

A PROJECT OF THE
PEORIA PARK DISTRICT
PEORIA, ILLINOIS

**HVAC REPLACEMENT
PEORIA PLAYERS THEATRE
4300 N UNIVERSITY ST
PEORIA, ILLINOIS**



PROJECT # 24-029
MARCH 11, 2025

PROJECT MANUAL

PACKAGE # _____

PROJECT MANUAL INCLUDING SPECIFICATIONS FOR:

**HVAC REPLACEMENT
PEORIA PLAYERS THEATRE
4300 N UNIVERSITY ST
PEORIA, ILLINOIS**

ENGINEER: KEITH ENGINEERING DESIGN
ATTN: MITCH ANDRES
707 NE JEFFERSON AVE
PEORIA, ILLINOIS 61603

OWNER: PLEASURE DRIVEWAY AND PARK DISTRICT OF PEORIA,
PEORIA, ILLINOIS

TRUSTEES: ROBERT L. JOHNSON, SR., PRESIDENT
TIMOTHY L. BERTSCHY
STEVE MONTEZ
LAURIE COVINGTON
JOYCE HARANT
REAGAN LESLIE HILL
ALEX SIERRA

PROJECT MANAGER: DAVE VOORHEES
PLANNING, DESIGN & CONSTRUCTION DIVISION
BRADLEY PARK EQUIPMENT SERVICE
1314 N. PARK ROAD
PEORIA, ILLINOIS 61604
TELEPHONE: (309) 678-0560

ADMINISTRATIVE STAFF: EMILY CAHILL, EXECUTIVE DIRECTOR
MATT FREEMAN, SUPERINTENDENT OF PARKS
KARRIE ROSS, SUPERINTENDENT OF FINANCE
AND ADMINISTRATIVE SERVICES
BECKY FREDRICKSON, SUPERINTENDENT OF PLANNING,
DESIGN AND CONSTRUCTION
SHALESSE PIE, SUPERINTENDENT OF HUMAN
RESOURCES
SCOTT LOFTUS, SUPERINTENDENT OF RECREATION

Address all communications regarding this work to the Project Manager listed above.

ADVERTISEMENT FOR BIDS

Sealed bids will be received by the Peoria Park District, Peoria, Illinois, hereinafter known as the Owner, for the following project:

HVAC REPLACEMENT
PEORIA PLAYERS THEATRE
4300 N UNIVERSITY ST
PEORIA, ILLINOIS

It is the intent of the Owner to receive Base Bids & Alternates for the project listed above.

Sealed bids will be received until Tuesday, March 25, 2025 at 1:00 pm prevailing time, by the Owner, at the Peoria Park District Administrative Office, 1125 W. Lake Ave., Peoria, Illinois 61614. (The Board Room clock shall be the official time keeping device in respect to the bid submission deadline.)

An electronic file including Bid Documents is available at www.peoriaparks-planning.org at no charge. Bid Documents, including Plans, Specifications and Interpretations for this project may be obtained at the Planning, Design & Construction Department, Bradley Park Equipment Service, 1314 N. Park Road, Peoria, IL 61604. Telephone (309) 686-3386. A non-refundable plan deposit of \$250 will be charged for each printed set of Bid Documents.

A list of planholders can be obtained upon request. This information will be available up to twenty-four (24) hours prior to the scheduled bid opening time. **After that deadline, no information pertaining to the project will be given.**

A 10% Bid Bond is required, and is to be included with the Bid Proposal. The successful Bidder will be required to furnish a 100% Performance Bond and a 100% Labor and Materials Payment Bond within ten (10) days of formal Award of Contract.

The general prevailing rate of wage for the Peoria area shall be paid for each craft or type of worker needed to execute this contract or perform this work as required by the State of Illinois Department of Labor. Additionally, it is required that provisions of the Illinois Preference Act, the Illinois Drug Free Workplace Act, and the Substance Abuse Prevention on Public Works Act must be adhered to. Bidders are also advised that contract documents for this project include the non-discrimination, equal opportunity and affirmative action provisions in the Human Rights Act and rules and regulations of the Department of Human Rights. The Peoria Park District is an AA/EEO organization and encourages participation by minority and female-owned firms.

The Peoria Park District reserves the right to reject any or all bids, waive technical deficiencies, informalities or irregularities or rebid any project.

PLEASURE DRIVEWAY AND PARK DISTRICT
OF PEORIA, ILLINOIS

BY: ROBERT L. JOHNSON, SR., President

BY: ALICIA WOODWORTH, Secretary

TABLE OF CONTENTS

TITLE PAGE(S)	1-2
INVITATION TO BID	3
TABLE OF CONTENTS	4-5
BIDDING DOCUMENTS:	
- SUPPLEMENTARY INSTRUCTIONS TO BIDDERS	6-10
- BID FORM(S)	11-13
- SUBCONTRACTORS LIST	14
- CERTIFICATION OF COMPLIANCE OF LISTED PROVISIONS AND LAWS	15
- W-9	16-21
- SEXUAL HARASSMENT POLICY STATEMENT	22
- SAMPLE ADDENDUM FORM	23
CONTRACT DOCUMENTS:	
- AGREEMENT BETWEEN OWNER AND CONTRACTOR	24-28
- PERFORMANCE BOND	29-30
- LABOR & MATERIALS PAYMENT BOND	31-32
- CONTRACTOR'S AFFIDAVIT	33
- LIEN WAIVER FORMS	34-37
- SUPPLEMENTAL GENERAL CONDITIONS	38-54
PROJECT SPECIFICATIONS:	
GENERAL REQUIREMENTS:	
DIVISION 010000: GENERAL REQUIREMENTS	55-66
TECHNICAL SPECIFICATIONS:	
DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)	
230529 HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT	13
230553 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT	6
230593 TESTING, ADJUSTING, AND BALANCING FOR HVAC	22
230713 DUCT INSULATION	13
230716 HVAC EQUIPMENT INSULATION	6
230719 HVAC PIPING INSULATION	17
232113 HYDRONIC PIPING	13
232116 HYDRONIC PIPING SPECIALTIES	7
232300 REFRIGERANT PIPING	10
232513 WATER TREATMENT FOR CLOSED-LOOP HYDRONIC SYSTEMS	5
233113 METAL DUCTS	12
233116 NONMETAL DUCTS	5
233300 AIR DUCT ACCESSORIES	15
233346 FLEXIBLE DUCTS	3
233600 AIR TERMINAL UNITS	5
233713.13 AIR DIFFUSERS	6
233713.23 REGISTERS AND GRILLES	4
237416.13 PACKAGED, LARGE-CAPACITY, ROOFTOP AIR-CONDITIONING UNITS	13
238126 SPLIT-SYSTEM AIR-CONDITIONERS	7
238216.11 HYDRONIC AIR COILS	3

DIVISION 26 - ELECTRICAL

260500	COMMON WORK RESULTS FOR ELECTRICAL	6
260519	LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES	3
260523	CONTROL-VOLTAGE ELECTRICAL POWER CABLES	4
260526	GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS	6
260529	HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS	4
260533	RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS	5
260544	SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING	2
260553	IDENTIFICATION FOR ELECTRICAL SYSTEMS	4
262416	PANELBOARDS	6
262726	WIRING DEVICES	4
262813	FUSES	3
262816	ENCLOSED SWITCHES AND CIRCUIT BREAKERS	7
265119	LED INTERIOR LIGHTING	7
265600	EXTERIOR LIGHTING	6

EXHIBITS:

ATTACHMENT A - INSURANCE REQUIREMENTS	6 PAGES
ATTACHMENT B – SOLICITATION & HIRING FOR QUALIFYING CONSTRUCTION CONTRACTS POLICY & FORMS	21 PAGES
ATTACHMENT C – DIRECTORY OF MINORITY & WOMEN OWNED BUSINESS ENTERPRISES	7 PAGES
ATTACHMENT D – PREVAILING WAGES FOR PEORIA COUNTY – ILLINOIS DEPARTMENT OF LABOR	8 PAGES

DRAWINGS:

MD110	FIRST FLOOR -MECHANICAL DEMOLITION
M100	BASEMENT -MECHANICAL NEW WORK
M110	FIRST FLOOR -MECHANICAL NEW WORK
M400	MECHANICAL DETAILS & NOTES
M500	MECHANICAL SCHEDULES
ED100	BASEMENT -ELECTRICAL DEMOLITION
ED110	FIRST FLOOR -ELECTRICAL DEMOLITION
E100	BASEMENT -ELECTRICAL NEW WORK
E110	FIRST FLOOR -ELECTRICAL NEW WORK
E500	ELECTRICAL SCHEDULES & GENERAL NOTES

END OF TABLE OF CONTENTS

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

1. INSTRUCTIONS TO BIDDERS

- A. "Instructions to Bidders", AIA Document A701, 2018 Editions, published by the American Institute of Architects, including revisions adopted before date of this Project Manual, is hereby made part of these specifications with same force and effect as though set forth in full.
- B. The following modifies, changes, deletes from or adds to the **Instructions to Bidders** (AIA Document A701, 2018 Edition). Where any Article of the Instructions to Bidders is modified or any Paragraph, Subparagraph or Clause thereof is modified or deleted by these Supplementary Conditions, the unaltered provisions of that Article, Paragraph, Subparagraph or Clause shall remain in effect.
- C. Parenthesis () indicates the appropriate section and Subparagraph of the Instructions to Bidders which each paragraph of the Supplementary Instructions to Bidders modifies or refers to.

2. PROJECT DESCRIPTION

- A. The Project description generally is as follows:
 - 1. **BASE BID:** The project consists of heating, ventilation, air conditioning and electrical demolition, including the installation of a new ground mounted roof top unit, new roof mounted condensing units, new painted ductwork, grilles, electrical power, controls, concrete pad, fencing and miscellaneous associated work at Peoria Players Theatre.
 - 2. **ALTERNATE #1:** Furnish and install new exposed supply air ductwork and drum louvres in auditorium.
- B. **PRE-BID MEETING :**
 - 1. A pre-bid meeting will be held at Peoria Players Theatre, 4300 N University in Peoria, Illinois on Tuesday, March 18, 2025 at 12:00 pm.

3. CODES AND PERMITS

- A. **COSTS ASSOCIATED WITH REGULATORY COMPLIANCE.** All Work performed in connection with this Project shall be in compliance with the requirements of all applicable local, state, and federal laws, regulations, and rules, as well as the requirements of the Construction Documents. The Bid Price shall reflect all costs of compliance to those requirements, whether or not specifically stated in the Construction Documents or specific sections of the Project Manual.
- B. **PERMITS/FEEES.** Work shall not commence until all required building (and/or other) permits have been secured by the Contractor and copies of these permits submitted to the Owner's Representative. Cost of permits is to be included in the Bid Price.

4. BID GUARANTY

The bid must be accompanied by a Bid Guaranty which shall not be less than 10% of the amount of the Bid. At the option of the Bidder, the 10% Guaranty may be a Certified Check, Cashier's Check, or a Bid Bond. The Bid Bond shall be secured by a Guaranty or a Surety Company acceptable to the Owner. No bid will be considered unless it is accompanied by the required Guaranty. Funds must be made payable to the order of the Owner. Cash deposits will not be accepted. The Bid Guaranty shall ensure the execution of the Agreement and the furnishing of the Surety Bond or Bonds by the successful Bidder, all as required by the Contract Documents.

5. AWARD OF CONTRACT/REJECTION OF BIDS:

The Contracts will be awarded on the basis of Paragraph 5.3 of the Instructions to Bidders and Paragraph 16 of the Supplementary Instructions to Bidders. The Bidders to whom the awards are made will be notified at the earliest possible date. The Owner, however, reserves the right to reject any and all Bids, to accept any combination of base bids and alternates and to waive any technical deficiencies, informalities, or irregularities in Bids received whenever such rejection or waiver is in its interest.

No bid shall be withdrawn for a period of sixty (60) days after the opening of bids without the consent of the Owner. The failure of the Bidder to submit a Bid Bond, Certified Check or Cashier's Check in the full amount to cover all proposals bid upon shall be sufficient cause for rejection of his bid. The award will be made contingent upon submittal and evaluation of Contractor's Qualification Statement if requested, Bonds, Certificate of Insurance, Contractor Certifications, including Certification of Compliance of Listed Provisions and Laws, Peoria Park District Certificate of Equal Employment Opportunity Compliance for Contractors and Vendors, Workforce Profile, Company Ownership Certification, Minority/Women Owned Contact Sheet, Contractor/Subcontractor Workforce Plan, etc.

6. EXECUTION OF AGREEMENT:

Following the award and within ten (10) days after the prescribed forms are prepared and presented for signature by the Owner's Representative, the successful Bidder shall execute and return to the Owner's Representative the Agreement in the form included in the Contract Documents in such number of copies as the Owner may require. The Owner's Representative will provide Notice to Proceed after all bonds and any other required documents have been received by the Park District.

7. PERFORMANCE BOND/LABOR AND MATERIAL PAYMENT BOND & INSURANCE

- A. **BONDS REQUIRED.** Having satisfied all conditions of award as set forth elsewhere in these Documents, the successful Bidder shall, within ten (10) calendar days after award of contract, furnish Surety Bonds in penal sums, each not less than the amount of the Contract as awarded as security for the faithful performance of the Contract (Performance Bond), and for the payment (Labor and Materials

Payment Bond) of all persons, firms or corporations to whom the Contractor may become legally indebted for labor, materials, tools, equipment or services employed or used by him in performing the work.

- B. FORM OF BONDS.** Such bonds shall be in the same form as the samples included in the Project Manual and shall bear the same date as or a date subsequent to that of the Agreement. The current Power of Attorney for the person who signs for any Surety Company shall be attached to such Bonds. Bonds shall be signed by a Guaranty or Surety Company acceptable to the Owner.
- C. COST OF PERFORMANCE BOND/LABOR AND MATERIAL PAYMENT BOND.** All costs for the Performance Bond/Labor and Material Payment Bond shall be included in the submitted Bid Price.
- D. INSURANCE.** Insurance requirements for this project are addressed both in the Supplementary General Conditions and in "Attachment A.6", in the "Exhibits" section of this Project Manual.
 - a) In respect to the property ("builders risk") insurance coverages referenced in the Supplementary General Conditions: the successful Bidder will be required to provide such coverages as the work of the Project will be accomplished by one general/prime contractor(s).
- E. TIME FRAMES.** The successful Bidder shall, within ten (10) days after award of contract by the Board of Trustees, submit Proof of Insurance coverages/Bonds in the form and amounts required to the Owner's Representative. Should the Bidder be unable to provide the required Proof of Insurance(s)/Bonds within the specified ten day period the Owner reserves the right, at its sole discretion, to withdraw its award of contract from that Bidder.

8. DEFAULT

- A.** The failure of the successful Bidders to execute the Agreement, supply the required Bonds or proof of required insurance coverage(s) within (ten) 10 days after award of contract, or within such extended period as the Owner may grant based upon reasons determined sufficient by the Owner, may constitute a default. In such case, award of contract will be transferred to the second lowest bidder.

9. CONTRACTOR'S QUALIFICATION STATEMENT

- A.** Contractor's Qualification Statement (AIA Document 305) shall be submitted by low bidder for evaluation prior to award of contract if so requested by the Owner or his representatives.

10. LIST OF SUBCONTRACTORS/PRODUCT & EQUIPMENT SUBSTITUTIONS

- A.** Each Bidder shall submit a "SUBCONTRACTORS LIST" proposed to be used in the execution of the Work. If there will be no subcontractors, the Bidder shall state "No Subcontractors" on this form. The completed form is due with the Bid Proposal.
 - 1) Identify the trade name, address, telephone number, and category of work of each subcontractor.
 - 2) Failure to submit the "Subcontractors List" with the Bid Proposal may result in the rejection of the Bid.
 - 3) Delete Subparagraphs (6.3.1.1) from AIA A701.
- B.** The Bidder, by submission of a signed bid form, agrees to install all products and equipment by brand name or names specified in the Technical Specifications sections of this Project Manual. "Or equal" substitutions will be allowed only if approved in writing prior to the bid opening and listed in the "Substitutions" section of the Bid Form.

11. CONTRACT ADMINISTRATION FORMS/COSTS OF FORMS

- A. REQUIRED FORMS.** The following AIA forms will be used (AIA forms will be supplied by the Owner if requested, and charged to the Contractor at cost) in the administration of the project:
 - 1) **AIA Document A310:** "Bid Bond", February 1970 edition
 - 2) **AIA Document A305:** "Contractor's Qualification Statement", 1986 edition
 - 3) **AIA Document G702:** "Application and Certificate of Payment", May 1992 edition
 - 4) **AIA Document G703:** "Continuation Sheet", May 1992 edition
- B. OTHER FORMS.** Other contract administration forms (to be provided by the Owner unless otherwise noted) required for use in the Project are:
 - 1) **Subcontractors List**
 - 2) **Contractor's Affidavit**
 - 3) **Performance Bond**
 - 4) **Labor and Material Payment Bond**
 - 5) **Lien Waiver Forms**
 - 6) **Certified Payroll Form**

Please Note: Illinois State Law has changed. As a Contractor on a public works project, Contractor must submit

certified payroll directly to the Illinois Department of Labor. See details at <https://www2.illinois.gov/idol/laws-rules/conmed/pages/prevailing-wage-portal.aspx>

The first time submitting certified payroll to this site requires additional set-up time and specialized forms that must be used.

After submitting certified payroll directly to the Illinois Department of Labor, Contractor will receive a PDF proof of submittal. A copy of this PDF proof of submittal is required with pay applications to Owner.

- 7) **Insurance Forms: As required in Attachment A (at end of Project Manual)** (will not be provided by Owner)
- 8) **Agreement Between Owner and Contractor**

Examples of these forms are included in the Project Manual.

12. CONSTRUCTION TIME AND LIQUIDATED DAMAGES CLAUSE:

PROJECT COMPLETION. The Agreement will include the following paragraph(s) or language substantially the same, regarding construction time and liquidated damages:

- 1) **LIQUIDATED DAMAGES:** Owner and Contractor recognize that time is of the essence of this Agreement and that Owner will suffer financial loss if the Work is not Substantially Complete within the time specified below, plus any extensions thereof allowed in accordance with Article 8 of the General Conditions. They also recognize the delays, expense and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time.
- 2) Accordingly, instead of requiring any such proof, Owner and Contractor agree that as Liquidated Damages for delay (but not as a penalty) Contractor shall pay Owner Two Hundred and Fifty Dollars (\$250.00) for each calendar day that expires after Two Hundred Nineteen (219) calendar days from Notice of Award until Substantial Completion is attained. The work is tentatively scheduled to begin on April 10, 2025 and be at Substantial Completion by November 15, 2025. ** Note: Air handler installation shall take place between heating and cooling seasons, October 1, 2025 to November 15, 2025, tentatively. **
- 3) After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work necessary to achieve Final Completion within Fourteen (14) calendar days or any proper extension thereof granted by Owner, Contractor shall pay Owner Two Hundred and Fifty Dollars (\$250.00) for each day that expires after the time specified.
- 4) Owner and Contractor agree that the per day liquidated damage amounts set forth in subparagraphs "2" and "3" of this section constitute a reasonable forecast of the financial losses, actual costs and increased expenses the Owner may incur as a result of delayed Substantial or Final Completion of the Project.

13. PROJECT MANUAL/PLANS & SITE VISITATION

- A. A set of Bid Documents may be examined, at no charge, at the office of the Owner's Representative.
- B. **PLAN DEPOSIT.** An electronic file including Bid Documents is available at www.peoriaparks-planning.org at no charge. A printed set of Bid Documents, including Plans, Specifications and Interpretations for this project may be obtained at the Planning, Design & Construction Department, Bradley Park Equipment Service, 1314 N. Park Road, Peoria, IL 61604. Telephone (309) 686-3386. A non-refundable plan deposit of Two Hundred and Fifty Dollars (\$250.00) will be charged for each printed set of Bid Documents.
- C. **FAMILIARITY WITH BID DOCUMENTS & SITE VISITATION.** Bidders, by submission of their Bids, represent that they have visited the site to acquaint themselves with the local conditions in which the Work is to occur, and that they are familiar with all the requirements of the Project, as defined in the Project Manual and the Plan(s).

14. OTHER MODIFICATIONS TO AIA-701/OTHER CONDITIONS

- A. Add the following sentence to (4.1.7): "Bidder shall submit two (2) completed copies of Bid Form and retain one (1) copy for his files."
- B. Delete (4.2.1)
- C. Delete Section (6.2) - "Owner's Financial Capability"
- D. In reference to (7.2.1), the Peoria Park District reserves the right of final approval of bonding companies. Replace the first Sentence with "The Bidder shall deliver the required bonds to the Owner not later than ten days following the date of execution of the Contract."
- E. Delete paragraph (7.1.3).

15. EQUAL EMPLOYMENT OPPORTUNITY/SEXUAL HARASSMENT

- A. It is a goal of the Peoria Park District to encourage participation of minorities and women on Peoria Park District construction projects through contracts and workforce. Good Faith Effort must be made to encourage the use of minority and women owned businesses as sub-contractors and suppliers on the project.

On all bids \$50,000.00 and over, see requirements listed in **Attachment B "Solicitation and Hiring for Qualifying Construction Contracts & Forms"**.

On all bids less than \$50,000.00, complete and submit the following listed forms (provided in Attachment B) with the Bid. Failure to submit the forms may result in rejection of the bid.

1. **"Peoria Park District Certificate of Equal Employment Opportunity Compliance for Contractors and Vendors"** Form
2. **"Workforce Profile"** Form
3. **"Company Ownership Certification"** Form

- B. Effective July 1, 1993, every party to a public contract and every party bidding on public contracts is required to have a written **"Sexual Harassment Policy"**. The Sexual Harassment Policy must contain:

- 1) A definition of sexual harassment under state law;
- 2) A description of sexual harassment utilizing examples;
- 3) A formalized complaint procedure;
- 4) A statement of victim's rights;
- 5) Directions on how to contact the Illinois Department of Human Rights - **Illinois companies**. Out-of-State companies must include directions on how to contact the enforcement agency within their state. Companies that issue a standard policy for all business locations must prepare an addendum providing directions on how to contact the appropriate enforcement agency.
- 6) A recitation that there cannot be any retaliation against employees who elect to file charges.

Recommendation: Your **"Sexual Harassment Policy"** should be drafted in language easy to understand and any revisions should be reviewed by legal counsel. A copy of your policy should be posted in a prominent and accessible location to assure all employees will be notified of the company's position.

In order to conduct business with the Peoria Park District, you must have a written "Sexual Harassment Policy" that conforms to the Act.

FAILURE TO DO SO WILL DISQUALIFY YOU AS AN ELIGIBLE VENDOR.

16. BID SUBMISSION

- A. **DATE, TIME & PLACE OF RECEIVING BIDS.** Bids will be received until the date and time listed in the "Advertisement for Bids", at which time they will be publicly opened, read aloud and recorded. The Bid Opening will be held at the place listed in the "Advertisement for Bids".
- B. **REQUIRED ITEMS.** The following items must be included as part of the "BID":
- 1) Two (2) signed copies of the **BID FORM**. (Retain the third copy for your files.)
 - 2) The **SUBCONTRACTORS LIST**. (Submit form and state "No Subcontractors" on the form, if none will be used.)
 - 3) The **PEORIA PARK DISTRICT CERTIFICATE OF EQUAL EMPLOYMENT OPPORTUNITY COMPLIANCE FOR CONTRACTORS AND VENDORS** form.
 - 4) The **WORKFORCE PROFILE** form.
 - 5) The **COMPANY OWNERSHIP CERTIFICATION** form.
 - 6) The **CERTIFICATION OF COMPLIANCE OF THE LISTED PROVISIONS AND LAWS** form.
 - 7) Completed **W-9**.
 - 8) The **BID GUARANTY**.
 - 9) If the bid is over \$50,000.00, the **MINORITY/WOMEN OWNED CONTACT SHEET** form.
 - 10) If the bid is over \$50,000.00, the **CONTRACTOR/SUBCONTRACTOR WORKFORCE PLAN** form.

- C. **BID SUBMISSION.** The "BID" shall be enclosed in envelopes (outer and inner), both of which shall be sealed and clearly labeled with the following information, in order to prevent premature opening of the bid:

- "PROPOSAL"
- NAME OF PROJECT
- NAME OF BIDDER
- DATE/TIME OF BID OPENING

END OF SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

Bid From: _____

PROJECT NO. 24-029
BID FOR: HVAC REPLACEMENT
LOCATION: PEORIA PLAYERS THEATRE

BID FORM

BID TO: PEORIA PARK DISTRICT

UNDERSIGNED:

1. Acknowledges receipt of:
 - A. Project Manual and Drawings for:

HVAC REPLACEMENT
PEORIA PLAYERS THEATRE
4300 N UNIVERSITY ST
PEORIA, ILLINOIS
 - B. Addenda: No. _____ through No. _____
2. Has examined facility and the bid documents and shall be responsible for performing work specifically required of him by all parts of bidding documents including specifications for entire project, even though such work may be included as related requirements specified in other divisions or sections.
3. And agrees to enter into and execute Contract with Owner, if awarded on basis of this bid, and to:
 - A. Furnish Bonds and Insurance required by the Bidding & Contract Documents.
 - B. Accomplish work in accord with Contract.
 - C. Complete work within specified Contract time.
4. **CONTRACT TIME:** Contractor agrees to Substantially Complete ALL WORK as required by the Contract Documents per the Supplementary General Conditions and Supplementary Instructions to Bidders.
5. **BASE BIDS:**
 - A. Base Bid:

Bidder agrees to perform all building and site work, as set forth in the Project Manual and Drawings for the sum of:

_____ Dollars (\$ _____ . _____)
6. **ALTERNATES:**

Bidder agrees to perform all building and/or site work items as set forth below. The prices submitted may be accepted either at the time of Base Bid approval or up to no later than ninety (90) days after award of the Bid; however, if not approved at the time of the award of the Base Bid, the contract times as set forth in the Project Manual and Drawings will be adjusted to compensate for the additional time taken in award of the Alternate:

Bid From: _____

PROJECT NO. 24-029
BID FOR: HVAC REPLACEMENT
LOCATION: PEORIA PLAYERS THEATRE

A. Add Alternate #1: Furnish and install new exposed supply air ductwork and drum louvres in auditorium.

_____ Dollars (\$_____.____)

7. **PROPOSED SUBSTITUTION LIST:**

Base Bid(s) and Alternates are understood to include only those product brands, items, and elements which are specified in the Bid Documents. The following is a list of substitute products, equipment or methods of construction which the Bidder proposes to furnish on this project, with difference in price being added or deducted from Base Bid(s).

Bidder understands that acceptance of any proposed substitution which has not been approved as an "equal" to the product brand, item, or element specified prior to bid opening is at Owner's option. Approval or rejection of any substitutions listed below will be indicated before executing Contract.

<u>ITEM</u>	<u>ADD</u>	<u>DEDUCT</u>
_____	\$ _____	\$ _____
_____	\$ _____	\$ _____
_____	\$ _____	\$ _____

8. **BIDDERS CHECKLIST:**

Did you visit the site?	Yes	No
Is Bid Security enclosed? (If applicable)	Yes	No
Is Peoria Park District Certificate of Equal Employment Opportunity Compliance for Contractors enclosed?	Yes	No
Is Workforce Profile enclosed?	Yes	No
Is Company Ownership Certification enclosed?	Yes	No
If the bid is \$50,000.00 or over, the Minority/Women Owned Contact Sheet enclosed?	Yes	No
If the bid is \$50,000.00 or over, the Contractor/Subcontractor Workforce Plan enclosed?	Yes	No
Is Subcontractors List enclosed?	Yes	No
Is Certification of Compliance of the Listed Provisions and Laws form enclosed?	Yes	No

Bid From: _____

PROJECT NO. 24-029
BID FOR: HVAC REPLACEMENT
LOCATION: PEORIA PLAYERS THEATRE

Is a completed W-9 enclosed?

Yes

No

10. **BIDDER INFORMATION:**

NAME OF BIDDER: _____

ADDRESS: _____

CITY, STATE, ZIP: _____

TELEPHONE NO.: _____

BY: _____

(Signature of Authorized Official)

TITLE: _____

BIDDER'S SEAL

WITNESS: _____

END OF BID FORM

SUBCONTRACTORS LIST

The following tabulation of Subcontractors shall be attached and made a condition of the Bid. The Bidder expressly understands and agrees to the following provisions:

- A. If awarded a Contract as a result of this Bid, the subcontractors used in the prosecution of the work will be those listed below.
- B. The following list includes all subcontractors, known at the time of the Bid, who will perform work on this project.
- C. The subcontractors listed below are financially responsible and are qualified to perform the work required.
- D. The subcontractors listed below comply with the requirements of the Contract Documents.
- E. Any substitutions in the subcontractors listed below shall be requested in writing by the Contractor and must be approved in writing by the Owner. No sub-subcontractors will be allowed unless specifically stated on the form. All pertinent financial, performance, insurance and other applicable information shall be submitted with the request for substitution(s). Owner shall respond to such requests within 14 calendar days following the submission of all necessary information to the full satisfaction of the Owner.
- F. Failure to submit the list of Subcontractors as stated herein shall constitute a material variation from the Invitation to Bid; and any such Bid may be rejected by the Owner.

Subcontractor Name	Telephone/Email	Area of Work	Minority/Women Owned Business (Yes/No)	Dollar Amount of Contract

BIDDER: _____

END OF SUBCONTRACTORS LIST

**CERTIFICATION OF COMPLIANCE
OF THE LISTED PROVISIONS AND LAWS**

1) Illinois Drug Free Workplace Act of 1991

2) The Substance Abuse Prevention on Public Works Act Public Act 95-0635:

Prohibits the use of drugs and alcohol while performing work on a public works project.

The Contractor/Subcontractor has signed collective bargaining agreement for all of its employees that deal with the subject matter or the Contractor/Subcontractor has a prevention program that meets or exceeds the requirements of the Public Act for all employees not covered by a collective bargaining agreement.

3) Safety Compliance:

Contractor/Subcontractors will comply with any and all prevailing occupational safety and health standards. Such compliance may include a training component or require a written program of compliance.

4) Illinois Criminal Code, Illinois Compiled Statutes 720 ILCS 5/33E-3 and 5/33E-4:

Contractor/Subcontractor has not been barred from bidding on public contract as a result of bid rigging or bid rotating.

The undersigned representative of the Contractor/Vendor hereby certifies to comply with the laws and provisions listed above.

Contractor/Subcontractor

Name of Authorized Representative (type or print)

Signature of Authorized Representative

Date

Request for Taxpayer Identification Number and Certification

Go to www.irs.gov/FormW9 for instructions and the latest information.

**Give form to the
 requester. Do not
 send to the IRS.**

Before you begin. For guidance related to the purpose of Form W-9, see *Purpose of Form*, below.

Print or type. See Specific Instructions on page 3.	1	Name of entity/individual. An entry is required. (For a sole proprietor or disregarded entity, enter the owner's name on line 1, and enter the business/disregarded entity's name on line 2.)	
	2	Business name/disregarded entity name, if different from above.	
	3a	Check the appropriate box for federal tax classification of the entity/individual whose name is entered on line 1. Check only one of the following seven boxes. <input type="checkbox"/> Individual/sole proprietor <input type="checkbox"/> C corporation <input type="checkbox"/> S corporation <input type="checkbox"/> Partnership <input type="checkbox"/> Trust/estate <input type="checkbox"/> LLC. Enter the tax classification (C = C corporation, S = S corporation, P = Partnership) _____ Note: Check the "LLC" box above and, in the entry space, enter the appropriate code (C, S, or P) for the tax classification of the LLC, unless it is a disregarded entity. A disregarded entity should instead check the appropriate box for the tax classification of its owner. <input type="checkbox"/> Other (see instructions) _____	4 Exemptions (codes apply only to certain entities, not individuals; see instructions on page 3): Exempt payee code (if any) _____ Exemption from Foreign Account Tax Compliance Act (FATCA) reporting code (if any) _____ <i>(Applies to accounts maintained outside the United States.)</i>
	3b	If on line 3a you checked "Partnership" or "Trust/estate," or checked "LLC" and entered "P" as its tax classification, and you are providing this form to a partnership, trust, or estate in which you have an ownership interest, check this box if you have any foreign partners, owners, or beneficiaries. See instructions _____ <input type="checkbox"/>	
	5	Address (number, street, and apt. or suite no.). See instructions.	Requester's name and address (optional)
	6	City, state, and ZIP code	
	7	List account number(s) here (optional)	

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on line 1 to avoid backup withholding. For individuals, this is generally your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the instructions for Part I, later. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN*, later.

Social security number									
				-					
or									
Employer identification number									

Note: If the account is in more than one name, see the instructions for line 1. See also *What Name and Number To Give the Requester* for guidelines on whose number to enter.

Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me); and
2. I am not subject to backup withholding because (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding; and
3. I am a U.S. citizen or other U.S. person (defined below); and
4. The FATCA code(s) entered on this form (if any) indicating that I am exempt from FATCA reporting is correct.

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and, generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions for Part II, later.

Sign Here	Signature of U.S. person	Date
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General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Future developments. For the latest information about developments related to Form W-9 and its instructions, such as legislation enacted after they were published, go to www.irs.gov/FormW9.

What's New

Line 3a has been modified to clarify how a disregarded entity completes this line. An LLC that is a disregarded entity should check the appropriate box for the tax classification of its owner. Otherwise, it should check the "LLC" box and enter its appropriate tax classification.

New line 3b has been added to this form. A flow-through entity is required to complete this line to indicate that it has direct or indirect foreign partners, owners, or beneficiaries when it provides the Form W-9 to another flow-through entity in which it has an ownership interest. This change is intended to provide a flow-through entity with information regarding the status of its indirect foreign partners, owners, or beneficiaries, so that it can satisfy any applicable reporting requirements. For example, a partnership that has any indirect foreign partners may be required to complete Schedules K-2 and K-3. See the Partnership Instructions for Schedules K-2 and K-3 (Form 1065).

Purpose of Form

An individual or entity (Form W-9 requester) who is required to file an information return with the IRS is giving you this form because they

must obtain your correct taxpayer identification number (TIN), which may be your social security number (SSN), individual taxpayer identification number (ITIN), adoption taxpayer identification number (ATIN), or employer identification number (EIN), to report on an information return the amount paid to you, or other amount reportable on an information return. Examples of information returns include, but are not limited to, the following.

- Form 1099-INT (interest earned or paid).
- Form 1099-DIV (dividends, including those from stocks or mutual funds).
- Form 1099-MISC (various types of income, prizes, awards, or gross proceeds).
- Form 1099-NEC (nonemployee compensation).
- Form 1099-B (stock or mutual fund sales and certain other transactions by brokers).
- Form 1099-S (proceeds from real estate transactions).
- Form 1099-K (merchant card and third-party network transactions).
- Form 1098 (home mortgage interest), 1098-E (student loan interest), and 1098-T (tuition).
- Form 1099-C (canceled debt).
- Form 1099-A (acquisition or abandonment of secured property).

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN.

Caution: If you don't return Form W-9 to the requester with a TIN, you might be subject to backup withholding. See *What is backup withholding*, later.

By signing the filled-out form, you:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued);
2. Certify that you are not subject to backup withholding; or
3. Claim exemption from backup withholding if you are a U.S. exempt payee; and
4. Certify to your non-foreign status for purposes of withholding under chapter 3 or 4 of the Code (if applicable); and
5. Certify that FATCA code(s) entered on this form (if any) indicating that you are exempt from the FATCA reporting is correct. See *What Is FATCA Reporting*, later, for further information.

Note: If you are a U.S. person and a requester gives you a form other than Form W-9 to request your TIN, you must use the requester's form if it is substantially similar to this Form W-9.

Definition of a U.S. person. For federal tax purposes, you are considered a U.S. person if you are:

- An individual who is a U.S. citizen or U.S. resident alien;
- A partnership, corporation, company, or association created or organized in the United States or under the laws of the United States;
- An estate (other than a foreign estate); or
- A domestic trust (as defined in Regulations section 301.7701-7).

Establishing U.S. status for purposes of chapter 3 and chapter 4 withholding. Payments made to foreign persons, including certain distributions, allocations of income, or transfers of sales proceeds, may be subject to withholding under chapter 3 or chapter 4 of the Code (sections 1441–1474). Under those rules, if a Form W-9 or other certification of non-foreign status has not been received, a withholding agent, transferee, or partnership (payor) generally applies presumption rules that may require the payor to withhold applicable tax from the recipient, owner, transferor, or partner (payee). See Pub. 515, *Withholding of Tax on Nonresident Aliens and Foreign Entities*.

The following persons must provide Form W-9 to the payor for purposes of establishing its non-foreign status.

- In the case of a disregarded entity with a U.S. owner, the U.S. owner of the disregarded entity and not the disregarded entity.
- In the case of a grantor trust with a U.S. grantor or other U.S. owner, generally, the U.S. grantor or other U.S. owner of the grantor trust and not the grantor trust.
- In the case of a U.S. trust (other than a grantor trust), the U.S. trust and not the beneficiaries of the trust.

See Pub. 515 for more information on providing a Form W-9 or a certification of non-foreign status to avoid withholding.

Foreign person. If you are a foreign person or the U.S. branch of a foreign bank that has elected to be treated as a U.S. person (under Regulations section 1.1441-1(b)(2)(iv) or other applicable section for chapter 3 or 4 purposes), do not use Form W-9. Instead, use the appropriate Form W-8 or Form 8233 (see Pub. 515). If you are a qualified foreign pension fund under Regulations section 1.897(l)-1(d), or a partnership that is wholly owned by qualified foreign pension funds, that is treated as a non-foreign person for purposes of section 1445 withholding, do not use Form W-9. Instead, use Form W-8EXP (or other certification of non-foreign status).

Nonresident alien who becomes a resident alien. Generally, only a nonresident alien individual may use the terms of a tax treaty to reduce or eliminate U.S. tax on certain types of income. However, most tax treaties contain a provision known as a saving clause. Exceptions specified in the saving clause may permit an exemption from tax to continue for certain types of income even after the payee has otherwise become a U.S. resident alien for tax purposes.

If you are a U.S. resident alien who is relying on an exception contained in the saving clause of a tax treaty to claim an exemption from U.S. tax on certain types of income, you must attach a statement to Form W-9 that specifies the following five items.

1. The treaty country. Generally, this must be the same treaty under which you claimed exemption from tax as a nonresident alien.
2. The treaty article addressing the income.
3. The article number (or location) in the tax treaty that contains the saving clause and its exceptions.
4. The type and amount of income that qualifies for the exemption from tax.
5. Sufficient facts to justify the exemption from tax under the terms of the treaty article.

Example. Article 20 of the U.S.-China income tax treaty allows an exemption from tax for scholarship income received by a Chinese student temporarily present in the United States. Under U.S. law, this student will become a resident alien for tax purposes if their stay in the United States exceeds 5 calendar years. However, paragraph 2 of the first Protocol to the U.S.-China treaty (dated April 30, 1984) allows the provisions of Article 20 to continue to apply even after the Chinese student becomes a resident alien of the United States. A Chinese student who qualifies for this exception (under paragraph 2 of the first Protocol) and is relying on this exception to claim an exemption from tax on their scholarship or fellowship income would attach to Form W-9 a statement that includes the information described above to support that exemption.

If you are a nonresident alien or a foreign entity, give the requester the appropriate completed Form W-8 or Form 8233.

Backup Withholding

What is backup withholding? Persons making certain payments to you must under certain conditions withhold and pay to the IRS 24% of such payments. This is called "backup withholding." Payments that may be subject to backup withholding include, but are not limited to, interest, tax-exempt interest, dividends, broker and barter exchange transactions, rents, royalties, nonemployee pay, payments made in settlement of payment card and third-party network transactions, and certain payments from fishing boat operators. Real estate transactions are not subject to backup withholding.

You will not be subject to backup withholding on payments you receive if you give the requester your correct TIN, make the proper certifications, and report all your taxable interest and dividends on your tax return.

Payments you receive will be subject to backup withholding if:

1. You do not furnish your TIN to the requester;
2. You do not certify your TIN when required (see the instructions for Part II for details);
3. The IRS tells the requester that you furnished an incorrect TIN;
4. The IRS tells you that you are subject to backup withholding because you did not report all your interest and dividends on your tax return (for reportable interest and dividends only); or
5. You do not certify to the requester that you are not subject to backup withholding, as described in item 4 under "*By signing the filled-out form*" above (for reportable interest and dividend accounts opened after 1983 only).

Certain payees and payments are exempt from backup withholding. See *Exempt payee code*, later, and the separate Instructions for the Requester of Form W-9 for more information.

See also *Establishing U.S. status for purposes of chapter 3 and chapter 4 withholding*, earlier.

What Is FATCA Reporting?

The Foreign Account Tax Compliance Act (FATCA) requires a participating foreign financial institution to report all U.S. account holders that are specified U.S. persons. Certain payees are exempt from FATCA reporting. See *Exemption from FATCA reporting code*, later, and the Instructions for the Requester of Form W-9 for more information.

Updating Your Information

You must provide updated information to any person to whom you claimed to be an exempt payee if you are no longer an exempt payee and anticipate receiving reportable payments in the future from this person. For example, you may need to provide updated information if you are a C corporation that elects to be an S corporation, or if you are no longer tax exempt. In addition, you must furnish a new Form W-9 if the name or TIN changes for the account, for example, if the grantor of a grantor trust dies.

Penalties

Failure to furnish TIN. If you fail to furnish your correct TIN to a requester, you are subject to a penalty of \$50 for each such failure unless your failure is due to reasonable cause and not to willful neglect.

Civil penalty for false information with respect to withholding. If you make a false statement with no reasonable basis that results in no backup withholding, you are subject to a \$500 penalty.

Criminal penalty for falsifying information. Willfully falsifying certifications or affirmations may subject you to criminal penalties including fines and/or imprisonment.

Misuse of TINs. If the requester discloses or uses TINs in violation of federal law, the requester may be subject to civil and criminal penalties.

Specific Instructions

Line 1

You must enter one of the following on this line; **do not** leave this line blank. The name should match the name on your tax return.

If this Form W-9 is for a joint account (other than an account maintained by a foreign financial institution (FFI)), list first, and then circle, the name of the person or entity whose number you entered in Part I of Form W-9. If you are providing Form W-9 to an FFI to document a joint account, each holder of the account that is a U.S. person must provide a Form W-9.

- **Individual.** Generally, enter the name shown on your tax return. If you have changed your last name without informing the Social Security Administration (SSA) of the name change, enter your first name, the last name as shown on your social security card, and your new last name.

Note for ITIN applicant: Enter your individual name as it was entered on your Form W-7 application, line 1a. This should also be the same as the name you entered on the Form 1040 you filed with your application.

- **Sole proprietor.** Enter your individual name as shown on your Form 1040 on line 1. Enter your business, trade, or “doing business as” (DBA) name on line 2.

- **Partnership, C corporation, S corporation, or LLC, other than a disregarded entity.** Enter the entity’s name as shown on the entity’s tax return on line 1 and any business, trade, or DBA name on line 2.

- **Other entities.** Enter your name as shown on required U.S. federal tax documents on line 1. This name should match the name shown on the charter or other legal document creating the entity. Enter any business, trade, or DBA name on line 2.

- **Disregarded entity.** In general, a business entity that has a single owner, including an LLC, and is not a corporation, is disregarded as an entity separate from its owner (a disregarded entity). See Regulations section 301.7701-2(c)(2). A disregarded entity should check the appropriate box for the tax classification of its owner. Enter the owner’s name on line 1. The name of the owner entered on line 1 should never be a disregarded entity. The name on line 1 should be the name shown on the income tax return on which the income should be reported. For

example, if a foreign LLC that is treated as a disregarded entity for U.S. federal tax purposes has a single owner that is a U.S. person, the U.S. owner’s name is required to be provided on line 1. If the direct owner of the entity is also a disregarded entity, enter the first owner that is not disregarded for federal tax purposes. Enter the disregarded entity’s name on line 2. If the owner of the disregarded entity is a foreign person, the owner must complete an appropriate Form W-8 instead of a Form W-9. This is the case even if the foreign person has a U.S. TIN.

Line 2

If you have a business name, trade name, DBA name, or disregarded entity name, enter it on line 2.

Line 3a

Check the appropriate box on line 3a for the U.S. federal tax classification of the person whose name is entered on line 1. Check only one box on line 3a.

IF the entity/individual on line 1 is a(n) . . .	THEN check the box for . . .
• Corporation	Corporation.
• Individual or • Sole proprietorship	Individual/sole proprietor.
• LLC classified as a partnership for U.S. federal tax purposes or • LLC that has filed Form 8832 or 2553 electing to be taxed as a corporation	Limited liability company and enter the appropriate tax classification: P = Partnership, C = C corporation, or S = S corporation.
• Partnership	Partnership.
• Trust/estate	Trust/estate.

Line 3b

Check this box if you are a partnership (including an LLC classified as a partnership for U.S. federal tax purposes), trust, or estate that has any foreign partners, owners, or beneficiaries, and you are providing this form to a partnership, trust, or estate, in which you have an ownership interest. You must check the box on line 3b if you receive a Form W-8 (or documentary evidence) from any partner, owner, or beneficiary establishing foreign status or if you receive a Form W-9 from any partner, owner, or beneficiary that has checked the box on line 3b.

Note: A partnership that provides a Form W-9 and checks box 3b may be required to complete Schedules K-2 and K-3 (Form 1065). For more information, see the Partnership Instructions for Schedules K-2 and K-3 (Form 1065).

If you are required to complete line 3b but fail to do so, you may not receive the information necessary to file a correct information return with the IRS or furnish a correct payee statement to your partners or beneficiaries. See, for example, sections 6698, 6722, and 6724 for penalties that may apply.

