TO SOCCER FIELD LIGHTING POLES - 2 #6, #6 GRD., 1 1/2 INCH CONDUIT AT 24 INCHES DEEP..
- PROVIDE 240 VAC SINGLE PHASE POWER TO ELECTRICAL PANEL "A" FROM PENNYRILE ELECTRIC PAD - MOUNTED TRANSFORMER - 3 #4/0, #3 GRD., 4 INCH CONDUIT 24 INCHES DEEP. REFER TO SHEET E-100 FOR PANEL LOCATION.
- TRANSFORMER PAD PROVIDED BY CONTRACTOR PER PENNYRILE ELECTRIC (PRECC) REQUIREMENTS. CONSTRUCTION CHARGES BY PRECC SHALL BE INCLUDED IN BID.
- CONTRACTOR SHALL EXTEND EXISTING 3 INCH PRIMARY CONDUIT TO TRANSFORMER. PROVIDE 3 INCH CONDUIT 48 INCHES DEEP WITH GALVANIZED 90'S HAVING 24 INCH SWEEP. CONTRACTOR TO VERIFY LOCATION OF EXISTING PRIMARY CONDUIT PRIOR TO BID.

NOTE: PROVIDE NEMA3R DISCONNECT WHERE LOCATED OUTSIDE THE BUILDING.

#### LIGHTING FIXTURE SCHEDULE - SITE LIGHTING

Type	Wattage / Lamp	Manufacturer	Catalog Number	Mounting	Description
A1	54W / L.E.D.	COOPER	PRV-PA1A-750-U-T4W	25 FT. POLE KW INDUSTRIES # SSP25-4-7-BRZ-DM10-BC	SINGLE
A2	108W / L.E.D.	COOPER	PRV-PA1A-750-U-T4W	25 FT. POLE KW INDUSTRIES # SSP25-4-7-BRZ-DM10-BC	QTY 2 FIXTURES @ 180 DEGREES
A3	108W / L.E.D.	COOPER	PRV-PA1A-750-U-T4W	25 FT. POLE KW INDUSTRIES # SSP25-4-7-BRZ-DM10-BC	QTY 2 FIXTURES @ 90 DEGREES



#### ELECTRICAL PLAN - SITE

**WBW Engineering, Inc.**  
3000 Canton Street, Hopkinsville, KY 42240  
Phone: 270-886-2536 Fax: 270-885-7978 mail@wbwengr.com

TODD CO. SOCCER FIELD  
RESTROOM BUILDING & LIGHTING  
N MAIN ST., ELKTON, KY 42220

CONSULTANT:	Drawn by: GC	Checked by: TW	Scale: 1" = 60'-0"	Date: 12-19-24	Revised: ---	Sheet: <b>UE100</b>
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HVAC GENERAL NOTES:

