

## **ADDENDUM NUMBER THREE (3)**



**Project:** Nancy Lopez Elementary School  
1600 E. Tilden Street  
Roswell, New Mexico

**Date:** March 29, 2024

**From:** PA Architects

**To:** Prospective Proposers

This addendum forms a part of the Contract Documents and modifies the original Proposal Documents (construction drawings and the Project Manual), dated December 22, 2023 as noted below. Acknowledge receipt of this Addendum in the space provided on the Proposal Form. Failure to do so may subject the Proposer to disqualification.

**NOTE TO POTENTIAL OFFERORS:** All written questions or request for Product Substitutions received to date, but NOT responded to in this Addendum will be addressed in future Addenda.

This Addendum consists of **4** pages plus referenced attachments.

### **RFP QUESTIONS**

1. Q: Is there a preference on irrigation materials, (i.e., Rainbird, Hunter, etc.)? ANSWER: The District does not have a preferred manufacturer.

### **ARCHITECTURAL**

#### **1. CHANGES TO THE SPECIFICATIONS:**

- a. SECTION 07 9500 – EXPANSION CONTROL: Delete this section in its entirety.
- b. SECTION 08 8100 – SOLAR CONTROL COATED GLASS:
  - i. Delete 2.3.A. reference to item “C”.
  - ii. Delete paragraph 2.3.C. in its entirety.
- c. SECTION 09 2100 – GYPSUM BOARD
  - i. 2.1.D.: change to read “Abuse Resistant Gypsum Panels – Scheduled for Multiuse room #414 and Student Dining #415 up 8’-0” AFF, and all Halls up 4’-0”.” Note: drawings refer to Abuse Resistant Gypsum Panels as “High Impact Gypsum Board”.
  - ii. PART 2 – PRODUCTS, 2.1.E. delete item 2. “Core.”
- d. SECTION 10 5113- METAL LOCKERS:
  - i. Change 2.2.B. to read: “Style: single tiered lockers in classrooms, double tiered lockers in staff Lockers 416A.
  - ii. Change 2.2.C. to read: “Locker size:
    - i. Classrooms 107 – 120: 15”W x 15”D x 48”H.
    - ii. Pre-K 206, Kindergarten 208 + 210: 15”W x 15”D x 37”H.
    - iii. Lockers 416A: 15”W x 15”D x 30”H per tier (overall locker height 60”).
- e. SECTION 10 2800 TOILET ACCESSORIES:
  - i. Items 2.2.C, G, I, and L: delete in their entirety.
    - i. The Owner shall furnish, and the GC shall install soap dispensers, paper towel dispensers and toilet tissue dispensers.

- ii. The Owner shall furnish and install Waste Receptacles and Sanitary Napkin Disposals.
- ii. Item 2.2.M.: Change to read “Basis of Design: Harloff Narcotics Cabinet, Large, Single Door/Double Lock, 23-1/2" W x 10-1/2"D x 29-1/2"H, Beige, as furnish by Global Industrial ([www.globalindustrial.com](http://www.globalindustrial.com)) or approved equal.”
- f. SECTION 10 7119 – EXTERIOR SUNSHADES 2.4 finishes: Add the following: “Finish to match window frames – Bronze Anodized.”
- g. SECTION 11 6813 - PLAYGROUND EQUIPMENT:
  - i. 1.2 SUBMITTALS: Add the following: “J. Engineering Shade Structures and Play Equipment: The Play Equipment manufacturer and Play Equipment Contractor are responsible for the structural engineering of all play equipment, the shade structure(s) and related footings, including geotechnical analysis, structural integrity, compliance with State and local building codes, and any required Special Inspections related to fabrication and erection of this work.”
  - ii. PART 2 PRODUCTS:
    - i. 2.1 BASIS-OF-DESIGN PRODUCT: Add: “C. See attached sketch SKA-1 for Play Equipment Layout.”
    - ii. Add: “2.5 SHADE STRUCTURES:
      - a. See SKA-1 (attached) for shade structure location and size.
      - b. See SKA-2 and SKA-3 (attached) for shade structure configuration and components.
      - c. FINISHES: All shade structure steel framing components to be powder coated Bronze. Metal roof of shade structures to match metal roof of building: IMETCO Series 300 Standing Seam Panel System, 24 ga., 16” width panel with center step-up (refer to SECTION 07 6113.02 for specification), color: IMETCO Platinum Silver custom premium.
- h. SECTION 12 9313 BIKE RACKS: Change 1.1.A.2. to read: “Provide two (2) units for a total of 12 bikes.”
- i. Add the following Specification Sections:
  - i. SECTION 32 3113 - GALVANIZED CHAIN LINK FENCES AND GATES
  - ii. SECTION 32 3119 -ORNAMENTAL FENCE AND GATES
- j. SECTION 32 8400 – LANDSCAPE IRRIGATION
  - i. 3.6 PROJECT CLOSEOUT B. WARRANTY PERIOD AND REPLACEMENT: Change to read “The irrigation system and all related work shall be functioning properly at the end of the warranty period. Contractor shall guarantee all planting and irrigation system work for a period of two (2) years beginning on the issue date of Substantial Completion except as follows:” Paragraph 3.6.B.1.a shall remain unchanged.
- k. SECTION 32 9000 – LANDSCAPE PLANTING
  - i. Delete 1.6.A. SUBSTITUTIONS in its entirety. Add: “A. Subject to compliance with requirements of the Construction Documents, comparable products of equal performance may be considered for in in accordance with SECTION 01 6300 PRODUCT SUBSTITUTION PROCEDURES.”
  - ii. 1.9.B. PROJECT CLOSEOUT: delete paragraphs B, C, and D, in their entirety. Add:” B. WARRANTY: Contractor shall guarantee all planting for 2 years from issue of Substantial Completion.”
  - iii. 3.9 PLANT MATERIALS: Add “C. LABELS, All trees shall exhibit original Landscape Nursery labels identifying common and botanical names. Leave intact until receipt of Substantial Completion.”
  - iv. Delete 2.2 SUBSTITUTIONS in its entirety.

- v. 3.9 PROJECT CLOSEOUT, B. WARRANTY PERIOD AND REPLACEMENT paragraph 1.: Change to read “ All plants shall be alive and growing properly, with all related work, such as irrigation, functioning properly at the end of the warranty period. Contractor shall guarantee all planting work for a period of two (2) years beginning on the issue date of Substantial Completion except as follows:” Paragraph 3.9.B.1.a shall remain unchanged.
- vi. Delete 3.9.C. MAINTENANCE in its entirety.

**2. CHANGES TO THE DRAWINGS:**

- a. SHEET AS-501 SITE DETAILS: Details E1, C1, C3: rails, pickets and post sizes shall be governed by Specification SECTION - 32 3119 ORNAMENTAL FENCES AND GATES, 2.03 Components.
  - b. SHEETS A-101 + A-102 FLOOR PLANS:
    - i. Change keyed note 33 to read: “Steel Storage cabinet, 30” W x 18” D x 72” H. Basis of Design item #T97237635TN by Global Industrial ([www.globalindustrial.com](http://www.globalindustrial.com)) or approved equal.”
    - ii. Change keyed note 31 to read: “Double tiered staff lockers on 4” high FRT solid wood frame base.
  - c. SHEET A-602 DOOR SCHEDULES, HM WINDOW FRAME TYPES, DOOR + GATE TYPES:
    - i. Change gate G-1 to 6’-0” high.
- 3. MANUFACTURER’S PRIOR APPROVALS:** (The following manufacturers are approved to submit pricing in accordance with Sections 01 6300 and 01 6301):
- a. SECTION 07 2419 – WATER-DRAINAGE EXTERIOR INSULATION + FINISH SYSTEM (EIFS): Sto Therm ci Classic, model 520.
  - b. SECTION 07 2726 – FLUID APPLIED MEMBRANE AIR BARRIERS: W. R. Meadows ([www.wrmeadows.com](http://www.wrmeadows.com)) AIR-SHIELD LMP Liquid Membrane Vapor Permeable Air Barrier.
  - c. SECTION 10 5113 – METAL LOCKERS: Lockers MFG, phone (901)467.0166: All Welded Series Metal Locker.
  - d. SECTION 11 600 - ATHLETIC EQUIPMENT:
    - i. ADP LEMCO INC., 13702 S 200 W Draper UT 84020
      - i. 1325 BASKETBALL FRAME
      - ii. 150C WINCH
      - iii. 64 BACKBOARD
      - iv. 105 CUSHION EDGE PAD
      - v. 25 GOAL
      - vi. 125EL HEIGHT ADJUSTER
      - vii. 110 SAFETY STRAP
      - viii. 6600G DIVIDER CURTAIN
      - ix. 200 SAFETY WALL PADS
      - x. 6109 VOLLEYBALL SYSTEM
      - xi. 7602 NET
      - xii. 6410 ANTENNA & MARKERS
      - xiii. 6010 POST PAD
      - xiv. 6400 and 6430/6431 SLEEVE AND PLATE

**CIVIL**

**1. CHANGES TO THE DRAWINGS:**

- a. Replace SHEET 5 of 6 and SHEET 6 of 6 with the attached SHEET 5 of 6 and SHEET 6 of 6 dated 3/27/24.

## FOOD SERVICE EQUIPMENT

### 1. CHANGES TO THE SPECIFICATIONS:

- a. SECTION 11400 FOOD SERVICE EQUIPMENT- Item No. 11 – Fly Fan:

### 2. CLARIFICATIONS:

- a. **ITEM NUMBER 5 – SALAD BAR:** color shall be selected by the Architect from the manufacturer's standard color line.

## MECHANICAL AND PLUMBING:

### 1. CHANGES TO THE SPECIFICATIONS:

- a. Delete SECTION 25 0000 – INTEGRATED AUTOMATION INDEX in its entirety and replace with the following SECTION 25 0000 – INTEGRATED AUTOMATION INDEX ( 1 page).
- b. Add the following Sections, attached:
  - i. SECTION 25 0500 – GENERAL INTEGRATED AUTOMATION REQUIREMENTS (pages 1-19).
  - ii. SECTION 25 1000 – DIRECT DIGITAL CONTROL (DDC) SOFTWARE, INSTALLATION AND COMPONENTS (pages 1- 14).
  - iii. SECTION 25 1100 – ELECTRICAL CONTROLS AND INTERLOCKS (pages 1- 3).
  - iv. SECTION 25 30000 – CONTROLS AND INSTRUMENTATION (pages 1- 5).

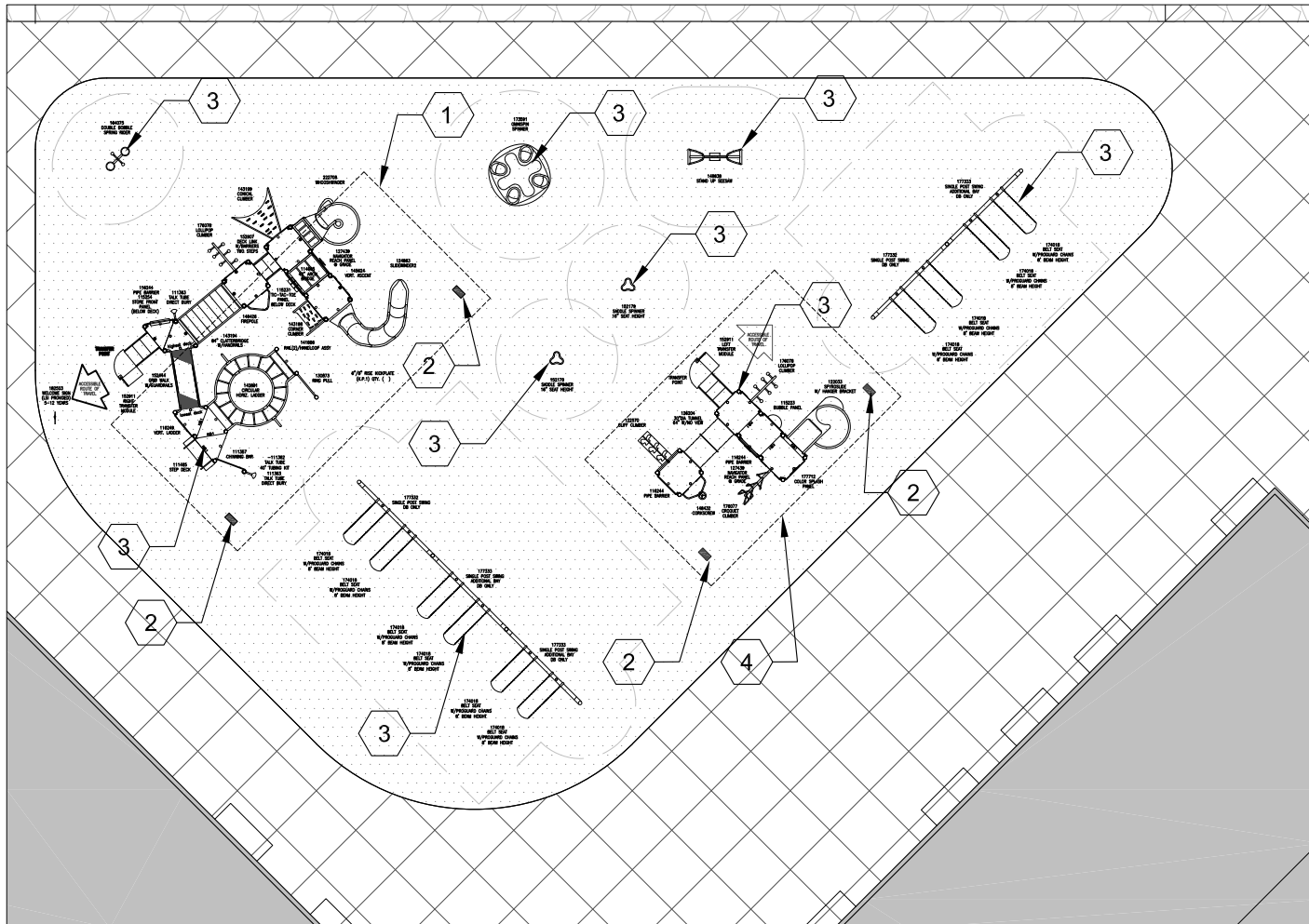
ALL OTHER TERMS AND CONDITIONS OF THE CONTRACT DOCUMENTS REMAIN UNCHANGED

*Attachment 53 pages*

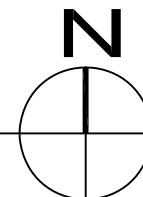
END OF ADDENDUM

# KEYED NOTES:

1. LINE OF 20' x 40' SHADE STRUCTURE OVERHEAD.
2. SHADE STRUCTURE COLUMN + FOOTING.
3. PLAY EQUIPMENT.
4. LINE OF 20' x 30' SHADE STRUCTURE OVERHEAD.



1 PLAYEQUIPMENT PLAN  
SCALE: 1"=20'-0"



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NANCY LOPEZ  
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PAA JOB NO.: 202121

PSFA PROJ. NO.:  
P19-010

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PA ARCHITECTS 2024

DATE  
ADDENDUM #3 03.29.2024

SHEET TITLE

PLAY  
EQUIPMENT  
PLAN

SHEET NO.