Line 4 Exemptions

If you are exempt from backup withholding and/or FATCA reporting, enter in the appropriate space on line 4 any code(s) that may apply to you.

Exempt payee code.

- Generally, individuals (including sole proprietors) are not exempt from backup withholding.
- Except as provided below, corporations are exempt from backup withholding for certain payments, including interest and dividends.
- Corporations are not exempt from backup withholding for payments made in settlement of payment card or third-party network transactions.
- Corporations are not exempt from backup withholding with respect to attorneys’ fees or gross proceeds paid to attorneys, and corporations that provide medical or health care services are not exempt with respect to payments reportable on Form 1099-MISC.

The following codes identify payees that are exempt from backup withholding. Enter the appropriate code in the space on line 4.

1—An organization exempt from tax under section 501(a), any IRA, or a custodial account under section 403(b)(7) if the account satisfies the requirements of section 401(f)(2).

- 2—The United States or any of its agencies or instrumentalities.
- 3—A state, the District of Columbia, a U.S. commonwealth or territory, or any of their political subdivisions or instrumentalities.
- 4—A foreign government or any of its political subdivisions, agencies, or instrumentalities.
- 5—A corporation.
- 6—A dealer in securities or commodities required to register in the United States, the District of Columbia, or a U.S. commonwealth or territory.
- 7—A futures commission merchant registered with the Commodity Futures Trading Commission.
- 8—A real estate investment trust.
- 9—An entity registered at all times during the tax year under the Investment Company Act of 1940.
- 10—A common trust fund operated by a bank under section 584(a).
- 11—A financial institution as defined under section 581.
- 12—A middleman known in the investment community as a nominee or custodian.
- 13—A trust exempt from tax under section 664 or described in section 4947.

The following chart shows types of payments that may be exempt from backup withholding. The chart applies to the exempt payees listed above, 1 through 13.

IF the payment is for . . .	THEN the payment is exempt for . . .
• Interest and dividend payments	All exempt payees except for 7.
• Broker transactions	Exempt payees 1 through 4 and 6 through 11 and all C corporations. S corporations must not enter an exempt payee code because they are exempt only for sales of noncovered securities acquired prior to 2012.
• Barter exchange transactions and patronage dividends	Exempt payees 1 through 4.
• Payments over \$600 required to be reported and direct sales over \$5,000 ¹	Generally, exempt payees 1 through 5. ²
• Payments made in settlement of payment card or third-party network transactions	Exempt payees 1 through 4.

¹ See Form 1099-MISC, Miscellaneous Information, and its instructions.

² However, the following payments made to a corporation and reportable on Form 1099-MISC are not exempt from backup withholding: medical and health care payments, attorneys' fees, gross proceeds paid to an attorney reportable under section 6045(f), and payments for services paid by a federal executive agency.

Exemption from FATCA reporting code. The following codes identify payees that are exempt from reporting under FATCA. These codes apply to persons submitting this form for accounts maintained outside of the United States by certain foreign financial institutions. Therefore, if you are only submitting this form for an account you hold in the United States, you may leave this field blank. Consult with the person requesting this form if you are uncertain if the financial institution is subject to these requirements. A requester may indicate that a code is not required by providing you with a Form W-9 with "Not Applicable" (or any similar indication) entered on the line for a FATCA exemption code.

A—An organization exempt from tax under section 501(a) or any individual retirement plan as defined in section 7701(a)(37).

B—The United States or any of its agencies or instrumentalities.

C—A state, the District of Columbia, a U.S. commonwealth or territory, or any of their political subdivisions or instrumentalities.

D—A corporation the stock of which is regularly traded on one or more established securities markets, as described in Regulations section 1.1472-1(c)(1)(i).

E—A corporation that is a member of the same expanded affiliated group as a corporation described in Regulations section 1.1472-1(c)(1)(i).

F—A dealer in securities, commodities, or derivative financial instruments (including notional principal contracts, futures, forwards, and options) that is registered as such under the laws of the United States or any state.

G—A real estate investment trust.

H—A regulated investment company as defined in section 851 or an entity registered at all times during the tax year under the Investment Company Act of 1940.

I—A common trust fund as defined in section 584(a).

J—A bank as defined in section 581.

K—A broker.

L—A trust exempt from tax under section 664 or described in section 4947(a)(1).

M—A tax-exempt trust under a section 403(b) plan or section 457(g) plan.

Note: You may wish to consult with the financial institution requesting this form to determine whether the FATCA code and/or exempt payee code should be completed.

Line 5

Enter your address (number, street, and apartment or suite number). This is where the requester of this Form W-9 will mail your information returns. If this address differs from the one the requester already has on file, enter "NEW" at the top. If a new address is provided, there is still a chance the old address will be used until the payor changes your address in their records.

Line 6

Enter your city, state, and ZIP code.

Part I. Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. If you are a resident alien and you do not have, and are not eligible to get, an SSN, your TIN is your IRS ITIN. Enter it in the entry space for the Social security number. If you do not have an ITIN, see *How to get a TIN* below.

If you are a sole proprietor and you have an EIN, you may enter either your SSN or EIN.

If you are a single-member LLC that is disregarded as an entity separate from its owner, enter the owner's SSN (or EIN, if the owner has one). If the LLC is classified as a corporation or partnership, enter the entity's EIN.

Note: See *What Name and Number To Give the Requester*, later, for further clarification of name and TIN combinations.

How to get a TIN. If you do not have a TIN, apply for one immediately. To apply for an SSN, get Form SS-5, Application for a Social Security Card, from your local SSA office or get this form online at www.SSA.gov. You may also get this form by calling 800-772-1213. Use Form W-7, Application for IRS Individual Taxpayer Identification Number, to apply for an ITIN, or Form SS-4, Application for Employer Identification Number, to apply for an EIN. You can apply for an EIN online by accessing the IRS website at www.irs.gov/EIN. Go to www.irs.gov/Forms to view, download, or print Form W-7 and/or Form SS-4. Or, you can go to www.irs.gov/OrderForms to place an order and have Form W-7 and/or Form SS-4 mailed to you within 15 business days.

If you are asked to complete Form W-9 but do not have a TIN, apply for a TIN and enter "Applied For" in the space for the TIN, sign and date the form, and give it to the requester. For interest and dividend payments, and certain payments made with respect to readily tradable instruments, you will generally have 60 days to get a TIN and give it to the requester before you are subject to backup withholding on payments. The 60-day rule does not apply to other types of payments. You will be subject to backup withholding on all such payments until you provide your TIN to the requester.

Note: Entering "Applied For" means that you have already applied for a TIN or that you intend to apply for one soon. See also *Establishing U.S. status for purposes of chapter 3 and chapter 4 withholding*, earlier, for when you may instead be subject to withholding under chapter 3 or 4 of the Code.

Caution: A disregarded U.S. entity that has a foreign owner must use the appropriate Form W-8.

Part II. Certification

To establish to the withholding agent that you are a U.S. person, or resident alien, sign Form W-9. You may be requested to sign by the withholding agent even if item 1, 4, or 5 below indicates otherwise.

For a joint account, only the person whose TIN is shown in Part I should sign (when required). In the case of a disregarded entity, the person identified on line 1 must sign. Exempt payees, see *Exempt payee code*, earlier.

Signature requirements. Complete the certification as indicated in items 1 through 5 below.

1. Interest, dividend, and barter exchange accounts opened before 1984 and broker accounts considered active during 1983. You must give your correct TIN, but you do not have to sign the certification.

2. Interest, dividend, broker, and barter exchange accounts opened after 1983 and broker accounts considered inactive during 1983. You must sign the certification or backup withholding will apply. If you are subject to backup withholding and you are merely providing your correct TIN to the requester, you must cross out item 2 in the certification before signing the form.

3. Real estate transactions. You must sign the certification. You may cross out item 2 of the certification.

4. Other payments. You must give your correct TIN, but you do not have to sign the certification unless you have been notified that you have previously given an incorrect TIN. "Other payments" include payments made in the course of the requester's trade or business for rents, royalties, goods (other than bills for merchandise), medical and health care services (including payments to corporations), payments to a nonemployee for services, payments made in settlement of payment card and third-party network transactions, payments to certain fishing boat crew members and fishermen, and gross proceeds paid to attorneys (including payments to corporations).

5. Mortgage interest paid by you, acquisition or abandonment of secured property, cancellation of debt, qualified tuition program payments (under section 529), ABLE accounts (under section 529A), IRA, Coverdell ESA, Archer MSA or HSA contributions or distributions, and pension distributions. You must give your correct TIN, but you do not have to sign the certification.

What Name and Number To Give the Requester

For this type of account:	Give name and SSN of:
1. Individual	The individual
2. Two or more individuals (joint account) other than an account maintained by an FFI	The actual owner of the account or, if combined funds, the first individual on the account ¹
3. Two or more U.S. persons (joint account maintained by an FFI)	Each holder of the account
4. Custodial account of a minor (Uniform Gift to Minors Act)	The minor ²
5. a. The usual revocable savings trust (grantor is also trustee)	The grantor-trustee ¹
b. So-called trust account that is not a legal or valid trust under state law	The actual owner ¹
6. Sole proprietorship or disregarded entity owned by an individual	The owner ³
7. Grantor trust filing under Optional Filing Method 1 (see Regulations section 1.671-4(b)(2)(i)(A))**	The grantor*

For this type of account:	Give name and EIN of:
8. Disregarded entity not owned by an individual	The owner
9. A valid trust, estate, or pension trust	Legal entity ⁴
10. Corporation or LLC electing corporate status on Form 8832 or Form 2553	The corporation
11. Association, club, religious, charitable, educational, or other tax-exempt organization	The organization
12. Partnership or multi-member LLC	The partnership
13. A broker or registered nominee	The broker or nominee
14. Account with the Department of Agriculture in the name of a public entity (such as a state or local government, school district, or prison) that receives agricultural program payments	The public entity
15. Grantor trust filing Form 1041 or under the Optional Filing Method 2, requiring Form 1099 (see Regulations section 1.671-4(b)(2)(i)(B))**	The trust

¹ List first and circle the name of the person whose number you furnish. If only one person on a joint account has an SSN, that person's number must be furnished.

² Circle the minor's name and furnish the minor's SSN.

³ You must show your individual name on line 1, and enter your business or DBA name, if any, on line 2. You may use either your SSN or EIN (if you have one), but the IRS encourages you to use your SSN.

⁴ List first and circle the name of the trust, estate, or pension trust. (Do not furnish the TIN of the personal representative or trustee unless the legal entity itself is not designated in the account title.)

* **Note:** The grantor must also provide a Form W-9 to the trustee of the trust.

** For more information on optional filing methods for grantor trusts, see the Instructions for Form 1041.

Note: If no name is circled when more than one name is listed, the number will be considered to be that of the first name listed.

Secure Your Tax Records From Identity Theft

Identity theft occurs when someone uses your personal information, such as your name, SSN, or other identifying information, without your permission to commit fraud or other crimes. An identity thief may use your SSN to get a job or may file a tax return using your SSN to receive a refund.

To reduce your risk:

- Protect your SSN,
- Ensure your employer is protecting your SSN, and
- Be careful when choosing a tax return preparer.

If your tax records are affected by identity theft and you receive a notice from the IRS, respond right away to the name and phone number printed on the IRS notice or letter.

If your tax records are not currently affected by identity theft but you think you are at risk due to a lost or stolen purse or wallet, questionable credit card activity, or a questionable credit report, contact the IRS Identity Theft Hotline at 800-908-4490 or submit Form 14039.

For more information, see Pub. 5027, Identity Theft Information for Taxpayers.

Victims of identity theft who are experiencing economic harm or a systemic problem, or are seeking help in resolving tax problems that have not been resolved through normal channels, may be eligible for Taxpayer Advocate Service (TAS) assistance. You can reach TAS by calling the TAS toll-free case intake line at 877-777-4778 or TTY/TDD 800-829-4059.

Protect yourself from suspicious emails or phishing schemes.

Phishing is the creation and use of email and websites designed to mimic legitimate business emails and websites. The most common act is sending an email to a user falsely claiming to be an established legitimate enterprise in an attempt to scam the user into surrendering private information that will be used for identity theft.

The IRS does not initiate contacts with taxpayers via emails. Also, the IRS does not request personal detailed information through email or ask taxpayers for the PIN numbers, passwords, or similar secret access information for their credit card, bank, or other financial accounts.

If you receive an unsolicited email claiming to be from the IRS, forward this message to phishing@irs.gov. You may also report misuse of the IRS name, logo, or other IRS property to the Treasury Inspector General for Tax Administration (TIGTA) at 800-366-4484. You can forward suspicious emails to the Federal Trade Commission at spam@uce.gov or report them at www.ftc.gov/complaint. You can contact the FTC at www.ftc.gov/idtheft or 877-IDTHEFT (877-438-4338). If you have been the victim of identity theft, see www.IdentityTheft.gov and Pub. 5027.

Go to www.irs.gov/IdentityTheft to learn more about identity theft and how to reduce your risk.

Privacy Act Notice

Section 6109 of the Internal Revenue Code requires you to provide your correct TIN to persons (including federal agencies) who are required to file information returns with the IRS to report interest, dividends, or certain other income paid to you; mortgage interest you paid; the acquisition or abandonment of secured property; the cancellation of debt; or contributions you made to an IRA, Archer MSA, or HSA. The person collecting this form uses the information on the form to file information returns with the IRS, reporting the above information. Routine uses of this information include giving it to the Department of Justice for civil and criminal litigation and to cities, states, the District of Columbia, and U.S. commonwealths and territories for use in administering their laws. The information may also be disclosed to other countries under a treaty, to federal and state agencies to enforce civil and criminal laws, or to federal law enforcement and intelligence agencies to combat terrorism. You must provide your TIN whether or not you are required to file a tax return. Under section 3406, payors must generally withhold a percentage of taxable interest, dividends, and certain other payments to a payee who does not give a TIN to the payor. Certain penalties may also apply for providing false or fraudulent information.

PLEASE BE ADVISED!

Every party to a public contract and every party bidding on public contracts are required to have a written sexual harassment policy that contains:

- (1) a statement that sexual harassment is illegal;
- (2) a definition of sexual harassment under state law;
- (3) a description of sexual harassment utilizing examples;
- (4) an internal formalized complaint process, including penalties;
- (5) the legal recourse, investigative and complaint process available through the Department of Human Rights and the Illinois Human Rights Commission;
- (6) directions on how to contact the Illinois Department of Human Rights and Illinois Human Rights Commission – **Illinois companies. Out-of-State companies must include directions on how to contact the enforcement agency within their state.** Companies that issue a standard policy for all business locations must prepare an addendum providing directions on how to contact the appropriate enforcement agency.
- (7) a recitation that there cannot be any retaliation against employees who elect to file charges, as provided in Sections 6-101 and 6-101.5 of the Illinois Human Rights Act.

Recommendation: Your sexual harassment policy should be drafted in language easy to understand and any revisions should be reviewed by legal counsel. A copy of your policy should be posted in a prominent and accessible location to assure all employees will be notified of the company's position.

In order to conduct business with the THE PEORIA PARK DISTRICT, you must have a written sexual harassment policy that conforms to the Illinois Human Rights Act and/or the laws of your jurisdiction.

**FAILURE TO DO SO
WILL DISQUALIFY YOU AS AN ELIGIBLE VENDOR!!!**

SAMPLE ADDENDUM

Peoria Park District
Planning, Design and Construction Department
1314 N. Park Road
Peoria, IL 61604
Telephone: (309) 686-3386

ADDENDUM NO. _____

PROJECT TITLE: _____

ISSUANCE DATE: _____

LOCATION: _____

The proposed Contract Documents for this Work are modified as follows:

- I. **GENERAL INFORMATION:**

- II. **DRAWINGS:** (Delete/Change/Modify/Etc.)

- III. **PROJECT MANUAL/SPECIFICATIONS.:**
(Delete/Change/Modify/Etc.)

- IV. **INVITATION TO BID:** (Delete/Change/Modify/Etc.)

END OF ADDENDUM NO. _____

(Addendum may be bound into Project Manual, attached to front cover, faxed, mailed, emailed or delivered to bidders.)

Addendum No. _____
Page 1 of 1



Pleasure Driveway and Park District of Peoria, Illinois
Sample Agreement Between Owner and Contractor

This **AGREEMENT** for

HVAC REPLACEMENT
PEORIA PLAYERS THEATRE
4300 N UNIVERSITY ST
PEORIA, ILLINOIS

is made as of the _____ day of _____ in the year of Two Thousand Twenty-Five (2025)

Between the Owner:

PLEASURE DRIVEWAY AND PARK DISTRICT OF PEORIA, ILLINOIS
1125 W. LAKE AVENUE
PEORIA, IL 61614

And the Contractor:

The Owner's Representative is:

PLANNING, DESIGN AND CONSTRUCTION DEPARTMENT
1314 N. PARK ROAD
PEORIA, IL 61604

The Architect or Engineer is:

KEITH ENGINEERING DESIGN
ATTN: MITCH ANDRES
707 NE JEFFERSON AVE
PEORIA, ILLINOIS 61603

The Owner and Contractor agree as follows:

I. THE CONTRACT DOCUMENTS. The Contract Documents consist of this AGREEMENT, the Plans/Drawings for the Project dated February 14, 2025, all sections of the Project Manual dated March 11, 2025, including but not limited to the Instructions and Supplementary Instructions to Bidders, the Bid Form, the General Conditions (2017 AIA Document A201) and Supplementary General Conditions, the General Requirements, the Specifications, and other documents as enumerated in Section 10 and Attachment #1 of this AGREEMENT, and including addenda issued prior to the execution of this AGREEMENT. The Contract Documents form the CONTRACT between the Owner and the Contractor. The CONTRACT represents the entire and integrated contract for the construction of the Work of the Project between the parties hereto and supersedes prior proposals, contracts, negotiations, or representations, either written or oral.

II. THE WORK OF THE CONTRACT. The Contractor shall execute the entire Work described in the Contract Documents, unless modified in Section XI of this AGREEMENT.

III. BASIS OF PAYMENT. The Work of the CONTRACT shall be performed on a Lump Sum basis.

IV. CONTRACT SUM. The Owner shall pay the Contractor the sum of

(and incorporates the acceptance of bid alternates as defined in sub-paragraph "A", below) for the Contractor's performance of the Work required by the Contract Documents, subject to modifications made by Owner approved Change Orders. If this CONTRACT calls for a unit price basis of payment, the contract sum stated above shall be adjusted by Change Order based upon multiplying the unit prices submitted by the Contractor on the Bid Form (and included herein as an Attachment to this CONTRACT) times (x) the actual quantities installed.

A. ACCEPTANCE OF ALTERNATES. The contract sum stated above is based on the acceptance of the following alternates, which are described in the Project Manual:

<u>ITEM</u>	<u>ADD</u>	<u>DEDUCT</u>

V. DATES OF COMMENCEMENT AND COMPLETION OF THE WORK. The Owner's Representative will issue a written Notice to Proceed with the Work of the Project after receiving the required Performance Bond, Labor and Material Payment Bond, and Certificate of Insurance (in proper form and providing the required coverages and amounts from a company [or companies] acceptable to the Owner, and naming the Owner as an Additional Insured), and any other pre-construction submittals required by the Contract Documents. The Contractor hereby acknowledges and agrees that failure to provide such submittals in a timely manner shall not be cause to adjust the date(s) for completion of the Work.

- A. LIQUIDATED DAMAGES.** Owner and Contractor recognize that time is of the essence of this CONTRACT and that Owner will suffer financial loss if the Contractor has not achieved Substantial Completion and Final Completion of the Work within the time specified below, plus any extensions thereof allowed in accordance with Article 8 of the General Conditions. They also recognize the delays, expense and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time.
- B. SUBSTANTIAL COMPLETION.** Accordingly, instead of requiring any such proof, Owner and Contractor agree that as Liquidated Damages for delay (but not as a penalty), Contractor shall pay Owner Two Hundred Fifty dollars (\$250) for each calendar day that expires after Two Hundred Nineteen (219) calendar days from Notice of Award until Substantial Completion is attained. The work is tentatively scheduled to begin on April 10, 2025 and be at Substantial Completion by November 15, 2025. ** Note: Air handler installation shall take place between heating and cooling seasons, October 1, 2025 to November 15, 2025, tentatively. **
- C. FINAL COMPLETION.** After Substantial Completion if Contractor shall neglect, refuse, or fail to complete the remaining Work necessary to achieve Final Completion within Fourteen (14) calendar days or any proper extension thereof granted by Owner, Contractor shall pay Owner Two Hundred Fifty dollars (\$250) for each day that expires after the time specified.

VI. PROGRESS PAYMENTS, REDUCTION OF RETAINAGE AND FINAL PAYMENT.

- A.** Unless otherwise specified elsewhere in the Contract Documents, the Contractor may submit monthly applications for progress payments ("Application for Payment") to the Owner's Representative. Each Application for Payment must be certified by the Architect or Engineer (if applicable), or the Owner's Representative if an Architect or Engineer has not been engaged for construction phase services. An Application for Payment shall be for a period of no less than one calendar month ending on the last day of the month, unless otherwise approved in writing by the Owner's Representative. Application forms shall be subject to Owner's approval. Each Application for Payment shall be based upon the Schedule of Values submitted by the Contractor, in accordance with the Contract Documents. The Schedule of Values shall be approved by the Owner's Representative and the Architect or Engineer (if applicable) in advance of the Contractor's first Application for Payment and the approved schedule shall be used by the Contractor as the basis for submitting payment requests. The Owner's Representative and/or

Architect/Engineer's (if applicable) approval of the Schedule of Values shall not constitute a complete check for accuracy, and shall not relieve the Contractor from responsibility for errors of any sort.

- B. An Application for Payment (certified by the Architect or Engineer, if applicable) shall be submitted to the Owner's Representative no later than the fifth (5th) day of the month following the period for which the application is being submitted. In such case, the Owner shall make the progress payment to the Contractor not later than the twentieth day of the next month. A progress payment request on an Application for Payment (certified by the Architect or Engineer, if applicable) received by the Owner's Representative after the fifth (5th) day of a month shall be made by the Owner not later than forty-five days after receipt by the Owner's Representative.
- C. Based upon its review of the certified (by the Architect or Engineer, if applicable) Application for Payment, the Owner shall make a progress payment to the Contractor in such amount as the Owner reasonably determines is properly due, subject to a retainage of ten percent (10%) of the value of the Work completed and covered by the Application for Payment, less the aggregate of previous payments in each case. In determining the amount properly due, the Owner shall consider the value of labor, materials and equipment incorporated in the Work, or properly allocable to materials and equipment suitably stored at the site or at some other location previously agreed upon in writing by the parties. The Owner's Representative shall have the sole right to determine that materials or equipment stored off-site have been properly delivered, protected, and/or secured. The Owner's Representative (or the Architect or Engineer, if applicable) may nullify or withhold a Certificate of Payment, in whole or in part, for the reasons set forth in Section 9.5 of the General Conditions. Upon Substantial Completion of the Work, the Owner shall pay the Contractor a sum sufficient to increase the total payments to ninety-five percent (95%) of the Contract Sum, less such amounts as the Owner's Representative shall determine for incomplete work and unsettled claims.

VII. Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner when **1)** the Contract has been fully performed by the Contractor except for the Contractor's responsibility to correct nonconforming Work as provided in Subparagraph 12.2.2 of the General Conditions and to satisfy other requirements, if any, which necessarily survive final payment; and **2)** a final Certificate of Payment has been issued by the Architect/Engineer or Owner's Representative; such final payment shall be made by the Owner not more than forty-five (45) days after the receipt of the final Certificate of Payment by the Owner.

VIII. CHANGE ORDERS. The Owner and Contractor agree that changes in the Work are sometimes required and necessary, and that timely: **a)** submission of proposed changes in the Work or the scope of Work by the Owner, **b)** pricing by the Contractor, **c)** review by the Owner's Representative and/or Architect/Engineer, and **d)** final approval by the Owner are necessary in order to assure that the Work of the Project is completed on schedule. The Contractor hereby acknowledges and agrees that an increase in the scope of the Work does not grant or imply an increase in the Contract Time, unless specifically so stated on the final approved Change Order. The Contractor also agrees that any and all Work which deviates from the plans and specifications and/or results in additional Work performed by Contractor's forces, including those of his sub-contractor's, will not result in additional expense to the Owner, unless **finally approved both by the Owner and the Architect/Engineer (if applicable) prior to the additional Work being performed.** No claim for an addition to the Contract Sum shall be valid unless approved by a written Change Order signed by the Owner and the architect/engineer (if applicable) **prior to the additional Work being performed.**

IX. TERMINATION OR SUSPENSION. The CONTRACT may be terminated by the Owner or the Contractor as provided by Article 14 of the General Conditions. The Work may be suspended by the Owner as provided in Article 14 of the General Conditions.

X. ENUMERATION OF CONTRACT DOCUMENTS. The Contract Documents, except for modifications issued after the execution of this Agreement, consist of:

- A. this Standard Form of Agreement Between Owner and Contractor, of the Pleasure Driveway and Park District of Peoria, Illinois.
- B. the Plans or Drawings titled HVAC Upgrade – Peoria Players Theatre dated February 14, 2025, and enumerated in ATTACHMENT #1 - "LIST OF DRAWINGS".
- C. Supplementary and other Conditions of the CONTRACT, and the Specifications, are those found in the Project Manual titled HVAC Replacement – Peoria Players Theatre dated March 11, 2025 and enumerated as follows:
 - 1) Supplementary Instructions to Bidders
 - 2) Contractor's Proposal, as accepted by the Owner

- 3) General Conditions of the Contract for Construction, AIA Document A201, 2017 Edition
- 4) Supplementary General Conditions
- 5) Subcontractor List
- 6) Certification of Compliance for Listed Provisions and Laws
- 7) Company Ownership Certification
- 8) Peoria Park District Certificate of Equal Employment Opportunity Compliance for Contractors and Vendors
- 9) Workforce Profile
- 10) Minority/Women Owned Contact Sheet, if bid is over \$50,000.00
- 11) Contractor/Subcontractor Workforce Plan, if bid is over \$50,000.00
- 12) Performance Bond
- 13) Labor and Material Payment Bond
- 14) Proof of Insurance
- 15) Specifications: Division 010000, "General Requirements"; Divisions 020000-350000 as applicable
- 16) Attachment A.6 - Insurance Requirements
- 17) Attachment B – Solicitation & Hiring for Qualifying Construction Contracts & Forms
- 18) Attachment C – Directory of Minority & Women Owned Business Enterprises
- 19) Attachment D – IDOL Prevailing Wages of Peoria County
- 20) Proof of Certified Payroll Submitted to IDOL per “The Illinois Prevailing Wage Act”

XI. MISCELLANEOUS PROVISIONS. Other Provisions of this Agreement are as follows:

This AGREEMENT is entered into as of the day and year first written above and is executed in at least three original copies of which one is to be delivered to the Contractor, one to the Architect/Engineer (if any) for use in the administration of the CONTRACT, and one to the Owner.

OWNER:

CONTRACTOR:

(Signature)

(Signature)

ROBERT L. JOHNSON, SR., Park Board President

(Printed Name and Title)

ATTEST:

ATTEST:

ATTACHMENT #1 - LIST OF DRAWINGS

<u>Number</u>	<u>Title</u>	<u>Date</u>
MD110	FIRST FLOOR -MECHANICAL DEMOLITION	02/14/2025
M100	BASEMENT -MECHANICAL NEW WORK	02/14/2025
M110	FIRST FLOOR -MECHANICAL NEW WORK	02/14/2025
M400	MECHANICAL DETAILS & NOTES	02/14/2025
M500	MECHANICAL SCHEDULES	02/14/2025
ED100	BASEMENT -ELECTRICAL DEMOLITION	02/14/2025
ED110	FIRST FLOOR -ELECTRICAL DEMOLITION	02/14/2025
E100	BASEMENT -ELECTRICAL NEW WORK	02/14/2025
E110	FIRST FLOOR -ELECTRICAL NEW WORK	02/14/2025
E500	ELECTRICAL SCHEDULES & GENERAL NOTES	02/14/2025

PERFORMANCE BOND

**TO: PLEASURE DRIVEWAY AND PARK DISTRICT OF PEORIA
PEORIA, ILLINOIS**

KNOW ALL MEN BY THESE PRESENTS;

That _____

as Principal, and _____
_____ as
corporation of the State of _____, as Surety, are held and firmly bound unto the
PLEASURE DRIVEWAY AND PARK DISTRICT OF PEORIA, PEORIA, ILLINOIS, as Obligee, in the amount of _____
(\$ _____), for the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators,
successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal has by written agreement dated _____, 20 _____ entered into a contract
with Obligee for _____
_____ in accordance with contract documents prepared by the Architect-Engineer, which Contract is by reference made a part hereof and
is hereinafter referred to as "the Contract".

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that if Principal shall promptly and faithfully
perform the Contract and all changes thereof, and during the life of any guaranty or warranty required under the Contract, and, if
Principal shall fully secure and protect the Obligee from all liability and from all loss or expense of any kind, including all court
costs, engineering fees and attorneys' fees made necessary or arising from the failure, refusal or neglect of Principal to comply
with all obligations assumed by Principal in connection with the performance of the Contract and all changes thereof, then this
obligation shall be null and void; otherwise it shall remain in full force and effect.

Surety hereby waives notice of any changes in the Contract, including extensions of time for the performance thereof. Whenever
Principal shall be and is declared to be in default under the Contract, Obligee having performed Obligee's obligations thereunder,
Surety shall, after notice of such default, reserve all rights against all parties, take over and complete the Contract and become
entitled to payment of the balance of any monies due or to become due to such defined Principal in accordance with the progress
of the work.

A condition of this Bond is that the Principal shall faithfully perform in accordance with the prevailing wage clause provided in
the bid specification or Contract pursuant to Illinois Compiled Statutes 820 ILCS 130/1 *et. seq.*

No right of action shall accrue on this Bond to or for the use of any person or corporation other than the Obligee named
herein.

Signed and Sealed this _____ day of _____, 20 _____.

CONTRACTOR

Contractor Firm Name

By: _____
Signature

Title

SURETY

Surety Name

By: _____
Attorney-in-Fact

Resident Agent

ATTEST:

Corporate Secretary (Corporations only)

LABOR & MATERIAL PAYMENT BOND

**TO: PLEASURE DRIVEWAY AND PARK DISTRICT OF PEORIA
PEORIA, ILLINOIS**

KNOW ALL MEN BY THESE PRESENTS:

That: _____

as Principal, and _____

_____ a corporation of the State of _____ as Surety, are held and firmly bound unto the PLEASURE DRIVEWAY AND PARK DISTRICT OF PEORIA, PEORIA, ILLINOIS, as Obligees, for the use and benefit of claimants as hereinafter defined in the amount of _____ Dollars (\$ _____), for the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal has by written agreement dated _____, 20 _____, entered into a Contract with Obligees for _____

_____ in accordance with contract documents prepared by the Architect-Engineer which Contract is by reference made a part hereof, and is hereinafter referred to as "the Contract".

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that if Principal shall promptly pay for all laborers, workers and mechanics engaged in the work under the Contract, and not less than the general prevailing rate of hourly wages of a similar character in the locality in which the work is performed, as determined by the State of Illinois Department of Labor pursuant to the Illinois Compiled Statutes 820 ILCS 130/1 et. seq. and for all material used or reasonably required for use in the performance of the Contract, then this obligation shall be void; otherwise it shall remain in full force and effect.

1. A claimant is defined as any person, firm, or corporation having contracts with the Principal or with any of Principal's subcontractors for labor or materials furnished in the performance of the Contract on account of which this Bond is given.
2. Nothing in this Bond contained shall be taken to make the Obligees liable to any subcontractor, materialman or laborer, or to any other person to any greater extent than it would have been liable prior to the enactment of The Public Construction Bond Act, approved June 20, 1931, as amended; provided further, that any person having a claim for labor and materials furnished in the performance of the Contract shall have no right of action unless he shall have filed a verified notice of such claim with the Obligees within 180 days after the date of the last item of work or the furnishing of the last item of materials, which claim shall have been verified and shall contain the name and address of the claimant, the business address of the claimant within the State of Illinois, if any, or if the claimant be a foreign corporation having no place of business within the State the principal place of business of the corporation, and in all cases of partnership the names and residences of each of the partners, the name of the Contractor for the Obligees, the name of the person, firm or corporation by whom the claimant was employed or to whom such claimant furnished materials, the amount of the claim and a brief description of the public improvement for the construction or installation of which the Contract is to be performed. No defect in the notice herein provided for shall deprive the claimant of its right of action under the terms and provisions of this Bond unless it shall affirmatively appear that such defect has prejudiced the rights of an interested party asserting the same.
3. No action shall be brought on this Bond until the expiration of 120 days after the date of the last item of work or of the furnishing of the last item of material except in cases where the final settlement between the Obligees and the Contractor shall have been made prior to the expiration of the 120 day period, in which case action may be taken immediately following such final settlement; nor shall any action of any kind be brought later than 6 months after the acceptance by the Obligees of the work. Such suit shall be brought only in the circuit court of this State in the judicial district in which the Contract is to be performed.

4. Surety hereby waives notice of any changes in the Contract, including extensions of time for the performance thereof.
5. The amount of this Bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder.
6. The Principal and Surety shall be liable for any attorneys fees, engineering costs, or court costs incurred by the Obligee relative to claims made against this Bond.

Signed and Sealed this _____ day of _____, 20_____.

CONTRACTOR

SURETY

Contractor Firm Name:

By: _____
Signature

By: _____
Attorney-in-Fact

Title

Resident Agent

ATTEST:

Corporate Secretary (Corporations only)

CONTRACTOR'S AFFIDAVIT

STATE OF ILLINOIS)
) SS
COUNTY OF PEORIA)

TO WHOM IT MAY CONCERN:

THE undersigned, being duly sworn, deposes and says that he is _____
_____ of the _____
who is the contractor for the _____
building located at _____
owned by _____.

That the total amount of the contract including extras is \$ _____ on which he has received payment of \$ _____ prior to this payment. That all waivers are true, correct and genuine and delivered unconditionally and that there is no claim either legal or equitable to defeat the validity of said waivers. That the following are the names of all parties who have furnished material or labor, or both, for said work and all parties having contracts or sub-contracts for specific portions of said work or for material entering into the construction thereof and the amount due or to become due to each, and that the items mentioned include all labor and material required to complete said work according to plans and specifications:

NAMES	WHAT FOR	CONTRACT PRICE	AMOUNT PAID	THIS PMT.	BALANCE DUE

TOTAL ALL LABOR AND MATERIAL TO COMPLETE

There are no other contracts for said work outstanding, and that there is nothing due or to become due to any person for material, labor or other work of any kind done or to be done upon or in connection with said work other than above stated.

Signed this _____ day of _____, 20 ____.

Signature: _____

Subscribed and sworn to before me this _____ day of _____, 20 ____.

Notary Public

FINAL WAIVER OF LIEN

STATE OF ILLINOIS)
) SS
COUNTY OF PEORIA)

TO WHOM IT MAY CONCERN:

WHEREAS, the undersigned _____ ha _____ been employed by THE PEORIA PARK DISTRICT to furnish material and labor for the _____ at the premises commonly known as _____ located in the City of _____, County of Peoria, State of Illinois.

The undersigned, for and in consideration of _____ (\$ _____) Dollars, and other good and valuable considerations, the receipt whereof is hereby acknowledged, do _____ hereby waive and release any and all lien or claim or right of lien under the statutes of the State of Illinois relating to mechanics' liens, with respect to and on said above-described premises and improvements thereon and on the money, funds or other considerations due or become due from the owner on account of labor or services, material, fixtures, apparatus or machinery heretofore furnished or which may be furnished at any time hereafter by the undersigned for the above described premises.

Dated this _____ day of _____ 20 _____.

[Affix corporate seal here.]

(Name of sole owner, corporation or partnership)

ATTEST:

(Signature of secretary of corporation)

(Signature of sole owner or authorized representative of corporation or partnership) (SEAL)

WAIVER OF LIEN

**GENERAL CONTRACTOR'S PARTIAL
TO COVER ONLY CERTAIN PAYMENTS**

STATE OF ILLINOIS)
) SS
COUNTY OF PEORIA)

TO ALL WHOM IT MAY CONCERN:

WHEREAS, the undersigned _____ has been employed
by THE PEORIA PARK DISTRICT to furnish material and labor for the _____ at
the premises commonly known as _____

_____ located in the City of Peoria, County of Peoria, and State of Illinois.

NOW, THEREFORE, the undersigned, for and in consideration of the sum of _____ Dollars, and other good and valuable considerations, the receipt whereof is hereby acknowledged by the undersigned, does hereby waive and release to the extent only of the aforesaid amount of _____ Dollars, paid simultaneously herewith, any and all lien or right or claim of lien under the statutes of the State of Illinois relating to mechanics' liens, with respect to and on said above-described premises, and the improvements thereon and on the money, funds, or other consideration due or to become due from the owner on account of labor, services, material, fixtures, apparatus or machinery, furnished by the undersigned, to or on account of the said owner, for the above-described premises, but only to the extent of the payment aforesaid.

Dated this _____ day of _____, 20 _____.

[Affix corporate seal here]

(Name of sole owner, corporation or partnership)

ATTEST:

(Signature of secretary of corporation)

(SEAL)
(Signature of sole owner or authorized representative of corporation or partnership)

A complete copy of AIA Document A201, 2017 Edition, with Supplementary General Conditions incorporated, is available for review in the Peoria Park District's Planning, Design and Construction Office.

SUPPLEMENTARY GENERAL CONDITIONS

1. A. **"GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION"**, AIA Document A201, 2017 Edition, published by the American Institute of Architects, including revisions adopted before the date of the Project Manual, is hereby made part of these Specifications with same force and effect as though set forth in full.
- B. The following modifies, changes, deletes from or adds to the General Conditions of the Contract for Construction (AIA Document A201, Sixteenth Edition, 2017). Where any Article of the General Conditions is modified or any Paragraph, Subparagraph or Clause thereof is modified or deleted by these Supplementary Conditions, the unaltered provisions of that Article, Paragraph, Subparagraph or Clause shall remain in effect.
- C. Parenthesis () indicates the appropriate section and Subparagraph of the General Conditions which each paragraph of the Supplementary General Conditions modifies or refers to.

ARTICLE 1: GENERAL PROVISIONS

1.1 - Basic Definitions

INSERT THE FOLLOWING PHRASE TO PARAGRAPH (1.1.1) AFTER THE WORDS "The Contract Documents consist of the Agreement Between Owner and Contractor (hereinafter the Agreement) and consists of the Agreement,":

“the Contractor's Bid, the Advertisement for Bids, the Instructions to Bidders, sample forms and addenda relating to these,”

DELETE THE LAST SENTENCE OF PARAGRAPH (1.1.1).

PARAGRAPH (1.1.8) IN THE HEADING DELETE “Initial Decision Maker” SUBSTITUTE “Initial Recommendation Maker”

PARAGRAPH (1.1.8) DELETE “Initial Decision Maker” AND SUBSTITUTE “Initial Recommendation Maker”

IN PARAGRAPH (1.1.8) REPLACE “decisions” WITH “recommendations”.

1.2 - Correlations and intent of the Contract Documents

ADD THE FOLLOWING SENTENCES TO END OF PARAGRAPH (1.2.1):

The Contractor shall notify the Owner’s Representative immediately if discrepancies are discovered. Full-size or large-scale details or drawings shall govern small-scale drawings that the former are intended to amplify. Dimensions from drawings shall not be determined by scale or rule. Where the Drawings and Specifications conflict with each other or with themselves, the Owner’s Representative (in consultation with the Architect, if any) will decide which conflicting requirement governs. Should discrepancies or doubt occur, Contractor shall not proceed with the Work without clarification from the Owner. Contractor shall request clarification in a reasonable time to avoid delays and increases in the Contract Sum.

ADD THE FOLLOWING PARAGRAPHS TO SECTION (1.2):

- 1.2.4** If any item or material shown on the Drawings is omitted from the Specifications, or vice-versa (except when the Drawings and Specifications clearly exclude such omitted item), and when such item or material is clearly required to complete the detail shown or specified, the Contractor shall furnish and install such item or material of the type and quality established by the balance of the detail shown and specified at no increase to the Contract Sum.
- 1.2.5** Where a typical or representative detail is shown on the Drawings, this detail shall constitute the standard for workmanship and materials throughout those parts of the Work.
- 1.2.6** Any Summary of Work as outlined in the Specifications shall not be deemed to limit the work required by the Contract Documents. The Contractor and each Subcontractor shall be responsible for carefully examining all Drawings, including all details, plans, elevations, sections, schedules and diagrams for each particular type of work, and for coordinating the Work described in the Drawings, with the related Specifications. The Contractor shall also be responsible for determining the exact scope of work for each type of work per the Contract Documents and Contractor shall endeavor to check cross-references of work excluded from any division. The Contract Sum is deemed to be based on a complete installation. When additional details or instructions are clearly required to complete the work, the Contractor is deemed to have made an allowance in the Contract Sum for completion of such Work consistent with the local standard of care.
- 1.2.7** The Drawings are intended to show the arrangement, design and extent of the Work and are schematic in nature. They are not to be scaled for roughing-in measurements or used as shop drawings.

1.5 – Ownership and Use of Drawings, Specifications, and Other Instruments of Service

ADD THE FOLLOWING PARAGRAPH TO SECTION (1.5):

- 1.5.3** Neither any oral representation by or oral agreement with any officer, agent, or employee of Owner or Architect before execution of this Contract shall affect or modify any of the Contractor's rights or obligations hereunder. Contractor is not aware of any facts that make misleading or inaccurate in any material respect any information Owner or Architect has furnished to Contractor which would have a material adverse affect on the Contract Time or Contract Sum which Contractor has not advised Owner or Architect of, and if, during the course of the performance of the Work, Contractor learns of any such facts it will so advise Owner. Contractor shall not be entitled to any adjustments in the Contract Time or the Contract Sum as a consequence of Contractor's breach of the terms of this Subparagraph.

1.7 – Digital Data use and Transmission

DELETE THE SECOND SENTENCE IN PARAGRAPH (1.7).

1.8 – Building Information Models Use and Reliance

DELETE PARAGRAPH (1.8) IN ITS ENTIRETY.

ARTICLE 2: OWNER

2.3 – Information and Services Required of the Owner

DELETE PARAGRAPH (2.3.4) IN ITS ENTIRETY.

2.4 – Owner’s Right to stop the Work

ADD THE FOLLOWING SENTENCE AT THE END OF PARAGRAPH (2.4):

“The Owner shall not be liable for any extra cost incurred by the Contractor by such an order.”

2.5 – Owner’s Right to Carry Out the Work

IN PARAGRAPH (2.5), IN THE SECOND SENTENCE, DELETE “Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and”.

ARTICLE 3: CONTRACTOR

3.2 - Review of Contract Documents and Field Conditions by Contractor

IN PARAGRAPH (3.2.2, 3.2.3, AND (3.2.4) AFTER THE WORD “Architect” ADD THE WORDS “and Owner”.

ADD THE FOLLOWING PARAGRAPH TO SECTION (3.2):

3.2.5 Before starting any work, the Contractor shall examine work performed by others to which his work adjoins or is applied to and report to the Owner's Representative any conditions that will prevent the satisfactory accomplishment of his work. Failure to notify the Owner's Representative of deficiencies or faults in preceding work prior to commencing work shall constitute acceptance thereof and waiver of any claim of its unsuitability.

3.4 – Labor and Materials

ADD THE FOLLOWING PARAGRAPHS TO SECTION (3.4):

3.4.4 Before ordering any material or doing any Work, the Contractor shall verify all measurements at the Project site and he shall be responsible for the correctness of same. No extra charge or compensation will be allowed to the Contractor on account of any difference between actual dimensions and the measurements shown on the Project Drawings.

3.4.5 The Contractor shall carefully inspect all materials delivered on and to the Project site and reject defective materials without waiting for the Owner's Representative or other representative of Owner to observe the materials.

3.5 - Warranty

ADD THE FOLLOWING PARAGRAPHS TO SECTION (3.5):

3.5.3 The Contractor agrees to assign to the Owner any and all manufacturer’s warranties relating to materials and equipment furnished as part of the Work and further agrees to perform the Work in such manner so as to preserve any and all such manufacturer’s warranties subject to installation directives and other terms of the Contract Documents. The Contractor agrees to deliver to the Owner, upon final payment, such assignments along with or as part of a reference manual, in form and detail reasonably acceptable to Owner, showing all such warranties and guarantees provided by

the Contractor and Subcontractors. Such warranties and guarantees shall commence no sooner than the date of purchase from the supplier.

3.5.4 The warranty of Contractor provided in Paragraph 3.5 shall in no way limit or abridge the warranties of the suppliers of equipment and systems which are to comprise a portion of the Work, if they are broader, and all of such warranties shall be in form and substance as required by the Contract Documents. Contractor shall take no action or fail to act in any way which results in the termination or expiration of such third party warranties or which otherwise results in prejudice to the rights of the Owner under such warranties subject to installation directives and other terms of the Contract Documents. Contractor agrees to provide all notices required for the effectiveness of such warranties and shall include provisions in the contracts with the providers and manufacturers of such systems and equipment whereby Owner shall have a direct right of enforcement of such warranty obligations.

3.6 - Taxes

IN PARAGRAPH (3.6), DELETE THE WORD "Sales".

ADD THE FOLLOWING AT THE END OF PARAGRAPH (3.6):

The Peoria Park District is exempt from Federal, State and Local taxes. A certificate of exemption will be furnished upon request.