- CONTRACTOR SHALL FIELD VERIFY AND COORDINATE ALL MECHANICAL DUCT ROUTING, PIPING, ETC. WITH EXACT LOCATIONS OF STRUCTURAL COMPONENTS, LIGHTING, SUPPORTS, ARCHITECTURAL COMPONENTS, ETC.
- CONTRACTOR SHALL COORDINATE MECHANICAL WORK WITH OTHER TRADES. CONTRACTOR SHALL PERFORM WORK IN STRICT ACCORDANCE PER LOCAL, INTERNATIONAL, OR OTHER GOVERNING CODES.
- CONTRACTOR SHALL COMBINE AND SIZE CONDENSATE DRAINS AS NECESSARY PER IMC 2015 AND THE LATEST EDITION OF ASHRAE DESIGN GUIDELINES. PROVIDE CONDENSATE PUMPS WITH ASSOCIATED POWER WHERE NECESSARY. ROUTE INDOOR UNIT CONDENSATE DRAINS AS SHOWN ON CONTRACT DOCUMENTS.
- CONTRACTOR SHALL COORDINATE WITH OTHER TRADES ANY CHANGE OF EQUIPMENT DEVIATING FROM THE PROVIDED SCHEDULES IN THE CONTRACT DOCUMENTS.
- PROVIDE ACCESS PANELS IN DRYWALL/PLASTER CEILINGS FOR MAINTENANCE OF EQUIPMENT LOCATED ABOVE CEILING. REFER TO MANUFACTURER'S EQUIPMENT ACCESS TO LOCATE PANELS.
- CONTRACTOR SHALL AVOID ROUTING DUCTWORK OVER LIGHTING FIXTURES WHERE SPACE IS LIMITED ABOVE CEILING.
- CONTRACTOR SHALL MOUNT THERMOSTATS 48" A.F.F. OR EVEN WITH LIGHT SWITCH MOUNTING HEIGHT.
- PROVIDE THERMOSTATS LOCATED IN COMMON AREAS WITH PROTECTIVE LOCKABLE PLASTIC THERMOSTAT COVERS. COVERS SHALL BE VENTED AND SHALL NOT EXCEED MORE THAN 2" AROUND THERMOSTAT SIZE.
- CONTROL WIRING SERVING WALL MOUNTED THERMOSTATS, Co2 SENSORS, ETC. SHALL BE CONCEALED IN WALLS.
- EQUIPMENT CURBS SHALL BE SLOPED AS REQUIRED TO MATCH ROOF PITCH. REFER TO ARCHITECTURAL DRAWINGS.
- PROVIDE TURNING VANES IN ALL 90° RECTANGULAR DUCTWORK BENDS.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE COMPLETE AND PROPER INSTALLATION OF THERMOSTATS AND ALL OTHER NECESSARY FIELD MOUNTED CONTROL COMPONENTS. THE HVAC EQUIPMENT MANUFACTURER SHALL FURNISH COMPLETE WIRING DIAGRAMS TO THE INSTALLER FOR USE IN WIRING CONTROLS. ALL CONTROL WIRING SHALL BE INSTALLED IN STRICT ACCORDANCE W/ THE N.E.C. (NATIONAL ELECTRIC CODE).
- CONTRACTOR SHALL PROVIDE SMOKE DAMPERS AT ANY LOCATION WHERE DUCTWORK PENETRATES A SMOKE WALL. REFER TO ELECTRICAL DRAWINGS FOR POWER AND FIRE ALARM CONNECTION DETAILS.
- CONTRACTOR SHALL PROVIDE FIRE DAMPERS PER LOCAL AND GOVERNING CODES, AT ANY LOCATION WHERE DUCTWORK PENETRATES A FIRE RATED ASSEMBLY OR WALL TO MAINTAIN THAT ASSEMBLY'S FIRE RATING. REFER TO ARCH. DRAWINGS FOR FIRE RATINGS.
- SLEEVE ALL DUCTWORK AND HVAC PIPING PENETRATIONS. PROVIDE FIRE CAULK AT RATED WALLS FOR PIPING PENETRATIONS.
- CONTRACTOR SHALL FLASH AND SEAL ALL ROOF AND WALL PENETRATIONS.
- SEAL ALL TRANSVERSE DUCT JOINTS WITH AN APPROVED DUCT SEALER TO INSURE THAT THE SUM OF DIFFUSER OUTLETS/INLETS ARE WITHIN 10% OF THE DESIGN AIRFLOW.
- PROVIDE FLEXIBLE CONNECTION BETWEEN HVAC UNITS AND SHEET METAL DUCTWORK.
- ROUTE HVAC DUCTWORK AND PIPING INSTALLED ABOVE CEILING AS HIGH AS POSSIBLE.
- PROVIDE 1" MIN. OR SAME SIZE AS UNIT CONNECTION CONDENSATE DRAIN FROM EACH UNIT TRAPPED TO MAINTAIN A WATER SEAL 1" GREATER THAN THE FAN TOTAL STATIC PRESSURE.
- ALL PIPE AND DUCT SUPPORTS AND RESTRAINTS SHALL BE DESIGNED FOR SEISMIC CATEGORY FOR BUILDING LOCATION PER GOVERNING CODE REQUIREMENTS. SIZE AND INSTALL SUPPORTS AND RESTRAINTS IN ACCORDANCE WITH ASHRAE SEISMIC DESIGN GUIDELINES.
- MAINTAIN MANUFACTURER'S RECOMMENDED CLEARANCES ON ALL EQUIPMENT.
- DUCTWORK, PIPING, ETC. SHALL NOT BE ROUTED OVER TOP OF ELECTRICAL PANEL BOARDS.
- FAN COIL UNITS, VENT FANS, PACKAGED UNITS, ETC. SHALL BE INSTALLED IN SUCH A MANNER THAT ALL FILTERS, VALVES, MOTORS, PANELS ETC. ARE COMPLETELY ACCESSIBLE AND SERVICEABLE. PROVIDE ELECTRICAL SERVICE CLEARANCES IN ACCORDANCE WITH THE LATEST EDITION OF THE N.E.C.
- INSTALL ALL EQUIPMENT AS PER MANUFACTURER'S RECOMMENDATIONS UNLESS NOTED OTHERWISE.
- THESE PLANS ARE SCHEMATIC IN NATURE AND INDICATES THE APPROXIMATE AND GENERAL LOCATION OF DUCTWORK, EQUIPMENT, AND PIPING.
- EXHAUST AND FLUE TERMINATIONS SHALL MAINTAIN A 15' MINIMUM DISTANCE FROM FRESH AIR INTAKES AND BUILDING OPENINGS.
- CONTRACTOR SHALL PROVIDE NECESSARY DUCTWORK FITTINGS, BENDS, ETC. TO ROUTE DUCTWORK BETWEEN STRUCTURAL MEMBERS WHERE SPACE IS LIMITED ABOVE CEILING.
- DUCT DIMENSIONS SHOWN ARE INSIDE CLEAR DIMENSIONS.