SKA-1



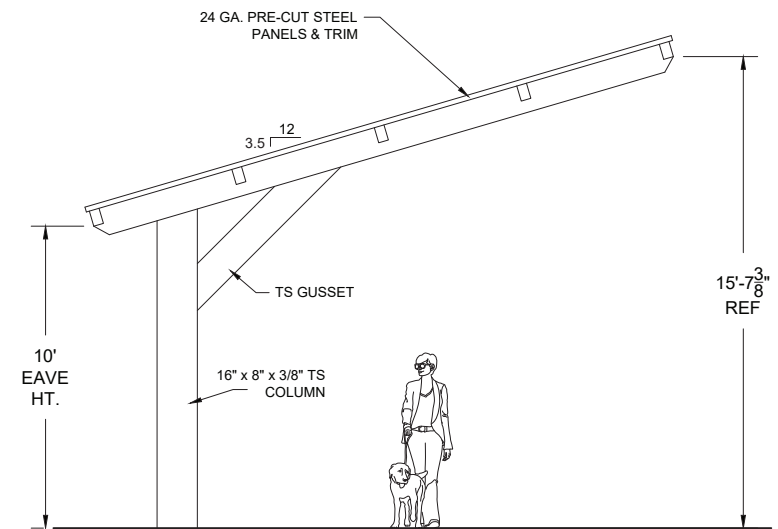
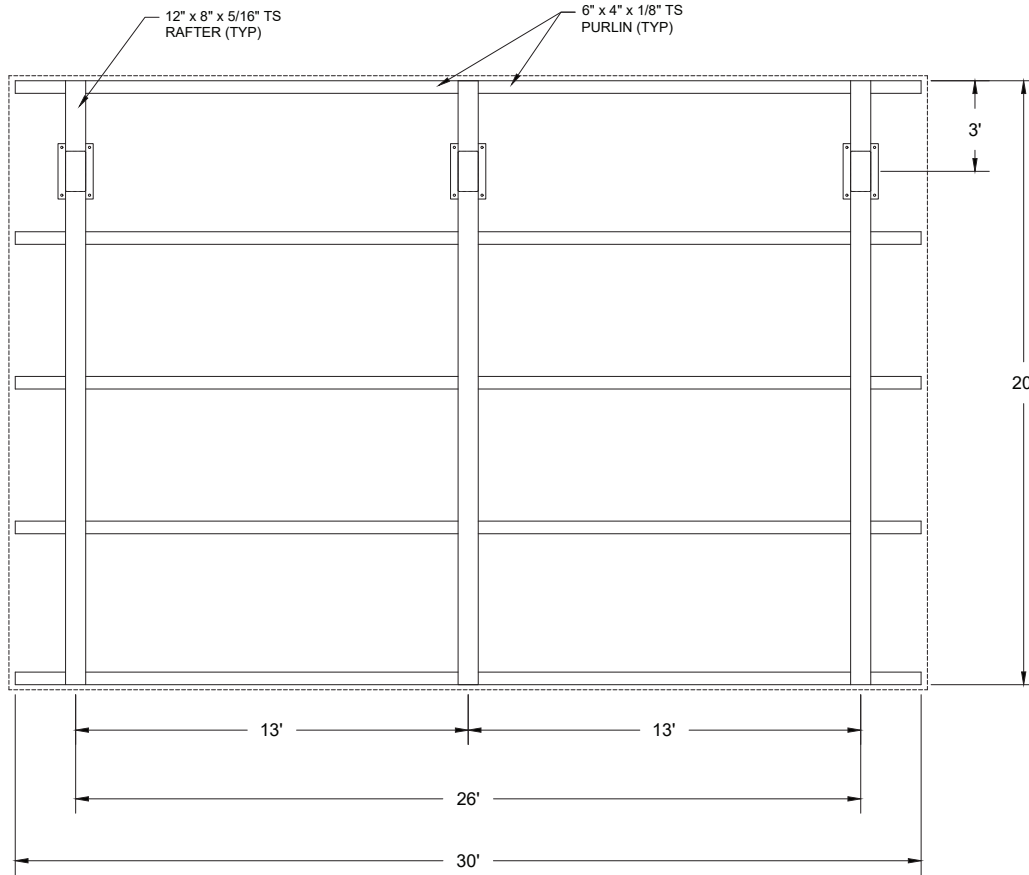
PH: 855-544-8439      www.ScenicShelters.com  
 ADDRESS: 7125 Headley Street SE #795, Ada, MI 49301

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NOTES:

TS = TUBULAR STEEL



# SKA-2 SHADE STRUCTURE

CONCEPT DRAWING - NOT FOR CONSTRUCTION		
MOD#: SCT2030-10EH-3.512PITCH	MODEL: 20x30 Steel Cantilever Monoslope Shelter	
BY: BRYAN	DRAWING SCALE: NTS	PAGE: 1 OF 1
ORG. DATE: 12-7-2023	REV. DATE: -	REV: -



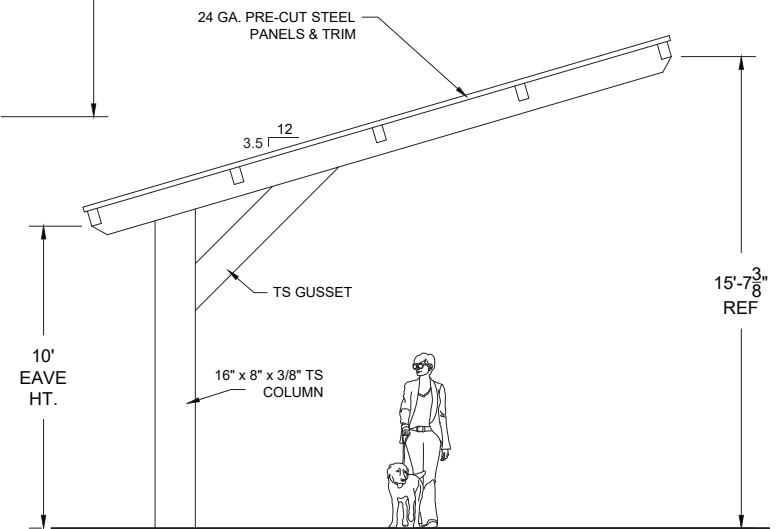
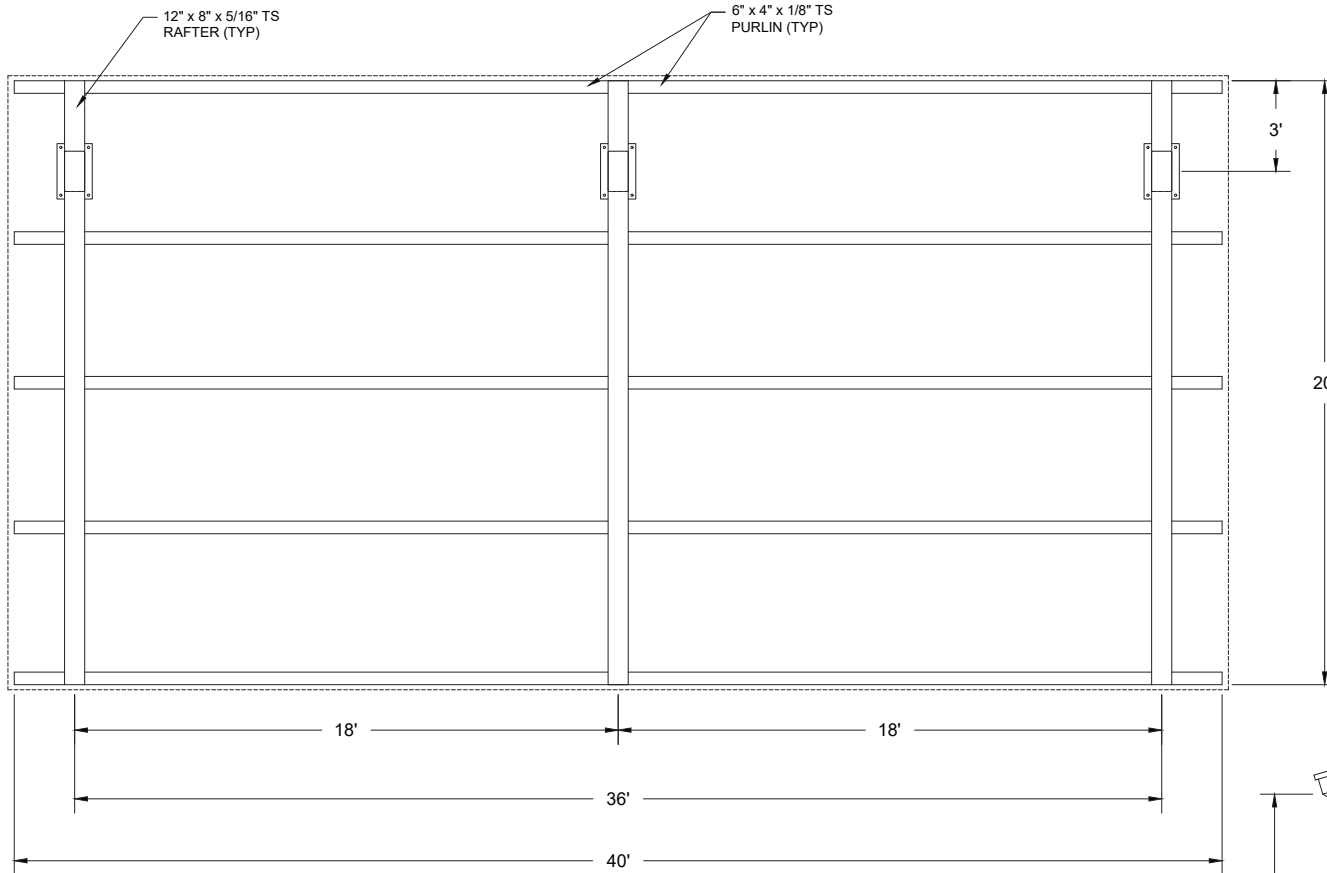
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NOTES:

TS = TUBULAR STEEL



# SKA-3 SHADE STRUCTURE

CONCEPT DRAWING - NOT FOR CONSTRUCTION

MOD#: SCT2040-10EH-3.512PITCH | MODEL: 20x40 Steel Cantilever Monoslope Shelter

BY: BRYAN      DRAWING SCALE: NTS      PAGE: 1 OF 1

ORG. DATE: 12-7-2023      REV. DATE: -      REV: -

## SECTION 32 3113 – GALVANIZED CHAIN LINK FENCES AND GATES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Work includes, but is not necessarily limited to, furnishing and installing chain link fences and gates as shown on drawings and as described below. Contractor shall furnish all supplementary items necessary for proper installation using manufacturer's components.
- B. Related Sections:
  - 1. 01 3300 Shop Drawings, product data
  - 2. 03 3000 Cast-in-Place Concrete
  - 3. 31 3000 Earthwork

#### 1.2 SUBMITTALS

- A. Product Data:

Submit manufacturer's product data, specifications and installation instructions for all products, including data substantiating that products comply with the Project drawings.
- B. Shop Drawings:

Submit complete shop and erection drawings for this work. Drawings must include post foundations.

### PART 2 – PRODUCTS

#### 2.1 FENCE AND GATES

- A. Manufacturer
  - 1. Chain Link Fence and gate design is based on products manufactured by: American Fence Company, 9634 2<sup>nd</sup> Street NW, Albuquerque, NM (505) 863-3688.
  - 2. Acceptable manufacturers: Merchants Metals (888) 260-1600  
www.merchantsmetals.com
  - 3. Subject to compliance with requirements, comparable products of equal performance may be used on Architect's review of submittals per Section 01 6300 "Product Substitution Procedures".
- B. Product Characteristics: Fence
  - 1. Fence Fabric: 2" mesh, 9 gage galvanized steel wire core per ASTM F668. Knuckled on both selvages. The fence fabric height is noted on the drawings.
    - a. Framing: Posts and rails conforming to ASTM A 569; hot rolled steel strip, cold formed to pipe configuration, longitudinally welded construction, minimum yield strength of 50 Ksi; coating conforming to ASTM F1234, Type B, on pipe exterior and interior. Fittings and Accessories: Comply with ASTM F 626, hot-dipped galvanized.
    - b. Tie Wires: 8 ¼" and 6 ½" 9-gage galvanized steel wire. Space 15 inches on center for line posts, and 24 inches on center for rails.



- c. Tension wire: 9 gage smooth wire tension wire attached to the bottom of the fence fabric with 9 gage steel hog rings spaced at 24-inches on center.
- d. Terminal Post: 2 7/8" schedule 40, 4.47 lbs. per foot. Line posts set 10' on center maximum spacing.
- e. Line Post: 2 3/8" O.D. schedule 40 pipe, 3.12 lbs. per foot. Line posts set 10'-0" on center maximum spacing.
- f. Top Rail: 1 5/8" O.D. schedule 40 pipe, 1.83 lbs. per foot. Top rail 21'-0" in length, joined with 1 5/8" sleeve.
- g. Post Brace Assembly: Terminal posts, gate posts, and at both sides of corner and pull posts with horizontal braces located at mid height of fabric braced and trussed to the nearest line post with 1 5/8 " O.D., schedule 40 pipe and 3/8" truss rod and truss rod tightener. Provide manufacturer's standard galvanized steel cap for each end.

#### C. Product Characteristics: Swing Gates

- 1. Fabric: Comply with ASTM A 342, 2-inch mesh, 9-gage core, steel galvanized chain-link fabric.
- 2. Framing: 1 7/8" schedule 40 (2.28 lbs. per foot).
- 3. Gate Posts: 4-inch diameter, 9.10 lbs. per foot, Type I, hot-dipped galvanized, with matching cap.
- 4. 6 5/8-inch diameter, 9.10 lbs. per foot, Type I, hot-dipped galvanized, with matching cap. Fittings and Accessories: Comply with ASTM F 626, hot-dipped galvanized.
- 5. Post Brace Assembly: Manufacturer's standard gate posts with horizontal braces located at mid height of fabric. Provide manufacturer's standard galvanized steel cap for each end.
- 6. Fabrication: Fabricate perimeter frames of gates from metal and finish to match fence framework. Assemble gate frames by welding. Provide horizontal and vertical members to ensure proper gate operation and attachment of fabric, hardware and accessories. Gate center rest, 2 piece drop latch, gate hinge 180° male and female, fork latch & latch catch, drop bolt and hardware for padlock. Gate hinge 180° male and female.
- 7. Gate Hardware: Gate center rest, 2 piece drop latch, gate hinge 180° male and female, fork latch and latch catch, drop bolt and hardware for padlock. Gate hinge 180° male and female.

#### D. Fabrication

- 1. Components shall be precut to specified lengths.
- 2. All fastener holes shall be predrilled.
- 3. Completed framing components shall be tested for alignment and fit at the factory prior to shipping.

#### E. Concrete

- 1. Truck poured 3,000 psi, 1-inch maximum aggregate, 3-inch maximum slump.

### 2.3 OTHER MATERIALS

- A. All other materials not specifically described but required for a complete and proper installation shall be provided by the contractor, subject to approval of Architect.

## PART 3 - EXECUTION

### 3.1 FABRICATION

- A. Fabricate the fences and gates in strict accordance with Construction Documents and approved shop drawings.

### 3.2 INSTALLATION

#### A. General

- 1. Install all fencing and gates in strict accordance with the Construction Documents and all pertinent codes and regulations and manufacturer's recommendations.

#### B. Methods

- 1. Install fencing and gates true to line, plumb, level and firmly anchored in position.
- 2. Upon completion of the fencing and gates and as a condition of their acceptance, demonstrate to the Owner's satisfaction that the gates function smoothly, lock securely and have been properly installed.

### 3.3 REPAIR/REPLACEMENT

- A. Touch-up marred and abraded surfaces to match adjacent undamaged surfaces, as approved by the Architect.
- B. Promptly replace components damaged beyond satisfactory field repair before their acceptance, with approved new components at no additional cost to the Owner.

END OF SECTION 32 3113

## SECTION 32 3119 – ORNAMENTAL FENCE AND GATES

### PART 1 - GENERAL

#### 1.01 SUMMARY

Work includes furnishing and installing an Ornamental rackable welded steel fence system and gates as shown on drawings and as described below. Contractor shall furnish all supplementary items necessary for proper installation using manufacturer's components.

#### 1.02 RELATED SECTIONS

Section 01 3300 Shop Drawings, product data  
Section 03 3000 Cast-in-Place Concrete  
Section 31 3000 Earthwork

#### 1.03 REFERENCES

ASTM A12 Hot Dip Electroplating  
ASTM A500 Seamless Grade A Metal Tubing  
ASTM F593-02e2 Stainless Steel Fasteners  
ASTM F2049 Standard Safety Performance for Fence  
ASTM F2408 Standard Specification for Ornamental

#### 1.04 WARRANTY

Materials shall include a 20-year limited warranty, from the date of purchase, for defects in material and workmanship, including protection against cracking, peeling, blistering and corrosion (rusting).

#### 1.05 SUBMITTALS

- A. Product Data:  
Submit manufacturer's product data, specifications and installation instructions for all products, including data substantiating that products comply with the Project drawings.
- B. Shop Drawings:  
Submit complete shop and erection drawings for this work. Drawings must include post foundations.

### PART 2 – PRODUCTS

#### 2.01 Basis of Design:

Fortress Fence Products  
1720 North First Street  
Garland, TX 75040  
Phone: (844) 909-1999 Fax: (972) 644-3720  
Website: [www.FortressFence.com](http://www.FortressFence.com)

Subject to compliance with requirements, comparable products of equal performance may be used on Architect's review of submittals per Section 01 6300 "Product Substitution Procedures".

## 2.02 MATERIALS:

Rails and Pickets are Grade A cold rolled 45,000 psi steel. Rails are formed U-Channel and Pickets are rolled formed and welded tubing. Both conforming to ASTM A500 with G-60 zinc coating (0.60 oz/ft<sup>2</sup>) total inside and outside surfaces in accordance with the ASTM A123 hot dipped electroplating process.

## 2.03 COMPONENTS:

- A. Rails: 1 <sup>9</sup>/<sub>16</sub>" x 1 <sup>3</sup>/<sub>16</sub>" (Leg x Web), 14 gauge formed U-Channel ASTM 500 galvanized steel.
- B. Pickets: <sup>3</sup>/<sub>4</sub>" square 16-gauge ASTM A500 galvanized welded and formed steel tubing for 4' 5' & 6' tall panels, 14-gauge ASTM A500 galvanized welded and formed steel tubing for 7' & 8' tall panels.
- C. Posts: 2 <sup>1</sup>/<sub>2</sub>" square 16-gauge, 14 gauge, or 3" square 14-gauge ASTM A500 galvanized formed and welded steel tubing with powder coated factory finish.
- D. Fasteners: All nuts, bolts, and sheet metal screws are stainless steel conforming to ASTM F593-02e2 standard.
- E. Post sizing (for fences and gates), shall be minimum as determined by manufacture to comply with performance expectations and design/ safety intent for locations as shown on drawings.

## 2.04 STYLE:

- A. Refer to Architectural Project Drawings for fabrication details of added fence component to be an integral part of fence assembly. Post spacing shall be 6'-0" o.c.
- B. Air space between pickets to meet applicable building and safety codes.

## 2.05 FABRICATION:

- A. Fence panels are fully assembled and fabricated with rail length and picket heights as shown on drawings. All panels comply with requirements indicated for materials, thickness, design and details of construction.
- B. Pickets are welded to the rails with a patented pin hinge system which allows the panel to rake without metal fatigue or damage to the finish.
- C. All welded connections comply with AWS standards for recommended practice in shop welding.
- D. All components are accurately cut and drilled to receive hardware, fasteners and accessories.
- E. Panels shall be capable of supporting a 300 lb. load (applied at mid-span) without permanent deformation. Panels shall be rackable to a 30" change in grade.

## 2.06 FINISH:

- A. Materials are coated with the Fortress Shield process including galvanization, zinc phosphate, electrodeposition (E-coat), and architectural grade powder coat.
- B. Metal parts are assembled and finished individually prior to shipment.
- C. Galvanized steel fence components are cleaned with a non-petroleum solvent followed by the application of a sealing zinc phosphate coating.
- D. Immediately after sealing, a two-step finishing process consisting of:
  - 1. An electrostatic dipping process in a lead-free high corrosion resistant epoxy resin leaving a coating of approximately 20 microns.