3.10 - Contractor's Construction and Submittal Schedules

IN PARAGRAPH (3.10.2), IN THE FIRST SENTENCE BEFORE THE WORD "Architect's approval" ADD THE WORDS "Owner's and".

IN PARAGRAPH (3.10.2), IN THE SECOND SENTENCE BEFORE THE WORD "Architect's" ADD THE WORDS "Owner's and".

IN PARAGRAPH (3.10.2), IN THE THIRD SENTENCE BEFORE THE WORD "Architect" ADD THE WORDS "Owner's Representative and".

ADD THE FOLLOWING PARAGRAPHS TO SECTION (3.10):

3.10.4 The construction schedule shall provide for the most expeditious and practicable execution of the Work. The Contractor shall also work closely with the Owner to confirm that the construction schedule accurately reflects the status of the Project. The Contractor's construction schedule shall be updated every month by the Contractor and submitted to the Owner.

.1 Whenever it becomes apparent from the updated construction schedule that any substantial completion previously established by the construction schedule cannot be met, the Contractor shall, at the Owner's request, take any or all of the following actions with no increase to the Contract Sum or Contract Time (unless the delay is caused by an event set forth in paragraph 8.3 of these General Conditions thereby permitting adjustment of the Contract Sum and/or Contract Time:

.1.1 Increase construction manpower to substantially return the Project to schedule;

.1.2 Increase the number of working hours per shift, shifts per day or the amount of construction equipment or any combination of the foregoing which will substantially return the Project to schedule;

- .1.3** Reschedule activities to concurrently accomplish activities, to the maximum degree practicable, in the time required by the Contract Documents.

If the Contractor fails to take any of these actions Owner shall have the notice and other rights set forth in Paragraph 2.5.

ARTICLE 4: ARCHITECT

4.1 - General

IN PARAGRAPH (4.1.1) DELETE THE FIRST SENTENCE AND SUBSTITUTE THE FOLLOWING:

"The Architect, Owner's Representative, and Owner's Project Manager are defined in Paragraph C of "Section 014200 - General" of "Division 010000 - General Requirements".

4.2 – Administration of the Contract

IN PARAGRAPH (4.2.1) DELETE THE WORDS “and will be an Owner’s Representative”.

IN PARAGRAPH (4.2.5) DELETE THE WORD “Architect’s” AND “Architect”AND SUBSTITUTE THE WORDS “Owner Representative’s” AND “Owner Representative”.

IN PARAGRAPH (4.2.6) IN THE SECOND SENTENCE AFTER THE WORDS “will have authority” INSERT THE WORDS “upon written authorization from the Owner”.

IN PARAGRAPH (4.2.8) DELETE THE WORD “prepare” AND SUBSTITUTE THE WORDS “assist the Owner’s Representative in preparing”.

IN PARAGRAPH (4.2.9) DELETE THE WORD “Architect” AND SUBSTITUTE WORDS “Owner’s Representative, assisted by the Architect”.

IN PARAGRAPH (4.2.11) IN THE FIRST SENTENCE DELETE THE WORDS “and decide”.

IN PARAGRAPH (4.2.12) IN THE FIRST SENTENCE DELETE THE WORD “and decisions”.

IN PARAGRAPH (4.2.12) IN THE SECOND SENTENCE DELETE THE WORDS “and initial decisions” AND “or decisions”.

ADD PARAGRAPH TO SECTION (4.2):

4.2.15 Notwithstanding any other provision of this Agreement to the contrary, the Architect shall have no authority to order or approve any material deviation from the Contract Documents, whether or not such deviation affects the Contract Sum or other Substantial Completion Date (as defined herein). In the event any such deviation is sought, prior written approval from the Owner’s Representative and the Owner must be obtained. The Architect may decide quality issues and may approve non-material deviations from the Contract Documents.

ARTICLE 5: SUBCONTRACTORS

5.2 – Award of Subcontracts and Other Contracts for Portions of the Work

IN PARAGRAPH (5.2.1) DELETE THE FIRST SENTENCE AND SUBSTITUTE:

“The subcontractors/suppliers listed by the Contractor on the Subcontractor/Supplier List (submitted with the Bid) shall not be changed without the written consent of the Owner.”

IN PARAGRAPH (5.2.1) IN THE SECOND SENTENCE DELETE THE WORDS “Architect” AND SUBSTITUTE THE WORDS “Owner’s Representative”.

IN PARAGRAPH (5.2.1) IN THE LAST SENTENCE DELETE THE WORDS “Architect” AND SUBSTITUTE THE WORDS “Owner’s Representative”.

ARTICLE 6: CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.2 – Mutual Responsibility

IN PARAGRAPH (6.2.2) BEFORE THE WORD “Architect” ADD THE WORDS “Owner and”.

6.3 – Owner’s Right to Clean Up

IN PARAGRAPH (6.3) DELETE THE WORD “Architect” AND SUBSTITUTE THE WORD “Owner”.

ARTICLE 7: CHANGES IN THE WORK

7.2 – Change Orders

IN PARAGRAPH (7.2.1) DELETE THE WORDS “the Architect” AND SUBSTITUTE THE WORDS “the Owner’s Representative”.

ADD THE FOLLOWING PARAGRAPHS TO SECTION (7.2):

7.2.2 A Change Order shall include all of the Contractor’s costs associated therewith.

7.2.3 The Contractor shall not accept any request for a Change Order from any person other than the Owner and may not perform any work asserted to constitute a change in the Work until the Owner has approved the Change Order in writing, unless the Owner authorizes the Contractor, in writing, to proceed with a change prior to the Owner’s final approval. Notwithstanding anything to the contrary herein, the Contractor shall not charge for overtime services in the performance of any Change Order Work, unless the Owner has specifically authorized overtime in writing. Owner may competitively bid changes in the Work and Contractor, Subcontractor and suppliers shall provide Owner with all documents Owner requests to facilitate such competitive bidding of changes in the Work.

7.2.4 There shall be no change in the Work, whether an alteration or addition to the Contract Sum or to any amounts due under the Contract Documents or to a change in the Contract Time, unless and until such alteration or addition has been authorized by a written Change Order executed and issued in accordance and compliance with the requirements with this Article 7 or by written authorization to proceed with such change in the Work signed by the Owner or as otherwise provided pursuant to the Contract Documents. The requirements set forth in this Paragraph 7.2.4 are of the essence. No claim that the Owner has been unjustly enriched by any alteration or addition to the Work, whether or not any such unjust enrichment to the Work or to the Owner in fact exists, shall form the basis of any claim for an increase in any amount due under the Contract Documents or a change in the Contract Time, and the terms of a fully-executed Change Order shall be conclusive.

7.3 – Construction Change Directives

IN PARAGRAPH (7.3.1) DELETE THE WORDS “the Architect” AND SUBSTITUTE THE WORDS “the Owner’s Representative”.

IN PARAGRAPH (7.3.4) DELETE THE WORD “determine” AND SUBSTITUTE THE WORD “recommend”.

IN PARAGRAPH (7.3.6) DELETE THE WORD “Architect” ADD SUBSTITUTE THE WORDS “Owner’s Representative”.

IN PARAGRAPH (7.3.8) IN THE FIRST SENTENCE AFTER THE WORD “Architect” ADD THE WORDS “and the Owner’s Representative”.

IN PARAGRAPH (7.3.9) DELETE THE WORDS “Architect” AND “Architect’s” AND SUBSTITUTE THE WORDS “Owner’s Representative” and “Owner’s Representative’s”.

IN PARAGRAPH (7.3.10) DELETE THE WORD “determination” AND SUBSTITUTE THE WORD “recommendation”.

ARTICLE 8: TIME

8.1 - Definitions

IN PARAGRAPH (8.1.3) DELETE THE WORD “Architect” AND SUBSTITUTE THE WORDS “Owner’s Representative”.

8.2 – Progress and Completion

ADD THE FOLLOWING PARAGRAPHS TO SECTION (8.2) .

8.2.4 All work shall be "Substantially Complete" as required by the **Instructions to Bidders** and the **Agreement Between Owner and Contractor**.

8.2.5 It is further agreed that said completion schedule is reasonable, and the Contractor shall prosecute said work regularly, diligently and continuously at such rate of progress as will insure full completion thereof within the time specified.

8.2.6 Provided, however, the following exceptions:

- .1** Any preference, priority or allocation order duly issued by the United States Government.
- .2** Any unforeseeable cause beyond the control and without the fault or negligence of the Contractor, including acts of God, or of a public enemy, acts of the Owner, acts of another Contractor in performance of a separate contract with the Owner, fire, floods, epidemics, quarantine restrictions, strikes, freight embargoes and unusually severe weather. The criteria on which the unusually severe weather shall be based is the average precipitation/temperatures received in the project area, as recorded over a period of the last five (5) years at the local area United States Weather Station. Any extension of time due to unusually severe weather must be requested by the Contractor on the basis of documented records of the actual precipitation/temperatures during the contract time period, compared with the normal/average for the area. Also, the criteria shall include the number of excessive precipitation or extreme cold days (i.e., days in which the temperature would adversely affect the type of work being

constructed) over the same period and whether or not the Contractor's force worked on said days or stage of construction was affected.

.3 Any delays of subcontractors occasioned by any of the causes specified in this paragraph.

8.2.7 Provided further that the Contractor shall, within seven (7) days from the beginning of any such delay during the performance of the Contract, notify the Owner's Representative in writing of the alleged cause of such delay.

8.3 – Delays and Extensions of Time

IN PARAGRAPH (8.3.1) DELETE THE WORDS “and binding dispute resolution”.

IN PARAGRAPH (8.3.1) DELETE THE WORD “determine” AND SUBSTITUTE THE WORD “recommend”.

ARTICLE 9: PAYMENTS AND COMPLETION

9.2 – Schedule of Values

DELETE PARAGRAPH (9.2) AND SUBSTITUTE THE FOLLOWING UNDER (9.2):

“Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Owner’s Representative before the first Application for Payment, allocating the entire Contract Sum to the Various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect and Owner’s Representative. This schedule, unless objected to by the Architect and Owner’s Representative, shall be used as a basis for reviewing the Contractor’s Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and Owner’s Representative and supported by such data to substantiate its accuracy as the Architect and Owner’s Representative may require, and unless objected to by the Architect and Owner’s Representative, shall be used as a basis for reviewing the Contractor’s subsequent Applications for Payment.”

9.3 – Applications for Payments

IN THE FIRST SENTENCE OF (9.3.1), CHANGE "ten" TO "thirty”.

IN PARAGRAPH (9.3.1) IN THE FIRST AND SECOND SENTENCE DELETE THE WORD “Architect” AND SUBSTITUTE THE WORDS “Owner’s Representative”.

ADD THE FOLLOWING TO THE END OF PARAGRAPH (9.3.1):

“Payment requests shall consist of AIA Documents #702 "Application and Certificate for Payment"; AIA #703 "Continuation Sheet"; Contractors Affidavit of Payment to Subcontractors and Suppliers; Certified Payroll Form; EEO Documents; and Waivers of Lien. (Waivers of Lien are required from the general contractor in the full amount of the current payment application, and from all subcontractors, suppliers, or workers who provide more than \$10,000 of project material/labor of the Work. The waiver shall be in the amount(s) listed in the Contractor's Affidavit.) For final payment, the general contractor shall also provide a Waiver of Lien in the full amount of the contract price.

The Waiver of Lien and Contractor Affidavit forms used shall be the Peoria Park District's standard form(s): 1) "Final Waiver of Lien" (for general contractors), 2) "Waiver of Lien - General Contractor's Partial To Cover Only Certain Payments", 3) "Sub-Contractor's Final Waiver of Lien", 4)

"Waiver of Lien - Sub-Contractor's Partial To Cover Only Certain Payments, and 5) "Contractor's Affidavit". (These forms are included in the Project Manual, and are the required Waiver of Lien forms for the project.)

(If the Contractor is unable to provide the required sub-contractor waiver at the time the application for payment is submitted (preferred method) alternatively, it may be provided at the time that payment is delivered by the District. If the sub-contractor waiver(s) still cannot be provided at that time, the District will provide "two-party" checks in which the Contractor and the sub-contractor are named jointly as payees.)

Format of AIA #703 shall follow that of "Schedule of Values". All payment requests shall reflect retainage in the amount of 10% of completed work.”

IN PARAGRAPH (9.3.1.1) DELETE THE WORDS “or by interim determination of the Architect, but not yet included in Change Orders”.

ADD THE FOLLOWING SUB-PARAGRAPHS TO PARAGRAPH (9.3.1):

9.3.1.3 Upon Substantial Completion, the Owner will pay 95% percent of the amount due to the Contractor on account.

9.3.1.4 Monthly progress payments will be made by the Owner on projects lasting more than sixty days (from award of the bid to the Substantial Completion date given in the Supplementary Instructions to Bidders).

ADD THE FOLLOWING SUB-PARAGRAPHS TO PARAGRAPH (9.3.2):

9.3.2.1 Material stored on site will be considered for payment only when a Schedule of Stored Materials with appropriate values accompany the payment request as an attachment.

9.3.2.2 All material and work covered by partial payments made shall thereupon become the sole property of the Owner, but this provision shall not be construed as relieving the Contractor from the sole responsibility for the care and protection of material and work upon which payments have been made or the restoration of any damaged work, or as a waiver of the contract.

9.4 – Certificates for Payment

IN PARAGRAPH (9.4.1) DELETE THE WORDS “Architect” AND “Architect’s” AND SUBSTITUTE THE WORDS “Owner’s Representative” AND “Owner’s Representative’s”.

IN PARAGRAPH (9.4.1) DELETE THE PHRASE "with a copy to the Contractor".

IN THE FIRST SENTENCE OF PARAGRAPH (9.4.2) DELETE THE WORD “Architect” AND SUBSTITUTE THE WORDS “Owner’s Representative”.

IN THE FIRST SENTENCE OF PARAGRAPH (9.4.2) AFTER THE WORDS “Architect’s” ADD THE WORDS “and Owner’s Representative’s”.

IN THE THIRD SENTENCE OF PARAGRAPH (9.4.2) DELETE THE WORDS “Architect has” AND SUBSTITUTE THE WORDS “Owner’s Representative and Architect have”.

9.5 – Decisions to Withhold Certification

IN PARAGRAPH (9.5.1) DELETE THE WORDS “Architect” AND “Architect’s” AND SUBSTITUTE THE WORDS “Owner’s Representative AND “Owner’s Representative’s”.

IN PARAGRAPH (9.5.2) DELETE THE WORD “Architect’s” AND SUBSTITUTE THE WORDS “Owner’s Representative’s”.

IN PARAGRAPH (9.5.4) DELETE THE WORD “Architect” AND SUBSTITUTE THE WORDS “Owner’s Representative”.

9.6 – Progress Payments

IN PARAGRAPHS (9.6.1), (9.6.3), AND (9.6.4) DELETE THE WORDS “Architect” AND SUBSTITUTE THE WORDS “Owner’s Representative”.

9.7 – Failure of Payment

IN PARAGRAPH (9.7) DELETE THE WORD “Architect” AND SUBSTITUTE THE WORDS “Owner’s Representative”.

IN PARAGRAPH (9.7) DELETE THE WORDS “or awarded by binding dispute resolution”.

9.8 – Substantial Completion

IN PARAGRAPH (9.8.2) DELETE THE WORD “Architect” AND SUBSTITUTE THE WORDS “Owner’s Representative”.

IN THE FIRST SENTENCE OF PARAGRAPH (9.8.3) DELETE THE WORD “Architect” AND SUBSTITUTE THE WORDS “Owner’s Representative assisted by the Architect”.

IN THE SECOND AND THIRD SENTENCES OF PARAGRAPH (9.8.3) DELETE THE WORDS “Architect’s” and “Architect” AND SUBSTITUTE THE WORDS “Owner’s Representative’s” and “Owner’s Representative”.

IN PARAGRAPH (9.8.4) DELETE THE WORD “Architect” AND SUBSTITUTE THE WORDS “Owner’s Representative”.

9.9 – Partial Occupancy or Use

IN PARAGRAPH (9.9.1) DELETE THE WORD “Architect” AND SUBSTITUTE THE WORDS “Owner’s Representative”.

9.10 – Final Completion and Final Payment

IN PARAGRAPH (9.10.1) IN THE FIRST AND SECOND SENTENCE AFTER THE FIRST TWO APPEARANCES OF THE WORD ‘Architect’ ADD THE WORDS “and Owner’s Representative”.

IN PARAGRAPH (9.10.1) DELETE THE THIRD AND FOURTH APPEARANCES OF THE WORD “Architect” and “Architect’s” AND SUBSTITUTE THE WORDS “Owner’s Representative” and “Owner’s Representative’s”.

IN PARAGRAPH (9.10.1) AFTER THE FIFTH APPEARANCE OF THE WORD “Architect’s” ADD THE WORDS “and Owner’s Representative’s”.

IN THE LAST SENTENCE OF PARAGRAPH (9.10.1) DELETE THE WORD “Architect’s” AND SUBSTITUTE THE WORDS “Owner’s Representative’s”.

IN PARAGRAPH (9.10.2) DELETE THE WORD “Architect” AND SUBSTITUTE THE WORD “Owner’s Representative”.

ADD THE FOLLOWING SUB-PARAGRAPH TO PARAGRAPH (9.10.2):

9.10.2.1 When all items including items noted within Division 10000 General Requirements are found to be complete and in conformance with the Contract Documents, a final payment will be issued.

IN PARAGRAPH (9.10.3) DELETE THE WORD “Architect” AND SUBSTITUTE THE WORDS “Owner’s Representative”.

ARTICLE 11: INSURANCE AND BONDS

11.1 – Contractor’s Insurance and Bonds

IN PARAGRAPH (11.1.1) IN THE FIRST SENTENCE DELETE THE WORDS “the Agreement or elsewhere in the Contract Documents” AND SUBSTITUTE THE FOLLOWING WORDS “Attachment A – Project Specific Insurance Requirements” (which is included in the last section of the Project Manual and the requirements therein shall be made part of the Contract Documents). In addition, if any of the work occurs within fifty feet of an active railroad line and the Contractor’s general liability coverages provide for exclusions of coverage when working on or near a railroad, the Contractor shall provide a separate Railroad Protective Liability Insurance Policy naming the railroad as the insured party, with the coverage limits required by that railroad.”

IN PARAGRAPH (11.1.1) IN THE LAST SENTENCE, DELETE THE WORDS “the Contract Documents” AND ADD THE WORDS “Attachment A”.

AT THE END OF PARAGRAPH (11.1.2) ADD THE FOLLOWING:

“The Contractor shall furnish a Performance Bond and a separate Labor and Material Payment Bond, each for one hundred percent (100%) of the Contract Sum. Form of these bonds shall be as provided by the Owner in the Project Manual and no other form will be accepted. The Surety shall be authorized to do business in the State of Illinois and be acceptable to the Owner.”

ADD THE FOLLOWING SUB-PARAGRAPHS TO PARAGRAPH (11.1)

11.1.5 The Contractor may, at his option, furnish Owner’s Protective Liability Insurance in lieu of naming the Owner Additional Insured on the Contractor’s policy, as required above. This insurance shall protect the Owner from claims as set forth in Paragraph 11.1.1 of the General Conditions, and to the limits required herein, as shown in “Attachment A”.

11.1.6 The Contractor shall furnish two copies of each of the required Certificates or Endorsements for each copy of the Agreement which shall specifically set forth evidence of all coverage required by the Contract Documents. The form of the Certificate(s) or Endorsement(s) shall be those as required in “Attachment A”. The Contractor shall also furnish to the Owner copies of any endorsements which limit coverage, or are subsequently issued amending coverage or limits of coverage.

11.2 – Owner’s Insurance

IN PARAGRAPH (11.2.1) DELETE THE FIRST AND SECOND SENTENCE.

ADD THE FOLLOWING TO PARAGRAPH (11.2.1) “If the work of the Project is being completed by one general or prime contractor rather than multiple prime contractors, the Contractor shall purchase and maintain property insurance upon the entire Work at the site to the full replacement value thereof. Such insurance shall be in a company or companies against which the Owner has no reasonable objection. This insurance shall include the interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Work.”

DELETE PARAGRAPHS (11.2.2) AND (11.2.3) IN THEIR ENTIRETY.

11.3 – Waiver of Subrogation

DELETE PARAGRAPHS (11.3.1) AND (11.3.2) IN THEIR ENTIRETY.

11.4 – Loss of Use, Business Interruption, and Delay in Completion Insurance

DELETE PARAGRAPH (11.4) IN ITS ENTIRETY:

11.5 – Adjustment and Settlement of Insured Loss

DELETE PARAGRAPHS (11.5.1) AND (11.5.2) IN THEIR ENTIRETY.

ARTICLE 12: UNCOVERING AND CORRECTION OF WORK

12.1 – Uncovering of Work

IN PARAGRAPH (12.1.1) DELETE THE WORD “Architect’s” AND SUBSTITUTE WORDS “Owner’s Representative’s and Architect’s”.

IN PARAGRAPH (12.1.1) DELETE THE WORD “Architect” AND SUBSTITUTE THE WORDS “Owner’s Representative”.

IN PARAGRAPH (12.1.2) AFTER THE WORD “Architect” ADD THE WORDS “and Owner’s Representative”.

12.2 – Correction of Work

IN PARAGRAPH (12.2.1) AFTER THE WORD “Architect” ADD THE WORDS “and Owner’s Representative”.

ARTICLE 13: MISCELLANEOUS PROVISIONS

13.4 – Tests and Inspections

IN PARAGRAPH (13.4.4) AFTER THE WORD “Architect” ADD THE WORDS “and Owner’s Representative”.

ARTICLE 14: TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 – Termination by the Contractor

IN SUB-PARAGRAPH (14.1.1.3) DELETE THE WORD “Architect” AND SUBSTITUTE THE WORDS “Owner’s Representative”.

14.2 – Termination by the Owner for Cause

IN PARAGRAPH (14.2.2) DELETE THE PHRASE “, upon certification by the Architect that sufficient cause exists to justify such action,”.

IN PARAGRAPH (14.2.4) DELETE THE LAST SENTENCE AND ADD THE FOLLOWING “Upon application, the obligation for payment of the amount to be paid to the Contractor or Owner, as the case may be, shall survive termination of the Contract.”

14.4 – Termination by the Owner for Convenience

DELETE PARAGRAPH (14.4.3) IN ITS ENTIRETY AND SUBSTITUTE UNDER (14.4.3):

“In case of such termination for the Owner’s convenience, the Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination. In no event, however, will such amounts exceed the Contract Sum reduced by the amount of prior payments except for increases pursuant to the claims procedure in the Contract Documents. Subcontracts, subsubcontracts, and purchase orders will contain appropriate provisions for termination for convenience under this Paragraph 14.4.”

ARTICLE 15: CLAIMS AND DISPUTES

15.1 – Claims

IN THE FIRST SENTENCE OF PARAGRAPH (15.1.2) DELETE “requirements of the binding dispute”.

IN PARAGRAPH (15.1.3.1) DELETE “Initial Decision Maker” AND SUBSTITUTE “Initial Recommendation Maker”

DELETE THE SECOND SENTENCE IN PARAGRAPH (15.1.3.2) IN ITS ENTIRETY.

DELETE PARAGRAPH (15.1.4.2) IN ITS ENTIRETY AND SUBSTITUTE THE FOLLOWING PARAGRAPH (15.1.4.2):

“The contract Sum and Contract Time may be adjusted in accordance with the Initial Recommendation Maker’s recommendation, subject to the right of either party to proceed in accordance with this Article 15. The Owner’s Representative will issue Certificates for Payment.”

DELETE (15.1.7) IN ITS ENTIRETY.

15.2 – Initial Decision

IN PARAGRAPH (15.2) DELETE IN THE HEADING “Initial Decision” AND SUBSTITUTE “Initial Recommendation”.

DELETE PARAGRAPH (15.2.1) IN ITS ENTIRETY AND SUBSTITUTE THE FOLLOWING PARAGRAPH (15.2.1):

“Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3 10.4, and 11.5, shall be referred to the Initial Recommendation Maker for initial recommendation. The Architect

will serve as the Initial Recommendation Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial recommendation shall be required as a condition precedent to mediation of any Claim. If an initial recommendation has not been rendered within 30 days after the Claim has been referred to the Initial Recommendation Maker, the party asserting the Claim may demand mediation without a decision having been rendered. “

DELETE PARAGRAPH (15.2.2) IN ITS ENTIRETY AND SUBSTITUTE THE FOLLOWING PARAGRAPH (15.2.2):

“The Initial Recommendation Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) recommend rejecting the Claim in whole or in part, (3) recommend approving the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Recommendation Maker is unable to recommend a resolution of the Claim if the Initial Recommendation Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Recommendation Maker concludes that, in the Initial Recommendation Maker’s sole discretion, it would be inappropriate for the Initial Recommendation Maker to make recommendation on the Claim.”

IN PARAGRAPH (15.2.3) DELETE “Initial Decision Maker” AND SUBSTITUTE “Initial Recommendation Maker”.

IN PARAGRAPH (15.2.3) IN THE FIRST SENTENCE, DELETE “rendering a decision” AND SUBSTITUTE “rendering a recommendation”.

IN PARAGRAPH (15.2.4) DELETE “Initial Decision Maker” AND SUBSTITUTE “Initial Recommendation Maker”.

IN PARAGRAPH (15.2.4) DELETE THE LAST SENTENCE AND SUBSTITUTE THE FOLLOWING “Upon receipt of the response or supporting data, if any, the Initial Recommendation Maker will provide a recommendation regarding the Claim in accordance with Paragraph 15.2.2.”

DELETE PARAGRAPH (15.2.5) IN ITS ENTIRETY.

DELETE PARAGRAPH (15.2.6.1) IN ITS ENTIRETY.

15.3 – Mediation

IN PARAGRAPH (15.3.1) DELETE “as a condition precedent to binding dispute resolution”.

IN PARAGRAPH (15.3.2) DELETE THE THIRD SENTENCE IN ITS ENTIRETY AND SUBSTITUTE THE FOLLOWING SENTENCE “The request may be made concurrently with the filing of legal or equitable proceedings but, in such event, mediation shall proceed in advance of legal or equitable proceedings which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order.”

IN PARAGRAPH (15.3.2) DELETE THE LAST SENTENCE IN ITS ENTIRETY.

DELETE PARAGRAPH (15.3.3) IN ITS ENTIRETY.

IN PARAGRAPH (15.3.4) DELETE THE FIRST SENTENCE IN ITS ENTIRETY.

15.4 – Arbitration

DELETE PARAGRAPHS (15.4.1), (15.4.1.1), (15.4.2), (15.4.3), (15.4.4.1), (15.4.4.2), AND (15.4.4.3) IN THEIR ENTIRETY.

ADD THE FOLLOWING ARTICLE 16: LABOR, SAFETY AND WAGE STANDARDS TO THE GENERAL CONDITIONS OF THE CONTRACT:

**ARTICLE 16
LABOR, WAGE, SAFETY, AND OTHER STANDARDS**

16.1 LABOR STANDARDS. All employers shall comply with the Employment of Illinois Workers on Public Works Act [30 ILCS 570/1 to 570/7].

16.2 WAGE STANDARDS.

16.2.1 PREVAILING WAGE ACT: Wages and benefits to employees shall comply with all Federal and State of Illinois statutes pertaining to public works projects and specifically: Wages of Employees on Public Works [820 ILCS 130/1 - 12].

16.2.2 Not less than the prevailing rate of wages plus benefits as determined by the Department of Labor shall be paid to all laborers, workers and mechanics performing work under this contract. All contractor's bonds shall include a provision as will guarantee the faithful performance of such prevailing wage clause as provided by this bid specification or contract.

16.2.3 The terms “general prevailing rate of hourly wages”, “general prevailing rate of wages” or “prevailing rate of wages” when used in this Act mean the hourly cash wages plus fringe benefits for training and apprenticeship programs approved by the U.S. Department of Labor, Bureau of Apprenticeship and Training, health and welfare, insurance, vacations and pensions paid generally, in the locality in which the work is being performed, to employees engaged in work of a similar character on public works.

16.2.4 PREVAILING WAGE ACT/FOIA
Contractors and subcontractors shall submit proof to the Park District of certified payroll submission to the Illinois Department of Labor on a monthly basis in compliance with the Illinois Prevailing Wage Act. These records will be kept by the Park District for three years and may be reviewed by others through the Freedom of Information Act (FOIA). The Park District will exclude employee’s address, telephone number, and social security number from public inspection.

16.3 SAFETY STANDARDS.

16.3.1 PROTECTION OF PERSONS AND PROPERTY: The Contractor and his subcontractors shall, at all times, comply with applicable provisions of Federal, State and Local laws.

16.3.1.1 The Contractor and his sub-contractors shall have written programs complying with Occupational Safety and Health Administration standards and/or Illinois Department of Labor requirements including, but not limited to the following: hazardous communications, hearing conservation, respirator use, confined space entry, scaffolding, ladders, ventilation, flammable and combustible liquids, and lockout/tagout. The Contractor shall submit documentation of their programs at the request of the Owner's Representative, or Occupational Safety and Health Administration and/or Illinois Department of Labor officials.

16.4 EQUAL EMPLOYMENT OPPORTUNITY/AFFIRMATIVE ACTION/SEXUAL HARASSMENT

16.4.1 During the performance of the contract, the contractor agrees to the following:

16.4.1.1 That it will not discriminate against any employee or applicant for employment because of race, color, religion, sex, marital status, national origin or ancestry, age, physical or mental handicap unrelated to ability, or an unfavorable discharge from military service; and further that it will examine all job classifications to determine if minority persons or women are under-utilized and will take appropriate affirmative action to rectify any such under-utilization.

16.4.1.2 That, if it hires additional employees in order to perform his contract or any portion thereof, it will determine the availability (in accordance with the Rules and Regulations of the Illinois Department of Human Rights) of minorities and women in the area(s) from which it may reasonably recruit and it will hire for each job classification for which employees are hired in such a way that minorities and women are not under-utilized.

16.4.1.3 That, in all solicitations or advertisements for employees placed by it or on its behalf, it will state that all applicants will be afforded equal opportunity without discrimination because of race, color, religion, sex, marital status, national origin or ancestry, age, physical or mental handicap unrelated to ability or an unfavorable discharge from military service.

16.4.1.4 That it will have a written sexual harassment policy to include at the minimum, the following:

16.4.1.4.1 a definition of sexual harassment under the law;

16.4.1.4.2 a description of sexual harassment utilizing examples;

16.4.1.4.3 a formalized complaint procedure;

16.4.1.4.4 a statement of victim's rights;

16.4.1.4.5 directions on how to contact the Illinois Department of Human Rights. Out-of-state companies must provide directions for filing with the enforcement agency within their state. Companies that issue a standard policy for all business locations must prepare an addendum providing directions on how to contact the appropriate enforcement agency; and

16.4.1.4.6 A recitation that there cannot be any retaliation against employees who elect to file charges.

16.4.1.4.7 In addition, it is recommended that the employer post a copy of the sexual harassment policy in a prominent and accessible location and distribute it in a manner to assure notice to all employees on an annual basis.

16.4.1.4.8 The Illinois Human Rights Act specifically provides that all documents may meet, but cannot exceed, the sixth-grade literacy level. Therefore, the employer's sexual harassment policy must be stated in plain language and in "laymen's terms".

- 16.4.1.5** That it will send to each labor organization or representative of workers with which it has or is bound by a collective bargaining or other agreement or understanding, a notice advising such labor organization or representative of the contractor's obligations under the Illinois Human Rights Act and the Department's Rules and Regulations. If any such labor organization or representative fails or refuses to cooperate with the contractor in its efforts to comply with such Act and Rules and Regulations, the contractor will promptly so notify the Department and the contracting agency and will recruit employees from other sources when necessary to fulfill its obligations thereunder.
- 16.4.1.6.** That it will submit reports as required by the Department's Rules and Regulations, furnish all relevant information as may from time to time be requested by the Department or the contracting agency, and in all respects comply with the Illinois Human Rights Act and the Department's Rules and Regulations.
- 16.4.1.7.** That it will permit access to all relevant books, records, accounts and work sites by personnel of the contracting agency and the Department for purposes of investigation to ascertain compliance with the Illinois Human Rights Act and the Department's Rules and Regulations.
- 16.4.1.8.** That it will include verbatim or by reference the provisions of this clause in every subcontract it awards under which any portion of the contract obligations are undertaken or assumed, so that such provisions will be binding upon such subcontractor. In the same manner as with other provisions of this contract, the contractor will be liable for compliance with applicable provisions of this clause by such subcontractors; and further it will promptly notify the contracting agency and the Department in the event any subcontractor fails or refuses to comply therewith. In addition, the contractor will not utilize any subcontractor declared by the Illinois Human Rights Commission to be ineligible for contracts or subcontracts with the State of Illinois or any of its political subdivisions or municipal corporations.
- 16.4.2** In the event of the contractor's non-compliance with the provisions of the Illinois Human Rights Act, the contractor may be declared ineligible for future contracts or subcontracts with the State of Illinois or any of its political subdivisions or municipal corporation, and the contract may be cancelled or voided in whole or in part, and such other sanctions or penalties may be imposed or remedies invoked as provided by statute or regulations.

END OF SUPPLEMENTARY GENERAL CONDITIONS

DIVISION 010000 GENERAL REQUIREMENTS

SECTION 010000 - GENERAL

A. SUMMARY OF THE WORK

1. The Work covered under this Contract consists of that work described by the Invitation to Bid, the Instructions/Supplemental Instructions to Bidders, the Bid/Proposal Form, the General/Supplemental Conditions of the Contract, these General Requirements, the Plans, and the Technical Specifications.
2. The Contractor shall be responsible for all items incidental to the scope of the Work intended by the bidding documents as per A.1 above, including but not limited to, expenses incurred by the requirements of various Sections of Division 010000, unless specifically stated otherwise herein.
3. Changes to the Work as required by approved Change Orders shall be at the expense of the Owner, however, requests for additional payments made after the fact will not be considered.

B. OCCUPANCY BY OWNER.

1. The Owner reserves the right to occupy any portion of the project before it has been entirely completed, with the understanding that such occupancy shall in no way constitute acceptance of the work, in whole or in part, or of any work performed under the Contract, provided that such occupancy does not substantially interfere with completion of the work by the Contractor.

SECTION 012300 – ALTERNATES

A. Alternates to the Bid are set forth in the Supplementary Instructions to Bidders and are listed in the Bid Form.

1. Accepted Alternates have been incorporated into the Agreement.

B. Bid Alternate pricing, as set forth in the Supplementary Instructions to Bidders and the Bid Form, shall be good for a minimum of 90 calendar days after the date of the Bid opening, and the Owner reserves the right to accept Alternates up to that time.

SECTION 012600 - CHANGE ORDERS

A. OWNER'S REPRESENTATIVE'S FIELD ORDERS

1. From time to time during progress of the Work the Owner's Representative may issue an "Owner's Representative's Field Order" which interprets the Contract Documents or orders minor changes in the Work without change in Contract Sum or Contract Time.
2. Should the Contractor consider that a change in Contract Sum or Contract Time is required he shall submit an itemized proposal to the Owner's Representative **immediately and before proceeding with the Work**. If the proposal is found to be satisfactory and in proper order, the Field Order will be superseded by a Change Order.

B. PROPOSAL REQUESTS

1. From time to time during the progress of work the Owner's Representative may issue a "Proposal Request" for an itemized quotation for changes to the Work which may result in a change to the Contract Sum or Contract Time. This document is **not a Change Order** and is not a direction to proceed with the changes described therein.

C. CHANGE ORDERS

1. Change Orders are written documents describing changes in the Work, in the Contract Sum, in the Contract Time of Completion, or any combination thereof. Change Orders must be signed by both the Owner and the Architect/Owner's Representative prior to proceeding with the Work subject to the Change Order. **REQUESTS FOR "EXTRA'S" OR OTHER ADDITIONAL PAYMENTS OVER AND ABOVE THE CURRENT CONTRACT SUM WILL NOT BE CONSIDERED WITHOUT THE PRIOR, WRITTEN APPROVAL OF BOTH THE OWNER AND THE OWNER'S REPRESENTATIVE.**
 - a) INITIATION. Change Orders may be initiated by a "Field Order" or "Proposal Request" per paragraphs "A" and "B" above. In addition, either the Contractor or Owner (or Owner's Representative) may initiate a Change Order through:
 - 1) Discovery of a discrepancy in the Contract Documents,
 - 2) Discovery of concealed conditions or,
 - 3) Discovery, during the course of the Work, of methods of accomplishing the Work in a better or more economical manner.
 - b) PROCESSING CHANGE ORDERS.
 - 1) Change Orders will be dated and will be numbered in sequence.
 - 2) The Change Order will describe the change or changes, or will refer to the Proposal Requests or Field Orders involved.
 - 3) The Owner's Representative will issue three copies of each Change Order to the Contractor.
 - 4) The Contractor promptly shall sign all three copies and return them to the Owner's Representative.
 - 5) The Owner and Owner's Representative will retain two signed copies in their files, and will forward one signed copy to the Contractor.
 - 6) Should the Contractor disagree with the stipulated change in Contract Sum or change in Contract Time of Completion, or both:
 - i) The Contractor promptly shall return all three of the Change Orders, unsigned by him, to the Owner's Representative with a letter signed by the Contractor stating the reason or reasons for the Contractor's disagreement.
 - ii) The Contractor's disagreement with the Change Order shall not in any way relieve the Contractor of his responsibility to proceed with the change as ordered and to seek settlement of the dispute under pertinent provisions of the Contract Documents.

SECTION 012900 – PAYMENT PROCEDURES

A. SCHEDULE OF VALUES

1. Prior to the start of construction, submit a proposed Schedule of Values to the Owner's Representative which shows a detailed breakdown of the agreed Contract Sum showing values allocated to each of the various parts of the Work, as specified herein and in other provisions of the Contract Documents.
 - a) The Schedule of Values is required to be compatible (in the same format) with the Application for Payment "Continuation Sheet", AIA G703.
2. If not requested to submit additional data or to modify the submitted Schedule of Values within ten (10) days of submittal, the initially submitted Schedule shall be deemed approved.

B. APPLICATIONS FOR PAYMENT

1. Progress payments will be made only if specifically called for in the Agreement. In all other cases, the Contractor may submit an Application for Payment (3 copies) upon Substantial Completion (95% of the Contract Sum), with the balance of the Contract Sum to be paid at Final Completion.
 - a) **Article 9 of the Supplementary General Conditions defines the documentation required for each payment request.**
 - b) Applications for payment shall be delivered to the Owner's Project Manager at:

Department of Planning, Design, and Construction
 Peoria Park District
 Bradley Park Equipment Service
 1314 N. Park Road
 Peoria, Illinois 61604

SECTION 013100 - PROJECT MEETINGS

A. PRECONSTRUCTION CONFERENCE

1. Conduct a preconstruction conference prior to the start of the Work, at the location of the Work. Provide attendance by the designated personnel of the Contractor, including Sub-contractor's and/or suppliers of major components of the Work, if requested by the Owner's Representative.
 - a) **AGENDA.** Discuss items of significance that could affect progress including such topics as:
 - 1) Tentative construction schedule.
 - 2) Critical Work sequencing.
 - 3) Designation of responsible personnel.
 - 4) Procedures for processing field decisions and Change Orders.
 - 5) Procedures for processing Applications for Payment.
 - 6) Distribution of Contract Documents.
 - 7) Submittal of Shop Drawings, Product Data and Samples.
 - 8) Preparation of record documents.
 - 9) Use of the premises.
 - 10) Office, Work and storage areas.
 - 11) Equipment deliveries and priorities.
 - 12) Safety procedures.
 - 13) First aid.
 - 14) Security.
 - 15) Housekeeping.
 - 16) Working hours.
 - 17) Permits and Permitting Agency Requirements

B. PROJECT MEETINGS

1. Project Meetings will be held per the schedule determined at the Preconstruction Conference, or as needed for proper coordination and administration of the project.
 - a) **AGENDA**
 - 1) Review and correct or approve minutes of the previous progress meeting.
 - 2) Review progress of the Work since last meeting, including status of submittals for approval.
 - 3) Identify problems which impede planned progress.
 - 4) Develop corrective measures and procedures to regain planned schedule.
 - 5) Complete other current business.

C. REPORTING

1. Distribute copies of the minutes of each meeting to each party present, and to other parties who should have been present, no later than three business days after each meeting.

SECTION 013300 - SUBMITTALS

A. Requirements for shop drawings, samples, mock-ups, product data, etc., relative to specific elements or components of the work are called out in the various sections of the Technical Specifications.

1. Submit items to allow for Owner's Representative's review and approval, potential re-submission if full approval is not given, ordering, delivery, fabrication time, etc., so as to allow the Work to proceed in a timely manner and in conformance with the project schedule.

B. OTHER CONTRACTOR SUBMITTALS

1. Unless otherwise modified the Contractor shall also submit:
 - a) A "bar chart" type proposed construction schedule, within ten days after award of the Bid.
 - b) Other submittals as required by other section of Division 010000.

C. Submission of the required Bonds and Certificate of Insurance are to be made prior to the Owner's issuance of a Notice to Proceed.

SECTION 014000 – QUALITY/REGULATORY REQUIREMENTS

- A. GENERAL: Contractors shall comply with all laws, rules and regulations governing the work.
1. When Contractor observes that contract documents are at variance with specified codes, notify Owner's Representative in writing immediately. Owner's Representative will issue all changes in accord with General Conditions.
 2. When Contractor performs any work knowing or having reason to know that the work is contrary to such laws, rules and regulations and fails to so notify the Owner's Representative, Contractor shall pay all costs arising therefrom. However, it will not be the Contractor's primary responsibility to make certain that the contract documents are in accord with such laws, rules and regulations.
- B. SAFETY:
1. Comply with all federal, state, and local laws, rules and regulations governing the installation/construction of the work.
 2. Develop and utilize safety program and training for workmen and sub-contractor employees.
- C. TESTING
1. TESTS AND INSPECTIONS REQUIRED
 - a) Provide all tests and inspections required by governmental agencies having jurisdiction, as required by provisions of the Contract Documents and/or as specifically required by sections of the Technical Specifications.
 2. PAYMENT FOR TESTING
 - a) Include within the Contract Sum an amount sufficient to cover all testing, re-testing, and inspections required by the Contract documents and/or the Technical Specifications. Additionally pay for all testing and inspections required by all governmental agencies having jurisdiction.
 - 1) The Owner will pay for any testing and inspecting specifically requested by the Owner's Representative which are over and above those described in Paragraph 1.a) above.
 - 2) When initial tests (over and above those defined by 1.a) above) requested by the Owner's Representative indicate non-compliance with the Contract Documents, costs of initial tests associated with that non-compliance will be deducted by the Owner from the Contract Sum, and subsequent retesting occasioned by the non-compliance shall be performed by the same testing laboratory and the costs thereof shall be paid by the Contractor.
 3. WAIVER OF INSPECTION AND/OR TESTS
 - a) Specified inspections and/or tests may be waived only by the specific written approval of the Owner's Representative, and **such waivers will be expected to result in credit to the Owner equal to normal cost of such inspection and/or test.**

SECTION 014200 - REFERENCE STANDARDS AND DEFINITIONS

- A. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents.
1. Where copies of standards are needed for performance of a required construction activity the Contractor shall obtain copies directly from the publication source.
 2. Although copies of standards needed for enforcement of requirements may be included as part of required submittals the Architect reserves the right to require the Contractor to submit additional copies as necessary for enforcement of requirements.
- B. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents they mean the recognized name of the trade association standards generating organization authority having jurisdiction or other entity applicable to the context of the text provision. Refer to the Encyclopedia of Associations, published by Gale Research Co. available in most libraries.
- C. Definitions: Architect, Owner's Representative, and Owner's Project Manager
1. **ARCHITECT:** The Architect shall be the person or entity designated by the Owner as the Owner's Representative and shall be identified as such in the Agreement Between Owner and Contractor, and is referred to throughout the Contract Documents as if singular in number and masculine in gender.
 2. **OWNER'S REPRESENTATIVE:** The duties of the Owner's Representative as listed in the Project Manual, include but are not limited to, construction phase observation and technical administration services.
 - a) **LIMITS OF AUTHORITY:** The Owner's Representative shall be authorized to provide approvals and interpretations concerning the plans, specifications and progress of the Work as bid, but is not authorized to change the scope of the Work on behalf of the Owner.
 3. **OWNER'S PROJECT MANAGER:** The Owner's Project Manager will represent, act on behalf of, and provide interface between the Owner and the Contractor in respect to contract administration and/or other matters which affect the scope of the Work.
 - a) Unless defined otherwise in the Project Manual, the Owner's Project Manager shall be a designated member of the Planning, Design, and Construction Division of the Peoria Park District.
 - b) The Owner's Project Manager will also be the Owner's Representative and will provide construction phase observation and technical administration services, if a consultant Architect has not been engaged to do so, by the Owner.

SECTION 015000 – TEMPORARY FACILITIES & CONTROLS

- A. MOBILIZATION
1. Furnish all labor, tools, materials, equipment, and incidentals necessary for preparatory work.
 2. Provide and establish personnel, equipment, supplies, materials, offices or buildings, and other facilities necessary to work on the project.
 3. Demobilize all of the above and remove temporary facilities at the completion of the project.
- B. BARRIERS, PROTECTION OF SITE AND PROPERTY
1. GENERAL
 - a) Owner's improvements to remain, existing utilities, as well as adjacent site improvements shall be protected from damage by barriers, guards and coverings. Damaged work shall be replaced or repaired to condition prevailing at time of signing of contract, at no additional cost to Owner.