HVAC NOTES:

- PROVIDE LOUVERED GRILLE OVER EXHAUST OPENING. PRICE MODEL 630 12"x10" OR EQUAL..

UNIT HEATER SCHEDULE					
TAG		UH-1	UH-2	UH-3	UH-4
AREA SERVED		WOMEN	MEN	ELEC.	P. CLOSET
MANUFACTURER		QMARK	QMARK	QMARK	QMARK
UNIT MODEL		MUH-05	MUH-03	MUH-03	HT
APPROX. OPERATING WEIGHT	LBS.	30	30	30	---
APPROX. DIMENSIONS WxDxH	IN.	14x8x16	14x8x16	14x8x16	14x4x18
AIRFLOW	CFM	350	350	350	---
POWER SUPPLY	V/ø/Hz	240 / 1 / 60	240 / 1 / 60	240 / 1 / 60	240 / 1 / 60
HEATING INFORMATION					
PRIMARY HEATING TYPE		ELECTRIC	ELECTRIC	ELECTRIC	ELECTRIC
HEATING CAPACITY	kW	5	3	3	2
MOUNTING HEIGHT	FT.	HI AS POSSIBLE			---
APPROX. HEAT THROW @ MAX. HEIGHT	FT.	12			---
NOTES/ACCESSORIES		1,3-7	1,3-7	1,3-7	1-4
NOTES/ACCESSORIES					
1 INSTALL PER MFG.'S RECOMMENDATIONS					
2 PROGRAMMABLE					
3 LED TOUCH SCREEN					
4 STEEL SHEATHED HEATING ELEMENTS					
5 STEEL CABINET					
6 PROVIDE MOUNTING BRACKET					
7 UNIT-MOUNTED THERMOSTAT					