2. A thermosetting carboxyl polyester resin topcoat with a minimum dry film thickness of 60 to 70 microns. The second coating will be applied by the electrostatic spray process.
- E. Color Bronze.

### PART 3 - EXECUTION

#### 3.01 PREPARATION

- A. Stake layout showing locations of all gates and posts.

#### 3.02 INSTALLATION

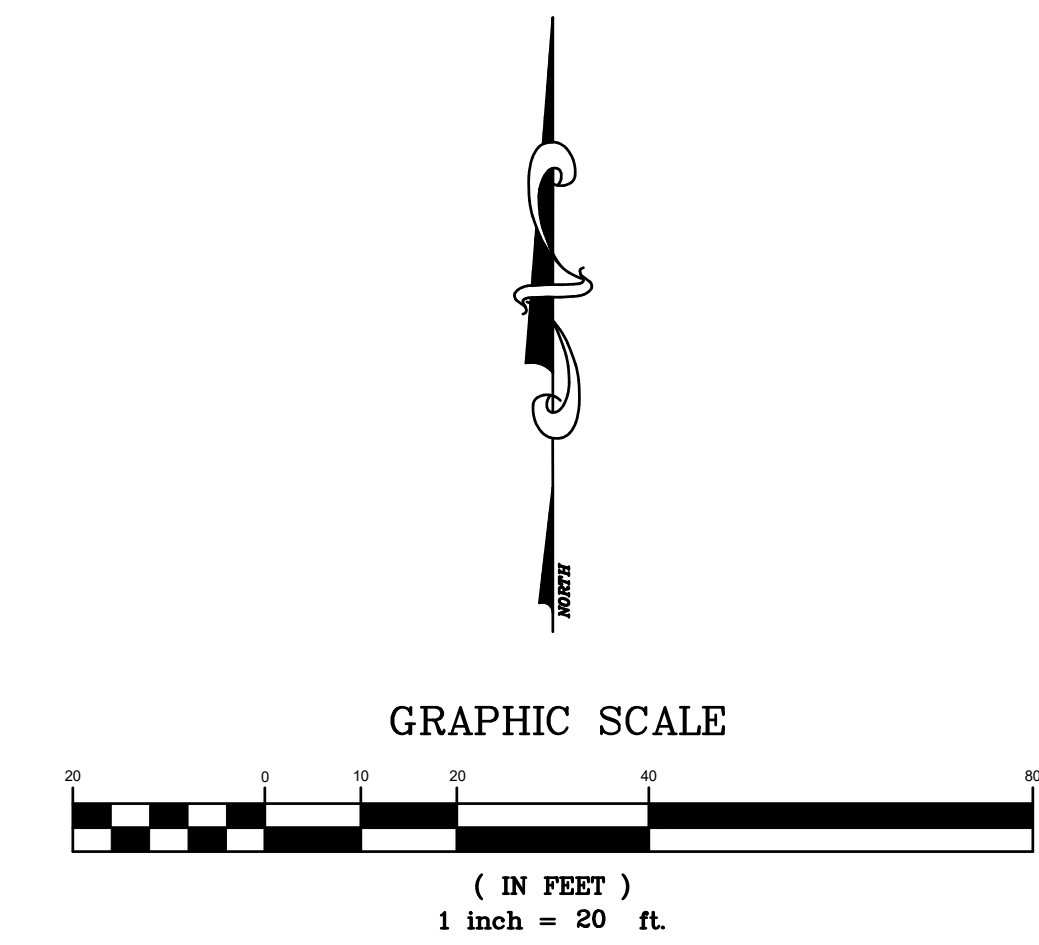
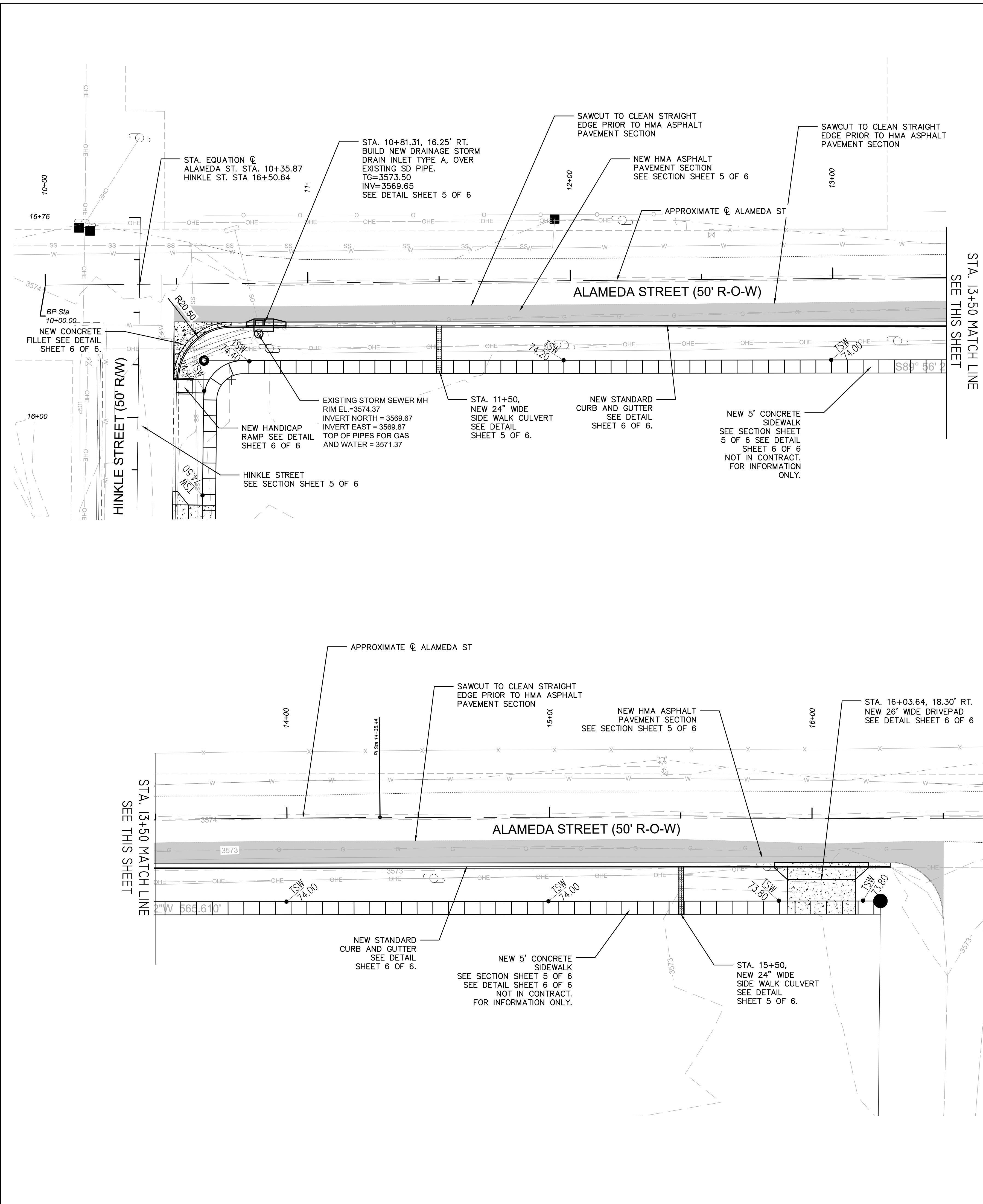
- A. Install fences in accordance with manufacturer's written instructions and in accordance with the Construction Documents.
- B. Concrete Set Posts: Drill hole in firm soil. Posts holes will be a minimum of 36" deep (environmental conditions or local codes may require a greater depth). Fence post shall be spaced as shown on Project Drawings to accommodate installation of brackets on square post. For non-level installations, the on-center post spacing must be measured along the grade.
- C. Installation is to conform to the specifications referenced in Section 1.02 of this specification.
- D. Install Fortress brackets onto fence section and posts as indicated in printed instructions for specific fence style. Attach fence sections to brackets with approved fasteners and techniques to ensure that fence sections are parallel to grade within 1/4" in 12 feet.
- E. Gate Installation: Install in accordance with printed instructions. Do not mount gate from wall of a structure. Provide gate post on both sides of a gate. For double drive gate installation, provide concrete center drop to foundation depth and drop rod retainers at center. Lubricate to ensure smooth operation and verify proper latch operation.

#### 3.03 CLEANING

- A. Remove all cutting and drilling chips that are attached to the fencing, post, brackets or additions to prevent corrosion.
- B. Repair scratches and other installation-incurred damage. Using a spray paint of the appropriate color that includes a zinc additive, repaint and seal any scratches or holes drilled in the fencing, post, brackets, or additions to prevent rust from forming. Clean up debris and unused material and remove from site.

END OF SECTION 32 3119

D:\hawks drafting\Scott.Mcgee.Elem.Roswell\good\Plan SET for NLES.dwg



- LEGEND**
- PROPERTY LINE
  - - - ADJACENT PROPERTY LINE
  - OHE — OVERHEAD ELECTRIC LINE
  - W — WATER LINE
  - G — GAS LINE
  - SS — SANITARY SEWER LINE
  - C — CURB AND GUTTER
  - E — EDGE OF TWO-TRACK DIRT ROAD
  - X — CHAIN LINK FENCE
  - // — BARBED WIRE FENCE
  - // — WOOD FENCE
  - FOUND 1/2" REBAR WITH CAP
  - STAMPED "21207"/CONTROL POINT
  - STREET SIGN
  - UTILITY POLE
  - SANITARY SEWER MANHOLE
  - WATER VALVE
  - WATER METER
  - FIRE HYDRANT

AS BUILT INFORMATION	
CONTRACTOR	DATE:
WORK STAKED BY	DATE:
INSPECTOR'S APPROVAL	DATE:
FIELD VERIFICATION BY	DATE:
DRAWING CORRECTED BY	DATE:
MICRO-FILM INFORMATION	DATE:
RECORDED BY	NO.

BENCH MARK	
XXX	NAD 1983 Central Zone
X=XXX	Y=XXX; U.S. Survey Feet
ELEV. = XXX	(NAVD 1988)

SURVEY INFORMATION	
FIELD NOTES	BY
SMITH ENGINEERING	AUGUST, 2022

REVISIONS/REMARKS	
NO.	DATE

DESIGNED BY:	SM	DATE:	08/20/2023
DRAWN BY:	HD	DATE:	08/20/2023
CHECKED BY:	SM	DATE:	08/20/2023

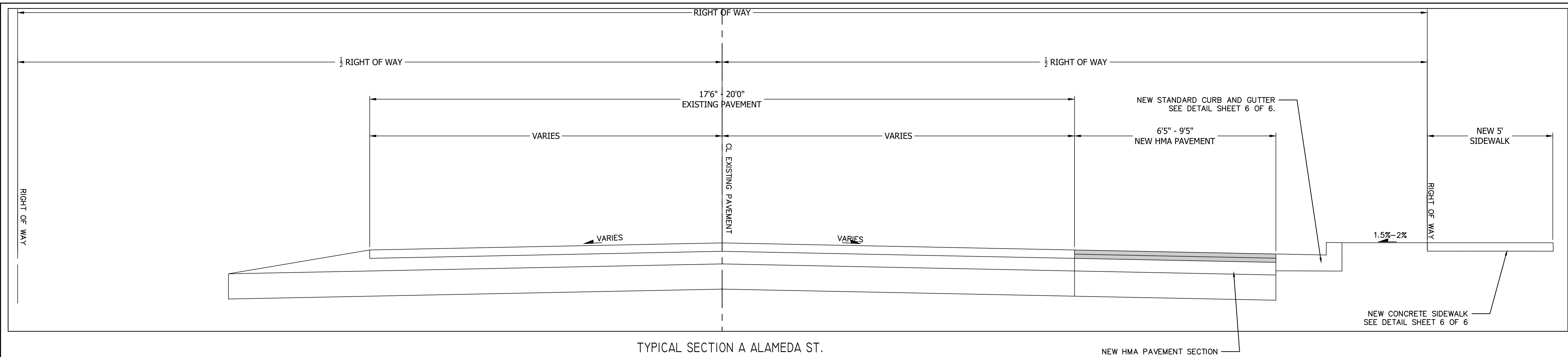


ROSWELL INDEPENDENT SCHOOL DISTRICT

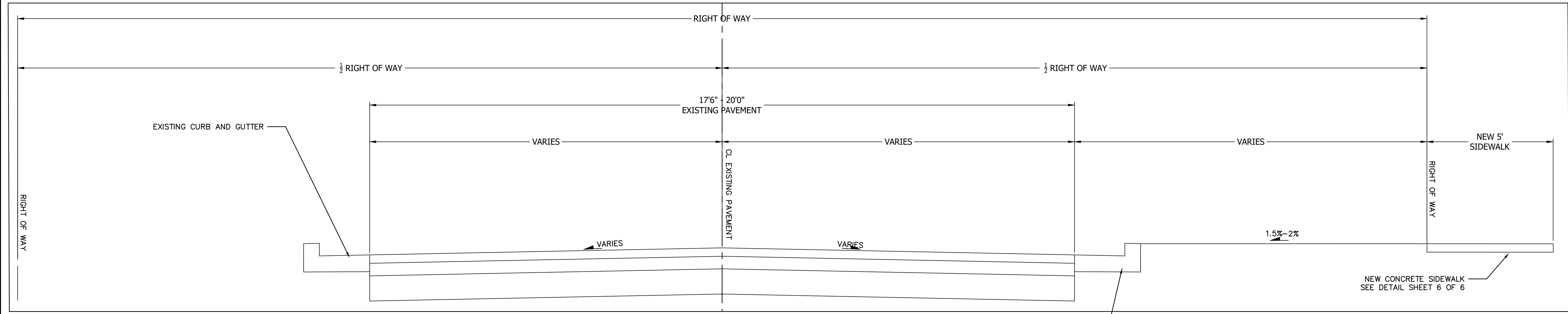
TITLE: PUBLIC INFRASTRUCTURE PLANS FOR HINKLE AND ALAMEDA ST. ROSWELL, NM

DESIGN REVIEW COMMITTEE	CITY ENGINEER APPROVAL	MO. 7 DAY 7 YR.	MO. 7 DAY 7 YR.

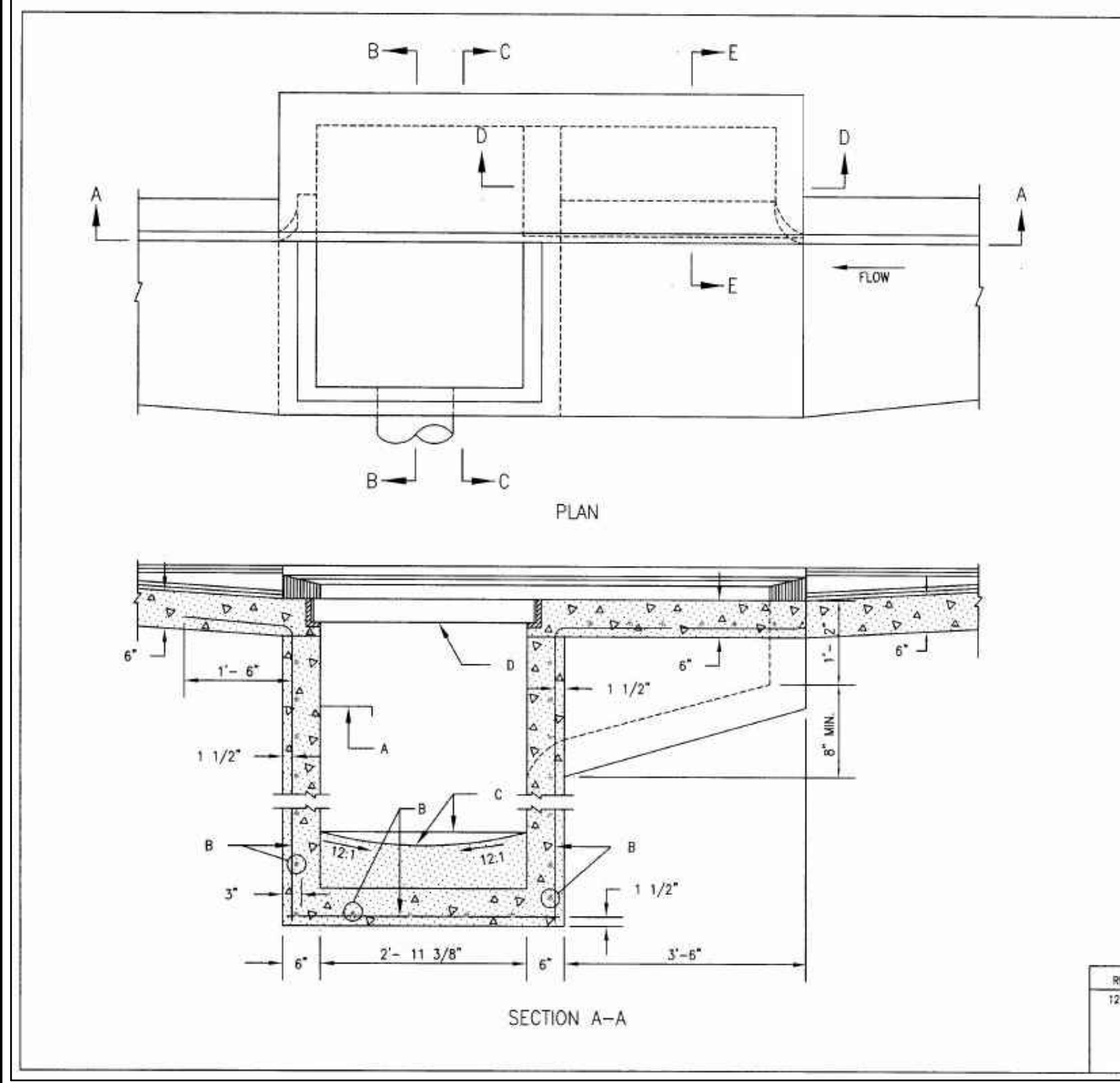
CITY PROJECT No. XXXXXXXX      ZONE MAP No. XXXX      SHEET: 3 OF 6



TYPICAL SECTION A ALAMEDA ST.