- b) Provide 6' high, continuous chain link or orange plastic (used materials acceptable) construction fence to prohibit unauthorized personnel or public entry from the site of the Work. (Substitutions may be considered; submit request in writing to the Owner's Representative.)
- c) Contractor shall provide, erect and maintain additional planking, fences, protective canopies, railings, shoring, lights, warning signs, etc., as needed for the protection of adjacent property and the public.

2. LANDSCAPE PROTECTION

- a) All live, healthy trees, shrubs, etc. on the site or on the street fronts of the site, not specified to be removed and not interfering with installation of new work required hereunder, shall be protected against injury from construction operations.
- b) All shade trees which are to remain and which are liable to damage during the building operations, shall be properly boxed and protected from damage during the course of construction work as directed by the Park District. **No site-related work shall occur until the required tree protection (fencing, boxing, etc.) has been installed and approved by the Owner or his representative.**
 - 1) LIQUIDATED DAMAGES: The Owner reserves the right to charge the Contractor for damage to existing trees, and to deduct the charges from the amounts due the Contractor, based on the following schedule:
 - aa) Broken limbs 1" or over in diameter: \$50 per caliper inch of limb
 - bb) Trenching or grading within the tree dripline or 20' from the trunk, whichever is less, of trees 4" or over in caliper diameter: \$100 per tree/per foot within dripline, or within 20' minimum if applicable
 - cc) Damage to tree trunks, including "barking", nicking, gouging, etc. \$150 per caliper inch of tree, per each injury

3. BARRIERS/CONSTRUCTION FENCE MATERIALS

- a) 2" open mesh chain link fence, 72" high minimum, galvanized, with appropriately sized posts; gates where indicated.
- b) Alternate barrier fencing materials may be acceptable, however, no additional payments will be made on account of approval of alternate barrier/safety fencing materials.
- c) Materials may be new or used, if in serviceable condition.

4. WATCHMAN SERVICE

- a) The Owner will not be responsible for loss due to theft or other damage which is not covered under Property Insurance. The Contractor shall make such arrangements for watchman service as he considers necessary and he shall be responsible for all loss or damage of his property, equipment, material, etc., at the site, and he shall make good such damage or loss without any additional cost to the Owner.

5. EXISTING IMPROVEMENTS - PROTECTION

- a) The Contractor shall be entirely responsible for all injuries to water pipes, electric conduits or cables, drains, sewers, gas mains, poles, telephones and telegraph lines, streets, pavements, sidewalks, curbs, culverts, retaining walls, building walls, foundation walls, or other structures of any kind met with during the progress of the Work, and shall be liable for damages to public or private property resulting therefrom.

C. CONSTRUCTION ACCESS, ROADS, AND PARKING AREAS

1. CONTRACTOR'S USE OF PREMISES

- a) The Contractor shall require that all personnel who will enter upon the Owner's property certify their awareness of and familiarity with the requirements of this Section.

2. CONSTRUCTION ACCESS

- a) To avoid traffic conflict with vehicles of the Owner's employees and customers, and to avoid over-loading of streets and driveways elsewhere on the Owner's property, limit the access of trucks and equipment to the route shown (IF SHOWN) on the Drawings as "Access Route". If access route is not shown on the Drawings, coordinate construction access and routes with the Owner's Project Manager.
- b) Do not permit such vehicles to park on any street or other area of the Owner's property except in the area shown on the Drawings as "Contractor's Parking Area". If not shown on the drawings, the Contractor's Parking Area shall be as designated by the Owner's Project Manager.
- c) Provide adequate protection for curbs and sidewalks over which trucks and equipment pass to reach the job site.

3. SECURITY

- a) Restrict the access of all persons entering upon the Owner's property in connection with the Work to the Access Route and to the actual site of the Work.

D. TEMPORARY ENVIRONMENTAL CONTROLS

1. GENERAL

- a) Provide temporary environmental controls at the site of the Work to ensure that construction operations have no harmful effects on adjacent properties and on members of the public who may come in proximity to the Work, and/or the employees of the Owner who are engaged in regular daily tasks and operations and are unable to be relocated to another work site during construction operations.
- b) Owner reserves the right to stop the Work, at the Contractor's expense, until the Contractor provides necessary control measures for the conditions listed below; additionally, the Owner reserves the right to perform or have performed necessary control measures, should the Contractor refuse to do so at the time requested and to deduct the cost of those expenses from the amount due the Contractor.

2. DUST CONTROL

- a) Provide dust control materials to minimize dust from construction operations. Prevent air-borne dust from dispersing into the atmosphere.

3. WATER CONTROL

- a). Control surface water to prevent damage to the project, the site and adjoining properties.
 - 1) Control fill, grading, and ditching to direct surface drainage away from excavations, pits, tunnels, and other construction areas; direct drainage to proper runoff channels or storm drainage utilities.
- b) Provide, operate and maintain hydraulic equipment of adequate capacity to control surface water.
- c) Dispose of drainage water in a manner to prevent flooding, erosion silting, or runoff of silt or sediment or other damage to all portions of the site or to adjoining properties.

4. RODENT CONTROL

- a) Provide rodent control to prevent infestation of construction or storage areas.
 - 1) Use methods and materials which will not adversely affect conditions at the site or on adjoining properties.

5. DEBRIS CONTROL

- a) Maintain all areas free of extraneous debris, waste, and rubbish.

6. POLLUTION CONTROL

- a) Prevent contamination of soil, water or atmosphere by the discharge of noxious substances from construction operations.
 - b) Provide equipment and personnel, perform emergency measures to contain all spillages, and to remove contaminated soils or liquids.
 - 1) Excavate and dispose of all contaminated earth off-site. Replace with suitable compacted fill and topsoil.
 - c) Take special measures, as necessary, to prevent harmful substances from entering public waters, including lakes, streams, intermittent drainage channels, and storm or sanitary sewers.
7. EROSION CONTROL
- a) Plan and execute construction and earthwork in a manner to control surface drainage from cuts and fills, and from borrow and waste disposal areas, to prevent erosion and sedimentation.
 - 1) Schedule the Work to minimize the areas of bare soil exposed at one time, if possible.
 - 2) Provide temporary control measures such as berms, dikes, and drains to prevent runoff of silt or sediment from the site.
 - 3) Comply with Section 015713.
- E. PROJECT IDENTIFICATION AND SIGNAGE
- 1. GENERAL
 - a) Provide and install project identification sign, if located and/or called out on the Drawings.
 - 2. SUBMITTALS
 - a) Provide shop drawing(s) of proposed sign/sign installation to Owner's Representative for approval, prior to installation
 - 3. INSTALLATION
 - a) Provide project sign as detailed on Drawings
 - b) If not detailed on Drawings provide project identification sign per the following minimum requirement:
 - 1) Content
 - aa) Name of project
 - bb) Name of Owner
 - cc) Name of Architect(s) and major consultants
 - dd) Names of Contractor and major subcontractors
 - ee) Allow additional 200 characters of text explaining the project
 - 2) Construction
 - aa) Size: 4' x 8'
 - bb) Materials: Min. 5/8" AC DFPA Exterior Plywood, with (2) 4" x 4" x 12' long pressure treated post supports
 - cc) Paint: paint front and back, seal edges, provide content as approved by Owner's Representative. Conform to recognized sign painting standards in selection of paint materials. Use only professional sign painter with three years minimum experience to apply sign graphics and lettering.
 - 3) Install sign in a manner consistent with length of time of construction operations. Remove sign and fill post holes at project completion.
- F. FIELD OFFICES
- 1. TEMPORARY FACILITIES

Provide and pay for temporary (new, or used if in serviceable condition) facilities and controls needed for the Work, if called out on the Drawings, which may include, but are not necessarily limited to:

 - a) Temporary utilities such as heat, water, electricity, and telephone;
 - b) Field office for the Contractor's personnel (required if shown on the Drawings; otherwise at the Contractor's option and expense).
 - 1) Conform with requirements for Engineer's Field Office Type B, as defined in Article 646.04 of the Standard Specifications for Road and Bridge Construction - Illinois Department of Transportation.
 - c) Sanitary facilities;
 - d) Enclosures such as tarpaulins, barricades, and canopies;
 - e) Temporary fencing of the construction site;
 - f) Project sign.
 - 2. Comply with Federal, State, and local codes and regulations.
 - a) Maintain temporary facilities and controls in proper and safe condition throughout the progress of the work. The Contractor is responsible for conformance with all safety codes and regulations for all Work under his jurisdiction, including that of Sub-Contractors.
 - 3. Locate temporary facilities as shown on the Drawings, or as approved by the Owner's Representative if not shown on the Drawings.

SECTION 015713 – EROSION & SEDIMENT CONTROL

- A. RELATED DOCUMENTS
- 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. SUMMARY
- 1. This Section includes the following:
 - a) Site erosion and sediment control
 - b) Silt fencing
 - c) Ditch checks
 - d) Erosion control blankets
 - e) Culvert and inlet protection
 - f) Stabilized entrance
 - 2. Related Sections include the following:
 - a) Division 31 – Earthwork.
 - b) Division 32 – Exterior Improvements.

3. Erosion and Sediment Control Statement: The Peoria Park District takes the issue of construction related erosion and sediment control extremely seriously. The Peoria Park District is a community leader in the conservation and protection of our area's natural resources. This project will be watched closely by both staff and citizens for compliance with erosion and sediment control regulations and specifications.

C. QUALITY ASSURANCE

1. Materials and methods of construction shall comply with the following standards:
 - a) Illinois Department of Transportation
 - b) City of Peoria

D. PRODUCTS

1. Silt Fencing
 - a) Fabric for silt fencing shall consist of woven or nonwoven filaments of polypropylene, polyester, or polyethylene. Fabric shall be resistant to degradation by ultraviolet light and heat exposure. Fabric shall be rot, insect, and mildew proof, and have a high resistance to tearing.
 - 1) Fabric shall comply with the following physical properties:

aa) Grab tensile strength (lb) – ASTM D4632	200 (min)
bb) Grab elongation @ break (%) – ASTM D4632	12
cc) Burst strength (psi) – ASTM D751	250 (min)
dd) Trapezoidal tear strength (lb) – ASTM D4533	75
ee) Width (ft)	3.5 (min)
ff) Weight (oz/sq. yd) – ASTM D3776	4.0
gg) Equivalent opening size	30 (nonwoven)
hh) (EOS) sieve no. – Corps of Engrs. CS-02215	50 (woven)
2. Ditch Checks
 - a) Ditch checks will consist of silt fencing with the addition of wire reinforcement.
 - b) Wire shall be 9 gauge.
 - c) Alternate: Straw bales may be used in lieu of silt fencing
3. Posts
 - a) Posts shall be standard “T” or “U” steel posts or wood with a minimum cross section of 3 square inches. Posts shall be a minimum of 60” in length. Posts shall be driven a minimum of 24” into the ground.
4. Erosion Control Blankets
 - a) Excelsior Blanket: Excelsior blanket shall consist of a machine produced mat of wood excelsior of 80% 6” or longer fiber length. The wood from which the excelsior blanket is cut shall be properly cured to achieve adequately curled and barbed fibers.
 - 1) The blanket shall be of consistent thickness, with the fiber evenly distributed over the entire area of the blanket. The excelsior blanket shall be covered on the top side with a 90-day biodegradable extruded plastic mesh netting having an approximate minimum opening of 16 x 16 mm (5/8 x 5/8 in.) to an approximate maximum opening of 50 x 25 mm (2 x 1 in.). The netting shall be substantially adhered to the excelsior blanket by a knitting process using biodegradable thread or by an applied degradable adhesive. The netting shall be substantially adhered to the excelsior by a knitting process using biodegradable thread. The netting shall be entwined with the excelsior blanket for maximum strength and ease of handling.
 - 2) The excelsior blanket shall comply with the following:

aa) Minimum width, ± 25 mm (1 in.)	600 mm (24 in.)
bb) Minimum mass ± 10%	0.34 kg/sm (0.63 lb/sq yd)
cc) Minimum length of roll, approximately	45 m (150 ft)
 - 3) The excelsior blanket shall be smolder resistant.
5. Culvert And Inlet Protection
 - a) Culvert protection shall consist of a ditch check immediately upstream of every culvert entrance. Ditch check shall be installed to protect culvert interior from sedimentation.
 - b) Inlet protection shall consist of purpose made devices by:

Dandy Products, Inc.
P. O. Box 1980
Westerville, Ohio 43086-1980
Phone: 1-800-591-2284
Fax: 740-881-2791
www.dandyproducts.com
dlc@dandyproducts.com

or

NILEX, Inc.
15171 E. Fremont Drive
Centennial, CO 80112
Phone: 1-800-537-4241
Fax: 303-766-1110
www.nilex.com
denver@nilex.com
 - c) “Or Equal” substitutions may be made with prior approval of Owner’s Representative.
6. Stabilized Entrance
 - a) Stabilized entrance shall consist of coarse aggregate laid over geotextile fabric.
 - b) Dimensions: 70’ long by 14’ wide.
 - c) Geotextile Fabric: as per requirements of “silt fencing”.
 - d) Aggregate: IDOT Class CA-1, CA-2, cA-3, or CA-4.

E. EXECUTION

1. Site Erosion And Sediment Control

- a) Contractor is responsible for fulfilling terms of City of Peoria Erosion Control Permit and all applicable portions of the "Erosion, Sediment, and Stormwater Control Ordinance of the City of Peoria".
 - b) Install control devices as shown on erosion control plan.
 - c) Install additional measures as needed to control erosion and sedimentation on the site.
2. Silt Fencing Installation
- a) Install silt fencing according to details in plans. The silt fence shall be entrenched to a minimum depth of 8".
 - b) The silt fence shall be installed on the contour, with the ends extending up-slope.
 - c) Install silt fencing before commencing site clearing work.
3. Ditch Check Installation
- a) Install ditch checks according to details in plans.
 - b) Install ditch checks at locations shown on plans.
 - c) Install additional ditch checks as needed to control erosion within drainage swales as site conditions and weather dictate.
 - d) Install ditch checks immediately after swales are graded.
4. Erosion Control Blankets Installation
- a) Install erosion control blankets as needed to control erosion in drainage swales and at the direction of the Owner's Representative.
 - b) Anchor stakes shall be driven at a spacing of 2 feet on center.
5. Culvert And Inlet Protection Installation
- a) Install culvert protection at upstream entrances to all culverts.
 - b) Install culvert protection to intercept waterborne silt and sediment and prevent it from entering culvert pipes.
 - c) Install immediately after culvert installation.
 - d) Install inlet protection according to manufacturer's written instructions at each inlet immediately after inlet construction.
6. Stabilized Construction Entrance Installation
- a) Install stabilized construction entrance and other approved measures as necessary to limit tracking of soil on to all paved surfaces.
 - b) Comply with all City of Peoria codes limiting tracking of soil on to City streets.
7. Maintenance
- a) Inspect silt fences after each rainfall. Repair fencing, failures, end runs, and erosion cuts immediately.
 - b) Remove soil from silt fencing after each rainfall.
 - c) Erosion control maintenance and repair shall be considered incidental to the contract.
 - d) Tracked soil and sediment shall be removed from all paved surfaces on a daily basis.
 - e) Replace or provide new erosion and sediment control measures as needed during construction to provide protection to site and surrounding property for the entire time of construction, or until project is complete.
8. Close-Out
- a) Remove silt fencing and other erosion and sediment control devices after lawn or seeding has been established.
 - b) Soil deposits remaining in place after silt fence is no longer required shall be dressed to conform to existing grade, and seeded with appropriate seed material.

SECTION 016000 – PRODUCT REQUIREMENTS

A. MATERIALS AND EQUIPMENT

1. STANDARD SPECIFICATIONS
 - a) Reference herein to known standard specifications of governmental agencies or technical societies shall refer to the latest edition of such specifications, adopted and published at date of these Specifications.
2. MANUFACTURED ARTICLES
 - a) All manufactured articles, materials and equipment to be incorporated in the work shall be new (unless otherwise specified) and of the quality specified and shall be used, erected, installed, connected, cleaned and conditioned as directed by and in conformity with job conditions to produce the best results obtainable.
 - 1) Field measurements for all special products and materials which requires close tolerances or fitting into other items or components of the Work shall be taken on the job by the party furnishing the materials.
3. QUALITY ASSURANCE
 - a) Per the Supplementary Instructions to Bidders, the Bidder by submission of a signed bid form, agrees to install products and equipment by brand and model name or names specified in the Technical Specifications, Divisions 02-35. Substitutions are allowed only in conformance to the following:
 - 1) Proprietary Specification Requirement: Where only a single product or manufacturer is named, provide the product indicated. No substitutions will be permitted.
 - 2) Semiproprietary Specification Requirement: Where two or more products or manufacturers are named, provide one of the products indicated. No substitutions will be permitted
 - aa) Where either of the two cases above prevail, and the named product is accompanied by "or approved equal" substitutions will be allowed only upon written approval of the Owner's Representative prior to submission of bids.
 - 3) Non-Proprietary Specification Requirement: When the Specifications lists products or manufacturers that are available and are accompanied by "or equal", the Contractor may propose any available product that complies with the Specifications' requirements; however, the Owner's Representative shall determine if the produced item complies with those requirements.
 - 4) Descriptive Specification Requirement: Where Specifications describe a product or assembly listing exact characteristics required, with or without use of a brand, trade, or model name, provide a product or assembly that provides the characteristics and otherwise complies with the Contract Documents.
 - 5) Performance Specification Requirement: Where Specifications require compliance with performance requirements, provide products or assembly that comply with these requirements and are recommended by the manufacturer for the application indicated.
 - 6) Compliance with Standards, Codes, and Regulations: Where the Specifications only require compliance with an imposed code, standard, or regulation, select a product that complies with the standard, code, or regulation specified.
 - b) VISUAL MATCHING AND SELECTION. Where the Specifications require matching an established sample or call for "as selected", the Owner's Representative's decision will be final on whether a proposed product matches satisfactorily.

B. STORAGE AND PROTECTION

1. GENERAL

- a) Contractor shall provide and maintain:
 - 1) Storage for materials and equipment to be installed in Project.
 - 2) Protection and security for stored materials and equipment, on and off site.
 - 3) Protection of existing on-site elements to remain.
 - 4) Protection of adjacent properties improvements

2. METHODS

- a) Store off grade and cover with impervious material all moisture or water vulnerable materials.
- b) Store finished products and equipment in an enclosed building, on or off site.
- c) Maintain integrity of shipping cartons until ready for installation.
- d) Provide separate storage for combustible and non-combustible products.
- e) Follow storage recommendations of product and equipment manufacturers.
- f) Other methods shall be subject to Owner's prior written approval.

- 3. The Contractor shall maintain an emergency phone number where a contact person can be notified at any time, Sundays and holidays included, of an emergency condition due to the work which requires immediate repair or protection.

C. SUBSTITUTIONS

- 1. See "SECTION 016000 – A. MATERIALS AND EQUIPMENT" for requirements pertaining to substitution of specified materials, products, equipment, etc.
- 2. Contractor may propose substitute materials, products, equipment, etc., after award of the Bid; however, such proposals are expected to result in a cost savings to the Owner and/or higher quality Work at no additional cost to the Owner.

D. WARRANTIES AND BONDS

1. GENERAL

- a) This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturer's standard warranties on products and special warranties.
- b) Warranties for the Work and products and installations of each Contractor shall be one (1) year unless specified otherwise in the individual Sections of Divisions 02 through 35.
- c) Disclaimers and Limitations:
 - 1) Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and Contractors required to countersign special warranties with the Contractor.
 - 2) The responsibility of the Contractor in respect to the required warranties shall not be relieved or limited in any way by the failure of installed components, equipment, materials, etc., due to naturally occurring and/or re-occurring conditions at the site or area of the Work including, but not limited to:
 - aa) ground and soil conditions, especially as related to frost heave;
 - bb) high wind velocities (except those exceeding velocities normally used for calculating wind loading at the site of the Work);
 - cc) rain and water damage (unless caused by winds exceeding normal design limits);
 - dd) ice/snow loading on structures
 - ee) and other naturally occurring or re-occurring site conditions
 - 3) The Contractor shall notify the Owner's Representative, prior to the award of the contract, of any part or component of the Work that is, in his opinion, not designed to accommodate the existing, naturally occurring, or re-occurring conditions of the site, and whether or not a change in the proposed methods of construction, types of equipment, etc., will affect the bid price.
 - aa) Should the proposed change in construction methods, equipment type, etc., result in additional expense, the Owner reserves the right to request proposals from the other bidders and to make award the contract based on the bid amount which includes the proposed change.

2. WARRANTY REQUIREMENTS

- a) Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- b) Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- c) Replacement cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- d) Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights or remedies.
 - aa) Rejection of Warranties: The Owner reserves the rights to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- e) The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.
- f) For specific warranty requirements related to landscape materials, refer to the applicable Section.

3. SUBMITTALS

- a) Submit written warranties to the Owner's Representative prior to the date certified for Substantial Completion. If the Owner's Representative's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Owner's Representative.
 - 1) When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Owner's Representative within fifteen days of completion of that designated portion of the Work.
- b) Form of Submittal: At Final Completion, compile two copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, Subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.
- c) Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2" by 11" paper.
- d) Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer.
- e) Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS", the project title or name, and the name of the Contractor.
- f) When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

SECTION 017300 – EXECUTION

A. GEOTECHNICAL DATA

- 1. If the Owner has caused borings or other subsurface investigations to be made, the data or report pursuant to these investigations will be included in the Project Manual, as an Appendix, and labeled as such.
- 2. The Owner and Owner's Representative do not guarantee the accuracy or validity of the data, nor do they assume any responsibility for the Contractor's interpretation of the data.
- 3. The Contractor's may, at his option, perform additional subsurface investigation, however, it shall be at the Contractor's sole expense.

B. FIELD ENGINEERING

Provide such field engineering services as are required for proper completion of the Work including, but not limited to:

- 1. Establishing and maintaining lines and levels
- 2. Structural design of shores, forms, and similar items provided by the Contractor as part of his means and methods of construction.
- 3. Verify layout information shown on the Drawings, in relation to the property survey and existing benchmarks and control points. Preserve permanent reference points during construction.

C. COORDINATION OF TRADES AND SUB-CONTRACTORS

- 1. The Contractor shall be responsible for the proper fitting of all work and for the coordination of the operation of all trades, sub-contractors, or materials and men engaged upon the work. He shall be prepared to guarantee to each of his subcontractors the dimensions which may be required for fitting of their work to all surrounding work and shall do, or cause his agents to do, all cutting, fitting, adjusting and patching necessary to make the several parts of the work come together properly and fit the work to receive, or be received by that of other contractors.
- 2. When two or more prime contracts are being executed at one time in such manner that the work on one contract may interfere with the work of another, the Owner's Representative shall decide which contractor shall cease work and which shall continue, or whether the work on both contracts may progress at the same time and in what manner.
 - a) The Contractor shall not cause any unnecessary hindrance or delay to any other contractors on the premises, and shall be responsible for all damages done to the work of other contractors caused by him or by his employees.

D. REFERENCE AND CONTROL POINTS PROVIDED BY OWNER

In addition to layout procedures provided by the Contractor for proper performance of the Contractor's responsibilities:

- 1. Locate and protect existing control points before starting work on the site.
- 2. Preserve permanent reference points during progress of the Work.
- 3. Do not change or relocate reference points or items of the Work without specific approval from the Owner's Representative.
- 4. Promptly advise the Owner's Representative when a reference point is lost or destroyed, or requires relocation because of other changes in the Work.
- 5. Upon direction of the Owner's Representative, require the field engineer to replace reference stakes or markers.
- 6. Locate such replacement according to the original survey control.

E. REFERENCE AND CONTROL POINTS PROVIDED BY THE CONTRACTOR

- 1. If not provided by the Owner (and defined as the responsibility of the Owner in the Contract Documents) establish sufficient general reference points in the form of permanent bench marks, grade stakes or other markers as will enable the Contractor to proceed with the Work.
- 2. The Contractor may lay out his own work, or cause the Work to be laid out by a qualified party such as a Registered Land Surveyor or a Professional Engineer, as necessary.
- 3. The Contractor shall establish and be responsible for all lines, elevations and measurements of the structure utilities, installations, and other Work executed by him under the contract.
 - a) Exercise proper precautions to verify the figures and dimensions shown on the drawings before laying out the work; be responsible for any error resulting from failure to exercise such precaution.

SECTION 017329 - CUTTING AND PATCHING

A. CHASES AND OPENINGS

- 1. The Contractor is responsible for the provision and/or coordination of all chases, openings and recesses required by work of his own forces, subcontractors or separate contractors.
 - a) Each subcontractor or separate contractor shall be responsible for furnishing advance information to the General Contractor as to exact dimensions and locations of such chases and openings, and shall provide and set in place all necessary sleeves, inserts and forms.

- b) Openings shall be accurately located, neatly cut, and no larger than necessary. Provide all rebuilding, patching, refinishing and painting required to restore the construction to original condition.
- 2. Provide shoring, bracing, and support as required to maintain structural integrity of the project.
- 3. Provide protection from cutting and patching operations as required for other portions of the project; protect the Work and existing improvements in proximity to the cutting and patching operations from the elements.

SECTION 017419 – CONSTRUCTION WASTE MANAGEMENT & DISPOSAL

A. PERIODIC CLEANING

- 1. Each Contractor shall clean up after his own work as needed and/or ensure that sub-contractors clean up after their work and remove accumulations of waste, debris, and rubbish caused by construction operations.
 - a) Remove all waste, rubbish and debris on a daily basis (if needed), as they accumulate, and after completion of the Work.

B. PROJECT COMPLETION

- 1. On completion of the project, the entire job shall be cleaned up and left in perfect condition, including adjacent areas.
 - a) Marred surfaces shall be patched or repaired and touched up to match adjoining surfaces.
 - b) All rubbish shall be removed from the site before acceptance.
 - c) New surfaces and/or exposed elements of the Work shall be protected from stain and marring. These surfaces shall be cleaned to the satisfaction of the Owner's Representative or replaced if said stains or mars are unable to be completely removed

C. GOVERNMENTAL REGULATIONS

- 1. Conduct cleaning and disposal operations in compliance with Federal, State and local ordinances and anti-pollution laws and regulations.

SECTION 017700 - PROJECT CLOSEOUT

A. GENERAL

Work includes:

- 1. Substantial Completion.
- 2. Final Completion
- 3. Closeout submittals.
- 4. Instruction

B. SUBSTANTIAL COMPLETION

- 1. Prepare and submit the list ("punch-list") required by the first sentence of Paragraph 9.8.2 of the General Conditions.
 - a) Within a reasonable time after receipt of the list the Owner's Representative will inspect to determine status of completion. Should the Owner's Representative determine that the Work is not Substantially Complete:
 - 1) The Owner's Representative will so notify the Contractor, in writing, giving the reasons therefore.
 - 2) Remedy the deficiencies and notify the Owner's Representative when ready for reinspection.
 - 3) The Owner's Representative will reinspect the Work.
 - b) When the Owner's Representative concurs that the Work is Substantially Complete:
 - 1) The Owner's Representative will prepare a "Certificate of Substantial Completion" on AIA form G704, accompanied by the Contractor's list of items to be completed or corrected, as verified and approved by the Owner's Representative.
 - 2) The Owner's Representative will submit the Certificate to the Owner and to the Contractor for their written acceptance of the responsibilities assigned to them in the Certificate.

C. FINAL COMPLETION

- 1. Prepare and submit the notice required by the first sentence of Paragraph 9.10.1 of the General Conditions.
 - a) Verify that the Work is complete including, but not necessarily limited to, the items mentioned in Paragraph 9.8.2 of the General Conditions. Certify that:
 - 1) the Contract Documents have been reviewed;
 - 2) the Work has been inspected for compliance with the Contract Documents;
 - 3) the Work has been completed in accordance with the Contract Documents;
 - 4) equipment and systems have been tested as required, and are operational;
 - 5) the Work is completed and ready for final inspection.
 - b) The Owner's Representative will make a final inspection to verify status of completion and if all "punch-list" items have been completed, and upon receipt of the Contractor's Final Application for Payment, issue a Certificate of Final Completion. Should the Owner's Representative determine that the Work is incomplete or defective:
 - 1) The Owner's Representative will so notify the Contractor, in writing, listing the incomplete or defective work.
 - 2) Remedy the deficiencies promptly, and notify the Owner's Representative when ready for reinspection.
 - c) FINAL APPLICATION FOR PAYMENT
 - 1) Submit a final Application for Payment to the Owner's Representative, showing all adjustments to the Contract Sum.
 - 2) If needed, the Owner's Representative will prepare a final Change Order showing adjustments to the Contract Sum which were not made previously by Change Orders.
 - 3) Include final waivers of lien from the Contractor, sub-contractors, and major suppliers.
 - 4) Final payment will not be released until all close-out submittals have been made, final cleaning has been performed, and required instruction(s) to Owner's personnel have been accomplished.

D. CLOSEOUT SUBMITTALS

- 1. When the Owner's Representative determines that the Work is acceptable under the Contract Documents, he will request the Contractor to make closeout submittals. Closeout submittals include, but are not necessarily limited to:
 - a) Project record documents described in "Section 017839".
 - b) Operation and maintenance manuals/data as described in "Section 017823".

- c) Warranties and bonds as described in "Section 016000".
- d) Keys and keying schedule;
- e) Spare parts and materials extra stock;
- f) Evidence of compliance with requirements of governmental agencies having jurisdiction including, but not necessarily limited to:
 - 1) Certificates of Inspection, as required
 - 2) Certificate(s) of Occupancy
- g) Certificates of Insurance for products and completed operations;
- h) Evidence of payment and release of liens.
 - 1) Consent of Surety to Final Payment
 - 2) Contractor's Final Waiver of Lien
 - 3) Separate releases or Waivers of Lien for sub-contractors, suppliers and others with lien rights against the Owner, together with a list of those parties.
- i) List of subcontractors, service organizations, and principal vendors, including names, addresses, and telephone numbers where they can be reached for emergency service at all times including nights, weekends, and holidays.

SECTION 017823 - OPERATING/MAINTENANCE MANUALS & INSTRUCTION

A. GENERAL

- 1. Compile operating/product data and related information appropriate for Owner's maintenance and operation of products and equipment provided under the Contract.
- 2. Instruct Owner's personnel in operation and maintenance of products, equipment and systems.
- 3. OPERATIONS AND MAINTENANCE DATA REQUIRED:
 - a) Operating and maintenance manuals are required for each area of Work which is listed below, if that area of Work is included within the scope of Work of the project:
 - 1) HVAC
 - 2) Plumbing – including water supply, sewage and waste disposal
 - 3) Electrical
 - 4) Landscape irrigation system
 - 5) Fire sprinkler system
 - 6) Communications equipment and systems
 - 7) Materials and finishes

B. OPERATIONS/MAINTENANCE MANUALS - FORM OF SUBMITTAL

- 1. Prepare operating and maintenance manuals in the form of an instructional manual, utilizing heavy-duty, durable 3-ring vinyl covered loose-leaf binders, for use by the Owner's operating personnel. Organize into suitable sets of manageable size. Where possible, assemble instructions for similar equipment into a single binder. Provide when drawings or diagrams are required as part of the manual.
- 2. Provide sturdy manila or kraft envelope, accordion type file folder, or cardboard file boxes, properly labeled, of sufficient size to contain all submittals.
- 3. Submit one copy of data in final form at least fifteen days before final inspection. This copy will be returned within fifteen days after final inspection, with comments. After final inspection make corrections or modifications to comply with the Owner's Representative's comments and submit three copies of each approved manual to the Owner's Representative
- 4. WARRANTIES, BONDS AND SERVICE CONTRACTS
 - a) Provide a copy of each warranty, bond or service contract in the appropriate manual for the information of the Owner's operating personnel. Provide written data outlining procedures to be followed in the event of product failure. List circumstances and conditions that would affect validity of the warranty or bond. Provide list for each product containing name, address, and phone number of:
 - 1) Contractor.
 - 2) Subcontractor.
 - 3) Maintenance contractor, as appropriate.
 - 4) Local supply source for parts and replacement.
 - b) Identify area of responsibility of each contractor.

C. MANUAL FOR MATERIALS AND FINISHES

- 1. Submit two (2) copies of complete manual in final form.
- 2. Refer to individual Specification Sections for additional requirements on care and maintenance of materials and finishes.
- 3. Content for products, applied materials and finishes:
 - a) Manufacturer's data, giving full information on products.
 - 1) Catalog number, size, composition.
 - 2) Color and texture designations.
 - 3) Information for re-ordering special-manufactured products.
- 4. Instructions for care and maintenance.
 - a) Manufacturer's recommendations for types of cleaning agents and methods.
 - b) Cautions against cleaning agents and methods detrimental to product.
 - c) Recommended cleaning and maintenance schedule.
- 5. Moisture-Protection and Weather-Exposed Products: Provide complete manufacturer's data with instructions on inspection, maintenance and repair of products exposed to the weather or designed for moisture-protection purposes.
- 6. Manufacturer's Data: Provide manufacturer's data giving detailed information, including the following, as applicable:
 - a) Applicable standards.
 - b) Chemical composition.
 - c) Installation details.
 - d) Inspection procedures.
 - e) Maintenance information.
 - f) Repair procedures.

D. INSTRUCTION

1. Instruct the Owner's personnel in proper operation and maintenance of systems, equipment, and similar items which were provided as part of the Work including, but not limited to;
 - a) Mechanical
 - b) Water supply
 - c) Electrical service/distribution and lighting
 - d) Other items or systems as required in individual sections of the Technical Specifications
2. Instructions for the Owner's Personnel: For instruction of the Owner's operating and maintenance personnel, use experienced instructors thoroughly trained and experienced in the operation and maintenance of the equipment or system involved.

SECTION 017839 - PROJECT RECORD DOCUMENTS (AS-BUILTS)

A. DOCUMENTS REQUIRED AT SITE

1. The Contractor shall maintain at the job site one copy of all Drawings, Specifications, Addenda, approved Shop Drawings, Change Orders, and other Contract modifications.
 - a) Each of these project record documents shall be clearly marked "**Project Record Copy**"
 - b) Shall be maintained in good condition
 - c) shall be available at all times for inspection by the Park District, and shall not be used for construction purposes.
- B. Project-record drawings shall be marked up to show significant changes made during construction progress, referenced to visible and accessible features of the structures. Project-record drawings shall be kept current and no work shall be concealed until required information has been recorded.
- C. Record-documents shall be submitted in satisfactory condition to the Park District at the completion of the project. **FINAL COMPLETION OF THE PROJECT WILL NOT BE ATTAINED, AND FINAL PAYMENT WILL BE WITHHELD, UNTIL PROJECT "AS-BUILTS" ARE SUBMITTED TO AND APPROVED BY THE OWNER'S REPRESENTATIVE.**

END OF GENERAL REQUIREMENTS

SECTION 23 0529

PART 1 -

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 2 - GENERAL

2.1 RELATED DOCUMENTS

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

2.2 SUMMARY

- A. Section Includes:
 - 1. Metal pipe hangers and supports.
 - 2. Trapeze pipe hangers.
 - 3. Fiberglass pipe hangers.
 - 4. Metal framing systems.
 - 5. Thermal-hanger shield inserts.
 - 6. Fastener systems.
 - 7. Pipe stands.
 - 8. Equipment supports.
- B. Related Requirements:
 - 1. Section 23 0516 "Expansion Fittings and Loops for HVAC Piping" for pipe guides and anchors.
 - 2. Section 23 3113 "Metal Ducts" and Section 23 3116 "Nonmetal Ducts" for duct hangers and supports.

2.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:
 - 1. Trapeze pipe hangers.
 - 2. Metal framing systems.
 - 3. Fiberglass strut systems.
 - 4. Pipe stands.
 - 5. Equipment supports.

2.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

2.5 QUALITY ASSURANCE

- A. Structural-Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code, Section IX.

PART 3 - PRODUCTS

3.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Galvanized Metallic Coatings: Pregalvanized, hot-dip galvanized, or electro-galvanized.
 - 3. Nonmetallic Coatings: Plastic coated, or epoxy powder-coated.
 - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
- B. Stainless-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 - 3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.
- C. Copper Pipe and Tube Hangers:
 - 1. Description: MSS SP-58, Types 1 through 58, copper-plated steel, factory-fabricated components.
 - 2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-plated steel.

3.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-58, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

3.3 FIBERGLASS PIPE HANGERS

- A. Clevis-Type, Fiberglass Pipe Hangers:

1. Description: Similar to MSS SP-58, Type 1, factory-fabricated steel pipe hanger except hanger is made of fiberglass or fiberglass-reinforced resin.
2. Hanger Rods: Continuous-thread rod, washer, and nuts made of fiberglass polyurethane or stainless steel.
3. Flammability: ASTM D 635, ASTM E 84, and UL 94.

B. Strap-Type, Fiberglass Pipe Hangers:

1. Description: Similar to MSS SP-58, Type 9 or Type 10, steel pipe hanger except hanger is made of fiberglass-reinforced resin.
 - a. Flammability: ASTM D 635, ASTM E 84, and UL 94.
2. Hanger Rod and Fittings: Continuous-thread rod, washer, and nuts made of stainless steel.

3.4 PLASTIC PIPE HANGERS

- A. Description: Similar to MSS SP-58, Types 1 through 58, factory-fabricated steel pipe hanger except hanger is made of plastic.
- B. Hanger Rods: Continuous-thread rod, nuts, and washer made of galvanized steel.
- C. Flammability: ASTM D 635, ASTM E 84, and UL 94.

3.5 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. B-line, an Eaton business.
 - b. Flex-Strut Inc.
 - c. G-Strut.
 - d. Haydon Corporation.
 - e. MIRO Industries.
 - f. Thomas & Betts Corporation; A Member of the ABB Group.
2. Description: Shop- or field-fabricated, pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
4. Channels: Continuous slotted carbon-steel channel with inturned lips.
5. Channel Width: Selected for applicable load criteria.
6. Channel Nuts: Formed or stamped nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
7. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
8. Paint Coating: Green epoxy, acrylic, or urethane.

B. Non-MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International.
 - b. Carpenter & Paterson, Inc.
 - c. Empire Industries, Inc.
 - d. ERICO International Corporation.
 - e. Gripple Inc.
2. Description: Shop- or field-fabricated, pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
4. Channels: Continuous slotted carbon-steel channel with inturned lips.
5. Channel Width: Select for applicable load criteria.
6. Channel Nuts: Formed or stamped nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
7. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
8. Paint Coating: Green epoxy, acrylic, or urethane.

3.6 FIBERGLASS STRUT SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Champion Fiberglass, Inc.
 2. Fabco Plastics Wholesale Limited.
 3. G-Strut.
- B. Description: Structural-grade, factory-formed, glass-fiber-resin channels and angles for supporting multiple parallel pipes.
 1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
 2. Channels: Continuous slotted fiberglass-reinforced plastic channel with inturned lips.
 3. Channel Width: Selected for applicable load criteria.
 4. Fittings and Accessories: Products provided by channel and angle manufacturer and designed for use with those items.
 5. Fitting and Accessory Materials: Same as those for channels and angles, except metal items may be stainless steel.
 6. Rated Strength: Selected to suit applicable load criteria.
 7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

3.7 THERMAL-HANGER SHIELD INSERTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Buckaroos, Inc.
 2. Carpenter & Paterson, Inc.

3. [Clement Support Services.](#)
 4. [ERICO International Corporation.](#)
 5. [National Pipe Hanger Corporation.](#)
 6. [Pipe Shields Inc.](#)
 7. [Piping Technology & Products, Inc.](#)
- B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psi or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psi minimum compressive strength and vapor barrier.
- C. Insulation-Insert Material for Hot Piping: Water-repellent-treated, ASTM C 533, Type I calcium silicate with 100-psi or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psi minimum compressive strength.
- D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

3.8 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
1. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:
 - a. [Hilti, Inc.](#)
 - b. [ITW Ramset/Red Head; Illinois Tool Works, Inc.](#)
- B. Mechanical-Expansion Anchors: Insert-wedge-type anchors for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
1. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:
 - a. [B-line, an Eaton business.](#)
 - b. [Empire Tool and Manufacturing Co., Inc.](#)
 - c. [Hilti, Inc.](#)
 2. Indoor Applications: Zinc-coated or stainless-steel.
 3. Outdoor Applications: Stainless steel.

3.9 PIPE STANDS

- A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
- B. Compact Pipe Stand:
 - 1. Description: Single base unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
 - 2. Base: Single, vulcanized rubber, molded polypropylene, or polycarbonate.
 - 3. Hardware: Galvanized steel or polycarbonate.
 - 4. Accessories: Protection pads.
- C. Low-Profile, Single Base, Single-Pipe Stand:
 - 1. Description: Single base with vertical and horizontal members, and pipe support, for roof installation without membrane protection.
 - 2. Base: Single, vulcanized rubber, molded polypropylene, or polycarbonate.
 - 3. Vertical Members: Two, galvanized-steel, continuous-thread 1/2-inch rods.
 - 4. Horizontal Member: Adjustable horizontal, galvanized-steel pipe support channels.
 - 5. Pipe Supports: Strut clamps.
 - 6. Hardware: Galvanized steel.
 - 7. Accessories: Protection pads.
 - 8. Height: 12 inches above roof.

3.10 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

3.11 MATERIALS

- A. Aluminum: ASTM B 221.
- B. Carbon Steel: ASTM A 1011/A 1011M.
- C. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; galvanized.
- D. Stainless Steel: ASTM A 240/A 240M.
- E. Threaded Rods: Continuously threaded. Zinc-plated or galvanized steel for indoor applications and stainless steel for outdoor applications. Mating nuts and washers of similar materials as rods.
- F. Grout: ASTM C 1107/C 1107M, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.

2. Design Mix: 5000-psi, 28-day compressive strength.

PART 4 - EXECUTION

4.1 APPLICATION

- A. Comply with requirements in Section 07 8413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

4.2 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Fiberglass Pipe-Hanger Installation: Comply with applicable portions of MSS SP-58. Install hangers and attachments as required to properly support piping from building structure.
- D. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled strut systems.
- E. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- F. Fastener System Installation:
 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- G. Pipe Stand Installation:
 1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.

2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 07 7200 "Roof Accessories" for curbs.
- H. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
 - I. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
 - J. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
 - K. Install lateral bracing with pipe hangers and supports to prevent swaying.
 - L. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
 - M. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
 - N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
 - O. Insulated Piping:
 1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.

- b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
 - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
 - e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
- 5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
 - 6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

4.3 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

4.4 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

4.5 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

4.6 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Touchup: Comply with requirements in Section 09 9123 "Interior Painting" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780/A 780M.

4.7 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-58 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports metal trapeze pipe hangers and metal framing systems and attachments for general service applications.
- F. Use stainless-steel pipe hangers and fiberglass pipe hangers and fiberglass strut systems and stainless-steel or corrosion-resistant attachments for hostile environment applications.
- G. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.
- H. Use padded hangers for piping that is subject to scratching.
- I. Use thermal-hanger shield inserts for insulated piping and tubing.
- J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.

4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is unnecessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is unnecessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

- L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
 4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction, to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
 11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
 12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
 15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.

3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
 2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
 3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
 4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
 5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
 6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
 7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
 8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
 - a. Horizontal (MSS Type 54): Mounted horizontally.
 - b. Vertical (MSS Type 55): Mounted vertically.
 - c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.
- P. Comply with MSS SP-58 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- Q. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- R. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION

SECTION 23 0553

PART 1 -

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 2 - GENERAL

2.1 RELATED DOCUMENTS

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

2.2 SUMMARY

- A. Section Includes:

- 1. Equipment labels.
- 2. Pipe labels.
- 3. Duct labels.
- 4. Valve tags.

2.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- D. Valve numbering scheme.
- E. Valve Schedules: For each piping system to include in maintenance manuals.

PART 3 - PRODUCTS

3.1 EQUIPMENT LABELS

- A. Plastic Labels for Equipment:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Brady Corporation.
 - b. Brimar Industries, Inc.
 - c. Carlton Industries, LP.
 - d. Champion America.
 - e. Craftmark Pipe Markers.
 - f. Kolbi Pipe Marker Co.
2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
 3. Letter Color: White.
 4. Background Color: Black.
 5. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
 6. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 7. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
 8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.
- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

3.2 PIPE LABELS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Brady Corporation.
 2. Brimar Industries, Inc.
 3. Carlton Industries, LP.
 4. Champion America.
 5. Craftmark Pipe Markers.
 6. Kolbi Pipe Marker Co.
 7. LEM Products Inc.
- B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction according to ASME A13.1.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1/2 inch for viewing distances up to 72 inches and proportionately larger lettering for greater viewing distances.

3.3 DUCT LABELS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Brady Corporation.
 2. Brimar Industries, Inc.
 3. Carlton Industries, LP.
 4. Champion America.
 5. Craftmark Pipe Markers.
 6. Kolbi Pipe Marker Co.
 7. LEM Products Inc.
- B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
- C. Letter Color: White.
- D. Background Color: Blue, Yellow and Green.
- E. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- F. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- G. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
- H. Fasteners: Stainless-steel rivets or self-tapping screws.
- I. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- J. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings; also include duct size and an arrow indicating flow direction.
 1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions or as separate unit on each duct label to indicate flow direction.

3.4 VALVE TAGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brady Corporation.
 2. Brimar Industries, Inc.
 3. Carlton Industries, LP.
 4. Champion America.
 5. Craftmark Pipe Markers.
 6. Kolbi Pipe Marker Co.
 7. LEM Products Inc.
- B. Description: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
1. Tag Material: Brass, 0.032-inch stainless steel, 0.025-inch aluminum, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 2. Fasteners: Brass wire-link chain or beaded chain or S-hook.
- C. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
1. Valve-tag schedule shall be included in operation and maintenance data.