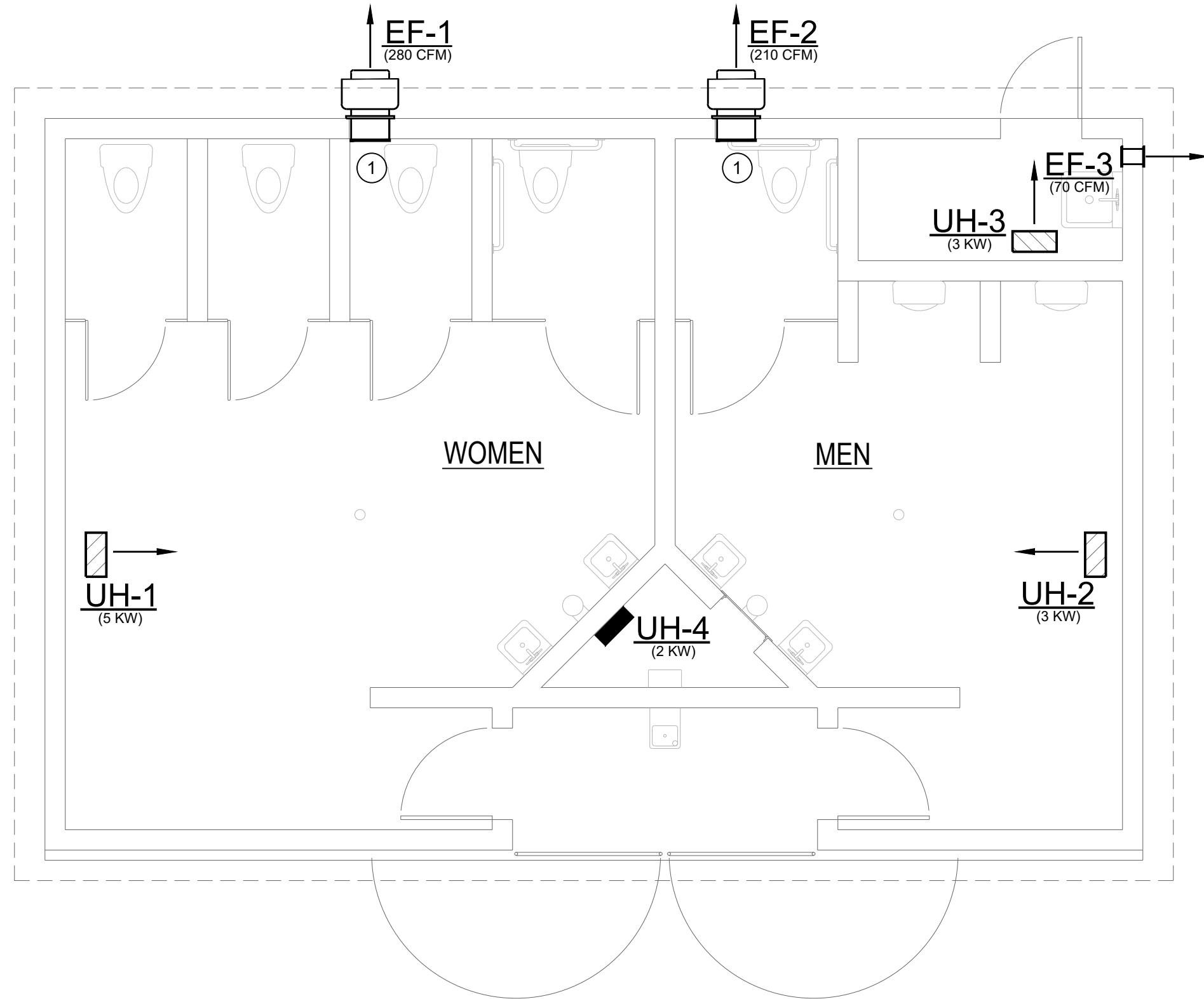
EXHAUST FAN SCHEDULE				
TAG		EF-1	EF-2	EF-3
AREA SERVED		WOMEN	MEN	ELEC.
MANUFACTURER		GREENHECK	GREENHECK	GREENHECK
MODEL		CUE-090	CUE-090	SP-L80
TYPE		SIDEWALL	SIDEWALL	SIDEWALL
APPROX. OPERATING WEIGHT	LBS.	45	45	15
OPENING SIZE	IN.	15 SQ.	15 SQ.	---
PERFORMANCE INFORMATION				
AIRFLOW	CFM	280	210	70
EXTERNAL STATIC PRESSURE	IN. W.G.	0.1	0.1	0.125
SONES		1.4	1.0	2.0
ELECTRICAL INFORMATION				
POWER SUPPLY	V/ø/Hz	115 / 1 / 60	115 / 1 / 60	115 / 1 / 60
FLA	A	1.5	1.5	---
MOTOR SIZE	HP / W	1/10 HP	1/10 HP	8W
MOTOR ENCLOSURE		ODP	ODP	ODP
NOTES / ACCESSORIES		1-4,6-8	1-4,6-8	1-3,5-8
NOTES / ACCESSORIES				
1 GRAVITY BACKDRAFT DAMPER				
2 WIRING PIGTAIL				
3 NEMA-1 TOGGLE DISCONNECT SWITCH				
4 VARI-GREEN MOTOR -OR- UNIT MOUNTED SPEED CONTROLLER IF REQ. FOR CFM				
5 DESIGNER GRILLE				
6 MOTORS MOUNTED ON VIBRATION ISOLATORS				
7 INTERLOCK EXHAUST FAN WITH LIGHT SWITCH. CONTRACTOR SHALL PROVIDE NECESSARY RELAYS, WIRING, ETC. TO TIE INTO LIGHT SWITCH.				
8 PROVIDE BIRDSCREEN OVER FAN DISCHARGE				