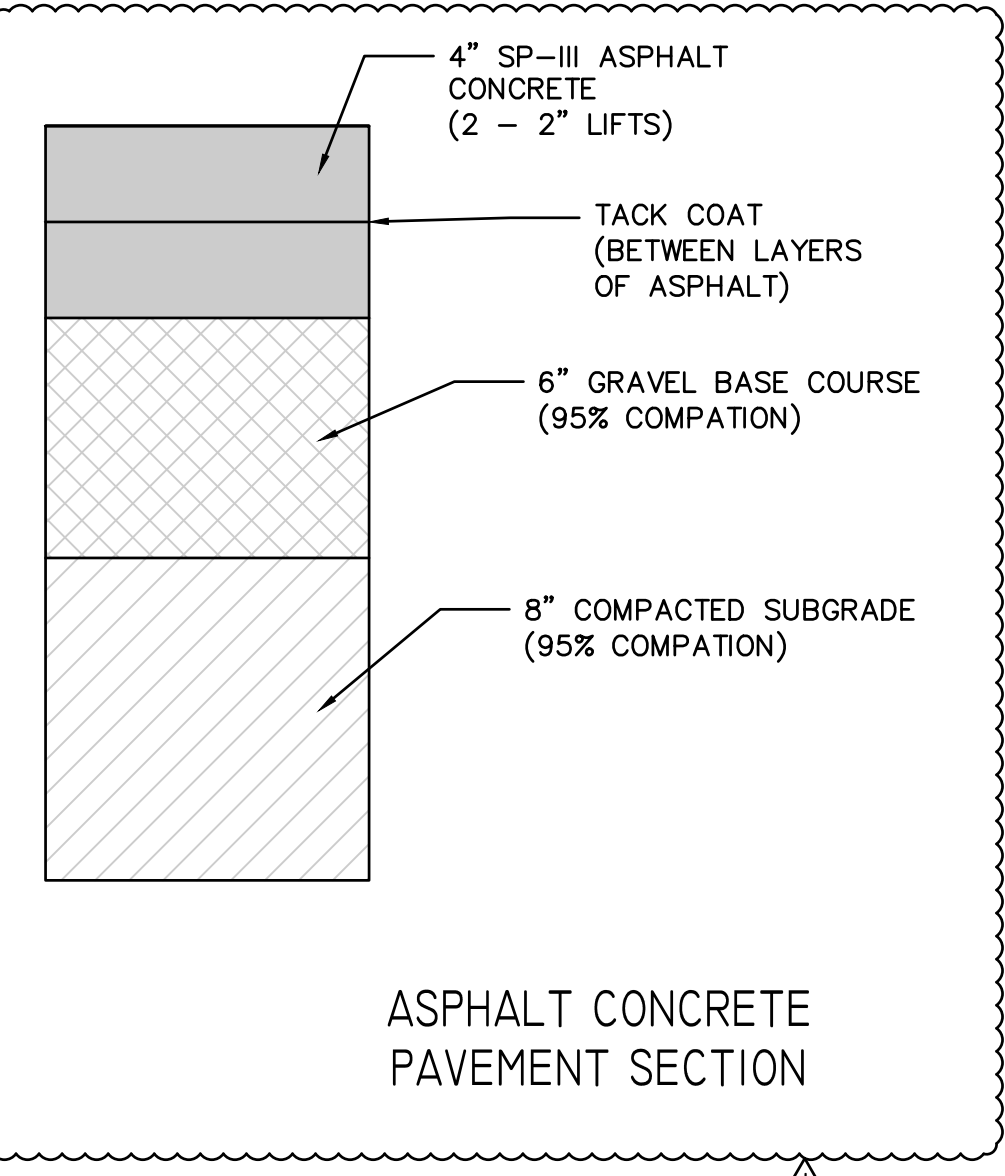
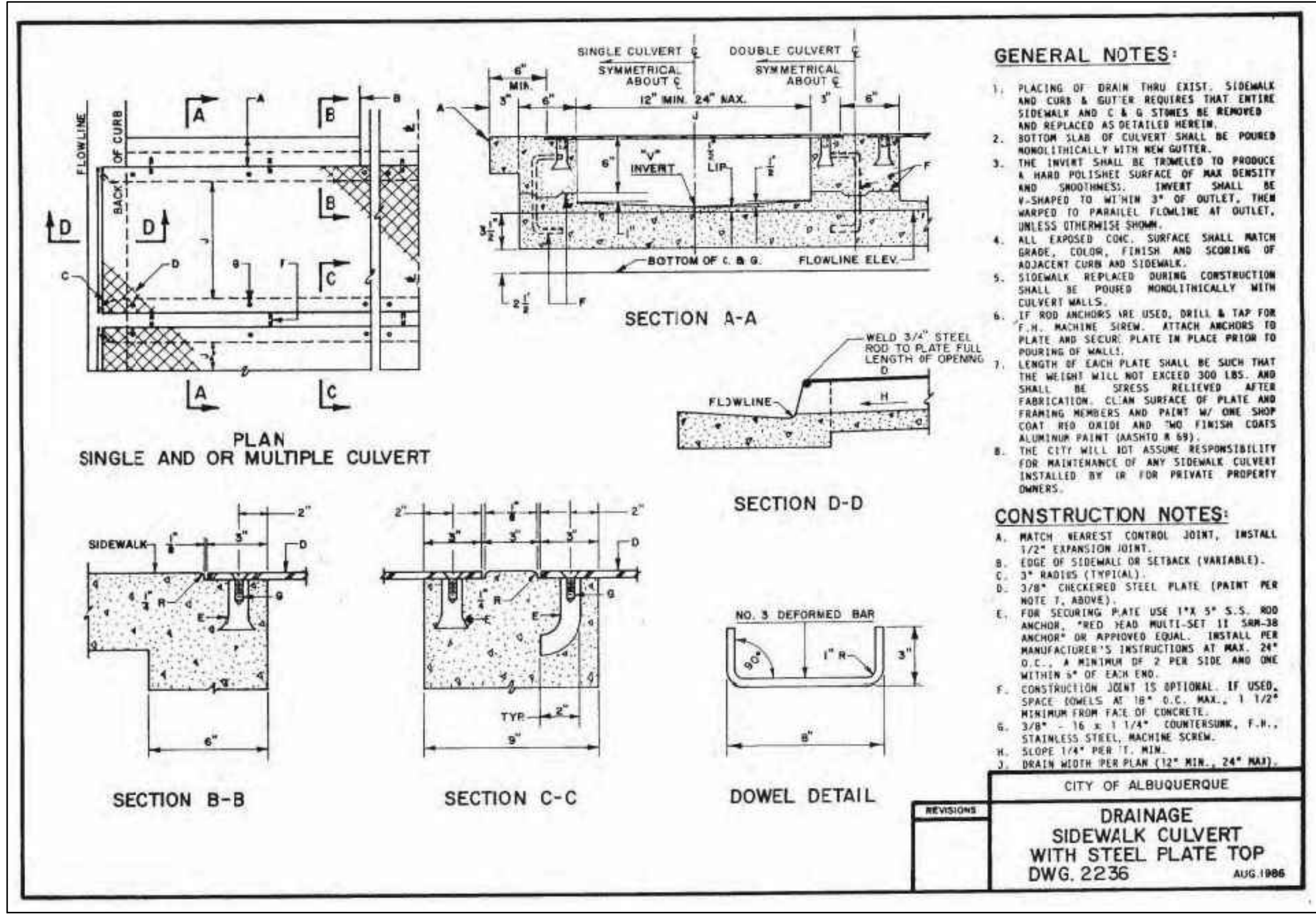


TYPICAL SECTION A HINKLE ST.



- GENERAL NOTES:**
- SEE DWG. 2202 FOR TYPE "A" INLET SECTIONS.
  - FOR STORM INLET GUTTER TRANSITION, SEE DWG. 2207.
  - OUTLET PIPE SIZE, PER DESIGN REQUIREMENT.
  - FOR FRAME & GRATING, SEE DWG. 2216, 2220 & 2221.
- CONSTRUCTION NOTES:**
- FOR STORM INLET DEPTHS GREATER THAN 4", INSTALL STD. STEPS, SEE DWG. 2228. STEPS ARE TO BE INSTALLED ON DOWNSTREAM FACE OF INLET.
  - NO. 4 BARS AT 6" O.C. EACH WAY.
  - CONCRETE FILL, MINIMUM SLOPE SHOWN IN SECTION A-A.
  - GRATE.

REVISIONS	NM APWA
12-21-92	DRAINAGE STORM INLET TYPE "A" PLAN AND SECTION A-A DWG. 2201
	FEB. 2006



AS BUILT INFORMATION	
CONTRACTOR	DATE:
WORK STAKED BY	DATE:
INSPECTOR'S APPROVAL	DATE:
FIELD VERIFICATION BY	DATE:
DRAWING CORRECTED BY	DATE:
MICRO-FILM INFORMATION	
RECORDED BY	DATE:
	NO.

SURVEY INFORMATION	
XXX	FIELD NOTES
BY	
SMITH ENGINEERING	
AUGUST, 2022	

REVISIONS/REMARKS	
NO.	DATE
1	3/27/24
ADDENDUM NO. 3	
BY	DATE
	08/20/2023
DESIGNED BY:	SM
DRAWN BY:	HD
CHECKED BY:	SM
DATE:	08/20/2023



ROSWELL INDEPENDENT SCHOOL DISTRICT	
TITLE: PUBLIC INFRASTRUCTURE PLANS FOR HINKLE AND ALAMEDA ST. ROSWELL, NM	
DESIGN REVIEW COMMITTEE	CITY ENGINEER APPROVAL
CITY PROJECT NO.	ZONE MAP NO.
XXXXXXX	XXXX
SHEET: 5	OF 6

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SECTION 25 00 00 - INTEGRATED AUTOMATION INDEX

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including General Special Conditions and the General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

- A. Furnish all service tools, equipment, etc., which are required for the complete installation of all Integrated Automation Work, as indicated on the Drawings, and specified herein. Integrated Automation work indicated on the Drawings and/or specifications covering other trades shall conform to Division 25 of these Specifications.
- B. Work or equipment not indicated or specified, which is necessary for the complete and proper operation of the Integrated Automation systems shall be accomplished without additional cost to the Owner.
- C. Furnish all labor and materials required for Integrated Automation service connections to all the various items of equipment requiring controls service throughout the project shown on the Contract Drawings (even if not shown on Integrated Automation Drawings). Coordinate with other trades for the installation of required connections and service.

1.3 INTEGRATED AUTOMATION DIVISION INDEX

250500	GENERAL INTEGRATED AUTOMATION REQUIREMENTS
251000	DIRECT DIGITAL CONTROL (DDC) SOFTWARE AND COMPONENTS
251100	ELECTRICAL CONTROLS AND INTERLOCKS
253000	CONTROLS AND INSTRUMENTATION

PART 2 – PRODUCTS: Not Used.

PART 3 – EXECUTION: Not Used.

END OF SECTION 25 00 00



## SECTION 25 05 00 - GENERAL INTEGRATED AUTOMATION REQUIREMENTS

### PART 1 – GENERAL

#### 1.1 SUMMARY

- A. Section Includes: General Mechanical Requirements specifically applicable to Division 25 sections in addition to Division 1- General Requirements.
- B. Scope:
  - 1. The work covered by this division consists of performing all operations in connection with the installation of heating, cooling, ventilating, and plumbing including site utility work as indicated under this section. This entire section applies to all mechanical work and all mechanical sections of these specifications. This Contractor shall read and comply with all sections of these specifications including all General and Special Conditions.

#### 1.2 REFERENCES

- A. Standard Requirements:
  - 1. For products or workmanship specified by association, trade, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. All work shall be executed in accordance with the local and state codes, ordinances, and regulations governing the particular class of work involved. This Contractor shall be responsible for the final execution of the work under this heading to suit these requirements. In the event of a conflict between the various codes and standards, the more stringent shall govern. Where these specifications and accompanying drawings conflict with these requirements, the Contractor shall report the matter to the Architect/Engineer. The Architect/Engineer shall prepare any supplementary drawings required, illustrating how the work may be installed so as to comply. On approval of the change by the Architect/Engineer, the Contractor shall install the work in a satisfactory manner without additional cost to the Owner. On completion of the various parts of the work, the installation shall be tested by the constituted authorities and approved, and on completion of the work, this Contractor shall obtain and deliver to the Owner final certificates of acceptance. This Contractor shall furnish copies of each certificate to the Architect/Engineer.
- C. The Contractor shall secure all permits and licenses for his work and shall pay all fees in connection with such permits and licenses.
- D. The contractor shall hold and save the Owner free and harmless from liability of any nature or kind arising from his failure to comply with codes and ordinances.
- E. Any and all meter deposits and all utility extension costs shall be paid by the Contractor whose work is done in connection with the service that the meter is connected to.

F. Schedule of Referenced Organizations: The following is a list of the acronyms of organizations referenced in these Specifications:

1. AABC Associated Air Balance Council
2. ADC Air Diffusion Council  
435 North Michigan Ave.  
Chicago, IL 60611
3. AMCA Air Movement and Control Association  
30 West University Drive  
Arlington Heights, IL 60004
4. ANSI American National Standards Institute  
1430 Broadway  
New York, NY 10018
5. ASHRAE American Society of Heating Refrigerating and Air  
Conditioning Engineers  
345 East 47th Street  
New York, NY 10017
6. ASME American Society of Mechanical Engineers  
345 East 45th Street  
New York, NY 10017
7. ASTM American Society for Testing and Materials  
1916 Race Street  
Philadelphia, PA 19103
8. FM Factory Mutual System  
1151 Boston-Providence Turnpike  
Norwood, MA 02062
9. FS Federal Specification  
General Services Administration  
Specifications and Consumer Information Distribution  
Section (WFSIS)  
Washington Navy Yard, Building 197  
Washington, DC 20407
10. NBFU National Board of Fire Underwriters  
5530 Wisconsin Avenue, Suite 750  
Chevy Chase, Maryland 20815
11. NEC National Electric Code (of NFPA)
12. NEBB National Environmental Balancing Bureau  
8224 Old Courthouse Road  
Vienna, VA 22180

- 13. NEMA  
National Electrical Manufacturer's Association  
2101 L Street, NW  
Washington, DC 20037
- 14. NSF  
National Sanitation Foundation  
Box 1468  
Ann Arbor, MI 48106
- 15. OSHA  
Occupational Safety and Health Administration  
U.S. Department of Labor
- 16. SMACNA  
Sheet Metal and Air Conditioning Contractor's  
National Association  
8224 Old Courthouse Road  
Vienna, VA 22180
- 17. TIMA  
Thermal Insulation Manufacturers Association  
Technical Services  
1420 King Street  
Alexandria, VA 22314
- 18. UL  
Underwriters Laboratories, Inc.  
333 Pfingston Road  
Northbrook, IL 60062

G. Underwriters Laboratories Inc. (UL): All materials, appliances, equipment, devices, or appurtenances shall conform to the applicable standards of Underwriters Laboratories Inc., where such standards have been established.

### 1.3 DRAWINGS

- A. Drawings and specifications shall be considered as cooperative, and work or materials called for by one and not mentioned in the other, or vice versa, shall be done and furnished as though treated by both.
- B. In the cases of discrepancies in figures, drawings, or specifications, the Architect/Engineer shall be notified immediately, and his decision shall determine the necessary adjustment. Without such decision, said discrepancies shall not be adjusted by the Contractor save only at his expense, and, in case of any settlement or any complication arising from such adjustment to the Contractor, he shall bear all extra expense involved.
- C. Should it appear that the work intended to be done, or any of the matters relative thereto, are not sufficiently detailed or explained on the drawings or specifications, the Contractor shall apply to the Architect/Engineer for such further drawings or explanations as may be necessary, allowing a reasonable time for the Architect/Engineer to supply same, and the Contractor shall conform to same as part of the Contract.
- D. Should any doubt or question arise in respect to the true meaning of the drawings or specifications, reference shall be made to the Architect\Engineer whose decision shall be final

and conclusive. No alleged oral admission, condonation, or inadvertent neglect on the part of the Architect/Engineer will be accepted as an excuse for inferior work.

- E. The mechanical plans do not give exact details as to elevations of ductwork and piping, exact locations, etc., and do not show all offsets, control lines, pilot lines, and other installation details. The Contractor shall carefully lay out his work at the site to conform to the structural conditions, provide proper grading of lines, to avoid all obstructions, to conform to details of installation supplied by the manufacturer of the equipment to be installed, and thereby to provide an integrated, satisfactory operational installation.
- F. Should the particular equipment which any Bidder proposes to install, require other space conditions than those indicated on the drawings, the Bidder shall arrange for such space with the Architect/Engineer before submitting his bid. Should changes become necessary on account of failure to comply with these details, the Contractor shall make such necessary changes at his (the Contractor's own expense).
- G. The Contractor shall submit working scale drawings of all his apparatus and equipment which in any way varies from these specifications and plans which shall be checked by the Architect/Engineer and approved before the work is started, Contractor before work proceeds. Interference with structural conditions shall be corrected by the Contractor.
- H. All equipment shall be installed in accordance with the manufacturer's recommendations. Provide all accessories and components for optimum operation as recommended by the manufacturer.