PART 4 - EXECUTION

4.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

4.2 GENERAL INSTALLATION REQUIREMENTS

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

4.3 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

4.4 PIPE LABEL INSTALLATION

- A. Piping Color Coding: Painting of piping is specified in Section 09 9123 "Interior Painting."
- B. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- C. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.
- D. Pipe Label Color Schedule:
 - 1. Chilled-Water Piping: White letters on a safety-green background.
 - 2. Heating Water Piping: White letters on a safety-green background.
 - 3. Dual-Temperature Piping: White letters on a safety-green background.
 - 4. Low Pressure Steam Piping: White letters on a safety-green background.
 - 5. Condensate Return Piping: White letters on a safety-green background.

4.5 DUCT LABEL INSTALLATION

- A. Install self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:
 - 1. Blue: For cold-air supply ducts.
 - 2. Yellow: For hot-air supply ducts.
 - 3. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
- B. Locate labels near points where ducts enter into and exit from concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

4.6 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, faucets, convenience and lawn-watering hose

connections, and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

- a. Chilled Water: 1-1/2 inches, round.
- b. Hot Water: 1-1/2 inches, round.
- c. Dual-Temperature: 1-1/2 inches, round.
- d. Low Pressure Steam: 1-1/2 inches, round.

2. Valve-Tag Colors:

- a. Potable and Other Water: White letters on a safety-green background.

END OF SECTION

SECTION 23 0593

PART 1 -

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 2 - GENERAL

2.1 RELATED DOCUMENTS

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

2.2 SUMMARY

- A. Section Includes:
 - 1. Balancing Air Systems:
 - a. Constant-volume air systems.
 - b. Variable-air-volume systems.
 - 2. Balancing Hydronic Piping Systems:
 - a. Constant-flow hydronic systems.
 - b. Variable-flow hydronic systems.
 - c. Primary-secondary hydronic systems.
 - 3. Balancing steam systems.
 - 4. Testing, Adjusting, and Balancing Equipment:
 - a. Heat exchangers.
 - b. Motors.
 - c. Chillers.
 - d. Condensing units.
 - e. Boilers.
 - f. Heat-transfer coils.
 - 5. Testing, adjusting, and balancing existing systems and equipment.
 - 6. Control system verification.

2.3 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. BAS: Building automation systems.
- C. NEBB: National Environmental Balancing Bureau.

- D. TAB: Testing, adjusting, and balancing.
- E. TABB: Testing, Adjusting, and Balancing Bureau.
- F. TAB Specialist: An independent entity meeting qualifications to perform TAB work.
- G. TDH: Total dynamic head.

2.4 INFORMATIONAL SUBMITTALS

- A. Examination Report: Submit a summary report of the examination review required in "Examination" Article.
- B. Certified TAB reports.
- C. Sample report forms.
- D. Instrument calibration reports, to include the following:
 - 1. Instrument type and make.
 - 2. Serial number.
 - 3. Application.
 - 4. Dates of use.
 - 5. Dates of calibration.

2.5 QUALITY ASSURANCE

- A. TAB Specialists Qualifications: Certified by AABC.
 - 1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC.
 - 2. TAB Technician: Employee of the TAB specialist and certified by AABC as a TAB technician.
- B. TAB Specialists Qualifications: Certified by NEBB or TABB.
 - 1. TAB Field Supervisor: Employee of the TAB specialist and certified by NEBB or TABB.
 - 2. TAB Technician: Employee of the TAB specialist and certified by NEBB or TABB as a TAB technician.
- C. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."
- D. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."

2.6 FIELD CONDITIONS

- A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

- B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

PART 3 - PRODUCTS (Not Applicable)

PART 4 - EXECUTION

4.1 TAB SPECIALISTS

- A. Subject to compliance with requirements, available TAB specialists that may be engaged include the following:
 - 1. Balancing Precision Inc.
 - 2. Illinois Certified LLC
 - 3. Riverplace Technologies LLC

4.2 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.
- B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.
- F. Examine equipment performance data including fan and pump curves.
 - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
 - 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

- G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- H. Examine test reports specified in individual system and equipment Sections.
- I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.
- J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.
- K. Examine strainers. Verify that startup screens have been replaced by permanent screens with indicated perforations.
- L. Examine control valves for proper installation for their intended function of throttling, diverting, or mixing fluid flows.
- M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- N. Examine system pumps to ensure absence of entrained air in the suction piping.
- O. Examine operating safety interlocks and controls on HVAC equipment.
- P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

4.3 PREPARATION

- A. Prepare a TAB plan that includes the following:
 - 1. Equipment and systems to be tested.
 - 2. Strategies and step-by-step procedures for balancing the systems.
 - 3. Instrumentation to be used.
 - 4. Sample forms with specific identification for all equipment.
- B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
 - 1. Airside:
 - a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
 - b. Duct systems are complete with terminals installed.
 - c. Volume, smoke, and fire dampers are open and functional.
 - d. Clean filters are installed.
 - e. Fans are operating, free of vibration, and rotating in correct direction.
 - f. Variable-frequency controllers' startup is complete and safeties are verified.
 - g. Automatic temperature-control systems are operational.
 - h. Ceilings are installed.
 - i. Windows and doors are installed.

- j. Suitable access to balancing devices and equipment is provided.
2. Hydronics:
- a. Verify leakage and pressure tests on water distribution systems have been satisfactorily completed.
 - b. Piping is complete with terminals installed.
 - c. Water treatment is complete.
 - d. Systems are flushed, filled, and air purged.
 - e. Strainers are pulled and cleaned.
 - f. Control valves are functioning per the sequence of operation.
 - g. Shutoff and balance valves have been verified to be 100 percent open.
 - h. Pumps are started and proper rotation is verified.
 - i. Pump gage connections are installed directly at pump inlet and outlet flanges or in discharge and suction pipe prior to valves or strainers.
 - j. Variable-frequency controllers' startup is complete and safeties are verified.
 - k. Suitable access to balancing devices and equipment is provided.

4.4 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" ASHRAE 111 NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
 - 2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 23 3300 "Air Duct Accessories."
 - 3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 23 0713 "Duct Insulation," Section 23 0716 "HVAC Equipment Insulation," and Section 23 0719 "HVAC Piping Insulation."
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

4.5 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.

- C. For variable-air-volume systems, develop a plan to simulate diversity.
- D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- G. Verify that motor starters are equipped with properly sized thermal protection.
- H. Check dampers for proper position to achieve desired airflow path.
- I. Check for airflow blockages.
- J. Check condensate drains for proper connections and functioning.
- K. Check for proper sealing of air-handling-unit components.
- L. Verify that air duct system is sealed as specified in Section 23 3113 "Metal Ducts."

4.6 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 - 1. Measure total airflow.
 - a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
 - b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
 - c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
 - d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.
 - 2. Measure fan static pressures as follows:
 - a. Measure static pressure directly at the fan outlet or through the flexible connection.
 - b. Measure static pressure directly at the fan inlet or through the flexible connection.
 - c. Measure static pressure across each component that makes up the air-handling system.
 - d. Report artificial loading of filters at the time static pressures are measured.
 - 3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
 - 4. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.

5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.
1. Measure airflow of submain and branch ducts.
 2. Adjust submain and branch duct volume dampers for specified airflow.
 3. Re-measure each submain and branch duct after all have been adjusted.
- C. Adjust air inlets and outlets for each space to indicated airflows.
1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
 2. Measure inlets and outlets airflow.
 3. Adjust each inlet and outlet for specified airflow.
 4. Re-measure each inlet and outlet after they have been adjusted.
- D. Verify final system conditions.
1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
 2. Re-measure and confirm that total airflow is within design.
 3. Re-measure all final fan operating data, rpms, volts, amps, and static profile.
 4. Mark all final settings.
 5. Test system in economizer mode. Verify proper operation and adjust if necessary.
 6. Measure and record all operating data.
 7. Record final fan-performance data.

4.7 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

- A. Adjust the variable-air-volume systems as follows:
1. Verify that the system static pressure sensor is located two-thirds of the distance down the duct from the fan discharge.
 2. Verify that the system is under static pressure control.
 3. Select the terminal unit that is most critical to the supply-fan airflow. Measure inlet static pressure, and adjust system static pressure control set point so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
 4. Calibrate and balance each terminal unit for maximum and minimum design airflow as follows:
 - a. Adjust controls so that terminal is calling for maximum airflow. Some controllers require starting with minimum airflow. Verify calibration procedure for specific project.
 - b. Measure airflow and adjust calibration factor as required for design maximum airflow. Record calibration factor.

- c. When maximum airflow is correct, balance the air outlets downstream from terminal units.
 - d. Adjust controls so that terminal is calling for minimum airflow.
 - e. Measure airflow and adjust calibration factor as required for design minimum airflow. Record calibration factor. If no minimum calibration is available, note any deviation from design airflow.
 - f. When in full cooling or full heating, ensure that there is no mixing of hot-deck and cold-deck airstreams unless so designed.
 - g. On constant volume terminals, in critical areas where room pressure is to be maintained, verify that the airflow remains constant over the full range of full cooling to full heating. Note any deviation from design airflow or room pressure.
5. After terminals have been calibrated and balanced, test and adjust system for total airflow. Adjust fans to deliver total design airflows within the maximum allowable fan speed listed by fan manufacturer.
- a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
 - b. Set terminals for maximum airflow. If system design includes diversity, adjust terminals for maximum and minimum airflow so that connected total matches fan selection and simulates actual load in the building.
 - c. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
 - d. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
 - e. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.
6. Measure fan static pressures as follows:
- a. Measure static pressure directly at the fan outlet or through the flexible connection.
 - b. Measure static pressure directly at the fan inlet or through the flexible connection.
 - c. Measure static pressure across each component that makes up the air-handling system.
 - d. Report any artificial loading of filters at the time static pressures are measured.
7. Set final return and outside airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.
- a. Balance the return-air ducts and inlets the same as described for constant-volume air systems.
 - b. Verify that terminal units are meeting design airflow under system maximum flow.
8. Re-measure the inlet static pressure at the most critical terminal unit and adjust the system static pressure set point to the most energy-efficient set point to maintain the optimum system static pressure. Record set point and give to controls contractor.
9. Verify final system conditions as follows:
- a. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to match design if necessary.
 - b. Re-measure and confirm that total airflow is within design.

- c. Re-measure final fan operating data, rpms, volts, amps, and static profile.
- d. Mark final settings.
- e. Test system in economizer mode. Verify proper operation and adjust if necessary. Measure and record all operating data.
- f. Verify tracking between supply and return fans.

4.8 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

- A. Prepare test reports for pumps, coils, and heat exchangers. Obtain approved submittals and manufacturer-recommended testing procedures. Crosscheck the summation of required coil and heat exchanger flow rates with pump design flow rate.
- B. Prepare schematic diagrams of systems' "as-built" piping layouts.
- C. In addition to requirements in "Preparation" Article, prepare hydronic systems for testing and balancing as follows:
 - 1. Check liquid level in expansion tank.
 - 2. Check highest vent for adequate pressure.
 - 3. Check flow-control valves for proper position.
 - 4. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
 - 5. Verify that motor starters are equipped with properly sized thermal protection.
 - 6. Check that air has been purged from the system.

4.9 PROCEDURES FOR CONSTANT-FLOW HYDRONIC SYSTEMS

- A. Adjust pumps to deliver total design gpm.
 - 1. Measure total water flow.
 - a. Position valves for full flow through coils.
 - b. Measure flow by main flow meter, if installed.
 - c. If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.
 - 2. Measure pump TDH as follows:
 - a. Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
 - b. Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
 - c. Convert pressure to head and correct for differences in gage heights.
 - d. Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.
 - e. With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.
 - 3. Monitor motor performance during procedures and do not operate motor in an overloaded condition.

- B. Adjust flow-measuring devices installed in mains and branches to design water flows.
 - 1. Measure flow in main and branch pipes.
 - 2. Adjust main and branch balance valves for design flow.
 - 3. Re-measure each main and branch after all have been adjusted.
- C. Adjust flow-measuring devices installed at terminals for each space to design water flows.
 - 1. Measure flow at terminals.
 - 2. Adjust each terminal to design flow.
 - 3. Re-measure each terminal after it is adjusted.
 - 4. Position control valves to bypass the coil, and adjust the bypass valve to maintain design flow.
 - 5. Perform temperature tests after flows have been balanced.
- D. For systems with pressure-independent valves at terminals:
 - 1. Measure differential pressure and verify that it is within manufacturer's specified range.
 - 2. Perform temperature tests after flows have been verified.
- E. For systems without pressure-independent valves or flow-measuring devices at terminals:
 - 1. Measure and balance coils by either coil pressure drop or temperature method.
 - 2. If balanced by coil pressure drop, perform temperature tests after flows have been verified.
- F. Verify final system conditions as follows:
 - 1. Re-measure and confirm that total water flow is within design.
 - 2. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
 - 3. Mark final settings.
- G. Verify that memory stops have been set.

4.10 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

- A. Balance systems with automatic two- and three-way control valves by setting systems at maximum flow through heat-exchange terminals, and proceed as specified above for hydronic systems.
- B. Adjust the variable-flow hydronic system as follows:
 - 1. Verify that the differential-pressure sensor is located as indicated.
 - 2. Determine whether there is diversity in the system.
- C. For systems with no diversity:
 - 1. Adjust pumps to deliver total design gpm.
 - a. Measure total water flow.
 - 1) Position valves for full flow through coils.

- 2) Measure flow by main flow meter, if installed.
 - 3) If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.
- b. Measure pump TDH as follows:
- 1) Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
 - 2) Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
 - 3) Convert pressure to head and correct for differences in gage heights.
 - 4) Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
 - 5) With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.
- c. Monitor motor performance during procedures and do not operate motor in an overloaded condition.
2. Adjust flow-measuring devices installed in mains and branches to design water flows.
- a. Measure flow in main and branch pipes.
 - b. Adjust main and branch balance valves for design flow.
 - c. Re-measure each main and branch after all have been adjusted.
3. Adjust flow-measuring devices installed at terminals for each space to design water flows.
- a. Measure flow at terminals.
 - b. Adjust each terminal to design flow.
 - c. Re-measure each terminal after it is adjusted.
 - d. Position control valves to bypass the coil and adjust the bypass valve to maintain design flow.
 - e. Perform temperature tests after flows have been balanced.
4. For systems with pressure-independent valves at terminals:
- a. Measure differential pressure and verify that it is within manufacturer's specified range.
 - b. Perform temperature tests after flows have been verified.
5. For systems without pressure-independent valves or flow-measuring devices at terminals:
- a. Measure and balance coils by either coil pressure drop or temperature method.
 - b. If balanced by coil pressure drop, perform temperature tests after flows have been verified.
6. Prior to verifying final system conditions, determine the system differential-pressure set point.

7. If the pump discharge valve was used to set total system flow with variable-frequency controller at 60 Hz, at completion open discharge valve 100 percent and allow variable-frequency controller to control system differential-pressure set point. Record pump data under both conditions.
 8. Mark final settings and verify that all memory stops have been set.
 9. Verify final system conditions as follows:
 - a. Re-measure and confirm that total water flow is within design.
 - b. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
 - c. Mark final settings.
 10. Verify that memory stops have been set.
- D. For systems with diversity:
1. Determine diversity factor.
 2. Simulate system diversity by closing required number of control valves, as approved by the design engineer.
 3. Adjust pumps to deliver total design gpm.
 - a. Measure total water flow.
 - 1) Position valves for full flow through coils.
 - 2) Measure flow by main flow meter, if installed.
 - 3) If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.
 - b. Measure pump TDH as follows:
 - 1) Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
 - 2) Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
 - 3) Convert pressure to head and correct for differences in gage heights.
 - 4) Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
 - 5) With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.
 - c. Monitor motor performance during procedures and do not operate motor in an overloaded condition.
 4. Adjust flow-measuring devices installed in mains and branches to design water flows.
 - a. Measure flow in main and branch pipes.
 - b. Adjust main and branch balance valves for design flow.
 - c. Re-measure each main and branch after all have been adjusted.
 5. Adjust flow-measuring devices installed at terminals for each space to design water flows.

- a. Measure flow at terminals.
 - b. Adjust each terminal to design flow.
 - c. Re-measure each terminal after it is adjusted.
 - d. Position control valves to bypass the coil, and adjust the bypass valve to maintain design flow.
 - e. Perform temperature tests after flows have been balanced.
6. For systems with pressure-independent valves at terminals:
 - a. Measure differential pressure, and verify that it is within manufacturer's specified range.
 - b. Perform temperature tests after flows have been verified.
 7. For systems without pressure-independent valves or flow-measuring devices at terminals:
 - a. Measure and balance coils by either coil pressure drop or temperature method.
 - b. If balanced by coil pressure drop, perform temperature tests after flows have been verified.
 8. Open control valves that were shut. Close a sufficient number of control valves that were previously open to maintain diversity, and balance terminals that were just opened.
 9. Prior to verifying final system conditions, determine system differential-pressure set point.
 10. If the pump discharge valve was used to set total system flow with variable-frequency controller at 60 Hz, at completion open discharge valve 100 percent and allow variable-frequency controller to control system differential-pressure set point. Record pump data under both conditions.
 11. Mark final settings and verify that memory stops have been set.
 12. Verify final system conditions as follows:
 - a. Re-measure and confirm that total water flow is within design.
 - b. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
 - c. Mark final settings.
 13. Verify that memory stops have been set.

4.11 PROCEDURES FOR PRIMARY-SECONDARY HYDRONIC SYSTEMS

- A. Balance the primary circuit flow first.
- B. Balance the secondary circuits after the primary circuits are complete.
- C. Adjust pumps to deliver total design gpm.
 1. Measure total water flow.
 - a. Position valves for full flow through coils.
 - b. Measure flow by main flow meter, if installed.
 - c. If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.

2. Measure pump TDH as follows:
 - a. Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
 - b. Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
 - c. Convert pressure to head and correct for differences in gage heights.
 - d. Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
 - e. With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.
 3. Monitor motor performance during procedures and do not operate motor in an overloaded condition.
- D. Adjust flow-measuring devices installed in mains and branches to design water flows.
1. Measure flow in main and branch pipes.
 2. Adjust main and branch balance valves for design flow.
 3. Re-measure each main and branch after all have been adjusted.
- E. Adjust flow-measuring devices installed at terminals for each space to design water flows.
1. Measure flow at terminals.
 2. Adjust each terminal to design flow.
 3. Re-measure each terminal after it is adjusted.
 4. Position control valves to bypass the coil and adjust the bypass valve to maintain design flow.
 5. Perform temperature tests after flows have been balanced.
- F. For systems with pressure-independent valves at terminals:
1. Measure differential pressure and verify that it is within manufacturer's specified range.
 2. Perform temperature tests after flows have been verified.
- G. For systems without pressure-independent valves or flow-measuring devices at terminals:
1. Measure and balance coils by either coil pressure drop or temperature method.
 2. If balanced by coil pressure drop, perform temperature tests after flows have been verified.
- H. Verify final system conditions as follows:
1. Re-measure and confirm that total water flow is within design.
 2. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
 3. Mark final settings.
- I. Verify that memory stops have been set.

4.12 PROCEDURES FOR HEAT EXCHANGERS

- A. Adjust water flow to within specified tolerances.
- B. Measure inlet and outlet water temperatures.
- C. Measure inlet steam pressure.
- D. Check settings and operation of safety and relief valves. Record settings.

4.13 PROCEDURES FOR MOTORS

- A. Motors 1/2 HP and Larger: Test at final balanced conditions and record the following data:
 - 1. Manufacturer's name, model number, and serial number.
 - 2. Motor horsepower rating.
 - 3. Motor rpm.
 - 4. Phase and hertz.
 - 5. Nameplate and measured voltage, each phase.
 - 6. Nameplate and measured amperage, each phase.
 - 7. Starter size and thermal-protection-element rating.
 - 8. Service factor and frame size.
- B. Motors Driven by Variable-Frequency Controllers: Test manual bypass of controller to prove proper operation.

4.14 PROCEDURES FOR CHILLERS

- A. Balance water flow through each evaporator to within specified tolerances of indicated flow with all pumps operating. With only one chiller operating in a multiple chiller installation, do not exceed the flow for the maximum tube velocity recommended by the chiller manufacturer. Measure and record the following data with each chiller operating at design conditions:
 - 1. Evaporator-water entering and leaving temperatures, pressure drop, and water flow.
 - 2. Evaporator and condenser refrigerant temperatures and pressures, using instruments furnished by chiller manufacturer.
 - 3. Power factor if factory-installed instrumentation is furnished for measuring kilowatts.
 - 4. Kilowatt input if factory-installed instrumentation is furnished for measuring kilowatts.
 - 5. Capacity: Calculate in tons of cooling.
 - 6. For air-cooled chillers, verify condenser-fan rotation and record fan and motor data including number of fans and entering- and leaving-air temperatures.

4.15 PROCEDURES FOR CONDENSING UNITS

- A. Verify proper rotation of fans.
- B. Measure entering- and leaving-air temperatures.
- C. Record fan and motor operating data.

4.16 PROCEDURES FOR BOILERS

- A. Hydronic Boilers:
 - 1. Measure and record entering- and leaving-water temperatures.
 - 2. Measure and record water flow.
 - 3. Record relief valve pressure setting.

4.17 PROCEDURES FOR HEAT-TRANSFER COILS

- A. Measure, adjust, and record the following data for each water coil:
 - 1. Entering- and leaving-water temperature.
 - 2. Water flow rate.
 - 3. Water pressure drop for major (more than 20 gpm) equipment coils, excluding unitary equipment such as reheat coils, unit heaters, and fan-coil units.
 - 4. Dry-bulb temperature of entering and leaving air.
 - 5. Wet-bulb temperature of entering and leaving air for cooling coils.
 - 6. Airflow.
- B. Measure, adjust, and record the following data for each electric heating coil:
 - 1. Nameplate data.
 - 2. Airflow.
 - 3. Entering- and leaving-air temperature at full load.
 - 4. Voltage and amperage input of each phase at full load.
 - 5. Calculated kilowatt at full load.
 - 6. Fuse or circuit-breaker rating for overload protection.
- C. Measure, adjust, and record the following data for each steam coil:
 - 1. Dry-bulb temperature of entering and leaving air.
 - 2. Airflow.
 - 3. Inlet steam pressure.
- D. Measure, adjust, and record the following data for each refrigerant coil:
 - 1. Dry-bulb temperature of entering and leaving air.
 - 2. Wet-bulb temperature of entering and leaving air.
 - 3. Airflow.

4.18 TOLERANCES

- A. Set HVAC system's airflow rates and water flow rates within the following tolerances:
 - 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
 - 2. Air Outlets and Inlets: Plus or minus 10 percent.
 - 3. Heating-Water Flow Rate: Plus or minus 10 percent.
 - 4. Cooling-Water Flow Rate: Plus or minus 10 percent.

- B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

4.19 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

- 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
- 2. Include a list of instruments used for procedures, along with proof of calibration.
- 3. Certify validity and accuracy of field data.

- B. Final Report Contents: In addition to certified field-report data, include the following:

- 1. Pump curves.
- 2. Fan curves.
- 3. Manufacturers' test data.
- 4. Field test reports prepared by system and equipment installers.
- 5. Other information relative to equipment performance; do not include Shop Drawings and Product Data.

- C. General Report Data: In addition to form titles and entries, include the following data:

- 1. Title page.
- 2. Name and address of the TAB specialist.
- 3. Project name.
- 4. Project location.
- 5. Architect's name and address.
- 6. Engineer's name and address.
- 7. Contractor's name and address.
- 8. Report date.
- 9. Signature of TAB supervisor who certifies the report.
- 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
- 11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
- 12. Nomenclature sheets for each item of equipment.
- 13. Data for terminal units, including manufacturer's name, type, size, and fittings.
- 14. Notes to explain why certain final data in the body of reports vary from indicated values.
- 15. Test conditions for fans and pump performance forms including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Face and bypass damper settings at coils.

- e. Fan drive settings including settings and percentage of maximum pitch diameter.
 - f. Inlet vane settings for variable-air-volume systems.
 - g. Settings for supply-air, static-pressure controller.
 - h. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
- 1. Quantities of outdoor, supply, return, and exhaust airflows.
 - 2. Water and steam flow rates.
 - 3. Duct, outlet, and inlet sizes.
 - 4. Pipe and valve sizes and locations.
 - 5. Terminal units.
 - 6. Balancing stations.
 - 7. Position of balancing devices.
- E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:
- 1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Unit arrangement and class.
 - g. Discharge arrangement.
 - h. Sheave make, size in inches, and bore.
 - i. Center-to-center dimensions of sheave and amount of adjustments in inches.
 - j. Number, make, and size of belts.
 - k. Number, type, and size of filters.
 - 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave and amount of adjustments in inches.
 - 3. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Filter static-pressure differential in inches wg.
 - f. Preheat-coil static-pressure differential in inches wg.
 - g. Cooling-coil static-pressure differential in inches wg.
 - h. Heating-coil static-pressure differential in inches wg.

- i. Outdoor airflow in cfm.
 - j. Return airflow in cfm.
 - k. Outdoor-air damper position.
 - l. Return-air damper position.
 - m. Vortex damper position.
- F. Gas- and Oil-Fired Heat Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:
- 1. Unit Data:
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Fuel type in input data.
 - g. Output capacity in Btu/h.
 - h. Ignition type.
 - i. Burner-control types.
 - j. Motor horsepower and rpm.
 - k. Motor volts, phase, and hertz.
 - l. Motor full-load amperage and service factor.
 - m. Sheave make, size in inches, and bore.
 - n. Center-to-center dimensions of sheave and amount of adjustments in inches.
 - 2. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm.
 - b. Entering-air temperature in deg F.
 - c. Leaving-air temperature in deg F.
 - d. Air temperature differential in deg F.
 - e. Entering-air static pressure in inches wg.
 - f. Leaving-air static pressure in inches wg.
 - g. Air static-pressure differential in inches wg.
 - h. Low-fire fuel input in Btu/h.
 - i. High-fire fuel input in Btu/h.
 - j. Manifold pressure in psig.
 - k. High-temperature-limit setting in deg F.
 - l. Operating set point in Btu/h.
 - m. Motor voltage at each connection.
 - n. Motor amperage for each phase.
 - o. Heating value of fuel in Btu/h.
- G. Fan Test Reports: For supply, return, and exhaust fans, include the following:
- 1. Fan Data:
 - a. System identification.
 - b. Location.
 - c. Make and type.

- d. Model number and size.
 - e. Manufacturer's serial number.
 - f. Arrangement and class.
 - g. Sheave make, size in inches, and bore.
 - h. Center-to-center dimensions of sheave and amount of adjustments in inches.
2. Motor Data:
- a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 - g. Number, make, and size of belts.
3. Test Data (Indicated and Actual Values):
- a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Suction static pressure in inches wg.
- H. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
1. Report Data:
- a. System and air-handling-unit number.
 - b. Location and zone.
 - c. Traverse air temperature in deg F.
 - d. Duct static pressure in inches wg.
 - e. Duct size in inches.
 - f. Duct area in sq. ft..
 - g. Indicated airflow rate in cfm.
 - h. Indicated velocity in fpm.
 - i. Actual airflow rate in cfm.
 - j. Actual average velocity in fpm.
 - k. Barometric pressure in psig.
- I. Air-Terminal-Device Reports:
1. Unit Data:
- a. System and air-handling unit identification.
 - b. Location and zone.
 - c. Apparatus used for test.
 - d. Area served.
 - e. Make.
 - f. Number from system diagram.

- g. Type and model number.
 - h. Size.
 - i. Effective area in sq. ft..
2. Test Data (Indicated and Actual Values):
- a. Airflow rate in cfm.
 - b. Air velocity in fpm.
 - c. Preliminary airflow rate as needed in cfm.
 - d. Preliminary velocity as needed in fpm.
 - e. Final airflow rate in cfm.
 - f. Final velocity in fpm.
 - g. Space temperature in deg F.
- J. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:
1. Unit Data:
- a. System and air-handling-unit identification.
 - b. Location and zone.
 - c. Room or riser served.
 - d. Coil make and size.
 - e. Flowmeter type.
2. Test Data (Indicated and Actual Values):
- a. Airflow rate in cfm.
 - b. Entering-water temperature in deg F.
 - c. Leaving-water temperature in deg F.
 - d. Water pressure drop in feet of head or psig.
 - e. Entering-air temperature in deg F.
 - f. Leaving-air temperature in deg F.
- K. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:
1. Unit Data:
- a. Unit identification.
 - b. Location.
 - c. Service.
 - d. Make and size.
 - e. Model number and serial number.
 - f. Water flow rate in gpm.
 - g. Water pressure differential in feet of head or psig.
 - h. Required net positive suction head in feet of head or psig.
 - i. Pump rpm.
 - j. Impeller diameter in inches.
 - k. Motor make and frame size.
 - l. Motor horsepower and rpm.
 - m. Voltage at each connection.

- n. Amperage for each phase.
 - o. Full-load amperage and service factor.
 - p. Seal type.
2. Test Data (Indicated and Actual Values):
- a. Static head in feet of head or psig.
 - b. Pump shutoff pressure in feet of head or psig.
 - c. Actual impeller size in inches.
 - d. Full-open flow rate in gpm.
 - e. Full-open pressure in feet of head or psig.
 - f. Final discharge pressure in feet of head or psig.
 - g. Final suction pressure in feet of head or psig.
 - h. Final total pressure in feet of head or psig.
 - i. Final water flow rate in gpm.
 - j. Voltage at each connection.
 - k. Amperage for each phase.

L. Instrument Calibration Reports:

- 1. Report Data:
 - a. Instrument type and make.
 - b. Serial number.
 - c. Application.
 - d. Dates of use.
 - e. Dates of calibration.

END OF SECTION

SECTION 23 0713

PART 1 -

DUCT INSULATION

PART 2 - GENERAL

2.1 RELATED DOCUMENTS

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

2.2 SUMMARY

- A. Section includes insulating the following duct services:
 - 1. Indoor, concealed supply and outdoor air.
 - 2. Indoor, exposed supply and outdoor air.
 - 3. Indoor, concealed return located in unconditioned space.
 - 4. Indoor, exposed return located in unconditioned space.
 - 5. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
 - 6. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
 - 7. Outdoor, concealed supply and return.
 - 8. Outdoor, exposed supply and return.
 - 9. Indoor, concealed mixed-air ductwork
 - 10. Indoor, exposed mixed-air ductwork
- B. Related Sections:
 - 1. Section 23 0716 "HVAC Equipment Insulation."
 - 2. Section 23 0719 "HVAC Piping Insulation."

2.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
 - 3. Detail application of field-applied jackets.
 - 4. Detail application at linkages of control devices.

2.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

2.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

2.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

2.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 23 0529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

2.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 3 - PRODUCTS

3.1 INSULATION MATERIALS

- A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. Knauf Insulation.

3.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
- C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

3.3 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
 - 1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
 - 2. Service Temperature Range: Minus 20 to plus 180 deg F.
 - 3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 - 4. Color: White.
- C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.
 - 1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
 - 2. Service Temperature Range: 0 to 180 deg F.
 - 3. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
 - 4. Color: White.
- D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below ambient services.
 - 1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
 - 2. Service Temperature Range: Minus 50 to plus 220 deg F.
 - 3. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
 - 4. Color: White.

3.4 SEALANTS

- A. FSK and Metal Jacket Flashing Sealants:
 - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 2. Fire- and water-resistant, flexible, elastomeric sealant.
 - 3. Service Temperature Range: Minus 40 to plus 250 deg F.
 - 4. Color: Aluminum.
- B. ASJ Flashing Sealants, and Vinyl and PVC Jacket Flashing Sealants:
 - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 2. Fire- and water-resistant, flexible, elastomeric sealant.
 - 3. Service Temperature Range: Minus 40 to plus 250 deg F.
 - 4. Color: White.

3.5 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 - 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 - 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
 - 3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

3.6 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

- B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.
- C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
 - 1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Johns Manville; a Berkshire Hathaway company.](#)
 - b. [P.I.C. Plastics, Inc.](#)
 - 2. Adhesive: As recommended by jacket material manufacturer.
 - 3. Color: White.
- D. Self-Adhesive Outdoor Jacket: 60-mil-thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a crosslaminated polyethylene film covered with stucco-embossed aluminum-foil facing.

3.7 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
 - 1. Width: 3 inches.
 - 2. Thickness: 11.5 mils.
 - 3. Adhesion: 90 ounces force/inch in width.
 - 4. Elongation: 2 percent.
 - 5. Tensile Strength: 40 lbf/inch in width.
 - 6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
 - 1. Width: 3 inches.
 - 2. Thickness: 6.5 mils.
 - 3. Adhesion: 90 ounces force/inch in width.
 - 4. Elongation: 2 percent.
 - 5. Tensile Strength: 40 lbf/inch in width.
 - 6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
 - 1. Width: 2 inches.
 - 2. Thickness: 6 mils.
 - 3. Adhesion: 64 ounces force/inch in width.
 - 4. Elongation: 500 percent.
 - 5. Tensile Strength: 18 lbf/inch in width.
- D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
 - 1. Width: 2 inches.

2. Thickness: 3.7 mils.
3. Adhesion: 100 ounces force/inch in width.
4. Elongation: 5 percent.
5. Tensile Strength: 34 lbf/inch in width.

3.8 CORNER ANGLES

- A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.
- B. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14.

PART 4 - EXECUTION

4.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 1. Verify that systems to be insulated have been tested and are free of defects.
 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

4.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

4.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Keep insulation materials dry during application and finishing.

- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

4.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 4. Seal jacket to wall flashing with flashing sealant.
- C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.
1. Comply with requirements in Section 07 8413 "Penetration Firestopping."
- E. Insulation Installation at Floor Penetrations:
1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 07 8413 "Penetration Firestopping."

4.5 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

- a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
 5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
 6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.

- b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
- a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

4.6 FIELD-APPLIED JACKET INSTALLATION

- A. Where FSK jackets are indicated, install as follows:
- 1. Draw jacket material smooth and tight.
 - 2. Install lap or joint strips with same material as jacket.
 - 3. Secure jacket to insulation with manufacturer's recommended adhesive.
 - 4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
 - 5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.
- B. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.
- 1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

- C. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

4.7 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
- B. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

4.8 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
 - 1. Indoor, concealed supply and outdoor air.
 - 2. Indoor, exposed supply and outdoor air.
 - 3. Indoor, concealed return located in unconditioned space.
 - 4. Indoor, exposed return located in unconditioned space.
 - 5. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
 - 6. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
 - 7. Outdoor, concealed supply and return.
 - 8. Outdoor, exposed supply and return.
 - 9. Indoor, concealed mixed-air ductwork
 - 10. Indoor, exposed mixed-air ductwork
- B. Items Not Insulated:
 - 1. Fibrous-glass ducts.
 - 2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
 - 3. Factory-insulated flexible ducts.
 - 4. Factory-insulated plenums and casings.
 - 5. Flexible connectors.
 - 6. Vibration-control devices.
 - 7. Factory-insulated access panels and doors.

4.9 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Concealed, round, supply-air duct insulation shall be one of the following:
 - 1. Mineral-Fiber Blanket: 2 inches thick providing minimum insulation factor of R-6 after installation and 0.75-lb/cu. ft. nominal density.

- B. Concealed, round, outdoor-air duct insulation shall be one of the following:
 - 1. Mineral-Fiber Blanket: 2 inches thick providing minimum insulation factor of R-6 after installation and 0.75-lb/cu. ft. nominal density.
- C. Concealed, rectangular, supply-air duct insulation shall be one of the following:
 - 1. Mineral-Fiber Blanket: 2 inches thick providing minimum insulation factor of R-6 after installation and 0.75-lb/cu. ft. nominal density.
- D. Concealed, rectangular, outdoor-air duct insulation shall be one of the following:
 - 1. Mineral-Fiber Blanket: 2 inches thick providing minimum insulation factor of R-6 after installation and 0.75-lb/cu. ft. nominal density.
- E. Concealed, rectangular, exhaust-air duct insulation between isolation damper and penetration of building exterior shall be one of the following:
 - 1. Mineral-Fiber Blanket: 2 inches thick providing minimum insulation factor of R-6 after installation and 0.75-lb/cu. ft. nominal density.
- F. Concealed, supply-air plenum insulation shall be one of the following:
 - 1. Mineral-Fiber Board: 2 inches thick providing minimum insulation factor of R-6 after installation and 3.0-lb/cu. ft. nominal density.
- G. Concealed, outdoor-air plenum insulation shall be one of the following:
 - 1. Mineral-Fiber Board: 2 inches thick providing minimum insulation factor of R-6 after installation and 3.0-lb/cu. ft. nominal density.
- H. Concealed, exhaust-air plenum insulation shall be one of the following:
 - 1. Mineral-Fiber Board: 2 inches thick providing minimum insulation factor of R-6 after installation and 3.0-lb/cu. ft. nominal density.
- I. Exposed, round, outdoor-air duct insulation shall be one of the following:
 - 1. Mineral-Fiber Blanket: 2 inches thick providing minimum insulation factor of R-6 after installation and 0.75-lb/cu. ft. nominal density.
- J. Exposed, rectangular, outdoor-air duct insulation shall be one of the following:
 - 1. Mineral-Fiber Blanket: 2 inches thick providing minimum insulation factor of R-6 after installation and 0.75-lb/cu. ft. nominal density.
- K. Exposed, outdoor-air plenum insulation shall be one of the following:
 - 1. Mineral-Fiber Board: 2 inches thick providing minimum insulation factor of R-6 after installation and 3.0-lb/cu. ft. nominal density.
- L. All un-insulated surfaces of hot water reheat coils shall be insulated with one of the following:
 - 1. Mineral-Fiber Blanket: 2 inches thick providing minimum insulation factor of R-6 after installation and 3.0-lb/cu. ft. nominal density.
- M. Concealed, round, combustion-air duct insulation shall be one of the following:
 - 1. Mineral-Fiber Blanket: 2 inches thick providing minimum insulation factor of R-6 after installation and 3.0-lb/cu. ft. nominal density.
- N. Exposed, round, combustion-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 2 inches thick providing minimum insulation factor of R-6 after installation and 3.0-lb/cu. ft. nominal density.
- O. Concealed, rectangular, mixed-air duct insulation shall be one of the following:
1. Mineral-Fiber Blanket: 2 inches thick providing minimum insulation factor of R-6 after installation and 0.75-lb/cu. ft. nominal density.
- P. Exposed, rectangular, mixed-air duct insulation shall be one of the following:
1. Mineral-Fiber Blanket: 2 inches thick providing minimum insulation factor of R-6 after installation and 0.75-lb/cu. ft. nominal density.

4.10 ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

1. All exterior ductwork to be non-metal ductwork. See specification 23 3116 – Non-metal Ducts for requirements.

END OF SECTION

SECTION 23 0716

PART 1 -

HVAC EQUIPMENT INSULATION

PART 2 - GENERAL

2.1 RELATED DOCUMENTS

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

2.2 SUMMARY

- A. Section includes insulating the following HVAC equipment that is not factory insulated:
 - 1. Dual-service heating and cooling pumps.
 - 2. Dual-service air separator.
 - 3. Dual-service side-stream filters.
 - 4. Chilled-water pumps.
 - 5. Chilled-water air separator.
 - 6. Chilled-water side-stream filters.
 - 7. Chilled-water remote evaporator.
 - 8. Hot-water pumps.
 - 9. Hot-water air separator.
 - 10. Hot-water side-stream filters
 - 11. Steam-to-hot water shell and tube heat exchanger
- B. Related Sections:
 - 1. Section 23 0713 "Duct Insulation."
 - 2. Section 23 0719 "HVAC Piping Insulation."

2.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).
- B. Sustainable Design Submittals:
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Detail attachment and covering of heat tracing inside insulation.
 - 3. Detail removable insulation at equipment connections.

4. Detail application of field-applied jackets.
5. Detail application at linkages of control devices.
6. Detail field application for each equipment type.

2.4 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

2.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

2.6 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 23 0529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with equipment Installer for equipment insulation application.

2.7 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 3 - PRODUCTS

3.1 INSULATION MATERIALS

- A. Comply with requirements in "Breeching Insulation Schedule" and "Equipment Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Aeroflex USA, Inc.
 - b. Armacell LLC.

3.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Aeroflex USA, Inc.
 - b. Armacell LLC.

PART 4 - EXECUTION

4.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

4.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
 2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

4.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.

- I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- L. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- M. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- N. For above ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.
 - 2. Testing agency labels and stamps.
 - 3. Nameplates and data plates.
 - 4. Manholes.
 - 5. Handholes.
 - 6. Cleanouts.

4.4 INSTALLATION OF EQUIPMENT, TANK, AND VESSEL INSULATION

- A. Flexible Elastomeric Thermal Insulation Installation for Tanks and Vessels: Install insulation over entire surface of tanks and vessels.
 - 1. Apply 100 percent coverage of adhesive to surface with manufacturer's recommended adhesive.
 - 2. Seal longitudinal seams and end joints.

4.5 FINISHES

- A. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

4.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections: Inspect field-insulated equipment, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

4.7 EQUIPMENT INSULATION SCHEDULE

- A. Insulation materials and thicknesses are identified below. If more than one material is listed for a type of equipment, selection from materials listed is Contractor's option.
- B. Duct Mounted Hot Water Heating Coil insulation shall be one of the following:
 - 1. Mineral-Fiber, Wrap, Type 1: 2 inch thick .

END OF SECTION

SECTION 23 0719

PART 1 -

HVAC PIPING INSULATION

PART 2 - GENERAL

2.1 RELATED DOCUMENTS

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

2.2 SUMMARY

- A. Section includes insulating the following HVAC piping systems:
 - 1. Condensate drain piping, indoors.
 - 2. Chilled-water piping, indoors and outdoors.
 - 3. Heating hot-water piping, indoors.
 - 4. Refrigerant suction and hot-gas piping, indoors and outdoors.
 - 5. Dual-service heating and cooling piping, indoors.
 - 6. Low-pressure steam piping, indoors
- B. Related Sections:
 - 1. Section 23 0713 "Duct Insulation."
 - 2. Section 23 0716 "HVAC Equipment Insulation."

2.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Detail attachment and covering of heat tracing inside insulation.
 - 3. Detail insulation application at pipe expansion joints for each type of insulation.
 - 4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
 - 5. Detail removable insulation at piping specialties.
 - 6. Detail application of field-applied jackets.
 - 7. Detail application at linkages of control devices.

2.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

2.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

2.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

2.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 23 0529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

2.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 3 - PRODUCTS

3.1 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Aeroflex USA, Inc.
 - b. Airex Manufacturing.
- G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. Knauf Insulation.
- H. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Johns Manville; a Berkshire Hathaway company.
 - b. Knauf Insulation.
 - c. CertainTeed Corporation.

2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- I. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied ASJ complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. Knauf Insulation.

3.2 INSULATING CEMENTS

- A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

3.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
- C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
- D. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
- E. PVC Jacket Adhesive: Compatible with PVC jacket.

3.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
 1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
 2. Service Temperature Range: Minus 20 to plus 180 deg F.
 3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 4. Color: White.
- C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below-ambient services.

1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
 2. Service Temperature Range: 0 to 180 deg F.
 3. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
 4. Color: White.
- D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.
1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
 2. Service Temperature Range: Minus 50 to plus 220 deg F.
 3. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
 4. Color: White.

3.5 SEALANTS

- A. FSK and Metal Jacket Flashing Sealants:
1. Materials shall be compatible with insulation materials, jackets, and substrates.
 2. Fire- and water-resistant, flexible, elastomeric sealant.
 3. Service Temperature Range: Minus 40 to plus 250 deg F.
 4. Color: Aluminum.
- B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
1. Materials shall be compatible with insulation materials, jackets, and substrates.
 2. Fire- and water-resistant, flexible, elastomeric sealant.
 3. Service Temperature Range: Minus 40 to plus 250 deg F.
 4. Color: White.

3.6 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
 3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
 4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
 5. PVDC Jacket for Indoor Applications: 4-mil-thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perm when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.
 - a. <Double click here to find, evaluate, and insert list of manufacturers and products.>
 6. PVDC Jacket for Outdoor Applications: 6-mil-thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 perm when tested according to ASTM E 96/E 96M

and with a flame-spread index of 5 and a smoke-developed index of 25 when tested according to ASTM E 84.

7. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.
8. Vinyl Jacket: White vinyl with a permeance of 1.3 perms when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

3.7 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.
- C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Airex Manufacturing.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. P.I.C. Plastics, Inc.
 2. Adhesive: As recommended by jacket material manufacturer.
 3. Color: White.
 4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.
- D. Metal Jacket:
 1. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
 - a. Sheet and roll stock ready for shop or field sizing.
 - b. Finish and thickness are indicated in field-applied jacket schedules.
 - c. Moisture Barrier for Indoor Applications: 1-mil-thick, heat-bonded polyethylene and kraft paper.
 - d. Moisture Barrier for Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
 - e. Factory-Fabricated Fitting Covers:
 - 1) Same material, finish, and thickness as jacket.
 - 2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
 - 3) Tee covers.

- 4) Flange and union covers.
 - 5) End caps.
 - 6) Beveled collars.
 - 7) Valve covers.
 - 8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.
- E. Self-Adhesive Outdoor Jacket: 60-mil-thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a cross-laminated polyethylene film covered with white aluminum-foil facing.