ROOM VENTILATION CALCULATIONS PER IMC 2015 - VENTILATION RATE PROCEDURE (1)

ROOM	FLOOR AREA (SQ. FT.) (2)	AREA OUTDOOR AIRFLOW RATE (CFM/SQ. FT.)	FLOOR AREA OUTDOOR AIR (CFM)	# OF OCCUPANTS	PEOPLE OUTDOOR AIRFLOW RATE (CFM/ PERSON)	PEOPLE OUTDOOR AIR (CFM)	OUTDOOR AIR REQ. (CFM)	OUTDOOR AIR PROVIDED (CFM)	EXHAUST REQ. (CFM)	EXHAUST PROVIDED (CFM)
WOMEN	402	0	0	0	0	0	0	0	280	280
MEN	253	0	0	0	0	0	0	0	210	210
ELEC.	35	0	0	0	0	0	0	0	70	70
PLUMB. CLOSET	16	0	0	0	0	0	0	0	0	0
TOTAL PER VRP							0	0	560	560

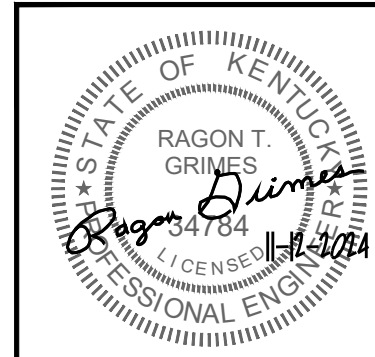
(1) VENTILATION RATE PROCEDURE AS DESCRIBED IN ASHRAE 62.1-2013 6.2

(2) AREA VALUES ARE FOR VENTILATION CALCULATIONS ONLY AND ARE NOT TO BE UTILIZED FOR OTHER PURPOSES



HVAC FLOOR PLAN

1/4" = 1'-0"



HVAC PLAN

**WBW**Engineering, Inc.  
3000 Canton Street, Hopkinsville, KY 42240  
Phone: 270-886-2536 Fax: 270-885-7978 mail@wbwengr.com

TODD CO. SOCCER FIELD  
RESTROOM BUILDING & LIGHTING  
N MAIN ST., ELKTON, KY 42220

CONSULTANT:

Drawn by:  
GC

Checked by:  
RG

Scale:  
1/4" = 1'-0"

Date:  
11-12-2024

Revised:  
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Sheet:

M100