#### 1.4 SYSTEM DESCRIPTIONS

- A. Not Used.

#### 1.5 PRIOR APPROVALS

- A. Each equipment item for which the Contractor desires to install equipment other than the specific item identified in the equipment schedule or equivalent equipment by manufacturers specifically named in the schedule, the Contractor shall bear full responsibility to prove to the Engineer that the furnished equipment is equivalent to or better than the specified item. Failure to provide such proof will result in rejection of the shop drawing submittal by the Engineer. Prior written or verbal approval by the Engineer of equipment by other manufacturers will not relieve the Contractor of responsibility to provide equivalence. Prior approval is not required, however, any prior approval given is intended only to provide preliminary agreement that the alternate manufacturer may make equipment that complies with the specification requirements and not that all equipment manufactured by him is acceptable.

#### 1.6 SHOP DRAWINGS

- A. Shop drawings or fully descriptive catalog data shall be submitted by the Contractor for all items of material and equipment furnished and installed under this Contract. This shall include piping, ductwork, mechanical equipment, plumbing equipment, control items, etc. The Contractor shall submit to the Architect/Engineer a sufficient number of copies of all such shop drawings or catalog data to provide him with as many review copies as he may need, plus three (3) copies for retention by the Architect/Engineer. No materials or equipment shall be installed until officially approved by the Architect/Engineer.

- B. Before submitting Shop Drawings to the Architect/Engineer for review, the Contractor shall examine them and satisfy himself that they are correctly representative of the material or equipment to which they pertain. The Contractor shall so note these Drawings before submitting them. The Contractor's review of Shop Drawings is not intended to take the place in any way of the official review of the Architect/Engineer, and the Shop Drawings which have not been reviewed by the Architect/Engineer shall not be used in fabrication or installing any work.
- C. The review of Shop Drawings or catalog data by the Architect/Engineer shall not relieve the Contractor from responsibility for deviations from the plans and Specifications unless he has, in writing, specifically called attention to such deviations as the time of submission and has obtained the permission of the Architect/Engineer thereon, nor shall it relieve him from the responsibility for error of any kind in Shop Drawings. When the Contractor does call such deviations to the attention of the Architect/Engineer, he shall state in his letter whether or not such deviations involve any extra cost. If this is not mentioned, it will be assumed that no extra costs are involved for making the change.
- D. After receiving approval on the make and type of materials, the Contractor shall order such materials in sufficient time so that no delay or changes will be caused. This is done to facilitate progress on the job and failure on the part of the Contractor shall render him liable to stand the expense of any and all delays occasioned by failure on this part to provide necessary details. All shop drawings shall be delivered to the Architect/Engineer's office within thirty (30) days from the date of the contract.
- E. Shop drawings will be returned unchecked unless the following information is included: reference to all pertinent data in the Specifications or on the drawings, size and characteristics of the equipment, name of the project and a space large enough to accept an approval stamp. The data submitted shall reflect the actual equipment performance under the specified conditions and shall not be a copy of the scheduled data on the drawings.

## 1.7 SUBMITTALS

- A. Submittal data shall be organized in commercial quality, three ring binders with durable and cleanable covers. Product information for each piece of equipment shall be separated by an indexing leaf with clear tabs. The product name and symbol (i.e., AHU/Air Handling Unit) shall be typed on white paper inserts and placed in appropriate tab. Complete data must be furnished showing performance, quality, and dimensions. A signed review by the Architect/Engineer must be obtained before purchasing any equipment.
- B. The following items shall be submitted for review by the Architect/Engineer but are not limited to:
  - 1. Temperature Controls
  - 2. Vibration Equipment and Calculations

## 1.8 QUALITY ASSURANCE

- A. General: Comply with Division 1.

- B. Welder Qualifications: Welders shall be certified by the American Society of Mechanical Engineers (ASME) National Certified Pipe for the type of work being performed. Current operators' certificates in accordance with ASME standards shall be on file at the site and shall be available to the Architect/Engineer for examination. Coupons shall be available for review by the Architect and Engineer.
- C. Locations of all pipes, ducts, outlets, appliance, etc., as shown on the drawings, are approximate only and are understood to be subject to such revisions as may prove necessary or desirable at the time the work is installed. Each Contractor will be required to install his work with relation to existing building conditions and shall be entirely responsible for the correctness of his work with reference to finished elevations, etc. Piping shown on the drawings is diagrammatic only and their exact locations, depths, and invert elevations shall be as required for proper flow and coordination with other trades.
- D. The contract drawing depicts graphically the arrangement of piping and ductwork. Should local conditions necessitate a rearrangement, or if any of the piping or ductwork can be installed to better advantage in a different manner, the Contractor shall, before proceeding with the work, prepare and submit three (3) copies of Drawings of the proposed arrangement for the Architect/Engineer's review.
- E. If the Contractor proposes to install equipment, including piping and ductwork, requiring space conditions other than those shown, or to rearrange the equipment, he shall assume full responsibility for the rearrangement of the space and shall have the Architect/Engineer review the change before proceeding with the work. The request for such change shall be accompanied by Shop Drawings of the space in question.
- F. Each Contractor is responsible for the proper location and size of all slots, holes, or openings in the building structure pertaining to his work, and for the correct location of pipe sleeves.
- G. Each Contractor shall coordinate his work with that of all other trades that it may be installed in the most direct and workmanlike manner without hindering or handicapping the other trades. Piping interferences shall be handled by giving precedence to pipelines which require a stated grade for proper operation. Drainage lines shall take precedence over water lines in determination of elevations. In all cases, lines requiring a stated grade for their proper operation shall have precedence over electrical conduit and ductwork.
- H. All oiling devices and all parts of equipment requiring adjustment shall be easily accessible. Lubricate all equipment properly in accordance with manufacturer's instructions. Furnish zerk grease fittings on all greaseable bearings.
- I. Equipment and Materials: The materials and equipment shall be new and shall be the standard products of the manufacturers regularly engaged in the production of Plumbing, Heating, Cooling, Ventilation, and Fire Protection Equipment, and shall be the manufacturer's latest standard design. Where two or more units of the same class of equipment are required, these units shall be the products of the same manufacturer. However, the component parts of the systems need not be the products of the same manufacturer. Specific equipment specified hereinafter is to be considered a standard of quality and operation. In general, all capacities of equipment, and motor and starter characteristics are shown in schedules on the drawings. Reference shall be made to the schedules for specific information. The capacities shown are minimum capacities. Variations in the characteristics will be permitted only on written approval of the

Architect/Engineer. All equipment shall be shipped to the job with not less than a prime coat of paint or as specified hereinafter. Insofar as is possible all items of the same type (i.e., pumps, fans, etc.) shall be by the same manufacturer. Where installation instructions are not included in these specifications or on the plans, the manufacturer's instructions shall be followed. All equipment affected by altitude shall be rated to operate at the altitude where it is to be installed.

- J. Excavation and Backfilling: This Contractor shall do all necessary excavation and backfill for the installation of the Mechanical systems as may be required. Curb cuts, asphalt, and concrete patching, cutting, and patching existing floor, etc., shall be part of this Contractor's responsibility. No extra payment will be made for rock excavation. Trenches for all underground piping shall be excavated to the required depths. The bottoms of trenches shall be tamped hard and graded to secure maximum fall. Bell holes shall be excavated to assure the pipe resting for its entire length on solid ground. Should rock be encountered, it shall be excavated to a depth of 6 inches below the bottom of the pipe, and before laying the pipe, the space between the bottom of the pipe and the rock surface shall be filled with gravel, thoroughly tamped. Pipe laid in trenches dug in fill shall be supported down in the trenches and shall be filled. No roots, rocks or foreign materials of any description shall be used in backfilling the trenches. The backfill material shall be identical to the surrounding fill material and shall be placed in 6-inch layer, wetted, and compacted to the density of the adjacent soil. See Division 2 for additional information for site utilities. All surplus materials shall be hauled from the project by the Contractor at his expense.
- K. Cutting and Repairing:
1. Responsibility of the Contractor whose work is involved. Coordinate with others to prevent unnecessary cutting and repairing.
  2. Lay out and locate equipment, openings, and chases. Install sleeves, inserts, and supports. Arrange with those whose work is involved to do cutting and replacing caused by negligence or error with costs reimbursed by the Contractor at fault. Cutting and replacing of existing work shall be the responsibility of the Contractor whose work is being installed.
  3. Removal or terminating connections of existing work which is abandoned or replaced shall also be done hereunder to provide correct and finished work.
- L. Foundations: All equipment shall be provided with suitable foundations and supports. It shall be the responsibility of the Contractor to provide for the proper locations of these foundations and supports. This applies to all rooftop equipment also.
1. All concrete foundations required by equipment furnished by the Mechanical Contractor shall be constructed by them (except where otherwise noted) the conformity with the recommendations of the manufacturer of the respective equipment, and with the approval of the Architect/Engineer. All corners of the foundations shall be neatly chamfered. Foundation bolts shall be placed in the forms when the concrete is poured. Allow 1 inch below the equipment base for alignment, leveling and grouting with non-shrinking grout. Grouting shall be done after the equipment is leveled in place. After the grout has hardened, the foundation bolts shall be pulled up tight and the equipment shimmed, if necessary. After removal of the forms, the surface of the foundation shall be rubbed.

2. Unless otherwise noted, foundations shall be a minimum of 6-inch high. All concrete work performed by these Contractors shall conform entirely to the requirements of the Concrete Specifications which describe this class of work.
- M. Code Requirements: Comply with state and local code requirements and ordinances. Call for inspections required by responsible building inspection authority.
- N. Applicable Building Codes and Ordinances: Including the latest edition of each code, but not limited to the following:
1. International Building Code.
  2. Uniform Mechanical Code.
  3. Uniform Plumbing Code.
  4. Governing Fire Department Requirements
  5. Utility Company Requirements
  6. National Fire Protection Association Standards
  7. NFPA 70 - National Electrical Code
  8. NFPA 90A - Installation of Air Conditioning and Ventilating Systems
  9. NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems
  10. NFPA 13 - Sprinkler Systems
  11. NFPA 101 - Life Safety
  12. NFPA 96 - Installation of Equipment for the Removal of Smoke and Grease Laden Vapors from Commercial Cooking Equipment
- O. Access Panels
1. Similar to Milcor, or as noted on the drawings, size as required for concealed expansion joints, valving, gauges, balancing dampers, valves, traps, pitot stations, equipment and similar items requiring accessibility. Notify the General Contractor of each access panel location and the required size. Panels shall be proper type for ceiling or wall in which they are installed. The panels shall be furnished under this section of the Specifications, unless otherwise directed, but shall be coordinated to be compatible with walls and ceilings furnished under other sections.

## 1.9 DELIVERY, STORAGE AND HANDLING

- A. General: Comply with Division 1.



- B. Large Items: Make arrangements with other trades on the job for introduction into the building of equipment too large to pass through finished openings.
- C. Acceptance: Check and sign for materials to be furnished by others for installation under all Mechanical Divisions upon delivery. Contractor shall be responsible for the storage and safekeeping of such materials from time of delivery until final acceptance.
- D. Protection: Close ends of pipe and ductwork at the close of each working day during construction to prevent entry of foreign material. Protect insulation against dirt, water, chemical or mechanical damage before, during and after installation. Protect fixtures and equipment against damage during mechanical work with heavy paper or plastic until final clean-up.
- E. Storage: Store equipment in covered enclosure or wrap with weather tight 6 mil Visqueen.
- F. Shipping Protection: Protective casings, crating, and coverings to remain in place until start-up of equipment.

#### 1.10 PROJECT CONDITIONS

- A. Performance: All systems are to be rated at 3,575 ft. elevation.

#### 1.11 SEQUENCING AND SCHEDULING

- A. General: Comply with Division 1.
- B. Schedule: Coordinate and order the progress of mechanical work to conform to the progress of the work of the other trades. Complete the entire installation as soon as the condition of the building will permit.
- C. Utility Interruptions: Schedule mechanical utility interruptions with the Architect/Engineer/Owner minimum of seven (7) days prior to the requested outage. Plan work so that duration of the interruptions a maximum of one day.

#### 1.12 CONTROLS WIRING AND ELECTRICAL EQUIPMENT

- A. All mechanical equipment controls wiring, conduit, relays, interlocks, and all accessories required for a completely operational controls system shall be the complete responsibility of the mechanical contractor. The mechanical contractor has the option to hire the project electrical contractor or any qualified controls contractor to install mechanical controls wiring and conduit. Refer to specification 251000 for installation requirements.
- B. Electrical items such as disconnect switches and motor starters associated with equipment provided by Division 25, when specifically mentioned to be furnished by the Mechanical Contractor, whether in these specifications or on the Electrical or Mechanical Drawings, shall be furnished by the Contractor. These items shall be mounted and connected as required for a completely operational system. See Control Systems Specification for further information.
- C. All electrical equipment characteristics (voltage, etc.) must be verified by the Contractor prior to ordering. If the Contractor proposes to furnish motors varying in horsepower and/or characteristics from those specified, he shall first inform the Architect/Engineer of the change and

shall then coordinate the change with the Electrical Contractor and shall pay all additional charges in connection with the change.

#### 1.13 PROTECTION AGAINST HAZARDOUS CONDITIONS

- A. The Contractor shall take precautions against hazardous construction conditions at all times during construction. The final condition of the facilities shall be safe, and where safety to operating personnel is jeopardized, suitable signage shall be posted.
- B. Protruding metal (bolts, steel angles, etc.) potentially hazardous to maintenance and operating personnel, shall be cut back and/or protected to reduce the risk of injury. All openings between floors shall be protected with barriers around the openings, gratings across the openings, or steel bars through the openings to avoid and protect against injury.

#### 1.14 HAZARDOUS SIGNS

- A. Equipment room contains moving or rotating parts, floor openings, or other potentially hazardous environments and shall include a sign on the door entering it that shall read similar to the following: **Hazardous Area - Authorized Personnel Only.**

#### 1.15 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. The Mechanical Contractor shall furnish to the Owner a bound manual in triplicate, containing complete repair parts lists, and operating, service, and maintenance instructions on all mechanical equipment, fixtures, and systems.
- B. The Mechanical Contractor shall also provide training as required by Section 230100 to the Owner's operation and maintenance personnel.

#### 1.16 OPERATION PRIOR TO ACCEPTANCE

- A. The Owner shall have the right to operate any and all apparatus as soon as and as long as it is in operating condition, after Owner personnel have received operational training, whether or not such apparatus has been accepted as complete and satisfactory, except that this shall not be construed to mean operations before any required alterations or repairs have been made. This operation does not indicate acceptance of the equipment by the Owner. When the Contractor enters into a contract with the Owner, he agrees to the above.

#### 1.17 WARRANTY AND SERVICE PROGRAM

- A. Due to the critical performance requirements and to clearly establish warranty responsibility for this project, the Contractor shall provide a full-service maintenance and warranty program to the Owner for one full year after beneficial occupancy (substantial completion).
- B. This service program shall be included as part of the base bid and shall include service, maintenance, repair, replacement, lubrication, temperature control calibration and repairs, and documenting proof for all service and maintenance work on all equipment and system furnished by the Contractor.

- C. A single representative in the employment of the Contractor shall be responsible for coordination and follow through of this program. This representative's name and phone number shall be submitted to the Owner as part of the maintenance manuals and supportive data. The Contractor shall respond to a request for service with 24 hours if so requested.
- D. During this first year of operation, the following sequence of maintenance service shall be performed as a minimum.
  - 1. Clean strainers in piping.
  - 2. Fans and/or pumps be lubricated and oiled once every four (4) months.
  - 3. Controls shall be calibrated throughout the facility at the end of six (6) months (following substantial completion). Any leaks in the piping systems shall be repaired.
  - 4. All equipment manufacturer's service recommendations shall be followed during this period.

#### 1.18 FLUSHING AND DRAINING

- A. It shall be the responsibility of this Contractor to properly drain and flush all ducts and pipes before use or acceptance to ensure that all debris is completely removed. Damage caused by such debris remaining in the ducts or pipes shall be repaired by this Contractor at his expense. This Contractor shall demonstrate to the Architect/Engineer's representative that all piping is clean.

#### 1.19 CLEANING

- A. This Contractor shall remove from the building construction site all rubbish and dirt as it accumulates under the contract. At completion, all areas shall be broom cleaned and all obstructions, surplus materials, etc., removed.

#### 1.20 GUARANTEE

- A. The Contractor shall guarantee all materials, equipment, and workmanship furnished and installed by him under this Contract, to be free from all defects of workmanship and materials, and shall agree to replace at his expense, without expense to the Owner, at any time within one year after installation is accepted by the Architect/Engineer, any and all defective equipment, parts, etc., that may be found. (This excludes normal maintenance and daily servicing of equipment which is the Owner's responsibility.)

#### 1.21 FLOOR, WALL, AND CEILING PLATES

- A. Where exposed pipes pass through floors, finished walls, or finished ceiling, they shall be fitted with chromium-plated escutcheons of an approved pattern. Escutcheons and plates in Mechanical Rooms do not require chrome finish.
- B. This Contractor shall be responsible for providing and installing all counter flashing. All openings in the roof shall be flashed and counterflashed. Use four-pound lead flashing materials for all vent lines and welded flashing in steel lines passing through roof. The Mechanical Contractor shall notify the General Contractor where each roof penetrations are and the size of the opening.