3.8 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
1. Width: 3 inches.
 2. Thickness: 11.5 mils.
 3. Adhesion: 90 ounces force/inch in width.
 4. Elongation: 2 percent.
 5. Tensile Strength: 40 lbf/inch in width.
 6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
1. Width: 3 inches.
 2. Thickness: 6.5 mils.
 3. Adhesion: 90 ounces force/inch in width.
 4. Elongation: 2 percent.
 5. Tensile Strength: 40 lbf/inch in width.
 6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
1. Width: 2 inches.
 2. Thickness: 6 mils.
 3. Adhesion: 64 ounces force/inch in width.
 4. Elongation: 500 percent.
 5. Tensile Strength: 18 lbf/inch in width.
- D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
1. Width: 2 inches.
 2. Thickness: 3.7 mils.
 3. Adhesion: 100 ounces force/inch in width.
 4. Elongation: 5 percent.
 5. Tensile Strength: 34 lbf/inch in width.

3.9 SECUREMENTS

- A. Bands:
 - 1. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 1/2 inch wide with wing seal or closed seal.
 - 2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.
 - 3. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.
- C. Wire: 0.062-inch soft-annealed, stainless steel.

PART 4 - EXECUTION

4.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 - 1. Verify that systems to be insulated have been tested and are free of defects.
 - 2. Verify that surfaces to be insulated are clean and dry.
 - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

4.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
 - 1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
 - 2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

4.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

- a. For below-ambient services, apply vapor-barrier mastic over staples.
- 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
- 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.
 - 2. Testing agency labels and stamps.
 - 3. Nameplates and data plates.
 - 4. Manholes.
 - 5. Handholes.
 - 6. Cleanouts.

4.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 - 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.

4. Seal jacket to wall flashing with flashing sealant.
- C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
1. Comply with requirements in Section 07 8413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- E. Insulation Installation at Floor Penetrations:
1. Pipe: Install insulation continuously through floor penetrations.
 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 07 8413 "Penetration Firestopping."

4.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

4.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
1. Install pipe insulation to outer diameter of pipe flange.
 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

4.7 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

4.8 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

C. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12

4.9 FINISHES

A. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

B. Do not field paint aluminum or stainless-steel jackets.

4.10 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

4.11 INDOOR PIPING INSULATION SCHEDULE

- A. Condensate and Equipment Drain Water below 60 Deg F:

- 1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Flexible Elastomeric: 1/2 inch thick.
 - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

- B. Chilled Water, above 40 Deg F:

- 1. NPS 12 and Smaller: Insulation shall be one of the following:
 - a. Mineral-Fiber, Preformed Pipe, Type I: 1-1/2 inch thick.

- C. Heating-Hot-Water Supply and Return, 200 Deg F and Below:

- 1. NPS 4 thru NPS 8: Insulation shall be one of the following:
 - a. Mineral-Fiber, Preformed Pipe, Type I: 2 inches thick.
- 2. NPS 1-1/2 thru NPS 3: Insulation shall be one of the following:
 - a. Mineral-Fiber, Preformed Pipe, Type I: 1-1/2 inch thick.
- 3. NPS 1 and Smaller: Insulation shall be one of the following:
 - a. Mineral-Fiber, Preformed Pipe, Type I: 1 inch thick.

- D. Refrigerant Liquid, Suction and Hot-Gas Piping:

- 1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Flexible Elastomeric: 1 inch thick.

- E. Refrigerant Thermostatic Expansion Valves:

- 1. Flexible Elastomeric: 1 inch thick.

- F. Dual-Service Heating and Cooling, 40 to 200 Deg F:

- 1. NPS 4 thru NPS 8: Insulation shall be one of the following:
 - a. Mineral-Fiber, Preformed Pipe, Type I: 2 inches thick.

2. NPS 1-1/2 thru NPS 3: Insulation shall be one of the following:
 - a. Mineral-Fiber, Preformed Pipe, Type I: 1-1/2 inch thick.
 3. NPS 1 and Smaller: Insulation shall be one of the following:
 - a. Mineral-Fiber, Preformed Pipe, Type I: 1 inch thick.
- G. Low Pressure Stream Supply and Low Pressure Return, 250 Deg F and below:
1. NPS 1-1/2" and smaller: Insulation shall be one of the following:
 - a. Mineral-Fiber, Preformed Pipe, Type I or II: 2 inches thick.
 2. NPS 6" thru NPS 2": Insulation shall be one of the following:
 - a. Mineral-Fiber, Preformed Pipe, Type I or II: 3 inches thick.
- H. Low Pressure Condensate Return, 200 Deg F and Below:
1. NPS 1-1/2 and Smaller: Insulation shall be one of the following:
 - a. Mineral-Fiber, Preformed Pipe, Type I or II: 1-1/2 inches thick.
 2. NPS 4 thru NPS 2: Insulation shall be one of the following:
 - a. Mineral-Fiber, Preformed Pipe, Type I or II: 2 inches thick.
- I. Pumped Steam Condensate, 200 Deg G and below.
1. All piping sizes: Insulation shall be one of the following:
 - a. Mineral-Fiber, Preformed Pipe, Type I or II: 2 inches thick.

4.12 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

- A. Chilled Water:
1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Flexible Elastomeric: 2 inches thick. Provide outdoor field applied jacket see below.
 - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick. Provide outdoor field applied jacket see below.
- B. Refrigerant Suction and Hot-Gas Piping:
1. All Pipe Sizes: Insulation shall be one of the following:

- a. Flexible Elastomeric: 1 inches thick. Provide outdoor field applied jacket see below.

4.13 INDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Concealed:
 1. None.
- D. Piping, Exposed: PVC Jackets shall be provided on all piping exposed to public view. Exception: In gymnasiums all piping located 20'-0" AFF, PVC Jackets are not required. In addition, all piping in other areas (i.e. Mechanical Rooms, Janitor's Closet, Storage Rooms, Etc.) below 7'-0" AFF exposed to damage from traffic/normal operations shall have PVC jackets.
 1. PVC: 20 mils thick.

4.14 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Exposed:
 1. UV Protected PVC: 20 mils thick.
 2. Aluminum, Stucco Embossed with Z-Shaped Locking Seam: 0.020 inch thick.

END OF SECTION

SECTION 23 2113

PART 1 -

HYDRONIC PIPING

PART 2 - GENERAL

2.1 RELATED DOCUMENTS

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

2.2 SUMMARY

- A. Section includes pipe and fitting materials and joining methods for the following:
 - 1. Copper tube and fittings.
 - 2. Steel pipe and fittings.
 - 3. Plastic pipe and fittings.
 - 4. Joining materials.
 - 5. Transition fittings.
 - 6. Dielectric fittings.

2.3 ACTION SUBMITTALS

- A. Product Data: For each type of the following:
 - 1. Pipe.
 - 2. Fittings.
 - 3. Joining materials.
 - 4. Bypass chemical feeder.

2.4 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installers of Pressure-Sealed Joints: Installers shall be certified by pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.
 - 2. Fiberglass Pipe and Fitting Installers: Installers of RTRF and RTRP shall be certified by manufacturer of pipes and fittings as having been trained and qualified to join fiberglass piping with manufacturer-recommended adhesive.

- B. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
 - 1. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

PART 3 - PRODUCTS

3.1 PERFORMANCE REQUIREMENTS

- A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:
 - 1. Hot-Water Heating Piping: 100 psig at 200 deg F.
 - 2. Chilled-Water Piping: 150 psig at 73 deg F.
 - 3. Dual-Temperature Heating and Cooling Water Piping: 100 psig at 200 deg F.
 - 4. Makeup-Water Piping: 80 psig at 73 deg F.
 - 5. Condensate-Drain Piping: 150 deg F.
 - 6. Blowdown-Drain Piping: 180 deg F.
 - 7. Air-Vent Piping: 180 deg F.
 - 8. Safety-Valve-Inlet and -Outlet Piping: Equal to the pressure of the piping system to which it is attached.

3.2 COPPER TUBE AND FITTINGS

- A. Drawn-Temper Copper Tubing: ASTM B 88, Type L.
- B. Annealed-Temper Copper Tubing: ASTM B 88, Type K.
- C. DWV Copper Tubing: ASTM B 306, Type DWV.
- D. Grooved, Mechanical-Joint, Wrought-Copper Fittings: ASME B16.22.
 - 1. Grooved-End Copper Fittings: ASTM B 75, copper tube or ASTM B 584, bronze casting.
 - 2. Grooved-End-Tube Couplings: Rigid pattern unless otherwise indicated; gasketed fitting. Ductile-iron housing with keys matching pipe and fitting grooves, pre-lubricated EPDM gasket rated for minimum 230 deg F for use with housing, and steel bolts and nuts.
- E. Copper or Bronze Pressure-Seal Fittings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Viega Pro-Press System
 - 2. Housing: Copper.

3. O-Rings and Pipe Stops: EPDM.
 4. Tools: Manufacturer's special tools.
 5. Minimum 200-psig working-pressure rating at 250 deg F.
- F. Wrought-Copper Unions: ASME B16.22.

3.3 STEEL PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; welded and seamless, Grade B, and wall thickness as indicated in "Piping Applications" Article.
- B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250 as indicated in "Piping Applications" Article.
- C. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in "Piping Applications" Article.
- D. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in "Piping Applications" Article.
- E. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, and 250; raised ground face, and bolt holes spot faced as indicated in "Piping Applications" Article.
- F. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.
- G. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 1. Material Group: 1.1.
 2. End Connections: Butt welding.
 3. Facings: Raised face.
- H. Grooved Mechanical-Joint Fittings and Couplings:
 1. Joint Fittings: ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 47/A 47M, Grade 32510 malleable iron; ASTM A 53/A 53M, Type F, E, or S, Grade B fabricated steel; or ASTM A 106/A 106M, Grade B steel fittings with grooves or shoulders constructed to accept grooved-end couplings; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
 2. Couplings: Ductile- or malleable-iron housing and EPDM or nitrile gasket of central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
- I. Steel Pipe Nipples: ASTM A 733, made of same materials and wall thicknesses as pipe in which they are installed.

3.4 PLASTIC PIPE AND FITTINGS

- A. CPVC Plastic Pipe: ASTM F 441/F 441M, with wall thickness as indicated in "Piping Applications" Article.

1. CPVC Plastic Pipe Fittings: Socket-type pipe fittings, ASTM F 438 for Schedule 40 pipe; ASTM F 439 for Schedule 80 pipe.
- B. PVC Plastic Pipe: ASTM D 1785, with wall thickness as indicated in "Piping Applications" Article.
 1. PVC Plastic Pipe Fittings: Socket-type pipe fittings, ASTM D 2466 for Schedule 40 pipe; ASTM D 2467 for Schedule 80 pipe.

3.5 JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless otherwise indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.
- F. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- G. Solvent Cements for CPVC Piping: ASTM F 493.
 1. Solvent cement shall have a VOC content of 490 g/L or less.
- H. Solvent Cements for PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
 1. Solvent cement shall have a VOC content of 490 g/L or less.

3.6 TRANSITION FITTINGS

- A. Plastic-to-Metal Transition Fittings:
 1. One-piece fitting with one threaded brass or copper insert and one solvent-cement-joint end of material and wall thickness to match plastic pipe material.
- B. Plastic-to-Metal Transition Unions:

1. Brass or copper end, solvent-cement-joint end of material and wall thickness to match plastic pipe material, rubber gasket, and threaded union.

3.7 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
 1. Description:
 - a. Standard: ASSE 1079.
 - b. Pressure Rating: 150 psig minimum at 210 deg F.
 - c. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Flanges:
 1. Description:
 - a. Standard: ASSE 1079.
 - b. Factory-fabricated, bolted, companion-flange assembly.
 - c. Pressure Rating: 150 psig minimum at 210 deg F.
 - d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
- D. Dielectric-Flange Insulating Kits:
 1. Description:
 - a. Nonconducting materials for field assembly of companion flanges.
 - b. Pressure Rating: 150 psig minimum at 210 deg F.
 - c. Gasket: Neoprene or phenolic.
 - d. Bolt Sleeves: Phenolic or polyethylene.
 - e. Washers: Phenolic with steel backing washers.
- E. Dielectric Nipples:
 1. Description:
 - a. Standard: IAPMO PS 66.
 - b. Electroplated steel nipple, complying with ASTM F 1545.
 - c. Pressure Rating: 150 psig minimum at 210 deg F.
 - d. End Connections: Male threaded or grooved.
 - e. Lining: Inert and noncorrosive, propylene.

PART 4 - EXECUTION

4.1 PIPING APPLICATIONS

- A. Hot-water heating piping, aboveground, NPS 2 and smaller, shall be any of the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered or pressure-seal joints.
 2. Schedule 40, Grade B steel pipe; Class 150, malleable-iron fittings; cast-iron flanges and flange fittings; and threaded joints.
- B. Hot-water heating piping, aboveground, NPS 2-1/2 and larger, shall be any of the following:
1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.
 2. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.
 3. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.
- C. Hot-water heating piping installed belowground and within slabs shall be either of the following:
1. Type K, annealed-temper copper tubing, wrought-copper fittings, and soldered joints. Use the fewest possible joints.
- D. Chilled-water piping, aboveground, NPS 2 and smaller, shall be any of the following:
1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered or pressure-seal joints.
 2. Schedule 40 steel pipe; Class 150, malleable-iron fittings; cast-iron flanges and flange fittings; and threaded joints.
- E. Chilled-water piping, aboveground, NPS 2-1/2 and larger, shall be any of the following:
1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.
 2. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.
 3. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.
- F. Chilled-water piping installed belowground and within slabs shall be either of the following:
1. Type K, annealed-temper copper tubing, wrought-copper fittings, and soldered joints. Use the fewest possible joints.
- G. Dual-temperature heating and cooling water piping, aboveground, NPS 2 and smaller, shall be any of the following:
1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered or pressure-seal joints.
 2. Schedule 40 steel pipe; Class 150, malleable-iron fittings; cast-iron flanges and flange fittings; and threaded joints.
- H. Dual-temperature heating and cooling water piping, aboveground, NPS 2-1/2 and larger, shall be any of the following:
1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

2. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.
 3. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.
- I. Dual-temperature heating and cooling water piping installed belowground and within slabs shall be either of the following:
1. Type K, annealed-temper copper tubing, wrought-copper fittings, and soldered joints. Use the fewest possible joints.
 2. RTRP and RTRF with adhesive or flanged joints.
- J. Glycol cooling-water piping, aboveground, NPS 2 and smaller, shall be any of the following:
1. Type L Type M, drawn-temper copper tubing, wrought-copper fittings, and soldered or pressure-seal joints.
 2. Schedule 40 steel pipe; Class 150, malleable-iron fittings; cast-iron flanges and flange fittings; and threaded joints.
- K. Glycol cooling-water piping, aboveground, NPS 2-1/2 and larger, shall be any of the following:
1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.
 2. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.
 3. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.
- L. Glycol cooling-water piping installed belowground and within slabs shall be either of the following:
1. Type K, annealed-temper copper tubing, wrought-copper fittings, and soldered joints. Use the fewest possible joints.
- M. Makeup-water piping installed aboveground shall be either of the following:
1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.
- N. Condensate-Drain Piping: Schedule 40 PVC plastic pipe and fittings and solvent-welded joints.
- O. Blowdown-Drain Piping: Same materials and joining methods as for piping specified for the service in which blowdown drain is installed.
- P. Air-Vent Piping:
1. Inlet: Same as service where installed with metal-to-plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions.
 2. Outlet: Type K, annealed-temper copper tubing with soldered or flared joints.
- Q. Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed with metal-to-

plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions.

4.2 PIPING INSTALLATIONS

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Select system components with pressure rating equal to or greater than system operating pressure.
- K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.
- M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.
- N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.
- O. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.
- P. Install valves according to the following:
 - 1. Section 23 0523.12 "Ball Valves for HVAC Piping."
 - 2. Section 23 0523.13 "Butterfly Valves for HVAC Piping."
 - 3. Section 23 0523.14 "Check Valves for HVAC Piping."
- Q. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

- R. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.
- S. Install shutoff valve immediately upstream of each dielectric fitting.
- T. Comply with requirements in Section 23 0516 "Expansion Fittings and Loops for HVAC Piping" for installation of expansion loops, expansion joints, anchors, and pipe alignment guides.
- U. Comply with requirements in Section 23 0553 "Identification for HVAC Piping and Equipment" for identifying piping.

4.3 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.
- C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.
- D. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

4.4 HANGERS AND SUPPORTS

- A. Comply with requirements in Section 23 0529 "Hangers and Supports for HVAC Piping and Equipment" for hanger, support, and anchor devices. Comply with the following requirements for maximum spacing of supports.
- B. Comply with requirements in Section 23 0548 "Vibration and Seismic Controls for HVAC" for seismic restraints.
- C. Install the following pipe attachments:
 1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
 2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
 4. Spring hangers to support vertical runs.
 5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
 6. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.
- D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
 1. NPS 3/4: Maximum span, 7 feet.
 2. NPS 1: Maximum span, 7 feet.
 3. NPS 1-1/2: Maximum span, 9 feet.
 4. NPS 2: Maximum span, 10 feet.

5. NPS 2-1/2: Maximum span, 11 feet.
 6. NPS 3 and Larger: Maximum span, 12 feet.
- E. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:
1. NPS 3/4: Maximum span, 5 feet; minimum rod size, 1/4 inch.
 2. NPS 1: Maximum span, 6 feet; minimum rod size, 1/4 inch.
 3. NPS 1-1/4: Maximum span, 7 feet; minimum rod size, 3/8 inch.
 4. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
 5. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
 6. NPS 2-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
 7. NPS 3 and Larger: Maximum span, 10 feet; minimum rod size, 3/8 inch.
- F. Plastic Piping Hanger Spacing: Space hangers according to pipe manufacturer's written instructions for service conditions. Avoid point loading. Space and install hangers with the fewest practical rigid anchor points.
- G. Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.

4.5 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- E. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.
- F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- G. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
 3. PVC Pressure Piping: Join ASTM D 1785 schedule number, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule number PVC pipe and socket fittings according to ASTM D 2855.
 4. PVC Nonpressure Piping: Join according to ASTM D 2855.
- H. Grooved Joints: Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid, grooved-end-pipe couplings.
- I. Pressure-Sealed Joints: Use manufacturer-recommended tool and procedure. Leave insertion marks on pipe after assembly.

4.6 TERMINAL EQUIPMENT CONNECTIONS

- A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.
- B. Install control valves in accessible locations close to connected equipment.
- C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.
- D. Install ports for pressure gages and thermometers at coil inlet and outlet connections. Comply with requirements in Section 23 0519 "Meters and Gages for HVAC Piping."

4.7 CHEMICAL TREATMENT

- A. Comply with requirements in Section 23 2513 "Water Treatment for Closed-Loop Hydronic Systems".
- B. Install side-stream filters to provide service as chemical feeders in each hydronic system where indicated.
 1. Install in upright position with top of funnel not more than 48 inches above the floor.
 2. Install feeder in minimum NPS 3/4 bypass line, from main with full-size, full-port, ball valve in the main between bypass connections.
 3. Install NPS 3/4 pipe from chemical feeder drain to nearest equipment drain and include a full-size, full-port, ball valve.
- C. Fill system with fresh water and add liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products from piping. Circulate solution for a minimum of 24 hours, drain, clean strainer screens, and refill with fresh water.
- D. Add initial chemical treatment and maintain water quality in ranges noted above for the first year of operation.

4.8 FIELD QUALITY CONTROL

- A. Prepare hydronic piping according to ASME B31.9 and as follows:
1. Leave joints, including welds, uninsulated and exposed for examination during test.
 2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
 3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
 4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
 5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.
- B. Perform the following tests on hydronic piping:
1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
 2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
 3. Isolate expansion tanks and determine that hydronic system is full of water.
 4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
 5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
 6. Prepare written report of testing.
- C. Perform the following before operating the system:
1. Open manual valves fully.
 2. Inspect pumps for proper rotation.
 3. Set makeup pressure-reducing valves for required system pressure.
 4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
 5. Set temperature controls so all coils are calling for full flow.
 6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
 7. Verify lubrication of motors and bearings.

END OF SECTION

SECTION 23 2116

PART 1 -

HYDRONIC PIPING SPECIALTIES

PART 2 - GENERAL

2.1 RELATED DOCUMENTS

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

2.2 SUMMARY

- A. Section Includes:

- 1. Hydronic specialty valves.
- 2. Air-control devices.
- 3. Strainers.
- 4. Connectors.

- B. Related Requirements:

- 1. Section 23 0516 "Expansion Fittings and Loops for HVAC Piping" for expansion fittings and loops.
- 2. Section 23 0523.12 "Ball Valves for HVAC Piping" for specification and installation requirements for ball valves common to most piping systems.
- 3. Section 23 0523.13 "Butterfly Valves for HVAC Piping" for specification and installation requirements for butterfly valves common to most piping systems.
- 4. Section 23 0523.14 "Check Valves for HVAC Piping" for specification and installation requirements for check valves common to most piping systems.
- 5. Section 23 0923.11 "Control Valves" for automatic control valve and sensor specifications, installation requirements, and locations.

2.3 ACTION SUBMITTALS

- A. Product Data: For each type of product:

- 1. Include construction details and material descriptions for hydronic piping specialties.
- 2. Include rated capacities, operating characteristics, and furnished specialties and accessories.
- 3. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.

2.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For hydronic piping specialties to include in emergency, operation, and maintenance manuals.

2.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Differential Pressure Meter: For each type of balancing valve and automatic flow control valve, include flowmeter, probes, hoses, flow charts, and carrying case.

2.6 QUALITY ASSURANCE

- A. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
- B. Safety Valves and Pressure Vessels: Shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 3 - PRODUCTS

3.1 HYDRONIC SPECIALTY VALVES

- A. Bronze, Calibrated-Orifice, Balancing Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armstrong Pumps, Inc.
 - b. Bell & Gossett; a Xylem brand.
 - c. Flow Design, Inc.
 - d. Griswold Controls.
 - e. HCI; Hydronics Components Inc.
 - f. Nexus Valve, Inc.
 - g. NIBCO INC.
 - 2. Body: Bronze, ball or plug type with calibrated orifice or venturi.
 - 3. Ball: Brass or stainless steel.
 - 4. Plug: Resin.
 - 5. Seat: PTFE.
 - 6. End Connections: Threaded or socket.
 - 7. Pressure Gage Connections: Integral seals for portable differential pressure meter.
 - 8. Handle Style: Lever, with memory stop to retain set position.
 - 9. CWP Rating: Minimum 125 psig.
 - 10. Maximum Operating Temperature: 250 deg F.
- B. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armstrong Pumps, Inc.
 - b. Bell & Gossett; a Xylem brand.
 - c. Flow Design, Inc.
 - d. Griswold Controls.
 - e. HCI; Hydronics Components Inc.
 - f. Nexus Valve, Inc.
 - g. NIBCO INC.
2. Body: Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Stem Seals: EPDM O-rings.
5. Disc: Glass and carbon-filled PTFE.
6. Seat: PTFE.
7. End Connections: Flanged or grooved.
8. Pressure Gage Connections: Integral seals for portable differential pressure meter.
9. Handle Style: Lever, with memory stop to retain set position.
10. CWP Rating: Minimum 125 psig.
11. Maximum Operating Temperature: 250 deg F.

C. Diaphragm-Operated, Pressure-Reducing Valves: ASME labeled.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AMTROL, Inc.
 - b. Apollo Flow Controls; Conbraco Industries, Inc.
 - c. Armstrong Pumps, Inc.
 - d. Bell & Gossett; a Xylem brand.
2. Body: Bronze or brass.
3. Disc: Glass and carbon-filled PTFE.
4. Seat: Brass.
5. Stem Seals: EPDM O-rings.
6. Diaphragm: EPT.
7. Low inlet-pressure check valve.
8. Inlet Strainer: stainless steel, removable without system shutdown.
9. Valve Seat and Stem: Noncorrosive.
10. Valve Size, Capacity, and Operating Pressure: Selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

D. Diaphragm-Operated Safety Valves: ASME labeled.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AMTROL, Inc.
 - b. Apollo Flow Controls; Conbraco Industries, Inc.

- c. Armstrong Pumps, Inc.
 - d. Bell & Gossett; a Xylem brand.
2. Body: Bronze or brass.
 3. Disc: Glass and carbon-filled PTFE.
 4. Seat: Brass.
 5. Stem Seals: EPDM O-rings.
 6. Diaphragm: EPT.
 7. Wetted, Internal Work Parts: Brass and rubber.
 8. Inlet Strainer: stainless steel, removable without system shutdown.
 9. Valve Seat and Stem: Noncorrosive.
 10. Valve Size, Capacity, and Operating Pressure: Comply with ASME Boiler and Pressure Vessel Code: Section IV, and selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

E. Automatic Flow-Control Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Caleffi.
 - b. Flow Design, Inc.
 - c. Griswold Controls.
 - d. HCI; Hydronics Components Inc.
 - e. Nexus Valve, Inc.
 - f. NIBCO INC.
2. Body: Brass or ferrous metal.
3. Flow Control Assembly, provide either of the following:
 - a. Piston and Spring Assembly: Stainless steel, tamper proof, self-cleaning, and removable.
 - b. Elastomeric Diaphragm and Polyphenylsulfone Orifice Plate: Operating ranges within 2- to 80-psig differential pressure.
4. Combination Assemblies: Include bronze or brass-alloy ball valve.
5. Identification Tag: Marked with zone identification, valve number, and flow rate.
6. Size: Same as pipe in which installed.
7. Performance: Maintain constant flow within plus or minus 10 percent, regardless of system pressure fluctuations.
8. Minimum CWP Rating: 175 psig.
9. Maximum Operating Temperature: 200 deg F.

3.2 AIR-CONTROL DEVICES

A. Manual Air Vents:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. AMTROL, Inc.
 - b. Apollo Flow Controls; Conbraco Industries, Inc.
 - c. Armstrong Pumps, Inc.
 - d. Bell & Gossett; a Xylem brand.
 - e. HCI; Hydronics Components Inc.
 - f. Nexus Valve, Inc.
- 2. Body: Bronze.
 - 3. Internal Parts: Nonferrous.
 - 4. Operator: Screwdriver or thumbscrew.
 - 5. Inlet Connection: NPS 1/2.
 - 6. Discharge Connection: NPS 1/8.
 - 7. CWP Rating: 150 psig.
 - 8. Maximum Operating Temperature: 225 deg F.

B. Automatic Air Vents:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AMTROL, Inc.
 - b. Armstrong Pumps, Inc.
 - c. Bell & Gossett; a Xylem brand.
 - d. Nexus Valve, Inc.
 - e. NuTech Hydronic Specialty Products.
- 2. Body: Bronze or cast iron.
- 3. Internal Parts: Nonferrous.
- 4. Operator: Noncorrosive metal float.
- 5. Inlet Connection: NPS 1/2.
- 6. Discharge Connection: NPS 1/4.
- 7. CWP Rating: 150 psig.
- 8. Maximum Operating Temperature: 240 deg F.

3.3 STRAINERS

A. Y-Pattern Strainers:

- 1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
- 2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
- 3. Strainer Screen: Stainless-steel, 60-mesh strainer, or perforated stainless-steel basket.
- 4. CWP Rating: 125 psig.

B. Basket Strainers:

- 1. Body: ASTM A 126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.
- 2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.

3. Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

C. T-Pattern Strainers:

1. Body: Ductile or malleable iron with removable access coupling and end cap for strainer maintenance.
2. End Connections: Grooved ends.
3. Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 57 percent free area.
4. CWP Rating: 750 psig.

3.4 CONNECTORS

A. Spherical, Rubber, Flexible Connectors:

1. Body: Fiber-reinforced rubber body.
2. End Connections: Steel flanges drilled to align with Classes 150 and 300 steel flanges.
3. Performance: Capable of misalignment.
4. CWP Rating: 150 psig.
5. Maximum Operating Temperature: 250 deg F.

PART 4 - EXECUTION

4.1 VALVE APPLICATIONS

- A. Install shutoff-duty valves at each branch connection to supply mains and at supply connection to each piece of equipment.
- B. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.
- C. Install check valves at each pump discharge and elsewhere as required to control flow direction.
- D. Install safety valves at hot-water generators and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install drip-pan elbow on safety-valve outlet and pipe without valves to the outdoors; pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.
- E. Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.

4.2 HYDRONIC SPECIALTIES INSTALLATION

- A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.
- B. Install automatic air vents at high points of system piping in mechanical equipment rooms only. Install manual vents at heat-transfer coils and elsewhere as required for air venting.

- C. Install piping from boiler air outlet, air separator, or air purger to expansion tank with a 2 percent upward slope toward tank.
- D. Install in-line air separators in pump suction. Install drain valve on air separators NPS 2 and larger.
- E. Install expansion tanks above the air separator. Install tank fitting in tank bottom and charge tank. Use manual vent for initial fill to establish proper water level in tank.
 - 1. Install tank fittings that are shipped loose.
 - 2. Support tank from floor or structure above with sufficient strength to carry weight of tank, piping connections, fittings, plus tank full of water. Do not overload building components and structural members.
- F. Install expansion tanks on the floor. Vent and purge air from hydronic system, and ensure that tank is properly charged with air to suit system Project requirements.

END OF SECTION

SECTION 23 2300

PART 1 -

REFRIGERANT PIPING

PART 2 - GENERAL

2.1 RELATED DOCUMENTS

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

2.2 SUMMARY

- A. Section Includes:
 - 1. Refrigerant pipes and fittings.
 - 2. Refrigerant piping valves and specialties.
 - 3. Refrigerants.

2.3 ACTION SUBMITTALS

- A. Product Data: For each type of valve, refrigerant piping, and piping specialty.
 - 1. Include pressure drop, based on manufacturer's test data, for the following:
 - a. Thermostatic expansion valves.
 - b. Solenoid valves.
 - c. Hot-gas bypass valves.
 - d. Filter dryers.
 - e. Strainers.
 - f. Pressure-regulating valves.

2.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Field quality-control reports.

2.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

2.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to 2010 ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
- B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."
- C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

2.7 PRODUCT STORAGE AND HANDLING

- A. Store piping with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 3 - PRODUCTS

3.1 PERFORMANCE REQUIREMENTS

- A. Line Test Pressure for Refrigerant R-410A:
 - 1. Suction Lines for Air-Conditioning Applications: 300 psig.
 - 2. Liquid Lines: 535 psig.

3.2 COPPER TUBE AND FITTINGS

- A. Copper Tube: ASTM B 280, Type ACR.
- B. Wrought-Copper Fittings: ASME B16.22.
- C. Wrought-Copper Unions: ASME B16.22.
- D. Brazing Filler Metals: AWS A5.8/A5.8M.
- E. Flexible Connectors:
 - 1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
 - 2. End Connections: Socket ends.
 - 3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
 - 4. Working Pressure Rating: Factory test at minimum 500 psig.
 - 5. Maximum Operating Temperature: 250 deg F.

3.3 VALVES AND SPECIALTIES

- A. Diaphragm Packless Valves:

1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
 2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
 3. Operator: Rising stem and hand wheel.
 4. Seat: Nylon.
 5. End Connections: Socket, union, or flanged.
 6. Working Pressure Rating: 500 psig.
 7. Maximum Operating Temperature: 275 deg F.
- B. Packed-Angle Valves:
1. Body and Bonnet: Forged brass or cast bronze.
 2. Packing: Molded stem, back seating, and replaceable under pressure.
 3. Operator: Rising stem.
 4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
 5. Seal Cap: Forged-brass or valox hex cap.
 6. End Connections: Socket, union, threaded, or flanged.
 7. Working Pressure Rating: 500 psig.
 8. Maximum Operating Temperature: 275 deg F.
- C. Check Valves:
1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
 2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
 3. Piston: Removable polytetrafluoroethylene seat.
 4. Closing Spring: Stainless steel.
 5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
 6. End Connections: Socket, union, threaded, or flanged.
 7. Maximum Opening Pressure: 0.50 psig.
 8. Working Pressure Rating: 500 psig.
 9. Maximum Operating Temperature: 275 deg F.
- D. Service Valves:
1. Body: Forged brass with brass cap including key end to remove core.
 2. Core: Removable ball-type check valve with stainless-steel spring.
 3. Seat: Polytetrafluoroethylene.
 4. End Connections: Copper spring.
 5. Working Pressure Rating: 500 psig.
- E. Solenoid Valves: Comply with AHRI 760 and UL 429; listed and labeled by a National Recognized Testing Laboratory (NRTL).
1. Body and Bonnet: Plated steel.
 2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
 3. Seat: Polytetrafluoroethylene.
 4. End Connections: Threaded.
 5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24-V ac coil.
 6. Working Pressure Rating: 400 psig.
 7. Maximum Operating Temperature: 240 deg F.
- F. Safety Relief Valves: Comply with 2010 ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.

2. Piston, Closing Spring, and Seat Insert: Stainless steel.
 3. Seat: Polytetrafluoroethylene.
 4. End Connections: Threaded.
 5. Working Pressure Rating: 400 psig.
 6. Maximum Operating Temperature: 240 deg F.
- G. Thermostatic Expansion Valves: Comply with AHRI 750.
1. Body, Bonnet, and Seal Cap: Forged brass or steel.
 2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
 3. Packing and Gaskets: Non-asbestos.
 4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
 5. Suction Temperature: 40 deg F.
 6. Superheat: Adjustable.
 7. Reverse-flow option (for heat-pump applications).
 8. End Connections: Socket, flare, or threaded union.
 9. Working Pressure Rating: 450 psig.
- H. Straight-Type Strainers:
1. Body: Welded steel with corrosion-resistant coating.
 2. Screen: 100-mesh stainless steel.
 3. End Connections: Socket or flare.
 4. Working Pressure Rating: 500 psig.
 5. Maximum Operating Temperature: 275 deg F.
- I. Angle-Type Strainers:
1. Body: Forged brass or cast bronze.
 2. Drain Plug: Brass hex plug.
 3. Screen: 100-mesh monel.
 4. End Connections: Socket or flare.
 5. Working Pressure Rating: 500 psig.
 6. Maximum Operating Temperature: 275 deg F.
- J. Moisture/Liquid Indicators:
1. Body: Forged brass.
 2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
 3. Indicator: Color coded to show moisture content in parts per million (ppm).
 4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
 5. End Connections: Socket or flare.
 6. Working Pressure Rating: 500 psig.
 7. Maximum Operating Temperature: 240 deg F.
- K. Replaceable-Core Filter Dryers: Comply with AHRI 730.
1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
 2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
 3. Desiccant Media: Activated alumina or charcoal.
 4. End Connections: Socket.
 5. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
 6. Maximum Pressure Loss: 2 psig.

7. Working Pressure Rating: 500 psig.
 8. Maximum Operating Temperature: 240 deg F.
- L. Receivers: Comply with AHRI 495.
1. Comply with 2010 ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
 2. Comply with UL 207; listed and labeled by an NRTL.
 3. Body: Welded steel with corrosion-resistant coating.
 4. Tappings: Inlet, outlet, liquid level indicator, and safety relief valve.
 5. End Connections: Socket or threaded.
 6. Working Pressure Rating: 500 psig.
 7. Maximum Operating Temperature: 275 deg F.
- M. Liquid Accumulators: Comply with AHRI 495.
1. Body: Welded steel with corrosion-resistant coating.
 2. End Connections: Socket or threaded.
 3. Working Pressure Rating: 500 psig.
 4. Maximum Operating Temperature: 275 deg F.

3.4 REFRIGERANTS

- A. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Arkema Inc.
 - b. DuPont Fluorochemicals Div.

PART 4 - EXECUTION

4.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

- A. Suction Lines NPS 1-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.
- B. Liquid Lines: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.

4.2 VALVE AND SPECIALTY APPLICATIONS

- A. Install diaphragm packless valves in suction and discharge lines of compressor.
- B. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.
- C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

- D. Except as otherwise indicated, install diaphragm packless valves on inlet and outlet side of filter dryers.
- E. Install a full-size, three-valve bypass around filter dryers.
- F. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.
- G. Install thermostatic expansion valves as close as possible to distributors on evaporators.
 - 1. Install valve so diaphragm case is warmer than bulb.
 - 2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
 - 3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.
- H. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.
- I. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for the device being protected:
 - 1. Solenoid valves.
 - 2. Thermostatic expansion valves.
 - 3. Compressor.
- J. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.
- K. Install receivers sized to accommodate pump-down charge.
- L. Install flexible connectors at compressors.

4.3 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.
- B. Install refrigerant piping according to ASHRAE 15.
- C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

- F. Install piping adjacent to machines to allow service and maintenance.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Select system components with pressure rating equal to or greater than system operating pressure.
- J. Refer to Section 23 0923 "Direct Digital Control (DDC) System for HVAC" and Section 23 0993.11 "Sequence of Operations for HVAC DDC" for solenoid valve controllers, control wiring, and sequence of operation.
- K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Section 08 3113 "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.
- M. Install refrigerant piping in protective conduit where installed belowground.
- N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.
- O. Slope refrigerant piping as follows:
 - 1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
 - 2. Install horizontal suction lines with a uniform slope downward to compressor.
 - 3. Install traps and double risers to entrain oil in vertical runs.
 - 4. Liquid lines may be installed level.
- P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.
- Q. Before installation of steel refrigerant piping, clean pipe and fittings using the following procedures:
 - 1. Shot blast the interior of piping.
 - 2. Remove coarse particles of dirt and dust by drawing a clean, lintless cloth through tubing by means of a wire or electrician's tape.
 - 3. Draw a clean, lintless cloth, saturated with compressor oil, squeezed dry, through the tube or pipe to remove remaining lint. Inspect tube or pipe visually for remaining dirt and lint.
 - 4. Finally, draw a clean, dry, lintless cloth through the tube or pipe.
- R. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

- S. Identify refrigerant piping and valves according to Section 23 0553 "Identification for HVAC Piping and Equipment."

4.4 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.
- D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
 - 1. Use Type BCuP (copper-phosphorus) alloy for joining copper socket fittings with copper pipe.
 - 2. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze or steel.

4.5 HANGERS AND SUPPORTS

- A. Comply with requirements for pipe hangers and supports specified in Section 23 0529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
 - 2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
 - 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
 - 4. Spring hangers to support vertical runs.
 - 5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- C. Install hangers for copper tubing with the following maximum spacing and minimum rod diameters:
 - 1. NPS 1/2: Maximum span, 60 inches; minimum rod, 1/4 inch.
 - 2. NPS 5/8: Maximum span, 60 inches; minimum rod, 1/4 inch.
 - 3. NPS 1: Maximum span, 72 inches; minimum rod, 1/4 inch.
 - 4. NPS 1-1/4: Maximum span, 96 inches; minimum rod, 3/8 inch.
 - 5. NPS 1-1/2: Maximum span, 96 inches; minimum rod, 3/8 inch.
 - 6. NPS 2: Maximum span, 96 inches; minimum rod, 3/8 inch.
 - 7. NPS 2-1/2: Maximum span, 108 inches; minimum rod, 3/8 inch.
 - 8. NPS 3: Maximum span, 10 feet; minimum rod, 3/8 inch.
 - 9. NPS 4: Maximum span, 12 feet; minimum rod, 1/2 inch.

- D. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 2: Maximum span, 10 feet; minimum rod, 3/8 inch.
 - 2. NPS 2-1/2: Maximum span, 11 feet; minimum rod, 3/8 inch.
 - 3. NPS 3: Maximum span, 12 feet; minimum rod, 3/8 inch.
 - 4. NPS 4: Maximum span, 14 feet; minimum rod, 1/2 inch.
- E. Support multifloor vertical runs at least at each floor.

4.6 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Comply with ASME B31.5, Chapter VI.
 - 2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
 - 3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in "Performance Requirements" Article.
 - a. Fill system with nitrogen to the required test pressure.
 - b. System shall maintain test pressure at the manifold gage throughout duration of test.
 - c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
 - d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.
- B. Prepare test and inspection reports.

4.7 SYSTEM CHARGING

- A. Charge system using the following procedures:
 - 1. Install core in filter dryers after leak test but before evacuation.
 - 2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
 - 3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
 - 4. Charge system with a new filter-dryer core in charging line.

4.8 ADJUSTING

- A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.
- B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

- C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.
- D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
 - 1. Open shutoff valves in condenser water circuit.
 - 2. Verify that compressor oil level is correct.
 - 3. Open compressor suction and discharge valves.
 - 4. Open refrigerant valves except bypass valves that are used for other purposes.
 - 5. Check open compressor-motor alignment and verify lubrication for motors and bearings.
- E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION

SECTION 23 2513

PART 1 -

WATER TREATMENT FOR CLOSED-LOOP HYDRONIC SYSTEMS

PART 2 - GENERAL

2.1 RELATED DOCUMENTS

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

2.2 SUMMARY

- A. Section includes the following water treatment for closed-loop hydronic systems:
 - 1. Chemicals.

2.3 DEFINITIONS

- A. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.
- B. TSS: Total suspended solids are solid materials, including organic and inorganic, that are suspended in the water. These solids may include silt, plankton, and industrial wastes.

2.4 ACTION SUBMITTALS

- A. Product Data: Include rated capacities, operating characteristics, and furnished specialties and accessories for the following products:
 - 1. Bypass feeders.
 - 2. Water meters.
 - 3. Inhibitor injection timers.
 - 4. pH controllers.
 - 5. TSS controllers.
 - 6. Chemical solution tanks.
 - 7. Injection pumps.
 - 8. Chemical test equipment.
 - 9. Chemical material safety data sheets.
- B. Shop Drawings: Pretreatment and chemical treatment equipment showing tanks, maintenance space required, and piping connections to hydronic systems.

1. Include plans, elevations, sections, and attachment details.
2. Include diagrams for power, signal, and control wiring.

2.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For sensors, injection pumps, and controllers to include in emergency, operation, and maintenance manuals.

2.6 QUALITY ASSURANCE

- A. HVAC Water-Treatment Service Provider Qualifications: An experienced HVAC water-treatment service provider capable of analyzing water qualities, installing water-treatment equipment, and applying water treatment as specified in this Section.

PART 3 - PRODUCTS

3.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Enerco Inc.
 2. Crown Solutions Inc.
 3. Certified Laboratories
 4. H-O-H Water Technology Inc.
 5. Watertech of America
 6. Butler Chemical Company
 7. Betz
 8. America's Best Water Treaters

3.2 PERFORMANCE REQUIREMENTS

- A. Water quality for hydronic systems shall minimize corrosion, scale buildup, and biological growth for optimum efficiency of hydronic equipment without creating a hazard to operating personnel or the environment.
- B. Base HVAC water treatment on quality of water available at Project site, hydronic system equipment material characteristics and functional performance characteristics, operating personnel capabilities, and requirements and guidelines of authorities having jurisdiction.
- C. Closed hydronic systems, including hot-water heating, chilled water and dual-temperature water, shall have the following water qualities:
 1. pH: Maintain a value within 9.0 to 10.5.
 2. "P" Alkalinity: Maintain a value within 100 to 500 ppm.
 3. Boron: Maintain a value within 100 to 200 ppm.
 4. Chemical Oxygen Demand: Maintain a maximum value of 100 ppm.
 5. Soluble Copper: Maintain a maximum value of 0.20 ppm.
 6. TSS: Maintain a maximum value of 10 ppm.

7. Ammonia: Maintain a maximum value of 20 ppm.
8. Free Caustic Alkalinity: Maintain a maximum value of 20 ppm.
9. Microbiological Limits:
 - a. Total Aerobic Plate Count: Maintain a maximum value of 1000 organisms/mL.
 - b. Total Anaerobic Plate Count: Maintain a maximum value of 100 organisms/mL.
 - c. Nitrate Reducers: Maintain a maximum value of 100 organisms/mL.
 - d. Sulfate Reducers: Maintain a maximum value of zero organisms/mL.
 - e. Iron Bacteria: Maintain a maximum value of zero organisms/mL.

3.3 CHEMICALS

- A. Chemicals shall be as recommended by water-treatment system manufacturer that are compatible with piping system components and connected equipment and that can attain water quality specified in "Performance Requirements" Article.

PART 4 - EXECUTION

4.1 WATER ANALYSIS

- A. Perform an analysis of supply water to determine quality of water available at Project site.

4.2 INSTALLATION

- A. Install chemical application equipment on concrete bases, level and plumb. Maintain manufacturer's recommended clearances. Arrange units so controls and devices that require servicing are accessible. Anchor chemical tanks and floor-mounting accessories to substrate.
- B. Side Stream Filters: Install in closed hydronic systems, including hot-water heating, chilled water, and dual-temperature water, and equipped with the following:
 1. Install bypass feeder in a bypass circuit around circulating pumps unless otherwise indicated on Drawings.
 2. Install water meter in makeup-water supply.
 3. Install test-coupon assembly in bypass circuit around circulating pumps unless otherwise indicated on Drawings.
 4. Install a gate or full-port ball isolation valves on inlet, outlet, and drain below the feeder inlet.
 5. Install a swing check on the inlet after the isolation valve.
- C. Fill system with fresh water and add liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products from piping. Circulate solution for a minimum of 24 hours, drain, clean strainer screens, and refill with fresh water.
- D. Add initial chemical treatment and maintain water quality in ranges noted above for the first year of operation.

4.3 CONNECTIONS

- A. Where installing piping adjacent to equipment, allow space for service and maintenance.
- B. Make piping connections between HVAC water-treatment equipment and dissimilar-metal piping with dielectric fittings. Comply with requirements in Section 23 2116 "Hydronic Piping Specialties."
- C. Install shutoff valves on HVAC water-treatment equipment inlet and outlet. Metal general-duty valves are specified in Section 23 0523.11 "Globe Valves for HVAC Piping," Section 23 0523.12 "Ball Valves for HVAC Piping," Section 23 0523.13 "Butterfly Valves for HVAC Piping," and Section 23 0523.15 "Gate Valves for HVAC Piping."
- D. Comply with requirements in Section 22 1119 "Domestic Water Piping Specialties" for backflow preventers required in makeup-water connections to potable-water systems.
- E. Confirm applicable electrical requirements in electrical Sections for connecting electrical equipment.
- F. Ground equipment according to Section 26 0526 "Grounding and Bonding for Electrical Systems."
- G. Connect wiring according to Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."