## 1.22 PIPE SLEEVES

- A. Schedule 40 steel pipe sleeves or pipe sleeves made of No. 20 gauge galvanized steel, properly secured in place with approximately 1/4" space between each sleeve and the surface of the pipe and/or insulation passing through it, shall be provided for all pipes passing through concrete floors, roofs, and masonry walls. All pipe sleeves shall be fixed in place as the walls and floors are built up. The Contractor shall furnish and locate all sleeves and pipes passing through concrete floors, exterior masonry walls, and roofs shall be made watertight with approved non-hardening plastic material. Sleeves through pipe chase or equipment room floors shall project a minimum of 2-inch above the floor and shall be of black steel pipe with waterproof flange at center of floor thickness. Each sleeve through a fireproof wall shall be packed with approved fireproof rope in the annular space.

## 1.23 PIPE HANGERS

- A. Pipe hangers shall be Fee and Mason of a type suitable for each use. Perforated straps shall not be used in any work. For ferrous pipes up to and including 4 inch in size, use Fee and Mason Fig. 199 malleable iron, adjustable, split ring, swivel hanger. For plumbing piping larger than 4 inches, use Fee and Mason Fig 239 steel clevis hanger. Where several pipes are parallel at the same elevation, trapeze hangers may be used. Where trapeze hangers are used, the pipes shall be supported on rollers where indicated on the Drawings. For copper pipes up to and including 3 inch in size, use Fee and Mason Fig. 360 malleable iron, copper plated hangers. For copper pipes larger than 3 inches, use Fee and Mason Fig. 364 copper plated clevis hanger.

- B. Hanger rod sizes shall conform to the following schedule:

1. Pipe up to and including 2"	3/8" rods
2. Pipe 2-1/2", 3" and 3-1/2"	1/2" rods
3. Pipe 4" and 5"	5/8" rods
4. Pipe 6"	3/4" rods
5. Pipe 8", 10", and 12"	7/8" rods

- C. Unless shown otherwise on the Plans, all horizontal runs of ferrous piping shall be suspended from the floor or roof construction, as the case may be, by means of hangers with the following spacing:

1. Pipe up to and including 1-1/4"	8'
2. Pipe 1-1/2" and 2"	10'
3. Pipe 2-1/2" and 3"	12'
4. Pipe 3 1/2" and 4"	14'
5. Pipe 5" and 6"	16'
6. Pipe 8" and 10"	20'

D. Unless shown otherwise on the Plans, all horizontal runs of copper piping shall be suspended from the floor or roof construction as the case may be, by means of hangers with the following maximum spacing:

- |                            |     |
|----------------------------|-----|
| 1. Pipe up to 3/4" in size | 5'  |
| 2. Pipe 1" and 1-1/4"      | 6'  |
| 3. Pipe 1-1/2" and larger  | 10' |

E. There shall be a hanger within 2 inches of each elbow or tee. Additional supports shall be provided for valves, strainers, etc. Cast iron pipe shall have not less than one hanger per length of pipe. Vertical risers shall be supported by approved riser clamps at each floor. Vertical pipes within a space shall have not less than two supports.

F. Supports and hangers shall be installed to permit free expansion and contraction in the piping systems. Hangers shall permit vertical adjustment to maintain proper pitch. Where necessary to control expansion and contraction, the piping shall be guided and firmly anchored. No piping shall be self-supporting, nor shall it be supported from equipment connection.

G. Expansion bolts shall be Ackerman-Johnson or Hilti.

H. Beam clamps suitable for use with this type of steel construction involved shall be Grinnell.

#### 1.24 PRESSURE VESSEL CERTIFICATION

A. Not used.

#### 1.25 ISOLATION

A. Excessive vibration or objectionable noise created in any part of the building by the operation of any equipment furnished and/or installed under the Mechanical Contract will be extremely objectionable and the Contractor shall take all precautions against the same by isolating the various items of equipment from the building structure and by such other means as may be necessary to eliminate all excessive vibration and objectionable noise produced by any equipment installed by them, and consequently, they shall design all foundations, supports, etc., for their equipment, and all piping with this end in view. In addition, these Contractors shall supervise the construction of all foundations and supports, whether they build them or not, in order that they may be constructed in such a manner as to prevent the transmission of objectionable noise and/or excessive vibration. Submit calculations on all vibration isolation equipment.

B. All equipment having moving parts shall be isolated from the building structure by means of Korfund isolation materials, unless specifically noted otherwise. All isolators shall be the same brand and shall be supplied from the same source. Equipment manufacturer's recommendations shall be followed in the isolation of equipment.

C. Vibration isolators shall have sufficient resilience to meet the following minimum efficiencies:

<u>Motor HP</u>	<u>Equipment Room</u>
Up to 5	90%
7-1/2 to 15	93%
20 to 40	95%
50 to 100	97.5%

D. Spring isolators shall be of the housed type with ribbed pads bonded to the underside of the baseplate or may be unboxed stable springs. Isolators shall be furnished with snubbers and limit stops where so recommended by the equipment manufacturer.

E. The Supplier of the isolating equipment shall, upon completion of the job, check all isolating materials and verify that they are installed properly, and submit a report in writing to the Architect/Engineer.

#### 1.26 TESTING

A. Before completion of this project, the Mechanical Contractor shall test all materials and equipment which normally require testing. All piping, etc., shall be tested to meet code requirements or the Specification requirements, whichever is more stringent.

B. All equipment shall be operated sufficiently long enough to prove to the Architect/Engineer that the equipment performs satisfactorily and meets the requirements set forth on the Plans or in these Specifications.

#### 1.27 CERTIFICATIONS

A. Before receiving final payment, the contractor shall verify that all equipment furnished, and all work done is in compliance with all applicable codes mentioned in these Specifications. Submit certifications and acceptable certificates to the Architect/Engineer.

#### 1.28 GENERAL PIPING INSTALLATION REQUIREMENTS

A. Provisions for Drainage: All piping systems shall be installed so that they may be easily drained. Drain caps, plugs, or hose bibbs shall be installed at low points. Grade piping toward drain locations.

B. Alignment: All installed pipelines shall be straight and shall remain straight against strains. Proper allowance shall be made for expansion and contraction.

C. Clean as Installed: All piping shall be kept free from scale or loose dirt when installed and must be kept clean during the completion of the installation. All openings in the piping system shall be capped or plugged while awaiting further connections. All detergents, solvents and other cleaning agents shall be compatible with the materials of fabrication of the system in which they are used. They shall not adversely affect the materials of mechanisms in the systems and they shall be acceptable to equipment manufacturers. All detergents, solvents, and other cleaning agents shall also be compatible with the process streams to be handled by the systems in which they are used.

- D. Insulated Fittings: Install between any dissimilar metals such as steel and copper.
- E. Expansion and Contraction: The Contractor shall make all necessary provisions for expansion and contraction with proper fittings, anchors, dresser couplings, loops, etc. Install flexible connectors on each pipe at each building expansion joint.
- F. Welding: Refer to Paragraph 1.29 of this section of these specifications.
- G. Bending: No bending of pipe will be permitted.
- H. General: The installation shall be coordinated with respect to space available with heating, cooling, ventilating, and electrical installation. In every instance where there is a conflict in the routing of the piping and the ducting, the routing of the ducting shall govern. Installed piping shall not interfere with the operation or accessibility of doors or windows, shall not encroach on aisles, passageways, and equipment, and shall not interfere with the servicing or maintenance of equipment. Pipe shall be cut accurately to measurements established at the construction site and shall be worked into place without springing or forcing, properly clearing all openings and equipment. Cutting or weakening of structural members to facilitate piping, installation is not permitted. Pipes shall have burrs removed by reaming and shall be so installed as to permit free expansion and contraction without damage to joints or hangers. Piping above ground shall be run parallel with the lines of the building unless otherwise noted on the drawings. Unless otherwise shown on the drawings, horizontal piping shall pitch down in the direction of flow with grade of not less than 1 inch in 40 feet. Piping connections to equipment shall be in accordance with details shown on the drawings or as recommended by the equipment manufacturer. Service pipe valves and fittings shall be kept a sufficient distance from other work to permit finished covering not less than 1/2 inch from such other work, and not less than 1/2-inch between finished covering on the different services.
- I. Installation of Valves: Valves shall be installed at the locations shown on the drawings and where specified and where directed at site. Gate valves shall be used unless otherwise shown, specified, or directed. All valves shall be installed with their stems horizontal or above. Where tight shutoff is required, a composition seat globe valve or resilient seat ball valve shall be used.
- J. All valves which must be used during operation, all control valve assemblies, instrument control cases, liquid level controls, gage glasses, orifices, relief valves, and other equipment which must be observed, adjusted, or serviced during operation shall be located conveniently accessible from an operating platform or grade.
- K. In general, relief valves within processing unit limits shall be located conveniently accessible from an operating platform or grade.
  - 1. Those in non-hazardous service, such as water, shall discharge directly to outside.
  - 2. Relief valves should have no piping between the vessel or line and the valve inlet, except as shown on the drawings.
  - 3. Relief valves shall be installed in a vertical position. Vent piping shall be braced and supported in a manner that will not produce excessive stresses in the relief valve and will permit removal of the relief valve without necessary temporary supports for the vent lines.

L. Equipment Connections: All piping connections to pumps and other equipment shall be installed without strain at the pipe connection of the equipment. The contractor shall be required as directed to remove the bolts in flanged connections or disconnect piping to demonstrate that the piping has been so connected. Pipe connections to equipment shall be made with unions or flanged fittings. Provide removable headers for large equipment for service access.

M. Joints

1. Flanged Joints: All flanged joints shall be face matched. Raised face flanges shall not be mated to flat-faced cast-iron flanges on valves or equipment. The raised face must be turned off. All flanged bolt holes shall straddle the horizontal and vertical center line unless otherwise noted.
2. Screwed Joints: Screwed pipe joints shall have American Standard Taper Pipe Threads ANSI-B2.1 Latest Edition. Burrs formed when cutting pipe shall be removed by reaming. Care shall be taken that the inside of pipe is thoroughly clean and free of cutting oil and foreign matter before installation. Joints shall be made perfectly tight by the use of Teflon tape or approved Teflon thread sealing and lubricating compound.
3. Solder-Joints: Tubing shall be cut square and burrs removed. Both inside of fittings and outside of tubing shall be well cleaned with steel wool or wire brush before seating. Care shall be taken to prevent annealing of fittings and hard drawn tubing when making connections. Joints for serrated fittings on water, compressed air below 60 psig, and vacuum lines shall be made with a 95 percent tin and 5 percent antimony. Cored solder or solder containing lead will not be permitted.

N. Reducers: Reduction in pipe size shall be made with one piece reducing fittings. Bushings reducing at least two pipe sizes will be acceptable only when there is no room for reducing couplings or swaged nipples.

O. Unions: All piping unions shall be of the ground joint type constructed from materials equivalent in alloy composition and strength to other fittings specified with which they are used. Union Pressure classes and end connections shall be the same as the fittings used in the lines with the unions. Steel unions shall have hardened stainless steel seating surfaces on both faces.

## 1.29 WELDING

A. All welding of piping covered by this specification, regardless of condition of service shall be accompanied as follows:

1. The welding shall be in accordance with the recommendations of the American Welding Society. Mitering of pipe to form elbows, notching to form these, or any similar construction will not be permitted. Welding fittings shall be installed on all welded lines. Joints to be welded shall be properly aligned and spaced, using special welding clamps where necessary. All welders to be employed shall have passed qualification tests prescribed by the National Certified Pipe Welding bureau (or by another reputable testing laboratory or agency) using procedures approved by the American Society of Mechanical Engineers or the American Welding Society. The welders will be required to pass qualification tests when the work of the welder creates a reasonable doubt as to his proficiency. Tests shall be conducted at no additional expense to the Owner.



2. Each welder shall, in addition to having passed the prescribed qualification tests (as noted in Paragraph 1.30.A.1), prepare sample coupons at the job site on a portion of pipe that is cut such that the cross section of the weld is opened to view. The sample weld should be prepared using a 6-inch diameter pipe. The sample shall reflect a continuous weld with perpendicular cut out to show the weld in cross sectional view. This sample, when accepted and approved by a certified welding inspector, shall be used as a standard of quality to compare to other welds that this welder will be performing on the job. This same sample weld will also be a basis for accepting or rejecting the welder for working on this project. The sample weld shall be identified with a date and the welder's name and shall be kept at the site throughout the project.
3. All welding on pressure piping shall conform to all of the requirements of the American Society of Mechanical Engineers Code for Pressure Piping - B31.1 (An American National Standards Institute publication), as defined in the latest edition of the ANSI Power Piping B31.1 Manual. All welding shall also conform to all of the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code. All chapters, current addenda and supplements of these manuals shall apply. This code shall be used to establish standards of performance and quality of welds. However, the Owner reserves the right to perform radiographic testing of all welds, to compare any of the welds to the approved "standard" sample welds of each welder, and to compare the welds to the welding diagrams and sketches of those recommended in the ANSI B31.1 Power Piping Manual. The intent is to obtain the highest quality welding job possible. The cost of any initial radiographic testing, for random inspection, shall be paid for by the Owner. If radiographic random testing reveals that a weld is defective, the Contractor shall bear the cost of all repairs and re-testing necessary to be made to subject weld until conformance with radiographic tests is reached. The potential for random radiographic testing and welding quality control applies to all pressure piping systems in this project, including systems below 100 psig. If a question should arise regarding the possibility of faulty welding or if there are obvious visual defects in the welding, the Contractor shall be required to correct such deficiencies to a quality level consistent with the recommendations, welding diagrams and sketches in the ANSI B31.1 Manual. The quality level shall also reflect that of the approved sample welds accomplished by each welder for this particular project.

### 1.30 COOPERATION WITH OTHER TRADES

- A. The Contractor shall refer to other sections of these specifications covering the work of other trades which must be carried out in conjunction with the mechanical work so that the construction operations can proceed without harm to the Owner from interference, delay, or absence of coordination.

### 1.31 FIELD MEASUREMENTS

- A. The Contractor shall verify the dimensions covering the mechanical work at the building. No extra compensation shall be claimed or allowed on account of difference between actual dimensions and those indicated on the drawings. He shall examine the adjoining work on which Mechanical work is dependent for maximum efficiency and shall report any work which must be corrected. No waiver of responsibility for defective work shall be claimed or allowed due to failure to report unfavorable work conditions affecting Mechanical work.

### 1.32 SAFETY GUARDS

- A. The Mechanical Contractor shall furnish and install safety guards required in order to obtain certificates of inspection from all authorities having jurisdiction. All belt driven equipment, projecting shafts, and other rotating parts shall be enclosed or adequately guarded. Provide coupling guards on all rotating shafts.

### 1.33 PROTECTION

- A. All work, equipment, and materials shall be protected at all times to prevent obstruction, damage, or breakage. All pipe openings shall be closed with caps or plugs during installation. All equipment shall be covered and protected against dirt, water, chemical, or mechanical injury. At the completion of the work, all equipment shall be thoroughly cleaned, and the entire system shall be delivered in a perfect, unblemished condition.

### 1.34 PAINTING AND IDENTIFICATION

- A. All equipment shall be delivered to the job with suitable factory finish. Should the finish be marred in transit or during installation, it shall be finished to present a neat, workmanlike appearance.
- B. Except as elsewhere hereinafter specifically required, any painting of equipment, piping, ductwork, grilles, insulation, etc., furnished and installed under this Section of the Specifications will be done by the Painting Contractor. However, the Mechanical Contractor shall leave his equipment clean and free from any grease, dirt, rust, etc., and in suitable condition for painting.
- C. No nameplates on equipment shall be painted, and suitable protection shall be afforded to the plates to prevent their being rendered illegible during the painting operation.
- D. The piping shall be painted the basic color as indicated in other sections of these specifications and shall be marked every 10 feet on centers with Brady pipe markers. Arrows, approximately 6 inch in length and spaced about 10 feet on centers shall indicate the direction of the flow pipe. Locate additional labels as required in Mechanical Rooms. Staple in place, brush with clear lacquer. Markers shall state pipe size, flow direction, and pipe usage (such as "cold water," etc.).

### 1.35 RECORD DRAWINGS

- A. The Contractor shall, during the execution of the work, maintain a complete set of drawings upon which all dimensional locations of equipment piping and all deviations and/or changes in the work shall be recorded. Water, storm, and drainage mains shall be delivered to the Architect/Engineer in good condition upon the completion and acceptance of the work and before final payment is made.

### 1.36 SUPPLIER RESPONSIBILITY

- A. Each supplier, whether furnishing equipment as specified or as a substitution shall be responsible for certifying that the equipment is properly installed and that the warranty is valid. Submit written reports on the installation and the equipment performance when requested to do so by the Architect/Engineer (or his representative). Each supplier shall be responsible for furnishing

qualified personnel at the job site at anytime requested by the Architect/Engineer (or his representative) during the construction or warranty periods.

END OF SECTION 25 05 00

## SECTION 25 10 00 – DIRECT DIGITAL CONTROL (DDC) SOFTWARE, INSTALLATION, AND COMPONENTS

### PART 1 – GENERAL

#### 1.1 SUMMARY

- A. Section includes all devices, equipment, wire, conduit, and installation of all required parts and performance criteria for furnishing all labor and materials for the installation and programming for Direct Digital Control for HVAC Systems utilizing wireless communication with cloud-based servers.

#### 1.2 RELATED SECTIONS

- A. Division 01: General Requirements.
- B. Section 23: Heating, Ventilating, and Air-Conditioning (HVAC).

#### 1.3 SUBMITTALS

- A. Shop Drawings and product data in accordance with the specifications.
- B. All shop drawings shall be prepared in AutoCAD 2016 or newer. In addition, Contractor shall provide drawings in electronic format with x-ref and layer information to other trades as required.
- C. All submittals shall be bound or in a three-ring binder with a table of contents and related section tabs. Five (5) copies shall be submitted to the Architect/Engineer for distribution and review.
- D. Shop drawings shall include basic floor plans depicting locations of all equipment and wiring, installed by others, to be controlled by system and locations of thermostats, gateways and other equipment provided under this section. Drawings shall also show location of electrical power, low voltage wiring and data ports, provided by the contractor, required for proper installation of systems of this section.
- E. Submittal data shall contain manufacturer's data on all hardware and software products required by the specification.
- F. Submit five (5) copies of submittal data and shop drawings to the Engineer for review prior to ordering or fabrication of the equipment. The Contractor prior to submitting shall check all documents for accuracy.
- G. The Engineer will make corrections, if required, and return to the Contractor. The Contractor will then resubmit with the corrected or additional data. This procedure shall be repeated until all corrections are made to the satisfaction of the Engineer and the submittals are fully approved.

## 1.4 SCOPE OF WORK

- A. Except as otherwise noted, the control system shall consist of any and all wiring devices, equipment, thermostats, gateways, etc. to fill the intent of the specification and provide for a complete and operable system.
- B. The DDC contractor shall review and study existing building/site conditions where applicable and all new construction drawings for the project including HVAC drawings and the entire project specifications to familiarize themselves with the equipment and system operation prior to bidding and submittal of a bid/price and notify the owner immediately of any conflicts between the project and the scope of work of this section, including work to be completed by others.
- C. All equipment and installation of control devices associated with the equipment listed below shall be provided under this Contractor.
- D. Related work for interconnection:
  - 1. Products Supplied but Not Installed Under This Section:
    - a) Control valves.
    - b) Flow switches.
    - c) Wells, sockets, and inline hardware for water sensors (temperature, pressure, flow).
    - d) Automatic control dampers, where not supplied with equipment.
    - e) Variable frequency drives. (Does not include VFDs integral to chillers or boilers).
  - 2. Products Installed but Not Supplied Under This Section: None.
  - 3. Products Not Furnished or Installed but Integrated with the Work of This Section:
    - a) Chiller control systems.
    - b) Boiler control systems.
    - c) Chemical water treatment.
    - d) Smoke detectors (through alarm relay contacts).
  - 4. Work Required Under Other Divisions Related to This Section:
    - a) Power wiring to line side of motor starters, disconnects or variable frequency drives.
    - b) Provision and wiring of smoke detectors and devices relating to fire alarm system.
    - c) Campus LAN (Ethernet) connection adjacent to gateways or global controllers Operator Workstation.

- E. When the DDC system is fully installed and operational, the DDC Contractor will make themselves available to meet with the designated representatives of the owner to review the as-installed condition of the system. At that time, the DDC contractor shall demonstrate the operation of the system and prove that it complies with the intent of the drawings and specifications.
- F. The Contractor shall furnish and install a complete DDC control system including all necessary hardware, wiring, conduit, etc., and all operating and applications software necessary to perform the control sequences of operation as called for in this specification. Provide and Install DDC controls for the HVAC Equipment as noted on the drawings:
- G. Provide technical support necessary for commissioning of system in coordination with the HVAC Contractor, Balancing Contractor, and the owner's team.
- H. Contractor shall provide one training session in the operation of the system, for owner's personnel, a minimum of 4 hours in duration. In addition, see General HVAC Requirements for maintenance requirements and M&O Manuals.
- I. All work performed under this section of the specifications will be in compliance with all codes and regulations as mandated by the authority having jurisdiction

#### 1.5 SYSTEM DESCRIPTION

- A. The Direct Digital Control (DDC) shall consist of thermostats, gateways and related accessories as indicated below and all related programming for a complete and fully operational web-based management system using a cloud server program complying with the following specifications.
- B. The entire Direct Digital Control (DDC) shall include a network of commercial Internet programmable thermostats which use IEEE 802.15.4 mesh wireless communication protocol to reach a Wireless Gateway (WG). The WG must connect to the owner's wide area network (WAN) over a TCP/IP connection. Access and control of DDC is through a web-based management tool which sits on a cloud server and must be accessible either locally or remotely via the Internet.

#### 1.6 WORK BY OTHERS

- A. The DDC Contractor shall coordinate with other contractors prior to performing the work on this project and cooperate as necessary to achieve a complete and neat installation. To that end, each contractor shall consult the drawings and specifications for all trades to determine the nature and extent of others' work prior to fabrication and installation. The Architect/Engineer representative shall be immediately notified if an area of conflict occurs between trades prior to fabrication and installation. DDC Contractor shall provide pre-installation of control components.
- B. Low voltage thermostat wiring between equipment and thermostat locations shall be furnished and installed by this contractor. Unless noted otherwise all new low voltage wiring shall be multiple conductor thermostat wiring (wire count as indicated in Thermostat Manufacturer's installation instructions) installed per these specifications. (Installations shall be minimum 3 conductor / 24-gauge wires per DDC manufacturer's standard specifications, multiple conductor/24-gauge thermostat wiring preferred).

C. Related work provided by others:

1. 110 V outlets shall be provided within 5 feet of each gateway location.
2. 1 Data port shall be provided within 10 feet of each gateway location.

D. Equipment start-up and servicing

1.7 CODE COMPLIANCE

- A. Provide DDC components and ancillary equipment which are code compliant.
- B. All wiring shall conform to the National Electrical Code.
- C. All products of the DDC shall reside with the following agency approvals.
  1. California 2016 Title 24 Compliant.
  2. California Energy Commission Occupant Control Smart Thermostat (OCST) certified.
  3. Open ADR 2.0 certified.

1.8 SYSTEM STARTUP & COMMISSIONING

- A. Each DDC component in the system shall be tested for both hardware and software functionality. In addition, each mechanical and electrical system under control of the DDC will be tested against the appropriate sequence of operation specified herein. Successful completion of the system test shall constitute the beginning of the warranty period. A written report will be submitted to the owner indicating that the installed system functions in accordance with the plans and specifications.
- B. The DDC Contractor shall provide all manpower and engineering services required to assist the HVAC Contractor and Balancing Contractor in testing, adjusting, and balancing all systems in the building. The DDC Contractor shall have a trained technician available during the balancing of the systems. The DDC Contractor shall coordinate all requirements to provide a complete air balance with the Balancing Contractor and shall include all labor and materials in his contract to assist with functional testing of system as it relates to DDC.

1.9 TRAINING

- A. The DDC Contractor shall provide training for two (2) owner's representatives and/or maintenance personnel. The DDC Contractor shall provide on-site training to the District's representative(s) and maintenance personnel per the following description.
- B. On-site training shall consist of a minimum of 4 hours, as indicated above of hands-on instruction geared at the operation and maintenance of the systems. The curriculum shall include:
  1. System Overview
  2. System Software and Operation

3. System Access
4. Software Features Overview
5. Changing Set Points and Other Attributes
6. Scheduling
7. Editing Programmed Variables
8. Displaying Color Graphics
9. Running Reports
10. Workstation Maintenance
11. Application Programming
12. Operational Sequences, Including Start-Up, Shutdown, Adjusting, and Balancing
13. Equipment Maintenance

#### 1.10 OPERATING AND MAINTENANCE MANUALS

- A. The operation and maintenance manuals shall contain all information necessary for the operation, maintenance, replacement, installation, and parts procurement for the entire DDC. This documentation shall include specific part numbers.
- B. Following project completion and testing, the DDC contractor will submit as-built documentation and M&O reflecting the exact installation of the system.

#### 1.11 WARRANTY

- A. The DDC Contractor shall warrant the system for 12 months after system acceptance and beneficial use by the District. During the warranty period, the DDC contractor shall be responsible for all necessary revisions to the software as required to provide a complete and workable system consistent with the letter and intent of the Sequence of Operation section of the specification. DDC equipment shall be warranted for a period of 5 years from the time of system acceptance.
- B. Warranty of equipment is limited to replacement of defective products.



## PART 2 – PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

- A. Unless noted otherwise, all products shall be of a single manufacturer. The standard of design and quality shall be products as manufactured by Pelican Wireless Systems, or a prior approved equal. See prior approval process in related sections.
- B. Products of other manufacturers will be considered for acceptance provided they equal or exceed the material requirements and functional requirements of the specified product. A request for Architect/Engineer's approval must be submitted with complete technical data to allow for proper evaluation. All materials for evaluation must be received by Architect/Engineer at least 10 days prior to bid due date.

### 2.2 WIRELESS GATEWAY (WG)

- A. Wireless gateway(s) shall be capable of providing communication between a dedicated cloud server using TCP/IP and the on-site Programmable Thermostats using the IEEE 802.15.4 wireless communication protocol. Additional WGs can be used for a single site, but each WG must meet or exceed these requirements.
- B. The WG must provide the following hardware features as a minimum:
  - 1. Single Ethernet Port.
  - 2. One micro-USB 5VDC power input.
  - 3. 2.4 GHz IEEE std. 802.15.4 built-in communication processor.
- C. The WG shall provide the communication link between the entire system and a cloud-based server. Communication with cloud server shall be secured using AES (Advanced Encryption Standard).
- D. The WG shall be able to support 2000 Programmable Thermostats.

### 2.3 PROGRAMMABLE THERMOSTAT (PT)

- A. Programmable Thermostat shall be a wireless communicating commercial programmable thermostat that uses IEEE 802.15.4 for networking communication and a wiring terminal block for controlling a single zone HVAC unit.
- B. The PT shall provide a keypad for setting:
  - 1. Temperature Set Points.
  - 2. System Mode (Heat, Cool, Auto, Off).
  - 3. Fan Mode (Auto, On).

4. Light Button.
- C. The PT shall include a wiring terminal for controlling a single zone HVAC unit or a single zone damper actuator. The wiring terminal must be able to be removed from the PT for installations where only 3-wires exist or are available between where the PT will be placed and its connection with the equipment it will be controlling. The thermostat must be able to control the HVAC unit based on these specifications.
- D. The PT must be configurable using a Web Based App. No thermostat configuration, other than setting the PT to Conventional Fan Coil shall be done at the thermostat. Web based Configuration Setting options shall include:
  1. Naming the thermostat
  2. Grouping multiple thermostats
  3. System Type: Conventional Fan Coil, or Damper Actuator system setting
  4. Anticipation Degrees (0°F - 0.5°F)
  5. Calibration Degrees (2.0°F - -2.0°F)
  6. Heat Stages (0 - 2)
  7. Cool Stages (0 - 2)
  8. Fan Stages (1 - 2)
  9. Temperature Display (Fahrenheit)
  10. Heat Range Temperature Setting Limitation
  11. Cool Range Temperature Setting Limitation
  12. Ability to disable and enable Keypad Control through schedule
  13. Heat consumption (kw, btu, ton, or watt)
  14. Damper Type: Open/Close or Floating
  15. Reheat Type: Open/Close or Floating
  16. Cool consumption (kw, btu, ton, or watt)
  17. Notification Sensitivity (High, Medium, Low)
  18. Alarm of exceeding temperature based on a Safe Range
  19. Schedule set times (2, 3, 4, or Variable)

E. PT settings and control through the Web Base App shall be in real-time and include:

1. Space Temperature
2. System Mode (Heat, Cool, Auto, Off).
3. Fan Mode (Auto, On).
4. Current set point.
5. Relay status (Heat/Cool and Fan).
6. Historical Trend Graphs.
7. Scheduling.
8. Lock and Unlock Entire Thermostat's Keypad.
9. Lock and Unlock the Thermostat's Fan Mode setting Only.

#### 2.4 WEB BASED GRAPHICAL USER INTERFACE

- A. The Web Based App (WBA) shall be able to run on any PC that uses Safari, Chrome, Firefox, or any other web browser that meets these browsers' functionality.
- B. The WBA Platform shall be able to run on any Internet Accessible Smartphone and/or Tablet that has a Web Browser compatible with HTML 5.
- C. The WBA shall not require any on-site servers or software to run to be usable by client.
- D. The WBA shall allow up to a minimum of 100 simultaneous users/clients to access the Direct Digital Control.
- E. The Web Based client shall support at a minimum, the following functions
  1. User log-on identification and password shall be required.
  2. HTML programming shall not be required to display any graphics or data on the Web page.
  3. Storage of data shall reside on cloud server and shall not sit within the client's computer or device. DDC that requires data storage on a client computer or on-site server is not acceptable.
  4. Users shall have administrator and user definable access privileges.
  5. OpenAPI interface with XML data output.

## F. Schedules

1. The WBA shall provide user with access to setting Programmable Thermostat (PT) schedules. Up to 12 schedule periods per day shall be available for each PT.
2. Schedules shall be available as Weekly (7-day), Daily, or Weekday/Weekend (5-2).
3. The WBA shall provide the user the ability to:
  - a) View Schedules.
  - b) Add/Modify Schedules.
  - c) Assign Thermostat to a Group Schedule.
  - d) Delete Schedules.
  - e) Create Share Schedules.
  - f) Create Event Based Schedules.

## G. Trending

1. The WBA shall provide real-time trend information on:
  - a) Each space temperature.
  - b) Each temperature set points.
  - c) Each current call: heat, cool, and/or fan.
  - d) Each call for economization.
  - e) Each damper position.
2. The WBA shall be able to record and provide at least two years of past trend data for every thermostat in the wireless network. Trend data shall include:
  - a) Space temperature, with resolution of every 1/10<sup>th</sup> of a degree Fahrenheit.
  - b) PT's temperature set points.
  - c) Indication of whether the thermostat was calling for heat, cool, and/or fan.
3. Trend data shall be viewable on the WBS

## H. Alarm Notifications

1. The WBA shall provide automatic alarming functionally based on real-time monitoring of at least:
  - a) Space temperature and temperature change.
  - b) PT's temperature set points.
  - c) PT's current call: heat, cool, and/or fan.
2. The WBA shall be able to provide a user with the ability to:
  - a) View Alarms.
  - b) Set Alarm Notification sensitivity level to High, Medium, or Low.
  - c) Delete Alarms.
3. Alarms shall be able to be sent via email and/or text message to up to 100 or more clients.

## I. Consumption Usage

1. The WBA shall be able to calculate and graphically display the consumption of running a single zone HVAC unit based on a user defined HVAC unit heat and/or cool consumption rate multiplied by the thermostat heat/cool call time.
2. The WBA shall be able to calculate and graphically display the cost of consumption of running a single zone HVAC unit based on taking a user defined HVAC unit heat and/or cool consumption and multiplying that by the client defined cost per kw and/or therm.
3. The WBA shall be able to display consumption usage for a single thermostat, multiple thermostats at a single time, or all the thermostats in the DDC.
4. The WBA shall be able to record and display up to at least two years of consumption usage information.

## 2.5 ENABLED ECONOMIZER (EE)

- A. EE shall use up to three 10K Type II external thermistor temperature sensor input.
- B. Web Based App shall be able to record and provide at least two years of past data for EE. Data must represent historical representations of:
  1. Calls for Economization
  2. Outside Air Damper Position
  3. Supply and Outside Air Temperature

- C. The trend data shall be viewable on the WBA.
- D. EE must have a settable 0-10VDC output for Outside Air Damper Actuator control.
- E. EE must have a 0-10VDC input for Outside Air Damper Position Feedback.

## 2.6 ENABLED AIR HANDLER CONTROLLER (EAHC)

- A. The EAHC shall be able to wirelessly communicate with all Programmable Thermostat (TS) which are controlling a damper actuator that the EAHC is going to provide conditioned air too.
- B. TS that meets the above statement must send EAHC information on what type of conditioned air the zone requires and how much of this conditioned air will be required to properly condition the zone.
- C. EAHC must be able to accept information from TS and automatically calculate a supply air temperature target based on TS demand.
- D. EAHC must not run air conditioning when there is no air conditioning demand by a TS.
- E. EAHC must not run the air conditioning when there is reheat demand from a TS.
- F. EAHC must be able to provide Demand Control Ventilation if a TS has a CO2 sensor.
- G. No wire must be required between the EAHC and a zone damper or zone thermostat/sensor.
- H. The EAHC must be configurable using a Web Based App. No configuration shall be done at the EAHC. Web based Configuration Setting options shall include:
  - 1. Name of the EAHC location.
  - 2. Description of what the EAHC is controlling.
  - 3. System Type: Conventional Fan Coil.
  - 4. Heat stages: 1-3.
  - 5. Cool stages: 1-3.
  - 6. Fan stages: 1, 2, or Variable
  - 7. Variable Speed Fan: Minimum Fan Speed
  - 8. Bypass Controller: Open damper position (VDC), Closed damper position (VDC)
  - 9. Static Pressure:
    - a) Target Operating Static: Static during a heating or cooling cycle
    - b) Target Circulation Static: Static during a ventilation cycle

- c) Maximum Static: Low static safety for automatic reset
- d) Maximum Static: High static safety for automatic reset
- 10. Input Sensor: Supply Air Temperature
- 11. Input Sensor: Return Air Temperature
- 12. Input Sensor: Outside Air Temperature

## PART 3 – EXECUTION

### 3.1 CONTRACTOR RESPONSIBILITIES

#### A. General

- 1. Installation of the Direct Digital Control shall be performed by an approved manufacturer. The Contractor shall certify all work as proper and complete. Under no circumstances shall the design, installation, scheduling, coordination, programming, training, and warranty requirements for the project be delegated to a subcontractor without prior written approval of the owner.

#### B. Demolition

- 1. Remove controls which do not remain as part of the Direct Digital Control. The Owner will inform the Contractor of any equipment which is to be removed that will remain the property of the Owner. All other equipment which is removed will be disposed of by the Contractor.