4.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Inspect field-assembled components and equipment installation, including piping and electrical connections.
 - 2. Inspect piping and equipment to determine that systems and equipment have been cleaned, flushed, and filled with water, and are fully operational before introducing chemicals for water-treatment system.
 - 3. Place HVAC water-treatment system into operation and calibrate controls during the preliminary phase of hydronic systems' startup procedures.
 - 4. Do not enclose, cover, or put piping into operation until it is tested and satisfactory test results are achieved.
 - 5. Test for leaks and defects. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 - 6. Leave uncovered and unconcealed new, altered, extended, and replaced water piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.
 - 7. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and

allow test pressure to stand for four hours. Leaks and loss in test pressure constitute defects.

8. Repair leaks and defects with new materials and retest piping until no leaks exist.
- C. Equipment will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.
- E. Comply with ASTM D 3370 and with the following standards:
 1. Silica: ASTM D 859.
 2. Acidity and Alkalinity: ASTM D 1067.
 3. Iron: ASTM D 1068.
 4. Water Hardness: ASTM D 1126.

4.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC water-treatment systems and equipment.
- B. Training: Provide a "how-to-use" self-contained breathing apparatus video that details exact operating procedures of equipment.

END OF SECTION

SECTION 23 3113

PART 1 -

METAL DUCTS

PART 2 - GENERAL

2.1 RELATED DOCUMENTS

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

2.2 SUMMARY

- A. Section Includes:

- 1. Single-wall rectangular ducts and fittings.
- 2. Single-wall round ducts and fittings.
- 3. Sheet metal materials.
- 4. Sealants and gaskets.
- 5. Hangers and supports.

- B. Related Sections:

- 1. Section 23 0593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
- 2. Section 23 3300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

2.3 ACTION SUBMITTALS

- A. Product Data: For each type of the following products:

- 1. Liners and adhesives.
- 2. Sealants and gaskets.

- B. Shop Drawings:

- 1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
- 2. Factory- and shop-fabricated ducts and fittings.
- 3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
- 4. Fittings.
- 5. Reinforcement and spacing.
- 6. Seam and joint construction.

7. Penetrations through fire-rated and other partitions.
8. Equipment installation based on equipment being used on Project.
9. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
10. Hangers and supports, including methods for duct and building attachment and vibration isolation.

2.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
 3. AWS D9.1/D9.1M, "Sheet Metal Welding Code," for duct joint and seam welding.

PART 3 - PRODUCTS

3.1 PERFORMANCE REQUIREMENTS

- A. Airstream Surfaces: Surfaces in contact with airstream shall comply with requirements in ASHRAE 62.1.
- B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment," and Section 7 - "Construction and System Startup."
- C. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."
- D. Duct Dimensions: Unless otherwise indicated, all duct dimensions indicated on Drawings are inside clear dimensions and do not include insulation or duct wall thickness.

3.2 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
 1. Construct ducts of galvanized sheet steel unless otherwise indicated.
 2. For ducts exposed to weather, construct of Type 304 stainless steel indicated by manufacturer to be suitable for outdoor installation.
- B. Transverse Joints: Fabricate joints in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 1. For ducts with longest side less than 36 inches, select joint types in accordance with Figure 2-1.

2. For ducts with longest side 36 inches or greater, use flange joint connector Type T-22, T-24, T-24A, T-25a, or T-25b. Factory-fabricated flanged duct connection system may be used if submitted and approved by engineer of record.
 3. Where specified for specific applications, all joints shall be welded.
- C. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible." All longitudinal seams shall be Pittsburgh lock seams unless otherwise specified for specific application.
1. Where specified for specific applications, all joints shall be welded.
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

3.3 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
1. Construct ducts of galvanized sheet steel unless otherwise indicated.
 2. For ducts exposed to weather, construct of Type 304 stainless steel indicated by manufacturer to be suitable for outdoor installation.
 3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ductmate Industries, Inc.
 - b. McGill AirFlow LLC.
 - c. SEMCO LLC.
- B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension).
- C. Transverse Joints: Select joint types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.
- D. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal

Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
 2. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.
- E. Tees and Laterals: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

3.4 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
1. Galvanized Coating Designation: G90.
 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.
- D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in "Duct Schedule" Article.
- E. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.
- F. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- G. Tie Rods: Galvanized steel, 1/4-inch-minimum diameter for lengths 36 inches or less; 3/8-inch-minimum diameter for lengths longer than 36 inches.

3.5 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested in accordance with UL 723; certified by an NRTL.
- B. Water-Based Joint and Seam Sealant:
 - 1. Application Method: Brush on.
 - 2. Solids Content: Minimum 65 percent.
 - 3. Shore A Hardness: Minimum 20.
 - 4. Water resistant.
 - 5. Mold and mildew resistant.
 - 6. VOC: Maximum 75 g/L (less water).
 - 7. Maximum Static-Pressure Class: 10 inch wg, positive and negative.
 - 8. Service: Indoor or outdoor.
 - 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- C. Solvent-Based Joint and Seam Sealant:
 - 1. Application Method: Brush on.
 - 2. Base: Synthetic rubber resin.
 - 3. Solvent: Toluene and heptane.
 - 4. Solids Content: Minimum 60 percent.
 - 5. Shore A Hardness: Minimum 60.
 - 6. Water resistant.
 - 7. Mold and mildew resistant.
 - 8. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
 - 9. Service: Indoor or outdoor.
 - 10. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- D. Flanged Joint Sealant: Comply with ASTM C 920.
 - 1. General: Single-component, acid-curing, silicone, elastomeric.
 - 2. Type: S.
 - 3. Grade: NS.
 - 4. Class: 25.
 - 5. Use: O.
- E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.
- F. Round Duct Joint O-Ring Seals:
 - 1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
 - 2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
 - 3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

3.6 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Galvanized-steel rods and nuts.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.
- F. Steel Cable End Connections: Galvanized-steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- H. Trapeze and Riser Supports:
 - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
 - 2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
 - 3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 4 - EXECUTION

4.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and coordination drawings.
- B. Install ducts in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install ducts in maximum practical lengths with fewest possible joints.
- D. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- E. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

- G. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- H. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- I. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- J. Install fire, combination fire/smoke, and smoke dampers where indicated on Drawings and as required by code, and by local authorities having jurisdiction. Comply with requirements in Section 23 3300 "Air Duct Accessories" for fire and smoke dampers and specific installation requirements of the damper UL listing.
- K. Install heating coils, cooling coils, air filters, dampers, and all other duct-mounted accessories in air ducts where indicated on Drawings.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials both before and after installation. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."
- M. Elbows: Use long-radius elbows wherever they fit.
 - 1. Fabricate 90-degree rectangular mitered elbows to include turning vanes.
 - 2. Fabricate 90-degree round elbows with a minimum of three segments for 12 inches and smaller and a minimum of five segments for 14 inches and larger.
- N. Branch Connections: Use lateral or conical branch connections.

4.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Maintain consistency, symmetry, and uniformity in arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- D. Repair or replace damaged sections and finished work that does not comply with these requirements.

4.3 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

- B. Seal ducts at a minimum to the following seal classes in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 2. Outdoor, Supply-Air Ducts: Seal Class A.
 3. Outdoor, Exhaust Ducts: Seal Class C.
 4. Outdoor, Return-Air Ducts: Seal Class C.
 5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
 6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
 7. Unconditioned Space, Exhaust Ducts: Seal Class C.
 8. Unconditioned Space, Return-Air Ducts: Seal Class B.
 9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
 10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
 11. Conditioned Space, Exhaust Ducts: Seal Class B.
 12. Conditioned Space, Return-Air Ducts: Seal Class C.

4.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
1. Where practical, install concrete inserts before placing concrete.
 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

4.5 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 23 3300 "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

4.6 PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Section 09 9113 "Exterior Painting" and Section 09 9123 "Interior Painting."

4.7 STARTUP

- A. Air Balance: Comply with requirements in Section 23 0593 "Testing, Adjusting, and Balancing for HVAC."

4.8 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:
 - 1. Fabricate all ducts to achieve SMACNA pressure class, seal class, and leakage class as indicated below.
- B. Supply Ducts:
 - 1. Ducts Connected to Fan Coil Units, Furnaces, and Terminal Units:
 - a. Pressure Class: Positive 1-inch wg.
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: 4.
 - d. SMACNA Leakage Class for Round and Flat Oval: 2.
 - 2. Ducts Connected to Constant-Volume Air-Handling Units:
 - a. Pressure Class: Positive 2-inch wg.
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: 4.
 - d. SMACNA Leakage Class for Round and Flat Oval: 2.
 - 3. Ducts Connected to Variable-Air-Volume Air-Handling Units:
 - a. Pressure Class: Positive 3-inch wg.
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: 4.
 - d. SMACNA Leakage Class for Round and Flat Oval: 2.

C. Return Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

- a. Pressure Class: Positive or negative 1-inch wg.
- b. Minimum SMACNA Seal Class: A.
- c. SMACNA Leakage Class for Rectangular: 4.
- d. SMACNA Leakage Class for Round and Flat Oval: 2.

2. Ducts Connected to Air-Handling Units:

- a. Pressure Class: Positive or negative 2-inch wg.
- b. Minimum SMACNA Seal Class: A.
- c. SMACNA Leakage Class for Rectangular: 4.
- d. SMACNA Leakage Class for Round and Flat Oval: 2.

D. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

- a. Pressure Class: Negative 1-inch wg.
- b. Minimum SMACNA Seal Class: A if negative pressure, and A if positive pressure.
- c. SMACNA Leakage Class for Rectangular: 4.
- d. SMACNA Leakage Class for Round and Flat Oval: 2.

2. Ducts Connected to Air-Handling Units:

- a. Pressure Class: Positive or negative 2-inch wg.
- b. Minimum SMACNA Seal Class: A if negative pressure, and A if positive pressure.
- c. SMACNA Leakage Class for Rectangular: 4.
- d. SMACNA Leakage Class for Round and Flat Oval: 2.

E. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

- a. Pressure Class: Positive or negative 1-inch wg.
- b. Minimum SMACNA Seal Class: A.
- c. SMACNA Leakage Class for Rectangular: 4.
- d. SMACNA Leakage Class for Round and Flat Oval: 2.

2. Ducts Connected to Air-Handling Units:

- a. Pressure Class: Positive or negative 2-inch wg.
- b. Minimum SMACNA Seal Class: A.
- c. SMACNA Leakage Class for Rectangular: 4.
- d. SMACNA Leakage Class for Round and Flat Oval: 2.

F. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel or carbon steel coated with zinc-chromate primer.
2. Stainless-Steel Ducts:
 - a. Exposed to Airstream: Match duct material.
 - b. Not Exposed to Airstream: Match duct material.
3. Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

G. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - a. Velocity 1000 fpm or Lower:
 - 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
 - 2) Mitered Type RE 4 without vanes.
 - b. Velocity 1000 to 1500 fpm:
 - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
 - c. Velocity 1500 fpm or Higher:
 - 1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

- a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
 - 2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
 - 3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
 - 4) Radius-to Diameter Ratio: 1.5.
- b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
- c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

H. Branch Configuration:

- 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Conical spin in.
- 2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
 - a. Velocity 1000 fpm or Lower: 90-degree tap.
 - b. Velocity 1000 to 1500 fpm: Conical tap.
 - c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION

SECTION 23 3116

PART 1 -

NONMETAL DUCTS

PART 2 - GENERAL

2.1 RELATED DOCUMENTS

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

2.2 SUMMARY

- A. Section Includes:
 - 1. Extent of non-metal ductwork is indicated on drawings and by requirements of this section.
 - 2. Types of non-metal ductwork required for this project include the following:
 - a. Indoor Textile Air Dispersion Products.
 - b. Outdoor Non-Metal Duct
- B. Related Requirements:
 - 1. Section 23 3113 "Metal Ducts" for single- and double-wall, rectangular and round ducts.

2.3 ACTION SUBMITTALS

- A. Product Data: For each type of the following products:
 - 1. Textile duct materials.
- B. Shop Drawings:
 - 1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
 - 2. Duct layout indicating sizes and pressure classes.
 - 3. Elevation of top of ducts.
 - 4. Dimensions of main duct runs from building grid lines.
 - 5. Fittings.
 - 6. Reinforcement and spacing.
 - 7. Seam and joint construction.
 - 8. Equipment installation based on equipment being used on Project.
 - 9. Hangers and supports, including methods for duct and building attachment and vibration isolation.

PART 3 - PRODUCTS

2.1 FIBROUS GLASS DUCT AND FITINGS

- A. Manufacturers Subject to compliance with requirements
 - 1. Thermaduct

- B. Fibrous-Glass Duct Materials: Resin-bonded fiberglass, faced on the outside surface with fire-resistant FSK vapor retarder and with a smooth fiberglass mat finish on the air-side surface.
 - 1. Duct Board: Factory molded into rectangular boards.
 - 2. Round Duct: Factory molded into straight round duct and smooth fittings.
 - 3. Temperature Limits: 185 deg F ambient temperature surrounding ducts.
 - 4. Maximum Thermal Conductivity: 0.13 Btu x in./h x sq. ft. x deg at 75 deg F
 - 5. Moisture Absorption: Not exceeding 5 percent by weight at 120 deg F (49 deg C) and 95 percent relative humidity for 96 hours when tested according to ASTM C 1104/C 1104M.
 - 6. Permeability: 0.00 perms maximum when tested according to ASTM E 96/E 96M, Procedure A.
 - 7. The density of the Kooltherm foam shall not be less than 3.5 pcf (56 Kg/m³) with a minimum compressive strength of 28 psi (.2 MPa).
 - 8. The standard panel is (31 mm) thickness panel with R-8.1 (1.5 RSI) shall be utilized unless indicated otherwise on the print.
 - 9. Antimicrobial Agent: Additive for antimicrobial shall not be used but instead, raw product must pass UL bacteria growth testing.
 - 10. Noise-Reduction Coefficient: 0.05 minimum when tested according to ASTM C 423, Mounting A.
 - 11. Required Markings: All interior duct liner shall bear UL label and other markings required by UL 181 on each full sheet of duct panel; UL ratings for internal closure materials.
 - 12. R-value:
 - i. 1 ¾ (45 mm) Thick Panel: 12 R
 - ii. 2 1/16" Double wall (55 mm): 14.1 R
 - iii. 2 3/8" Double wall (62 mm) Thick Panel: 16.2 R
 - iv. 3" Double wall (76 mm) Thick Panel: 20.1 R
 - v. 3.5 Double wall (100 mm) Thick Panel 24 R

- C. Closure Materials:
 - 1. V-Groove Adhesive: Silicone (interior only).
 - 2. UV stable 1000 micron high impact resistant titanium infused vinyl (exterior).
 - i. Factory manufactured seamless corners for zero perms.
 - ii. Cohesive bonded over-lap at corner seam covers for zero perms.
 - iii. Water resistant titanium infused welded vinyl seams.
 - iv. Mold and mildew resistant.
 - 3. Polymetric Sealing System:
 - i. Structural Membrane: Aluminum scrim with woven glass fiber with UV stable vinyl clad applied
 - ii. Minimum Seam Cover Width: 2 7/8" inches (75 mm)
 - iii. Sealant: Low VOC.
 - iv. Color: White (colors, matched by architect optional).
 - v. Water resistant.
 - vi. Mold and mildew resistant.
 - 4. Duct Connectors.
 - i. Factory manufactured cohesive bonded strips (low pressure only).
 - ii. Factory manufactured all aluminum grip flange.
 - 1. Grip flange
 - 2. F-flange
 - 3. H-flange
 - 4. U-flange
 - iii. Factory manufactured galvanized 4-bolt flange

- D. Outdoor Cladding
 - 1. Thermaduct outdoor Installations: Duct segments shall incorporate UV stable 1000 mi-

ron high impact resistant titanium infused vinyl which is introduced during the manufacturing process.

E. Reinforcement

1. Thermaduct shall provide designed and built with adequate reinforcement to both; withstand air pressure forces from within the duct from blower pressure and shall be built to handle expected snow load for the location where the Thermaduct is being installed. Thermaduct will employ Airtruss™ reinforcement system when both specified static pressure and duct sizes dictate the need. This is a factory installed system and no field installation of the reinforcement system is required.

F. Weight

1. Thermaduct shall provide low weight stresses on the building framing and support members. Assembled Thermaduct shall have a weight of 0.86 lbs. per square foot to maximum weight of 2.7 lbs. per square foot (depending on R-value and reinforcement requirement). Hangers and tie-downs are to be detailed on the manufacturer's installing contractors detail drawings prior to installation but not exceeding 13' for duct girth <84" and 8' for duct girth >85" between hangers and designed to carry the weight and wind load of the ductwork.

PART 4 - EXECUTION

3.1 CLEANING AND PROTECTION:

- A. Clean air handling unit and ductwork prior to the DuctSox system unit-by-unit as it is installed. Clean external surfaces of foreign substance which may cause corrosive deterioration of facing.
- B. Temporary Closure: At ends of ducts which are not connected to equipment or distribution devices at time of ductwork installation, cover with polyethylene film or other covering which will keep the system clean until installation is completed.
- C. If DuctSox systems become soiled during installation, they should be removed and cleaned following the manufacturers standard terms of laundry.

3.2 THERMADUCT SHOP FABRICATION:

A. Certification:

1. Ducts shall be detailed and fully factory manufactured by an authorized Thermaduct, LLC facility system. All fabrication labor will be certified "yellow label" building trade professionals, compliant to SMWIA and SMACNA labor guidelines (work preservation observed).

B. Fabrication:

1. Fabricated joints, seams, transitions, reinforcement, elbows, branch connections, access doors and panels, and damage repairs according to manufacturer's written and detailed instructions.
2. Fabricated 90-degree mitered elbows to include turning vanes.
3. Fabricated duct segments in accordance with manufacturer's written details.
4. Duct Fittings shall include 6 inches of connecting material, as measured, from last bend line to the end of the duct. Connections on machine manufactured duct may be 4 inches.
5. Fabricated duct segments utilizing v-groove method of fabrication. Factory welded or cohesively bonded seams will apply to fully manufactured ductwork and fittings. Internal seams will be supplied with an unbroken layer of low VOC silicone or bonding (for paint shop applications). Each duct segment will be factory supplied with either aluminum grip pro-file or pre-insulated duct connectors in accordance with manufacturer's detailed submittal guide. Applied duct reinforcement to protect against side deformation from both positive and negative pressure per manufacturer's design guide based on specified ductwork size and system pressure.
6. Designed and fabricated duct segments and fittings will be in accordance with "SMACNA Duct Construction Standards" latest edition.
7. Both positive and negative ductwork and fittings shall be constructed to incorporate a UL

Listed as a Class 1 air duct to Standard for Safety UL 181 liner with an exterior clad for permanent protection against water intrusion.

8. Duct shall be constructed to exceed requirements for snow and wind loads.

3.3 THERMADUCT DUCT INSTALLATION:

- A. Duct segments shall be installed by competent HVAC installers.
- B. Install ducts and fittings to comply with manufacturer's installation instructions as follows:
 1. Install ducts with fewest possible joints.
 2. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
 3. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
 4. Protect duct interiors from the moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."
 5. Use prescribed duct support spacing as described in this specification and manufacturer's recommendations.
- C. Air Leakage: Duct air leakage rates to be in compliance with "SMACNA HVAC Duct Construction Standards" latest version per applicable leakage class based on pressure.
- D. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 23 3300 "Air Duct Accessories" for fire and smoke dampers.

3.4 THERMADUCT HANGER AND SUPPORT INSTALLATION:

- A. Contractor to ensure that the ductwork system is properly and adequately supported.
 1. Ensure that the chosen method is compatible with the specific ductwork system requirements per Thermaduct installation detail drawings. Pre-installation should be provided prior to work commencement by installing contractor for approval.
 2. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Supports on straight runs of ductwork shall be positioned at centers not exceeding 13 feet (3.96 m) for duct sections when fabricated in 13 foot (3.96 m) lengths with duct girth less than 84". Larger duct sizes and short segments with duct girth greater than 84" are to be supported at 8 foot centers or less, in accordance with the Thermaduct installation details provided prior to work commencement.
- C. Ductwork shall be supported at changes of direction, at branch duct connections, tee fittings, parallel under turning vanes and all duct accessories such as dampers, etc.
- D. The load of such accessories to the ductwork shall be neutralized by the accessory support.

3.5 FIELD QUALITY CONTROL:

- E. Inspection: Arrange for manufacturer's representative to inspect completed installation and provide written report that installation complies with manufacturer's written instructions
 1. Remove and replace duct system where inspection indicates that it does not comply with specified requirements
- F. Perform additional testing and inspecting, at the Contractor's expense, to determine compliance of replaced or additional work with specified requirements.

3.6 THERMADUCT DUCT SCHEDULE:

- G. Outdoor Ducts and Fittings:
 - 1. Therma duct Rectangular Ducts and Fittings:
 - i. Minimum Panel Thickness: 45 mm
 - ii. Cladding: minimum 0.038 inch
 - iii. Insulation Rating: minimum R-12

END OF SECTION

SECTION 23 3300

PART 1 -

AIR DUCT ACCESSORIES

PART 2 - GENERAL

2.1 RELATED DOCUMENTS

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

2.2 SUMMARY

- A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Barometric relief dampers.
3. Manual volume dampers.
4. Control dampers.
5. Fire dampers.
6. Combination fire and smoke dampers.
7. Corridor dampers.
8. Flange connectors.
9. Turning vanes.
10. Remote damper operators.
11. Duct-mounted access doors.
12. Flexible connectors.
13. Duct accessory hardware.

- B. Related Requirements:

1. Section 23 3346 "Flexible Ducts" for insulated and non-insulated flexible ducts.
2. Section 23 3723 "HVAC Gravity Ventilators" for roof-mounted ventilator caps.
3. Section 28 4621.11 "Addressable Fire-Alarm Systems" for duct-mounted fire and smoke detectors.
4. Section 28 4621.13 "Conventional Fire-Alarm Systems" for duct-mounted fire and smoke detectors.

2.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
 - a. Special fittings.
 - b. Manual volume damper installations.
 - c. Control-damper installations.
 - d. Fire-damper, smoke-damper, combination fire- and smoke-damper, ceiling, and corridor damper installations, including sleeves; and duct-mounted access doors and remote damper operators.
 - e. Duct security bars.
 - f. Wiring Diagrams: For power, signal, and control wiring.

2.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

PART 3 - PRODUCTS

3.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

3.2 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 1. Galvanized Coating Designation: G90.
 2. Exposed-Surface Finish: Mill phosphatized.
- B. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and finish for exposed ducts.
- C. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- D. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.
- E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

- F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

3.3 BACKDRAFT AND PRESSURE RELIEF DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. American Warming and Ventilating; a Mestek Architectural Group company.
 - 2. Cesco Products; a division of MESTEK, Inc.
 - 3. Greenheck Fan Corporation.
 - 4. Nailor Industries Inc.
 - 5. Ruskin Company.
- B. Description: Gravity balanced.
- C. Maximum Air Velocity: 1000 fpm.
- D. Maximum System Pressure: 2-inch wg.
- E. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel, with welded corners or mechanically attached and mounting flange.
- F. Blades: Multiple single-piece blades, center pivoted, maximum 6-inch width, 0.050-inch-thick aluminum sheet with sealed edges.
- G. Blade Action: Parallel.
- H. Blade Seals: Neoprene, mechanically locked.
- I. Blade Axles:
 - 1. Material: Galvanized steel.
 - 2. Diameter: 0.20 inch.
- J. Tie Bars and Brackets: Galvanized steel.
- K. Return Spring: Adjustable tension.
- L. Bearings: Steel ball or synthetic pivot bushings.
- M. Accessories:
 - 1. Adjustment device to permit setting for varying differential static pressure.
 - 2. Chain pulls.
 - 3. Screen Mounting: Front mounted in sleeve.
 - a. Sleeve Thickness: 20 gage minimum.
 - b. Sleeve Length: 6 inches minimum.
 - 4. Screen Material: Aluminum.
 - 5. Screen Type: Bird.

6. 90-degree stops.

3.4 BAROMETRIC RELIEF DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. American Warming and Ventilating; a Mestek Architectural Group company.
 2. Cesco Products; a division of MESTEK, Inc.
 3. Greenheck Fan Corporation.
 4. Nailor Industries Inc.
 5. NCA Manufacturing, Inc.
 6. Ruskin Company.
- B. Suitable for horizontal or vertical mounting.
- C. Maximum Air Velocity: 1000 fpm.
- D. Maximum System Pressure: 2-inch wg.
- E. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel, with welded corners or mechanically attached and mounting flange.
- F. Blades:
 1. Multiple, 0.050-inch-thick aluminum sheet.
 2. Maximum Width: 6 inches.
 3. Action: Parallel.
 4. Balance: Gravity.
 5. Eccentrically pivoted.
- G. Blade Seals: Neoprene.
- H. Blade Axles: Galvanized steel.
- I. Tie Bars and Brackets:
 1. Material: Galvanized steel.
 2. Rattle free with 90-degree stop.
- J. Return Spring: Adjustable tension.
- K. Bearings: Synthetic.
- L. Accessories:
 1. Flange on intake.
 2. Adjustment device to permit setting for varying differential static pressures.

3.5 MANUAL VOLUME DAMPERS

A. Low-Leakage, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Warming and Ventilating; a Mestek Architectural Group company.
 - b. Flex-Tek Group.
 - c. McGill AirFlow LLC.
 - d. Nailor Industries Inc.
 - e. Pottorff.
 - f. Ruskin Company.
 - g. Trox USA Inc.
2. Comply with AMCA 500-D testing for damper rating.
3. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
4. Suitable for horizontal or vertical applications.
5. Frames:
 - a. Hat shaped.
 - b. 0.094-inch-thick, galvanized sheet steel.
 - c. Mitered and welded corners.
 - d. Flanges for attaching to walls and flangeless frames for installing in ducts.
6. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized, roll-formed steel, 0.064 inch thick.
7. Blade Axles: Galvanized steel.
8. Bearings:
 - a. Oil-impregnated bronze or Molded synthetic.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
9. Blade Seals: Neoprene.
10. Jamb Seals: Cambered stainless steel.
11. Tie Bars and Brackets: Galvanized steel.
12. Accessories:
 - a. Include locking device to hold single-blade dampers in a fixed position without vibration.

B. Low-Leakage, Aluminum, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Air Balance; a division of MESTEK, Inc.
 - b. American Warming and Ventilating; a Mestek Architectural Group company.
 - c. McGill AirFlow LLC.
 - d. Nailor Industries Inc.
 - e. Pottorff.
 - f. Ruskin Company.
 - g. Trox USA Inc.
2. Comply with AMCA 500-D testing for damper rating.
3. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
4. Suitable for horizontal or vertical applications.
5. Frames: Hat-shaped, 0.10-inch-thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.
6. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Roll-Formed Aluminum Blades: 0.10-inch-thick aluminum sheet.
 - d. Extruded-Aluminum Blades: 0.050-inch-thick extruded aluminum.
7. Blade Axles: Galvanized steel.
8. Bearings:
 - a. Oil-impregnated bronze or Molded synthetic.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
9. Blade Seals: Neoprene.
10. Jamb Seals: Cambered stainless steel.
11. Tie Bars and Brackets: Galvanized steel.
12. Accessories:
 - a. Include locking device to hold single-blade dampers in a fixed position without vibration.

C. Jackshaft:

1. Size: 0.5-inch diameter.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

D. Damper Hardware:

1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch-thick zinc-plated steel, and a 3/4-inch hexagon locking nut.

2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

3.6 CONTROL DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Tamco, Inc.
 2. Ruskin Company.
- B. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
- C. Frames:
 1. Hat shaped.
 2. 0.094-inch-thick, galvanized sheet steel.
 3. Mitered and welded corners.
- D. Blades:
 1. Multiple blade with maximum blade width of 6 inches.
 2. Parallel- and opposed-blade design.
 3. Extruded Aluminum Airfoil.
 4. 0.064 inch thick single skin.
 5. Blade Edging: Closed-cell neoprene.
- E. Blade Axles: 1/2-inch-diameter; galvanized steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.
 1. Operating Temperature Range: From minus 40 to plus 200 deg F.
- F. Bearings:
 1. Oil-impregnated bronze or Molded synthetic.
 2. Dampers in ducts with pressure classes of 6-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 3. Thrust bearings at each end of every blade.

3.7 FIRE DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Air Balance; a division of MESTEK, Inc.
 2. American Warming and Ventilating; a Mestek Architectural Group company.
 3. Cesco Products; a division of MESTEK, Inc.
 4. Greenheck Fan Corporation.
 5. Nailor Industries Inc.

6. NCA Manufacturing, Inc.
 7. Pottorff.
 8. Ruskin Company.
 9. United Enertech.
- B. Type: Static and dynamic; rated and labeled according to UL 555 by an NRTL.
 - C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.
 - D. Fire Rating: 1-1/2 hours.
 - E. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch-thick galvanized steel; with mitered and interlocking corners.
 - F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.
 1. Minimum Thickness: 0.138 inch thick, as indicated, and of length to suit application.
 2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.
 - G. Mounting Orientation: Vertical or horizontal as indicated.
 - H. Blades: Roll-formed, interlocking, 0.034-inch-thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch-thick, galvanized-steel blade connectors.
 - I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.
 - J. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

3.8 COMBINATION FIRE AND SMOKE DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. American Warming and Ventilating; a Mestek Architectural Group company.
 2. Cesco Products; a division of MESTEK, Inc.
 3. Greenheck Fan Corporation.
 4. Nailor Industries Inc.
 5. Pottorff.
 6. Ruskin Company.
- B. Type: Dynamic; rated and labeled according to UL 555 and UL 555S by an NRTL.
- C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.
- D. Fire Rating: 1-1/2 hours.
- E. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel, with interlocking, gusseted or mechanically attached corners and mounting flange.

- F. Blades: Roll-formed, horizontal, interlocking, 0.063-inch- thick, galvanized sheet steel.
- G. Leakage: Class I.
- H. Rated pressure and velocity to exceed design airflow conditions.
- I. Mounting Sleeve: Factory-installed, 0.05-inch- thick, galvanized sheet steel; length to suit wall or floor application with factory-furnished silicone caulking.
- J. Damper Motors: Modulating or two-position action.
- K. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 23 0513 "Common Motor Requirements for HVAC Equipment."
 - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
 - 2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Section 23 0923 "Direct Digital Control (DDC) System for HVAC."
 - 3. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
 - 4. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf and breakaway torque rating of 150 in. x lbf.
 - 5. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F.
 - 6. Nonspring-Return Motors: For dampers larger than 25 sq. ft., size motor for running torque rating of 150 in. x lbf and breakaway torque rating of 300 in. x lbf.
 - 7. Electrical Connection: 115 V, single phase, 60 Hz.
- L. Accessories:
 - 1. Auxiliary switches for signaling fan control or position indication.
 - 2. Test and reset switches, damper remote mounted.

3.9 FLANGE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. CL WARD & Family Inc.
 - 2. Ductmate Industries, Inc.
 - 3. Hardcast, Inc.
- B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

- C. Material: Galvanized steel.
- D. Gage and Shape: Match connecting ductwork.

3.10 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Aero-Dyne Sound Control Co.
 - 2. Ductmate Industries, Inc.
 - 3. Duro Dyne Inc.
 - 4. METALAIRE, Inc.
- B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
 - 1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.
- C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
- D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vaness and Vane Runners," and 4-4, "Vane Support in Elbows."
- E. Vane Construction: Single wall.
- F. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

3.11 REMOTE DAMPER OPERATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Pottorff.
- B. Description: Cable system designed for remote manual damper adjustment.
- C. Tubing: Copper.
- D. Cable: Stainless steel.
- E. Wall-Box Mounting: Recessed.
- F. Wall-Box Cover-Plate Material: Stainless steel.

3.12 DUCT-MOUNTED ACCESS DOORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. American Warming and Ventilating; a Mestek Architectural Group company.
 2. Cesco Products; a division of MESTEK, Inc.
 3. Ductmate Industries, Inc.
 4. Flexmaster U.S.A., Inc.
 5. Greenheck Fan Corporation.
 6. McGill AirFlow LLC.
 7. Nailor Industries Inc.
 8. Pottorff.
 9. United Enertech.
- B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2, "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."
1. Door:
 - a. Double wall, rectangular.
 - b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
 - c. Vision panel.
 - d. Hinges and Latches: 1-by-1-inchbutt or piano hinge and cam latches.
 - e. Fabricate doors airtight and suitable for duct pressure class.
 2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
 3. Number of Hinges and Locks:
 - a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
 - b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
 - c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches with outside and inside handles.
 - d. Access Doors Larger Than 24 by 48 Inches: Four hinges and two compression latches with outside and inside handles.
- C. Pressure Relief Access Door:
1. Door and Frame Material: Galvanized sheet steel.
 2. Door: Double wall with insulation fill with metal thickness applicable for duct pressure class.
 3. Operation: Open outward for positive-pressure ducts and inward for negative-pressure ducts.
 4. Factory set at 3.0- to 8.0-inch wg.
 5. Doors close when pressures are within set-point range.
 6. Hinge: Continuous piano.
 7. Latches: Cam.
 8. Seal: Neoprene or foam rubber.
 9. Insulation Fill: 1-inch-thick, fibrous-glass or polystyrene-foam board.

3.13 DUCT ACCESS PANEL ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. 3M.
 - 2. CL WARD & Family Inc.
- B. Labeled according to UL 1978 by an NRTL.
- C. Panel and Frame: Minimum thickness 0.0528-inch carbon steel.
- D. Fasteners: Stainless steel. Panel fasteners shall not penetrate duct wall.
- E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F.
- F. Minimum Pressure Rating: 10-inch wg, positive or negative.

3.14 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. CL WARD & Family Inc.
 - 2. Ductmate Industries, Inc.
 - 3. Duro Dyne Inc.
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.
- D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.
- E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 - 1. Minimum Weight: 26 oz./sq. yd..
 - 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 - 3. Service Temperature: Minus 40 to plus 200 deg F.
- F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
 - 1. Minimum Weight: 24 oz./sq. yd..
 - 2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
 - 3. Service Temperature: Minus 50 to plus 250 deg F.
- G. High-Corrosive-Environment System, Flexible Connectors: Glass fabric with chemical-resistant coating.

1. Minimum Weight: 14 oz./sq. yd..
 2. Tensile Strength: 450 lbf/inch in the warp and 340 lbf/inch in the filling.
 3. Service Temperature: Minus 67 to plus 500 deg F.
- H. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.
1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
 2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
 7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

3.15 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 4 - EXECUTION

4.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Compliance with ASHRAE/IESNA 90.1-2004 includes Section 6.4.3.3.3 - "Shutoff Damper Controls," restricts the use of backdraft dampers, and requires control dampers for certain applications. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

- D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 - 1. Install steel volume dampers in steel ducts.
 - 2. Install aluminum volume dampers in aluminum ducts.
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install fire and smoke dampers according to UL listing.
- H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
 - 1. On both sides of duct coils.
 - 2. Upstream and downstream from duct filters.
 - 3. At outdoor-air intakes and mixed-air plenums.
 - 4. At drain pans and seals.
 - 5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
 - 6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
 - 7. At each change in direction and at maximum 50-foot spacing.
 - 8. Upstream and downstream from turning vanes.
 - 9. Upstream or downstream from duct silencers.
 - 10. Control devices requiring inspection.
 - 11. Elsewhere as indicated.
- I. Install access doors with swing against duct static pressure.
- J. Access Door Sizes:
 - 1. One-Hand or Inspection Access: 8 by 5 inches.
 - 2. Two-Hand Access: 12 by 6 inches.
 - 3. Head and Hand Access: 18 by 10 inches.
 - 4. Head and Shoulders Access: 21 by 14 inches.
 - 5. Body Access: 25 by 14 inches.
 - 6. Body plus Ladder Access: 25 by 17 inches.
- K. Label access doors according to Section 23 0553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- L. Install flexible connectors to connect ducts to equipment.
- M. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

- N. Connect terminal units to supply ducts directly or with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.
- O. Connect diffusers to ducts directly or with maximum 48-inch lengths of flexible duct clamped or strapped in place.
- P. Connect flexible ducts to metal ducts with adhesive plus sheet metal screws.
- Q. Install duct test holes where required for testing and balancing purposes.
- R. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

4.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Operate dampers to verify full range of movement.
 - 2. Inspect locations of access doors and verify that purpose of access door can be performed.
 - 3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
 - 4. Inspect turning vanes for proper and secure installation.
 - 5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION

SECTION 23 3346

PART 1 -

FLEXIBLE DUCTS

PART 2 - GENERAL

2.1 RELATED DOCUMENTS

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

2.2 SUMMARY

- A. Section Includes:
 - 1. Insulated flexible ducts.

2.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For flexible ducts.
 - 1. Include plans showing locations and mounting and attachment details.

PART 3 - PRODUCTS

3.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- C. Comply with the Air Diffusion Council's "ADC Flexible Air Duct Test Code FD 72-R1."
- D. Comply with ASTM E 96/E 96M, "Test Methods for Water Vapor Transmission of Materials."

3.2 INSULATED FLEXIBLE DUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Flexmaster U.S.A., Inc.
 2. McGill AirFlow LLC.
- B. Insulated, Flexible Duct: UL 181, Class 1, two-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.
1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
 2. Maximum Air Velocity: 4000 fpm.
 3. Temperature Range: Minus 10 to plus 160 deg F.
 4. Insulation R-Value: R6.
- C. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.
1. Pressure Rating: 4-inch wg positive and 0.5-inch wg negative.
 2. Maximum Air Velocity: 4000 fpm.
 3. Temperature Range: Minus 20 to plus 175 deg F.
 4. Insulation R-Value: R6.
- D. Insulated, Flexible Duct: UL 181, Class 1, multiple layers of aluminum laminate supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.
1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
 2. Maximum Air Velocity: 4000 fpm.
 3. Temperature Range: Minus 20 to plus 210 deg F.
 4. Insulation R-Value: R6.
- E. Insulated, Flexible Duct: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.
1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
 2. Maximum Air Velocity: 4000 fpm.
 3. Temperature Range: Minus 20 to plus 210 deg F.
 4. Insulation R-Value: R6.
- F. Insulated, Flexible Duct: UL 181, Class 0, interlocking spiral of aluminum foil; fibrous-glass insulation; aluminized vapor-barrier film.
1. Pressure Rating: 8-inch wg positive or negative.
 2. Maximum Air Velocity: 5000 fpm.
 3. Temperature Range: Minus 20 to plus 250 deg F.
 4. Insulation R-Value: R6.

3.3 FLEXIBLE DUCT CONNECTORS

- A. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.
- B. Non-Clamp Connectors: Adhesive plus sheet metal screws.

PART 4 - EXECUTION

4.1 INSTALLATION

- A. Install flexible ducts according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install in indoor applications only. Flexible ductwork should not be exposed to UV lighting.
- C. Connect diffusers connect to ducts directly or with maximum 48-inch lengths of flexible duct clamped or strapped in place.
- D. Connect flexible ducts to metal ducts with adhesive plus sheet metal screws.
- E. Installation:
 - 1. Install ducts fully extended.
 - 2. Do not bend ducts across sharp corners.
 - 3. Bends of flexible ducting shall not exceed a minimum of one duct diameter.
 - 4. Avoid contact with metal fixtures, water lines, pipes, or conduits.
 - 5. Install flexible ducts in a direct line, without sags, twists, or turns.
- F. Supporting Flexible Ducts:
 - 1. Suspend flexible ducts with bands 1-1/2 inches wide or wider and spaced a maximum of 48 inches apart. Maximum centerline sag between supports shall not exceed 1/2 inch per 12 inches.
 - 2. Install extra supports at bends placed approximately one duct diameter from center line of the bend.
 - 3. Ducts may rest on ceiling joists or truss supports. Spacing between supports shall not exceed the maximum spacing per manufacturer's written installation instructions.
 - 4. Vertically installed ducts shall be stabilized by support straps at a maximum of 72 inches o.c.

END OF SECTION

SECTION 23 3600

PART 1 -

AIR TERMINAL UNITS

PART 2 - GENERAL

2.1 RELATED DOCUMENTS

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

2.2 SUMMARY

- A. Section Includes:
 - 1. Shutoff, single-duct air terminal units.

2.3 ACTION SUBMITTALS

- A. Product Data: For each type of air terminal unit.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for air terminal units.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For air terminal units.
 - 1. Include plans, elevations, sections, and mounting details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include diagrams for power, signal, and control wiring.
 - 4. Hangers and supports, including methods for duct and building attachment and vibration isolation.

2.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For air terminal units to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 01 7823 "Operation and Maintenance Data," include the following:

- a. Instructions for resetting minimum and maximum air volumes.
- b. Instructions for adjusting software set points.

PART 3 - PRODUCTS

3.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."
- C. ASHRAE Compliance: Applicable requirements in ASHRAE/IES 90.1, "Section 6 - Heating, Ventilating, and Air Conditioning."

3.2 SHUTOFF, SINGLE-DUCT AIR TERMINAL UNITS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Anemostat Products; a Mestek company.
 2. Carnes Company.
 3. ENVIRO-TEC; by Johnson Controls, Inc.
 4. Johnson Controls.
 5. Krueger.
 6. METALAIRE, Inc.
 7. Nailor Industries Inc.
 8. Price Industries.
 9. Titus.
 10. Trane.
- B. Configuration: Volume-damper assembly inside unit casing with control components inside a protective metal shroud.
- C. Casing: 0.040-inch- thick galvanized steel, single wall.
 1. Casing Liner: Comply with requirements in "Casing Liner" Article for fibrous-glass duct liner.
 2. Air Inlet: Round stub connection or S-slip and drive connections for duct attachment.
 3. Air Outlet: S-slip and drive connections, size matching inlet size.
 4. Access: Removable panels for access to parts requiring service, adjustment, or maintenance; with airtight gasket.
 5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- D. Regulator Assembly: System-air-powered bellows section incorporating polypropylene bellows for volume regulation and thermostatic control. Bellows shall operate at temperatures from zero

to 140 deg F, shall be impervious to moisture and fungus, shall be suitable for 10-inch wg static pressure, and shall be factory tested for leaks.

- E. Volume Damper: Galvanized steel with peripheral gasket and self-lubricating bearings.
 - 1. Maximum Damper Leakage: AHRI 880 rated, 3 percent of nominal airflow at 6-inch wg inlet static pressure.
 - 2. Damper Position: Normally open.
- F. Hydronic Heating Coils: 2-row coil with copper tubes and mechanically bonded aluminum fins spaced no closer than 0.1 inch, and rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 deg F. Include manual air vent and drain valve.
- G. Controls:
 - 1. Suitable for operation with duct pressures between 0.25- and 3.0-inch wg inlet static pressure.
 - 2. System-powered, wall-mounted thermostat.

PART 4 - EXECUTION

4.1 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 5, "Hangers and Supports" and with Section 23 0529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Where practical, install concrete inserts before placing concrete.
 - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes and for slabs more than 4 inches thick.
 - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes and for slabs less than 4 inches thick.
 - 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hangers Exposed to View: Threaded rod and angle or channel supports.
- D. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

4.2 TERMINAL UNIT INSTALLATION

- A. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.
- B. Install wall-mounted thermostats.

4.3 CONNECTIONS

- A. Where installing piping adjacent to air terminal unit, allow space for service and maintenance.
- B. Hot-Water Piping: Comply with requirements in Section 23 2113 "Hydronic Piping" and Section 23 2116 Hydronic Piping Specialties," and connect heating coils to supply with shutoff valve, strainer, control valve, and union or flange; and to return with balancing valve and union or flange.
- C. Comply with requirements in Section 23 3113 "Metal Ducts" for connecting ducts to air terminal units.
- D. Make connections to air terminal units with flexible connectors complying with requirements in Section 23 3300 "Air Duct Accessories."

4.4 IDENTIFICATION

- A. Label each air terminal unit with plan number, nominal airflow, and maximum and minimum factory-set airflows. Comply with requirements in Section 23 0553 "Identification for HVAC Piping and Equipment" for equipment labels and warning signs and labels.

4.5 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. After installing air terminal units and after electrical circuitry has been energized, test for compliance with requirements.
 - 2. Leak Test: After installation, fill water coils and test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Air terminal unit will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

4.6 STARTUP SERVICE

- A. Perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
 - 2. Verify that inlet duct connections are as recommended by air terminal unit manufacturer to achieve proper performance.
 - 3. Verify that controls and control enclosure are accessible.
 - 4. Verify that control connections are complete.
 - 5. Verify that nameplate and identification tag are visible.
 - 6. Verify that controls respond to inputs as specified.

4.7 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain air terminal units.

END OF SECTION

SECTION 23 3713.13

PART 1 -

AIR DIFFUSERS

PART 2 - GENERAL

2.1 RELATED DOCUMENTS

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

2.2 SUMMARY

- A. Section Includes:

- 1. Round ceiling diffusers.
- 2. Rectangular and square ceiling diffusers.
- 3. Perforated diffusers.
- 4. Louver face diffusers.
- 5. Linear bar diffusers.
- 6. Linear slot diffusers.
- 7. High-capacity drum louver diffusers.

- B. Related Requirements:

- 1. Section 23 3300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers.
- 2. Section 23 3713.23 "Air Registers and Grilles" for adjustable-bar register and grilles, fixed-face registers and grilles, and linear bar grilles.