#### C. Access to Site

- 1. Unless notified otherwise, entrance to building is restricted. No one will be permitted to enter the building unless their names have been cleared with the District or the District's Representative.

#### D. Code Compliance

- 1. All wiring shall be installed in accordance with all applicable electrical codes and will comply with equipment manufacturer's recommendations.

#### E. Cleanup

- 1. At the completion of the work, all equipment pertinent to this contract shall be checked and thoroughly cleaned, and all other areas shall be cleaned around equipment provided under this contract.

### 3.2 WIRING, CONDUIT, AND CABLE

- A. All control wires between HVAC units and thermostat locations to be furnished and installed by this contractor. The DDC contractor shall not begin work on this contract until all wiring is installed. The DDC contractor shall provide all wiring and conduit as required for a complete and operational system between remote temperature sensors, TA1 and thermostats as required, unless noted otherwise in drawings or specifications.

### 3.3 HARDWARE INSTALLATION

#### A. Installation Practices for Devices.

- 1. All devices are to be mounted level/plumb and per the manufacturer's installation documentation.

#### B. Identification

- 1. Identify all control wires with labeling tape or sleeves using either words, letters, or numbers that can be exactly cross-referenced with as-built drawings.
- 2. All field enclosures, other than controllers, shall be identified with a back lite nameplate. The lettering shall be in white against a black or blue background.
- 3. Junction box covers will be marked to indicate that they are a part of the DDC system.
- 4. All I/O field devices (except space sensors) that are not mounted within FIP's shall be identified with name plates.
- 5. All I/O field devices inside FIP's shall be labeled.

#### C. Existing Controls

- 1. Existing controls are not to be reused. All DDC devices will be new.

#### D. Control System Switch-Over

- 1. The Contractor shall minimize control system downtime during switch-over. Sufficient installation mechanics will be on site so that the entire switch-over can be accomplished in a reasonable time frame.

#### E. Location

- 1. The location of sensors is per mechanical and architectural drawings.
- 2. Space humidity or temperature sensors will be mounted away from machinery generating heat, direct light, and diffuser air streams.
- 3. If any line voltage electrical control is being installed, field enclosures shall be located immediately adjacent to the controller panel(s) to which it is being interfaced.



### 3.4 SYSTEM PROGRAMMING

#### A. General

1. The Contractor shall provide all labor necessary to install, initialize, start-up and debug all system software as described in this section. This includes any operating system software.
2. Contractor shall work with owner's representative to determine programming parameters including but not limited to hours of operation, set points, system variables, thermostat naming, and site naming. Thermostat & Site naming shall be performed by the contractor. Naming convention (equipment # or name, or space served) shall be provided by or agreed upon with the Owner.

### 3.5 COMMISSIONING AND SYSTEM STARTUP

#### A. DDC device functional testing.

1. Each system for which an DDC device has been installed shall be tested for proper installation and functional operation. Test shall include on-site control test to verify each wireless device is responding to signals sent from cloud-based servers and responding in accordance with manufacture's specifications.

END OF SECTION 25 10 00

## SECTION 25 11 00 - ELECTRICAL CONTROLS AND INTERLOCKS

### PART 1 – GENERAL

1.1 Conform with applicable provisions of the General Conditions, Supplementary Conditions and General Requirements.

#### 1.2 RELATED WORK IN OTHER SECTIONS

260500	GENERAL ELECTRICAL PROVISIONS
260519	LOW VOLTAGE CONDUCTORS
260526	GROUNDING
260533	RACEWAYS, BOXES, AND FITTINGS
262726	WIRING DEVICES AND PLATES
262900	MOTOR STARTERS

#### 1.3 DESCRIPTION OF WORK

- A. All disconnect means, motor controllers, electrical controls, protective, and signal devices for equipment furnished under Division 25 of these specifications will be installed and connected as scheduled herein or as otherwise noted on the drawings.
- B. Electrical items not shown on the electrical drawings, but which are required for equipment furnished under Division 25 of this specification shall be furnished under this section of the specifications and shall be installed and electrically connected in conformance with Division 26 Specifications.

#### 1.4 SUBMITTALS

- A. Submittal data for each individual electrically controlled item of equipment or device furnished under this Division of these specifications shall include complete electrical wiring diagrams, and elementary control diagrams (ladder form) showing all internal and external wiring connections and services. The submittal data shall itemize all electrical characteristics that are of a special nature or critical to the electrical installation or control system. Such equipment and devices will not be considered for approval until these requirements are met. These submittals shall form a part Section 250500 requirements and shall be properly coordinated by the Contractor.
- B. As soon as possible after contract notice to proceed, one print of the ladder diagrams shall be submitted by the contractor showing all necessary wiring for the mechanical equipment and devices proposed for installation. This print shall be reviewed and approved by the contractor, and then submitted to the Architect/Engineer for approval. The print shall indicate all components which shall be wired to the control/power circuits by the contractor, with all terminals for external connections of the components identified and labeled to correspond to the manufacturer's designations. Internal or factory installed wiring of package-type components need not be shown. Control diagrams shall show all internal and external wiring connection and shall clearly indicate field wiring furnished and installed under Division 25, differentiated from field wiring furnished and installed under Division 26.

- C. Revised Drawings: After the Architect/Engineer has approved the marked copy of the control diagrams submitted in accordance with Paragraph B above, the Contractor shall issue prints to all involved parties. The control diagrams shall be certified in writing as being acceptable to the contractor. The approved drawings will then be included in the control submittal and the Operating and Maintenance Manual.

## 1.5 INSTALLATION

- A. No control work shall be performed until control submittal has been approved by the Architect/Engineer.

## 1.6 CHANGES DURING CONSTRUCTION

- A. The complete responsibility and costs for revisions during construction to the approved control diagrams, and the resultant changes to the installation requirements, not covered by contract change order, shall be assigned to the contractor requesting such revisions.

## PART 2 – PRODUCTS

### 2.1 CONTROL AND INTERPOSING RELAYS

- A. Relays other than those on I/O cards shall be general purpose, enclosed plug-in type with 8 pin octal plug and protected by a heat and shock resistant dust cover. Relays shall be of the Neon or LED indicator type.
- B. Relay contact configuration and ratings shall be for rated load voltage and exceed load current rating by no less than fifty percent. Minimum contact rating shall be 10 amps at 120 volts AC.

### 2.2 TERMINAL STRIPS

- A. Terminal strips shall be of the molded nylon or polypropylene barrier type, individual plug-in mounted on a mounting channel. Terminal connections shall be rated 300-volt, 40-amp, and shall be of the tubular clamp type for use with bare wire ends, or of the strap screw type for use with crimp spade lug prepared wire ends. Terminal strips shall provide for removable marking strips or have pre-painted matte finish marking surfaces. Buchanan 600 series or approved substitute.

## PART 3 – EXECUTION

### 3.1 RELAYS

- A. All remote field devices shall be controlled through the use of an interposing relay. In no case shall a contactor or motor starter be directly controlled from a solid state device output or relay contact of a rating less than that stated above.

### 3.2 COMPONENT IDENTIFICATION

- A. All individual components (relays, timers, terminal strips, etc.) shall be clearly marked with the identification nomenclature shown on the manufacturer's shop drawings. Identification shall be by the use of press-type tape strip (kroy) covered with Scotch 600 clear tape or approved substitute method.

### 3.3 CONTROL WIRING INSTALLATION

- A. The installation and wiring of all electrical equipment installed under this contract shall meet all Electrical Division specifications. Special attention is called to the following:
  - 1. All wiring to be in conduit.
  - 2. All control wiring to be color-coded throughout. Conductor color shall be consistent for the entire length of circuit.
  - 3. All splices shall be made in junction boxes on terminal strips.
  - 4. All control wiring to terminate on marked terminal strips and shall be marked at all terminal points. Both ends of each wire shall be marked with a designation shown on the manufacturer's shop drawings, using interlocking chevron shaped snap-on plastic markers, hot-marked shrinkable tubing, hot stamping of the wire, or clear shrink-on tubing securing adhesive labels. Markers which depend solely on adhesive are not acceptable.

END OF SECTION 25 11 00

## SECTION 25 30 00 - CONTROLS AND INSTRUMENTATION

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including General and Special Conditions and the General Requirements, apply to the work specified in this section.

#### 1.2 DESCRIPTION OF WORK

- A. Furnish and install a control system, complete in all respects to provide the Sequence of Control shown on the drawings.
- B. All disconnect means, motor controllers, and all protective and signal devices for all electrical equipment provided under all Electrical Divisions will be furnished, installed, and connected under all Electrical Divisions with the following exceptions:
  - 1. All controls wiring and conduit for HVAC equipment is the complete responsibility of all Mechanical Divisions. Electrical connections, relays, interlocks, etc. not shown on the electrical drawings, but which are required for equipment furnished under all Mechanical Divisions shall be installed and electrically connected by all Mechanical Divisions in conformance with all Electrical Division Specifications.
  - 2. All disconnect means, motor controllers, and all protective and signal devices furnished with, mounted on, and connected integral with equipment furnished under other divisions.
  - 3. All disconnect means, motor controllers, electrical controls, protective, and signal devices for equipment furnished under all Mechanical Divisions of these specifications will be installed and connected as scheduled herein or as otherwise noted on the drawings.
- C. The mechanical trade is entirely responsible for furnishing, installing, wiring, connecting, and placing the control systems in operation. Electrical work required will be the final responsibility of the Mechanical Contractor either by his own electricians or by his subcontract with an Electrical Contractor.

#### 1.3 RELATED WORK IN OTHER SECTIONS

230593	TEST, ADJUST, AND BALANCE GUIDE SPECIFICATION (PSFA)
250000	INTEGRATED AUTOMATION INDEX
250500	GENERAL INTEGRATED AUTOMATION REQUIREMENTS

#### 1.4 GENERAL REQUIREMENTS

- A. The control system shall be furnished complete for the heating and air conditioning systems by Pelican or prior approved equal. The temperature control company shall have a permanent, fully staffed, well-established, local office and service organization. A complete stock of all repair and

replacement parts for all items furnished under this contract shall be carried in stock at the local office at all times.

- B. Submittals: Shall include plan size drawings, with individual literature on each item, showing control sequences, complete electrical ladder diagrams and all control components and their wiring requirements. The Contractor shall be responsible to see that all systems are properly coordinated.
- C. Operation and Maintenance Manuals: As soon as possible after Award of Contract, the Contractor shall prepare an Operation and Maintenance (O & M) Manual and submit it to the Engineer for review and approval. The control system testing, and training specified hereafter shall not be conducted until the O & M Manual has been approved. See Specification Section 251000 – DIRECT DIGITAL CONTROL SOFTWARE AND COMPONENTS. The Manual shall contain, as a minimum:
  - 1. Approved control diagrams.
  - 2. Equipment and device catalog cuts identifying each control device with a unique number or symbol coordinated with the control diagram symbols.
  - 3. A Sequence of Control for each system's control diagram identifying the function and physical location of each adjustable control device, written in language understandable to personnel not specifically trained in HVAC control systems.
  - 4. A Troubleshooting section for each control system indicating what tests and/or adjustments can be made to identify and/or correct common problems with control systems of the type installed. This description should address procedures to determine the cause of high or low space temperature and/or humidity in a typical room served by each air handling system. The description should be adequate to lead untrained persons to conclude, at minimum, whether the unit is receiving adequate primary cooling or heating, whether mixed air and supply air temperatures are reasonable and whether field adjustments or technical service is required to solve the problem. This troubleshooting section shall be bound in a separate section of O & M Manual and shall clearly refer to control device symbols shown on the Control Diagram drawings.

#### 1.5 SPECIAL REQUIREMENTS

- A. The controls trade shall check and adjust his control system completely, four (4) times during the warranty period. The fourth (4) check to be made during the final thirty days of the warranty period.
- B. The controls trade will furnish the Owner with an accurate, up-to-date wiring diagram of all electrical and electronic equipment installed under this contract.
- C. The Contractor shall furnish a complete set of parts lists, operating instructions, and maintenance literature, in duplicate, for proper maintenance of all control equipment.
- D. Steel lockable covers shall be provided for all space thermostats where shown on the drawings and where the space thermostat could be damaged.

## PART 2 – PRODUCTS

### 2.1 CONTROL AND INTERPOSING RELAYS

- A. Relays other than those on I/O cards shall be general purpose, enclosed plug-in type with 8 pin octal plug and protected by a heat and shock resistant dust cover. Relays shall be of the Neon or LED indicator type.
- B. Relay contact configuration and ratings shall be for rated load voltage and exceed load current rating by no less than fifty percent. Minimum contact rating shall be 10 amps at 120 volts AC.

### 2.2 TERMINAL STRIPS

- A. Terminal strips shall be individual plug-in type on a mounting channel. Terminal connections shall be rated 300-volt, 40 amp and shall be of the tubular clamp type for use with bare wire ends, or of the strap screw type for use with crimp spade lug prepared wire ends. Buchanan 600 series or approved substitute.

### 2.3 AUTOMATIC DAMPERS

- A. All automatic dampers shall be furnished by the controls trade and shall be constructed of galvanized sheet steel with bushings made of oil impregnated sintered bronze to give constant lubrication. Each damper section shall have positive closing neoprene blade and edge seals. Outside air, return air and relief dampers shall have blades designed so that the blades are interconnected to give parallel movement. Each modulating damper shall provide a near linear relationship between damper opening and airflow. All volume dampers shall have opposed blades, which will produce equal pressure drop flow characteristics. Blade width shall not exceed 6 inches.

### 2.4 AUTOMATIC CONTROL VALVES – ELECTRIC

- A. The controls trade shall provide all automatic control valves and shall be made by the control manufacturer. All electric control valves 2" and smaller in size shall be brass body and trim, 2-1/2" and larger shall be iron body with brass or stainless-steel trim. Valves shall be provided with renewable type seats and adjustable springs. Valves shall be designed to pass the quantity of water and with a maximum pressure loss not to exceed 10 ft. Valves shall be provided with "V" port or throttling type seat. Valves 2" or smaller shall be screwed. Valves 2-1/2" and larger shall be flanged. All sequencing valves shall have positive positioners.

### 2.5 DAMPER MOTORS – ELECTRIC

- A. The damper motor shall be electro-hydraulic type capable of providing full proportional control of dampers. The actuator shall be compatible with any low voltage controller or auxiliary device. One motor shall be provided per damper section.

### 2.6 CONTROL PANELS

- A. An enclosed control panel or panels with hinged door and locking device shall be installed where shown on the drawings. Panel layout shall be as shown. Thermometers switches and pilot lights

will be flush mounted on the hinged door. Hard tubing shall be brought into the panel. Tubing within the panel may be plastic neatly bundled and tagged. All indicators and controllers will have descriptive bakelite tags.

## 2.7 FILTER GAUGES

- A. Shall be furnished and installed in each filter bank located in the Mechanical Room and at each rooftop air handling unit. Gauges shall be Dwyer Magnahelic with static pressure tips and interconnecting tubing. Range shall be approximately 1-1/2 times the nominal filter change out pressure differential. Each rooftop filter bank shall also have a differential pressure switch with indicator lamp located on a control panel in the Mechanical Room to indicate filter replacement pressure differential has been exceeded.

## 2.8 SMOKE AND FIRE DETECTORS

- A. Smoke detectors shall be furnished and installed in each air handling unit or system and detectors shall be furnished by the Division 26 Contractor, installed by the Division 25 Contractor, connected, and tested by the Division 26 Contractor.

## 2.9 SEQUENCE OF OPERATION

- A. The operation of the control system shall be as indicated on the drawings and control diagrams. The sequence shall be rewritten and shown on the control submittal drawing diagramming that system. The sequence on the submittal drawing shall identify control devices by number and physical location coordinated with the submittal drawing device numbers.

# PART 3 – EXECUTION

## 3.1 RELAYS

- A. All remote field devices shall be controlled through the use of an interposing relay.

## 3.2 INSTALLATION

- A. No control work shall be performed until the control system shop drawings have been approved by the Engineer and returned to the contractor.

## 3.3 CONTROL WIRING

- A. The installation and wiring of all electrical equipment installed under this contract shall meet all Division 16 specifications. Special attention is called to the following:
  1. All wiring to be in conduit.
  2. All control wiring to be color-coded throughout. Conductor color shall be consistent for the entire length of circuit.
  3. All splices shall be made in junction boxes on terminal strips.



4. All control wiring to terminate on marked terminal strips and shall be marked at all terminal points. Both ends of each wire shall be marked with a designation shown on the manufacturer's shop drawings, using interlocking chevron shaped snap-on plastic markers, hot-marked shrinkable tubing, hot stamping of the wire, or clear shrink-on tubing securing adhesive labels. Markers which depend solely on adhesive are not acceptable.
- B. Terminal strips shall be used in all boxes and cabinets where more than six control wires are terminated, spliced or both.
  - C. All control wiring shall be color coded and marked in each box, at each termination with Brady wrap around labels or suitable tags approved by the Architect. The schematic control diagrams shown on the contract drawings are for the convenience of the contractor and may not be complete in all details of control wiring for the equipment purchased for installation.

### 3.4 SYSTEM TESTING

- A. The integrity and accuracy of each function and control point shall be demonstrated to the satisfaction of the Architect/Engineer during the test period. At the termination of the testing period the Contractor shall spend one working day instructing the Owner or his designated personnel in the control system operation. A complete operating booklet shall be provided and used during the training period.
- B. Upon completion of the installation, the Contractor or his authorized representative shall be sent to the installation to certify that all necessary electrical tests and control adjustments have been completed. He shall then file a letter of Certification indicating that the system functions and conforms to the intent of these specifications.

END OF SECTION 25 30 00