2.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
- 2. Diffuser Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 3 - PRODUCTS

3.1 ROUND CEILING DIFFUSERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Anemostat Products; a Mestek company.
 - 2. Carnes Company.
 - 3. Hart & Cooley Inc.
 - 4. METALAIRE, Inc.
 - 5. Nailor Industries Inc.
 - 6. Price Industries.
- B. Devices shall be specifically designed for variable-air-volume flows.
- C. Material: Aluminum.
- D. Finish: Baked enamel, white.
- E. Dampers: Radial opposed blade.
- F. Accessories:
 - 1. Equalizing grid.
 - 2. Plaster ring.

3.2 RECTANGULAR AND SQUARE CEILING DIFFUSERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Anemostat Products; a Mestek company.
 - 2. Carnes Company.
 - 3. Hart & Cooley Inc.
 - 4. Krueger.
 - 5. METALAIRE, Inc.
 - 6. Nailor Industries Inc.
 - 7. Price Industries.
- B. Devices shall be specifically designed for variable-air-volume flows.
- C. Material: Aluminum.
- D. Finish: Baked enamel, white.
- E. Dampers: Combination damper and grid.
- F. Accessories:

1. Equalizing grid.
2. Plaster ring.

3.3 PERFORATED DIFFUSERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. A-J Manufacturing Co., Inc.
 2. Carnes Company.
 3. Hart & Cooley Inc.
 4. Krueger.
 5. METALAIRE, Inc.
 6. Nailor Industries Inc.
 7. Price Industries.
 8. Titus.
- B. Devices shall be specifically designed for variable-air-volume flows.
- C. Material: Steel backpan and pattern controllers, with aluminum face.
- D. Finish: Baked enamel, white.
- E. Duct Inlet: Round.
- F. Dampers: Opposed blade.
- G. Accessories:
1. Equalizing grid.
 2. Plaster ring.

3.4 LOUVER FACE DIFFUSERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. A-J Manufacturing Co., Inc.
 2. Anemostat Products; a Mestek company.
 3. Carnes Company.
 4. METALAIRE, Inc.
 5. Nailor Industries Inc.
 6. Price Industries.
- B. Devices shall be specifically designed for variable-air-volume flows.
- C. Material: Aluminum.
- D. Finish: Baked enamel, white.

- E. Pattern: Two-way core style.
- F. Dampers: Combination damper and grid.
- G. Accessories:
 - 1. Square to round neck adaptor.
 - 2. Adjustable pattern vanes.
 - 3. Throw reducing vanes.
 - 4. Equalizing grid.

3.5 LINEAR BAR DIFFUSERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Anemostat Products; a Mestek company.
 - 2. Carnes Company.
 - 3. Hart & Cooley Inc.
 - 4. Krueger.
 - 5. METALAIRE, Inc.
 - 6. Nailor Industries Inc.
 - 7. Price Industries.
- B. Devices shall be specifically designed for variable-air-volume flows.
- C. Material: Aluminum.
- D. Finish: Baked enamel, white.
- E. Two-Way Deflection Vanes: Extruded construction fixed louvers with removable core.
- F. Frame: 1 inch wide.
- G. Mounting: Countersunk screw.
- H. Damper Type: Adjustable opposed-blade assembly.

3.6 LINEAR SLOT DIFFUSERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Anemostat Products; a Mestek company.
 - 2. Carnes Company.
 - 3. Hart & Cooley Inc.
 - 4. Krueger.
 - 5. METALAIRE, Inc.
 - 6. Nailor Industries Inc.
 - 7. Price Industries.

- B. Devices shall be specifically designed for variable-air-volume flows.
- C. Material - Shell: Aluminum, insulated.
- D. Material - Pattern Controller and Tees: Aluminum.
- E. Finish - Face and Shell: Baked enamel, black.
- F. Finish - Pattern Controller: Baked enamel, black.
- G. Finish - Tees: Baked enamel, white.

3.7 HIGH-CAPACITY DRUM LOUVER DIFFUSERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Anemostat Products; a Mestek company.
 - 2. Carnes Company.
 - 3. Hart & Cooley Inc.
 - 4. Krueger.
 - 5. METALAIRE, Inc.
 - 6. Nailor Industries Inc.
 - 7. Price Industries.
- B. Airflow Principle: Extended distance for high airflow rates.
- C. Material: Aluminum, heavy gage extruded.
- D. Finish: White baked acrylic.
- E. Border: 1-1/4-inch width with countersunk screw holes.
- F. Gasket between drum and border.
- G. Body: Drum shaped; adjustable vertically.
- H. Blades: Individually adjustable horizontally.
- I. Mounting: Surface to duct or wall.
- J. Accessories:
 - 1. Opposed-blade steel damper.
 - 2. Duct-mounting collars with countersunk screw holes.

3.8 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate diffusers according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 4 - EXECUTION

4.1 EXAMINATION

- A. Examine areas where diffusers are installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

4.2 INSTALLATION

- A. Install diffusers level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

4.3 ADJUSTING

- A. After installation, adjust diffusers to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

SECTION 23 3713.23

PART 1 -

REGISTERS AND GRILLES

PART 2 - GENERAL

2.1 RELATED DOCUMENTS

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

2.2 SUMMARY

- A. Section Includes:

- 1. Adjustable blade face registers and grilles.
- 2. Fixed face registers and grilles.
- 3. Linear bar grilles.

- B. Related Requirements:

- 1. Section 23 3300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to registers and grilles.
- 2. Section 23 3713.13 "Air Diffusers" for various types of air diffusers.

2.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
- 2. Register and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 3 - PRODUCTS

3.1 REGISTERS

- A. Adjustable Blade Face Register:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Anemostat Products; a Mestek company.
 - b. Carnes Company.
 - c. Hart & Cooley Inc.
 - d. Krueger.
 - e. METALAIRE, Inc.
 - f. Nailor Industries Inc.
 - g. Price Industries.
 - h. Metalaire
- 2. Material: Steel.
 - 3. Finish: Baked enamel, white.
 - 4. Face Blade Arrangement: Horizontal spaced 1/2 inch apart.
 - 5. Core Construction: Integral.
 - 6. Damper Type: Adjustable opposed blade.
 - 7. Accessories:
 - a. Rear-blade gang operator.

B. Fixed Face Register:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A-J Manufacturing Co., Inc.
 - b. Anemostat Products; a Mestek company.
 - c. Carnes Company.
 - d. Hart & Cooley Inc.
 - e. Krueger.
 - f. Nailor Industries Inc.
 - g. Price Industries.
 - h. Metalaire
- 2. Material: Steel.
- 3. Finish: Baked enamel, white.
- 4. Face Blade Arrangement: Horizontal spaced 1/2 inch apart.
- 5. Face Arrangement: Perforated core.
- 6. Core Construction: Integral.
- 7. Damper Type: Adjustable opposed blade.
- 8.

3.2 GRILLES

A. Adjustable Blade Face Grille:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A-J Manufacturing Co., Inc.
 - b. Anemostat Products; a Mestek company.
 - c. Carnes Company.

- d. Hart & Cooley Inc.
 - e. Krueger.
 - f. METALAIRE, Inc.
 - g. Nailor Industries Inc.
 - h. Price Industries.
 - i. Metalaire
- 2. Material: Steel.
 - 3. Finish: Baked enamel, white.
 - 4. Core Construction: Integral.
 - 5. Accessories:
 - a. Rear-blade gang operator.

B. Fixed Face Grille:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anemostat Products; a Mestek company.
 - b. Carnes Company.
 - c. Hart & Cooley Inc.
 - d. Krueger.
 - e. Nailor Industries Inc.
 - f. Price Industries.
 - g. Metalaire
- 2. Material: Steel.
- 3. Finish: Baked enamel, white.
- 4. Face Blade Arrangement: Horizontal; spaced 1/2 inch apart.
- 5. Face Arrangement: Perforated core.
- 6. Core Construction: Integral.

C. Linear Bar Grilles

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A-J Manufacturing Co., Inc.
 - b. Anemostat Products; a Mestek company.
 - c. Carnes Company.
 - d. Hart & Cooley Inc.
 - e. Krueger.
 - f. Nailor Industries Inc.
 - g. Price Industries.
 - h. Metalaire
- 2. Material: Steel.
- 3. Finish: Baked enamel, white.
- 4. Face Blade Arrangement: Horizontal; spaced 1/2 inch apart.
- 5. Face Arrangement: Perforated core.

6. Core Construction: Integral.
7. Distribution plenum.
 - a. Internal insulation.
 - b. Inlet damper.
8. Damper Type: Adjustable opposed blade.

PART 4 - EXECUTION

4.1 EXAMINATION

- A. Examine areas where registers and grilles are installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

4.2 INSTALLATION

- A. Install registers and grilles level and plumb.
- B. Outlets and Inlets Locations: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install registers and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

4.3 ADJUSTING

- A. After installation, adjust registers and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

SECTION 23 7416.13

PART 1 -

PACKAGED, LARGE-CAPACITY, ROOFTOP AIR-CONDITIONING UNITS

(Cooling Only)

PART 2 - GENERAL

2.1 RELATED DOCUMENTS

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

2.2 SUMMARY

- A. Section includes packaged, large-capacity, rooftop air conditioning units (RTUs) with the following components and accessories:
 - 1. Casings.
 - 2. Fans.
 - 3. Motors.
 - 4. Coils.
 - 5. Refrigerant circuit components.
 - 6. Air filtration.
 - 7. Dampers.
 - 8. Electrical power connections.
 - 9. Controls.
 - 10. Accessories
 - 11. Plenum Curbs.

2.3 DEFINITIONS

- A. DDC: Direct-digital controls.
- B. Outdoor-Air Refrigerant Coil: Refrigerant coil in the outdoor-air stream to reject heat during cooling operations and to absorb heat during heating operations. "Outdoor air" is defined as the air outside the building or taken from outdoors and not previously circulated through the system.
- C. RTU: Rooftop unit. As used in this Section, this abbreviation means packaged, large-capacity, rooftop air-conditioning units. This abbreviation is used regardless of whether the unit is mounted on the roof or on a concrete base on ground.

- D. Supply-Air Fan: The fan providing supply air to conditioned space. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.
- E. Supply-Air Refrigerant Coil: Refrigerant coil in the supply-air stream to absorb heat (provide cooling) during cooling operations and to reject heat (provide heating) during heating operations. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

2.4 ACTION SUBMITTALS

- A. Product Data: Include manufacturer's technical data for each RTU, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.
 - 1. Factory selection calculations for each antimicrobial ultraviolet lamp installation.
- B. Shop Drawings:
 - 1. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Include diagrams for power, signal, and control wiring.

2.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Structural members to which RTUs will be attached.
 - 2. Roof openings.
 - 3. Roof curbs and flashing.

2.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For RTUs to include in emergency, operation, and maintenance manuals.

2.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Filters: One set(s) of filters for each unit.

2.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of RTUs that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Compressors: Manufacturer's standard, but not less than five years from date of Substantial Completion.
2. Warranty Period for Solid-State Ignition Modules: Manufacturer's standard, but not less than three years from date of Substantial Completion.
3. Warranty Period for Control Boards: Manufacturer's standard, but not less than three years from date of Substantial Completion.

PART 3 - PRODUCTS

3.1 SYSTEM DESCRIPTION

A. AHRI Compliance:

1. Comply with AHRI 340/360 for testing and rating energy efficiencies for RTUs.
2. Comply with AHRI 270 for testing and rating sound performance for RTUs.
3. Comply with AHRI 1060 for testing and rating performance for air-to-air exchanger.
4. Comply with AHRI 210/240 for testing and rating energy efficiencies for RTUs.

B. AMCA Compliance:

1. Comply with AMCA 11 and bear the AMCA-Certified Ratings Seal for air and sound performance according to AMCA 211 and AMCA 311.
2. Damper leakage tested in accordance with AMCA 500-D.
3. Operating Limits: Classify according to AMCA 99.

C. ASHRAE Compliance:

1. Comply with ASHRAE 15 for refrigeration system safety.
2. Comply with ASHRAE 33 for methods of testing cooling and heating coils.
3. Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

D. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

E. NFPA Compliance: Comply with NFPA 90A or NFPA 90B.

F. UL Compliance: Comply with UL 1995.

G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

3.2 MANUFACTURERS

A. Manufacturers Cooling Only Unit: Subject to compliance with requirements, provide products by one of the following:

1. AAON.
2. Daikin Applied.

3. JCI/York.
4. Valent

3.3 CASINGS

- A. General Fabrication Requirements for Casings: Formed and reinforced double-wall insulated panels, fabricated to allow removal for access to internal parts and components, with joints between sections sealed.
- B. Double-Wall Construction: Fill space between walls with 2 inch foam insulation and seal moisture tight for R-13 performance.
- C. Exterior Casing Material: Galvanized steel with factory-painted finish, with pitched roof panels and knockouts with grommet seals for electrical and piping connections and lifting lugs.
- D. Inner Casing Fabrication Requirements:
 1. Inside Casing: G-90-coated galvanized steel, 0.034 inch thick.
- E. Condensate Drain Pans: Fabricated using stainless 0.025 inch thick steel sheet, a minimum of 2 inches deep, and complying with ASHRAE 62.1 for design and construction of drain pans.
 1. Double-Wall Construction: Fill space between walls with foam insulation and seal moisture tight.
 2. Drain Connections: Threaded nipple.
- F. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

3.4 FANS

- A. Supply-Air Fans: Aluminum or painted-steel wheels, and galvanized- or painted-steel fan scrolls.
 1. Direct-Driven Supply-Air Fans: Motor shall be resiliently mounted in the fan inlet.
- B. Condenser-Coil Fan: Variable-speed propeller, mounted on shaft of permanently lubricated multi-speed motors.
- C. Relief-Air Fan: Forward curved, shaft mounted on permanently lubricated motor.

3.5 MOTORS

- A. Comply with Section 23 0513 "Common Motor Requirements for HVAC Equipment" and the requirements of this Article.
- B. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

- C. Service Factor: 1.15.
- D. Efficiency: Premium efficient.
- E. NEMA Design: B.

3.6 COILS

- A. Supply-Air Refrigerant Coil:
 - 1. Aluminum-plate fin and seamless internally grooved copper tube in steel casing with equalizing-type vertical distributor.
 - 2. Polymer strip shall prevent all copper coil from contacting steel coil frame or condensate pan.
 - 3. Coil Split: Interlaced.
 - 4. Condensate Drain Pan: Stainless steel formed with pitch and drain connections complying with ASHRAE 62.1.
- B. Outdoor-Air Refrigerant Coil:
 - 1. Aluminum-plate fin and seamless internally grooved copper tube in steel casing with equalizing-type vertical distributor.
 - 2. Polymer strip shall prevent all copper coil from contacting steel coil frame or condensate pan.
- C. Hot-Gas Reheat Refrigerant Coil:
 - 1. Aluminum-plate fin and seamless internally grooved copper tube in steel casing with equalizing-type vertical distributor.
 - 2. Polymer strip shall prevent all copper coil from contacting steel coil frame or condensate pan.
 - 3. Suction-discharge bypass valve.

3.7 REFRIGERANT CIRCUIT COMPONENTS

- A. Number of Refrigerant Circuits: Two.
- B. Compressor: Hermetic, variable speed scroll, mounted on vibration isolators; with internal overcurrent and high-temperature protection, internal pressure relief.
- C. Refrigeration Specialties:
 - 1. Refrigerant: R-454B.
 - 2. Refrigerant Detection
 - 3. Emergency Operation for A2L Refrigerant.
 - 4. Expansion valve with replaceable thermostatic element.
 - 5. Refrigerant filter/dryer.
 - 6. Manual-reset high-pressure safety switch.

7. Automatic-reset low-pressure safety switch.
8. Minimum off-time relay.
9. Automatic-reset compressor motor thermal overload.
10. Brass service valves installed in compressor suction and liquid lines.
11. Low-ambient kit high-pressure sensor.
12. Hot-gas reheat solenoid valve modulating with a replaceable magnetic coil.

3.8 AIR FILTRATION

- A. Minimum arrestance and a minimum efficiency reporting value according to ASHRAE 52.2.
- B. Pleated Panel Filters:
 1. Description: Factory-fabricated, self-supported, extended-surface, pleated, panel-type, disposable air filters with holding frames.
 2. Filter Unit Class: UL 900, Class 1.
 3. Media: Interlaced glass or synthetic fibers coated with nonflammable adhesive.
 - a. Adhesive: As recommended by air-filter manufacturer and with a VOC content of 80 g/L or less.
 - b. Adhesive: As recommended by air-filter manufacturer and that complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - c. Media shall be coated with an antimicrobial agent.
 - d. Separators shall be bonded to the media to maintain pleat configuration.
 - e. Welded-wire grid shall be on downstream side to maintain pleat.
 - f. Media shall be bonded to frame to prevent air bypass.
 - g. Support members on upstream and downstream sides to maintain pleat spacing.

3.9 DAMPERS

- A. Outdoor- and Return-Air Mixing Dampers: Parallel-blade galvanized-steel dampers mechanically fastened to cadmium plated for galvanized-steel operating rod in reinforced cabinet. Connect operating rods with common linkage or gears and interconnect so dampers operate simultaneously.
 1. Leakage Rate: As required by ASHRAE/IES 90.1.
 2. Damper Motor: Modulating with adjustable minimum position.
 3. Relief-Air Damper: Gravity actuated or motorized, as required by ASHRAE/IES 90.1, with bird screen and hood.

3.10 ELECTRICAL POWER CONNECTIONS

- A. RTU shall have a single connection of power to unit with unit-mounted disconnect switch accessible from outside unit and control-circuit transformer with built-in overcurrent protection.

3.11 CONTROLS

A. Basic Unit Controls:

1. Control-voltage transformer.
2. Wall-mounted thermostat or sensor with the following features:
 - a. Heat-cool-off switch.
 - b. Fan on-auto switch.
 - c. Fan-speed switch.
 - d. Automatic changeover.
 - e. Adjustable deadband.
 - f. Exposed set point.
 - g. Exposed indication.
 - h. Degree F indication.
 - i. Unoccupied-period-override push button.
 - j. Data entry and access port to input temperature and humidity set points, occupied and unoccupied periods, and output room temperature and humidity, supply-air temperature, operating mode, and status.
3. Wall-mounted humidistat or sensor with the following features:
 - a. Exposed set point.
 - b. Exposed indication.

B. DDC Controller:

1. Controller shall have volatile-memory backup.
2. Safety Control Operation:
 - a. Low-Discharge Temperature: Stop fan and close outdoor-air damper if supply air temperature is less than 40 deg F.
 - b. Defrost Control for Condenser Coil: Pressure differential switch to initiate defrost sequence.
3. Scheduled Operation: Occupied and unoccupied periods on seven 365-day clock with a minimum of four programmable periods per day.
4. Unoccupied Period:
 - a. Heating Setback: Plus 10 deg F.
 - b. Cooling Setback: System off.
 - c. Override Operation: Two hours.
5. Supply Fan Operation:
 - a. Occupied Periods: Run fan continuously.
 - b. Unoccupied Periods: Cycle fan to maintain setback temperature.
6. Refrigerant Circuit Operation:
 - a. Occupied Periods: Cycle or stage compressors to match compressor output to cooling load to maintain discharge temperature and humidity. Cycle condenser

fans to maintain maximum hot-gas pressure. Operate low-ambient control kit to maintain minimum hot-gas pressure.

- b. Unoccupied Periods: Cycle compressors and condenser fans for heating to maintain setback temperature.
7. Hot-Gas Reheat-Coil Operation:
- a. Occupied Periods: Humidistat opens hot-gas valve to provide hot-gas reheat, and cycles compressor.
 - b. Unoccupied Periods: Reheat not required.
8. Fixed Minimum Outdoor-Air Damper Operation:
- a. Occupied Periods: Open to 25 percent.
 - b. Unoccupied Periods: Close the outdoor-air damper.
9. Economizer Outdoor-Air Damper Operation:
- a. Morning warm up and cool down cycles.
 - b. Occupied Periods: Open to 25 percent fixed minimum intake, and maximum 100 percent of the fan capacity. Controller shall permit air-side economizer operation when outdoor air is less than 60 deg F. Use mixed-air temperature and select between outdoor-air and return-air enthalpy to adjust mixing dampers. Start relief-air fan with end switch on outdoor-air damper. During economizer cycle operation, lock out cooling.
 - c. Unoccupied Periods: Close outdoor-air damper and open return-air damper.
10. Carbon Dioxide Sensor Operation:
- a. Occupied Periods: Reset minimum outdoor-air ratio down to minimum 10 percent to maintain maximum 1000-ppm concentration.
 - b. Unoccupied Periods: Close outdoor-air damper and open return-air damper.

C. Interface Requirements for HVAC Instrumentation and Control System:

- 1. Interface relay for scheduled operation.
- 2. Interface relay to provide indication of fault at the central workstation and diagnostic code storage.
- 3. Provide BACnet compatible interface for central HVAC control workstation for the following:
 - a. Adjusting set points.
 - b. Monitoring supply fan start, stop, and operation.
 - c. Inquiring data to include supply- and room-air temperature and humidity.
 - d. Monitoring occupied and unoccupied operations.
 - e. Monitoring constant and variable motor loads.
 - f. Monitoring variable-frequency drive operation.
 - g. Monitoring cooling load.
 - h. Monitoring economizer cycles.
 - i. Monitoring air-distribution static pressure and ventilation air volume.

3.12 ACCESSORIES

- A. Duplex, 115-V, ground-fault-interrupter outlet with 15-A overcurrent protection. Include transformer if required. Outlet shall be energized even if the unit main disconnect is open.
- B. Filter differential pressure switch with sensor tubing on either side of filter. Set for final filter pressure loss.
- C. Remote potentiometer to adjust minimum economizer damper position.
- D. Return-air bypass damper.
- E. Factory- or field-installed demand-controlled ventilation.
- F. Safeties:
 - 1. Condensate overflow switch.
 - 2. Phase-loss reversal protection.
 - 3. High and low pressure control.
- G. Hail guards of galvanized steel, painted to match casing.
- H. Door switches to disable heating or reset set point when open.
- I. Outdoor air intake weather hood.

3.13 PLENUM CURBS

- A. Materials: Galvanized steel with corrosion-protection coating, watertight gaskets, and factory-installed wood nailer; complying with NRCA standards.
 - 1. Insulated Plenum Curb with Supply air Outlet and Return air inlet.
 - 2. Curb Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.
 - a. Materials: ASTM C 1071, Type I or II.
 - b. R Value: Minimum R12.
 - 3. Application: Factory applied with adhesive and mechanical fasteners to the internal surface of curb.
 - a. Liner Adhesive: Comply with ASTM C 916, Type I.
 - b. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in cabinet.
 - c. Liner materials applied in this location shall have air-stream surface coated with a temperature-resistant coating or faced with a plain or coated fibrous mat or fabric depending on service air velocity.
 - d. Liner Adhesive: Comply with ASTM C 916, Type I.
- B. Curb Dimensions: Height of 36 inches.

PART 4 - EXECUTION

4.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of RTUs.
- B. Examine roughing-in for RTUs to verify actual locations of piping and duct connections before equipment installation.
- C. Examine roofs for suitable conditions where RTUs will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

4.2 INSTALLATION

- A. **Roof Curb:** Install on roof structure or concrete base, level and secure, according to NRCA's "NRCA Roofing Manual: Membrane Roof Systems." Install RTUs on curbs and coordinate roof penetrations and flashing with roof construction specified in Section 07 7200 "Roof Accessories." Secure RTUs to upper curb rail, and secure curb base to roof framing or concrete base with anchor bolts.
- B. **Unit Support:** Install unit level on structural curbs. Coordinate wall penetrations and flashing with wall construction. Secure RTUs to structural support with anchor bolts.

4.3 CONNECTIONS

- A. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.
- B. Duct installation requirements are specified in other HVAC Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:
 - 1. Install ducts to termination at top of roof curb.
 - 2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
 - 3. Connect supply ducts to RTUs with flexible duct connectors specified in Section 23 3300 "Air Duct Accessories."
 - 4. Install return-air duct continuously through roof structure.
- C. Connect electrical wiring according to Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."
- D. Ground equipment according to Section 26 0526 "Grounding and Bonding for Electrical Systems."
- E. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

1. Nameplate shall be laminated acrylic or melamine plastic signs as specified in Section 26 0553 "Identification for Electrical Systems."
2. Nameplate shall be laminated acrylic or melamine plastic signs as layers of black with engraved white letters at least 1/2 inch high.
3. Locate nameplate where easily visible.

4.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
 2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. RTU will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

4.5 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
- B. Complete installation and startup checks according to manufacturer's written instructions.
 1. Inspect for visible damage to unit casing.
 2. Inspect for visible damage to furnace combustion chamber.
 3. Inspect for visible damage to compressor, coils, and fans.
 4. Inspect internal insulation.
 5. Verify that labels are clearly visible.
 6. Verify that clearances have been provided for servicing.
 7. Verify that controls are connected and operable.
 8. Verify that filters are installed.
 9. Clean condenser coil and inspect for construction debris.
 10. Clean furnace flue and inspect for construction debris.
 11. Connect and purge gas line.
 12. Remove packing from vibration isolators.
 13. Inspect operation of barometric relief dampers.
 14. Verify lubrication on fan and motor bearings.
 15. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
 16. Adjust fan belts to proper alignment and tension.

17. Start unit according to manufacturer's written instructions.
 - a. Start refrigeration system.
 - b. Do not operate below recommended low-ambient temperature.
 - c. Complete startup sheets and attach copy with Contractor's startup report.
18. Inspect and record performance of interlocks and protective devices; verify sequences.
19. Operate unit for an initial period as recommended or required by manufacturer.
20. Perform the following operations for both minimum and maximum firing. Adjust burner for peak efficiency.
 - a. Measure gas pressure on manifold.
 - b. Inspect operation of power vents.
 - c. Measure combustion-air temperature at inlet to combustion chamber.
 - d. Measure flue-gas temperature at furnace discharge.
 - e. Perform flue-gas analysis. Measure and record flue-gas carbon dioxide and oxygen concentration.
 - f. Measure supply-air temperature and volume when burner is at maximum firing rate and when burner is off. Calculate useful heat to supply air.
21. Calibrate thermostats.
22. Adjust and inspect high-temperature limits.
23. Inspect outdoor-air dampers for proper stroke and interlock with return-air dampers.
24. Start refrigeration system and measure and record the following when ambient is a minimum of 15 deg F above return-air temperature:
 - a. Coil leaving-air, dry- and wet-bulb temperatures.
 - b. Coil entering-air, dry- and wet-bulb temperatures.
 - c. Outdoor-air, dry-bulb temperature.
 - d. Outdoor-air-coil, discharge-air, dry-bulb temperature.
25. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
26. Measure and record the following minimum and maximum airflows. Plot fan volumes on fan curve.
 - a. Supply-air volume.
 - b. Return-air volume.
 - c. Relief-air volume.
 - d. Outdoor-air intake volume.
27. Simulate maximum cooling demand and inspect the following:
 - a. Compressor refrigerant suction and hot-gas pressures.
 - b. Short circuiting of air through condenser coil or from condenser fans to outdoor-air intake.
28. Verify operation of remote panel including pilot-light operation and failure modes. Inspect the following:
 - a. High-temperature limit on gas-fired heat exchanger.

- b. Low-temperature safety operation.
 - c. Filter high-pressure differential alarm.
 - d. Economizer to minimum outdoor-air changeover.
 - e. Relief-air fan operation.
 - f. Smoke and firestat alarms.
29. After startup and performance testing and prior to Substantial Completion, replace existing filters with new filters.

4.6 CLEANING AND ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
- B. After completing system installation and testing, adjusting, and balancing RTU and air-distribution systems, clean filter housings and install new filters.

4.7 DEMONSTRATION

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

END OF SECTION

SECTION 23 8126

SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes split-system air-conditioning units consisting of separate evaporator-fan and compressor-condenser components.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Filters: One set(s) for each air-handling unit.
 - 2. Gaskets: One set(s) for each access door.
 - 3. Fan Belts: One set(s) for each air-handling unit fan.

1.6 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance:

1. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - "Procedures," and Section 7 - "Construction and System Start-up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

1.7 COORDINATION

- A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Warranty Period:

- a. For Compressor: One year(s) from date of Substantial Completion.
- b. For Parts: One year(s) from date of Substantial Completion.
- c. For Labor: One year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carrier Corporation; a unit of United Technologies Corp.
2. Samsung
3. Lennox Industries, Inc.; Lennox International.
4. Mitsubishi Electric & Electronics USA, Inc.
5. SANYO North America Corporation.
6. Trane.
7. Daikin-McQuay
8. York-JCI

2.2 INDOOR UNITS (5 TONS OR LESS)

- A. Concealed Evaporator-Fan Components:

1. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
2. Insulation: Faced, glass-fiber duct liner.
3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
4. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
5. Fan Motors:
 - a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 23 0513 "Common Motor Requirements for HVAC Equipment."
 - b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
 - c. Wiring Terminations: Connect motor to chassis wiring with plug connection.
6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
7. Filters: Permanent, cleanable.
8. Condensate Drain Pans:
 - a. Fabricated with one percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.
 - b. Single-wall, galvanized-steel sheet.
 - c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.
 - 1) Minimum Connection Size: NPS 1.
 - d. Pan-Top Surface Coating: Asphaltic waterproofing compound.
 - e. Units with stacked coils shall have an intermediate drain pan to collect condensate from top coil.

B. Wall-Mounted, Evaporator-Fan Components:

1. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.
2. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
3. Fan: Direct drive, centrifugal.
4. Fan Motors:
 - a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 23 0513 "Common Motor Requirements for HVAC Equipment."
 - b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
 - c. Enclosure Type: Totally enclosed, fan cooled.
 - d. NEMA Premium (TM) efficient motors as defined in NEMA MG 1.

- e. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.
 - f. Mount unit-mounted disconnect switches on interior of unit.
5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
6. Condensate Drain Pans:
- a. Fabricated with one percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.
 - b. Single-wall, galvanized-steel sheet.
 - c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.
 - 1) Minimum Connection Size: NPS 1.
 - d. Pan-Top Surface Coating: Asphaltic waterproofing compound.
7. Air Filtration Section:
- a. General Requirements for Air Filtration Section:
 - 1) Comply with NFPA 90A.
 - 2) Minimum Arrestance and MERV according to ASHRAE 52.2.
 - 3) Filter-Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lifted out from access plenum.
 - b. Disposable Panel Filters:
 - 1) Factory-fabricated, viscous-coated, flat-panel type.
 - 2) Thickness: 1 inch.
 - 3) Arrestance according to ASHRAE 52.2: 80.
 - 4) MERV according to ASHRAE 52.2: 5.

2.3 OUTDOOR UNITS (5 TONS OR LESS)

A. Air-Cooled, Compressor-Condenser Components:

- 1. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
- 2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
 - a. Compressor Type: Scroll.
 - b. Refrigerant Charge: R-410A.

- c. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 206/110.
- 3. Heat-Pump Components: Reversing valve and low-temperature-air cutoff thermostat.
- 4. Fan: Aluminum-propeller type, directly connected to motor.
- 5. Motor: Permanently lubricated, with integral thermal-overload protection.
- 6. Low Ambient Kit: Permits operation down to -20 deg F.
- 7. Mounting Base: Polyethylene.

2.4 ACCESSORIES

- A. Control equipment and sequence of operation are specified in Section 23 0923 "Direct Digital Control (DDC) System for HVAC" and Section 23 0993.11 "Sequence of Operations for HVAC DDC."
- B. Thermostat: Low voltage with subbase to control compressor and evaporator fan.
- C. Thermostat: Wireless infrared functioning to remotely control compressor and evaporator fan, with the following features:
 - 1. Compressor time delay.
 - 2. 24-hour time control of system stop and start.
 - 3. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
 - 4. Fan-speed selection including auto setting.
- D. Automatic-reset timer to prevent rapid cycling of compressor.
- E. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.
- F. Drain Hose: For condensate.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install units level and plumb.
- B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
- C. Install roof-mounted, compressor-condenser components on pre-cast concrete pad.
- D. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.
- C. Duct Connections: Duct installation requirements are specified in Section 23 3113 "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply[and return] ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Section 23 3300 "Air Duct Accessories."

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Tests and Inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Remove and replace malfunctioning units and retest as specified above.
- E. Prepare test and inspection reports.

3.4 STARTUP SERVICE

- A. Perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.

3.5 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION

SECTION 23 8216.11

PART 1 -

HYDRONIC AIR COILS

PART 2 - GENERAL

2.1 RELATED DOCUMENTS

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

2.2 SUMMARY

- A. Section includes hydronic heating and cooling air coils.

2.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each air coil.
 - 2. Include rated capacities, operating characteristics, and pressure drops for each air coil.

2.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which coil location and ceiling-mounted access panels are shown and coordinated with each other.

2.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For air coils to include in operation and maintenance manuals.

PART 3 - PRODUCTS

3.1 DESCRIPTION

- A. ASHRAE Compliance: Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

3.2 COILS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Aerofin.
 - 2. Coil Company, LLC.
 - 3. Colmac Coil Manufacturing, Inc.
 - 4. Greenheck Fan Corporation.
 - 5. Heatcraft Worldwide Refrigeration.
 - 6. RAE Coils; a division of RAE Corporation.
 - 7. Daikin-McQuay
 - 8. JCI/York
 - 9. Aaon
 - 10. Carrier
 - 11. Trane
- B. Performance Ratings: Tested and rated according to AHRI 410 and ASHRAE 33.
- C. Minimum Working-Pressure/Temperature Ratings: 200 psig, 325 deg F.
- D. Source Quality Control: Factory tested to 300 psig.
- E. Tubes: ASTM B 743 copper, minimum 0.035 inch thick.
- F. Fins: Aluminum, minimum 0.010 inch thick.
- G. Headers: Seamless copper tube with brazed joints, prime coated.
- H. Frames: Galvanized-steel channel frame, minimum 0.064 inch thick for flanged mounting.

PART 4 - EXECUTION

4.1 EXAMINATION

- A. Examine ducts, plenums, and casings to receive air coils for compliance with requirements for installation tolerances and other conditions affecting coil performance.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before coil installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

4.2 INSTALLATION

- A. Install coils level and plumb.
- B. Install coils in metal ducts and casings constructed according to SMACNA's "HVAC Duct Construction Standards, Metal and Flexible."

- C. Install stainless-steel drain pan under each cooling coil.
 - 1. Construct drain pans with connection for drain; insulated and complying with ASHRAE 62.1.
 - 2. Construct drain pans to extend beyond coil length and width and to connect to condensate trap and drainage.
 - 3. Extend drain pan upstream and downstream from coil face.
 - 4. Extend drain pan under coil headers and exposed supply piping.
- D. Straighten bent fins on air coils.
- E. Clean coils using materials and methods recommended in writing by manufacturers, and clean inside of casings and enclosures to remove dust and debris.

4.3 CONNECTIONS

- A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to coils to allow service and maintenance.
- C. Connect water piping with unions and shutoff valves to allow coils to be disconnected without draining piping. Control valves are specified in Section 23 0923.11 "Control Valves," and other piping specialties are specified in Section 23 2116 "Hydronic Piping Specialties."

END OF SECTION

1. GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Specified Elsewhere:
 - 1. Division 22 – Plumbing Specifications and Drawings
 - 2. Division 23 – HVAC Specifications and Drawings
 - 3. Division 26 – Other Electrical Specifications and Drawings
 - 4. Division 27 – Communications
 - 5. Division 28 – Electronic Safety and Security
 - 6. Divisions 31-33 – Site Work Specifications and Drawings

1.2 SUMMARY

- A. Section Includes:
 - 1. Labor and materials for complete electrical systems. These materials include, but are not limited to; circuit breakers, devices, boxes, conduit, conductors, connectors, fittings, and anchors, as required and/or indicated in these specifications and/or shown on the Electrical drawings.
 - 2. Power connections and control equipment and wiring, as required for equipment furnished and installed under other sections or by Owner.
 - 3. All minor system components reasonably required for the proper functioning and/or safe operation of the electrical systems, and to meet all related codes and ordinances.
 - 4. Required system and component testing, as required in associated specification sections and/or related codes and ordinances.
 - 5. Coordination with other trades, Owner(s), suppliers, utilities, and Authorities Having Jurisdiction.
 - 6. General requirements included in this section apply to all other Division 26, 27, and 28 specifications and drawings.

1.3 DEFINITIONS (Apply to all sections)

- A. AHJ: Authority Having Jurisdiction
- B. FBO: Furnished by Others
- C. IAC: Illinois Accessibility Code (current edition)
- D. IBC: International Building Code (current edition adopted by the City of Peoria)
- E. IECC: International/Illinois Energy Conservation Code (current edition adopted by the State of Illinois)

- F. IFC: International Fire Code (current edition adopted by the City of Peoria)
- G. NEC: National Electrical Code (NFPA 72) (current edition adopted by the City of Peoria)
- H. NFPA: National Fire Protection Association (current edition adopted by the City of Peoria)
- I. NRTL: Nationally Recognized Testing Laboratory
- J. Provide: Furnish and install.

1.4 VERIFICATION OF CONNECTION POINTS

- A. Before submitting his proposal, Contractor shall visit the site to carefully verify all exposed points of existing utilities and new connections. Contractor shall verify concealed or buried points for connection, as near as possible. Verify these points as to locations, size, type, depth, operating characteristics, and complications; including, but not limited to:
 - 1. Present site conditions.
 - 2. Present and new electrical utility distribution system and requirements.
 - 3. Work associated with equipment provided under other sections, or by Owner.

1.5 COORDINATION

- A. Coordinate all work per requirements of Division 1.
- B. See mechanical, plumbing, and architectural specifications, drawings, and submittals for work concerning the connection of electrical systems and any required controls.
- C. Contractor shall verify electrical characteristics and requirements (name plate data) of equipment furnished by others for proper coordination and equipment operation. Contractor shall confirm requirements of final equipment furnished by others and shall select associated electrical devices and materials accordingly. Before any work is installed, and before any equipment is purchased, the Contractor shall carefully inspect specifications and plans for every trade and job condition, and any lack of coordination between his work, the plans, specifications, or job conditions, shall be immediately reported to the Architect/Engineer in writing.
- D. Contractor shall coordinate equipment connection requirements with approved equipment submittals, prior to rough-in.
- E. Coordinate arrangement, mounting, and support of electrical equipment;
 - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
 - 3. To allow right of way for piping and conduit installed at required slope.
 - 4. So connecting raceways, cables and wireways will be clear of obstructions and of the working and access space of other equipment.
- F. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

- G. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed.
- H. Coordinate sleeve selection and application with selection and application of firestopping.

2. PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. When two or more items of the same material or equipment are required, they shall be of the same manufacturer. Product manufacturer uniformity does not apply to raw materials, bulk materials, wire, conduit, fittings, sheet metal, steel bar stock, welding rods, solder, fasteners, motors for dissimilar equipment units, and similar items in Work, except as otherwise indicated.
- B. Provide products compatible within systems, with interconnected systems, and with other connected items.
- C. Products shall be provided with permanent operational data nameplate for each item of power operated equipment, indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data. Locate nameplate in an accessible location.

2.2 PRODUCT OPTIONS AND SUBSTITUTIONS

- A. Options and Substitutions shall be done per Division 1 instructions.
- B. All product substitutions shall include any incurred costs by the Contractor, any sub-contractor, other trades, Owner, or Owner's consultants. No increase in cost or contract shall be allowed for modifications or corrections, due to approval of Contractor requested or submitted, changes, variations, or substitutions from the basis of design.

2.3 SUBMITTALS FOR ELECTRICAL ITEMS

- A. Submit per Division 1 specification requirements.
- B. Electrical equipment and material submittals shall include a clear item description. Catalog numbers only, are not acceptable.
- C. Catalog pages must be clearly marked to indicate the exact product being proposed, with all necessary accessories and options identified and selected. Pages including multiple products or options, where selections are not clearly indicated, may be rejected for re-submittal.

2.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver products and materials to project site with proper identification, including; project name, part names, model numbers, types, grades, compliance labels, and similar information needed for distinct identifications; adequately packaged and protected to prevent damage during shipment, storage, and handling.
- B. Store equipment and materials at the site unless off-site storage is authorized in writing. Protect stored equipment and materials from damage.

- C. Coordinate deliveries of electrical materials and equipment to minimize construction site congestion. Limit each shipment of materials and equipment to the items and quantities needed for smooth and efficient flow of installations.

3. EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items, unless noted otherwise.
- C. If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements, for ease of maintenance.
- D. Coordinate electrical equipment and materials installation with other building components.
- E. Install equipment to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- F. Give right-of-way to piping systems installed at a required slope.
- G. Verify all dimensions with field measurements.
- H. Arrange for chases, slots, and openings in other building components to all for electrical installations.
- I. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of work.
- J. Coordinate the cutting and patching of building components to accommodate the installation of electrical equipment and materials.
- K. Install electrical equipment for compliance with code-required clearances. Contractor shall be responsible for identification of necessary clearance issues at the time products are submitted for approval.
- L. Coordinate the installation of electrical materials and equipment above ceilings with suspension system, mechanical equipment, piping, ductwork, and other systems and structural components.
- M. Drawings for work under Divisions 26, 27, and 28 are diagrammatic and are intended to convey the scope of work and indicate the general arrangement of conduit, boxes, equipment, lighting fixtures, and other work included in the contract.
 - 1. See details and schedules on drawings and specifications for meanings of abbreviations, additional requirements and information. Check civil, structural, mechanical, plumbing, and other electrical drawings for scale, space limitations, beams, door swings, windows, ductwork, coordination, and additional information, and report any discrepancies or conflicts to Architect/Engineer prior to submitting bid.
 - 2. The Contractor shall install and completely wire all equipment furnished by others (FBO) in accordance with the manufacturer's wiring diagrams and recommendations, necessary for a complete and operational installation. Contractor shall verify and coordinate electrical

characteristics and requirements of FBO equipment prior to ordering associated equipment and materials, or rough-in of boxes, conduit, and wiring, to avoid conflicts.

3.2 RECORD DOCUMENTS

- A. Provide Record Documents as required by this Section and Division 1 specifications.
- B. Mark drawings to indicate revisions to conduit size and location, both exterior and interior, actual equipment locations, and concealed equipment dimensioned to column lines or wall face. Record distribution and branch electrical circuitry, fuse and circuit breaker size and arrangements, and support and hanger details.
- C. Accurately mark locations of underground and under floor electrical conduits and conductors. Provide dimensions from fixed points of reference.
- D. Record Change Orders, Supplemental Instructions, or Field Directives, that modify work shown in contract documents, on drawings and in specifications.

3.3 OPERATION AND MAINTENANCE DATA

- A. Procedures and requirements for preparation and submittal of maintenance manuals shall be done as required by Division 1.
- B. In addition to the information required by Division 1 specifications, include the following information when requested:
 - 1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.
 - 2. Manufacturers' printed operating procedures to include start-up, break-in, and routine and normal operating instructions.
 - 3. Maintenance procedures for routine preventative maintenance and trouble-shooting, disassembly, repair, and reassembly, aligning and adjusting instructions.

3.4 WARRANTIES

- A. Procedures and submittal requirements for warranties shall be done as directed by the Division 1 specifications, and as pertains to specific warranties. See individual specification sections for warranty requirements that exceed 1 year or are otherwise distinct.
- B. Compile and assemble warranties specified for Divisions 26, 27, and 28 into a file folder labeled for this project.
- C. Provide complete warranty information for each product or equipment item, to include date of beginning of warranty or bond, duration of warranty or bond, and names, addresses, and telephone numbers and procedures for filing a claim and obtaining warranty services.
- D. Except as modified in individual specification sections:
 - 1. All materials and workmanship shall be warranted for 1 year.
 - 2. All warranties begin upon official date of substantial completion, allowing Owner's beneficial use of the work.

3. Warranted materials shall be provided for replacement within 30 days of notice of failure to Contractor (or as specifically allowed by Owner's Representative).
4. The first year of warranted items shall include materials and labor for replacement/repair and shall be responded to within 10 working days of notice of problem to Contractor. If the issue is of a severe nature, with the use of the facility at risk, response shall be within 2 calendar days.
5. Warranty material replacements shall not diminish the Owner's stock of extra items.

3.5 CLEANING

- A. General requirements for final cleaning shall be done as required by Division 1.
- B. Maintain clean work spaces with daily cleanup of all occupied areas.

3.6 TESTING

- A. Provide testing and documented results as required by each specification section or applicable codes, laws, and ordinances.
- B. Provide testing and documented results as required by manufacturer(s) for certification or warranty.

END 26 0500

1. GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.

1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For testing agency.
- C. Field quality-control test reports.

1.5 QUALITY ASSURANCE

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

2. PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Alcan Products Corporation; Alcan Cable Division.
 - 2. American Insulated Wire Corp.; a Leviton Company.
 - 3. General Cable Corporation.
 - 4. Senator Wire & Cable Company.
 - 5. Southwire Company.
- B. Copper Conductors: Comply with NEMA WC 70.

- C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN/THWN-2.
- D. Multiconductor Cable: Not permitted.

2.2 CONNECTORS AND SPLICES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Hubbell Power Systems, Inc.
 - 3. O-Z/Gedney; EGS Electrical Group LLC.
 - 4. 3M; Electrical Products Division.
 - 5. Tyco Electronics Corp.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

3. EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper. Stranded for all conductors.
- B. Branch Circuits: Copper. Stranded for all conductors.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN/THWN-2 or XHHW-2, single conductors in raceway.
- B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- D. Exposed Branch Circuits, Including in Crawlspace: Type THHN/THWN-2, single conductors in raceway. Homerun conductors shall be minimum #10 AWG.
- E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway. Homerun conductors shall be minimum #10 AWG. Metal-clad, armored, multi-conductor cable (MC or AC) is not permitted, without specific documented allowance.
- F. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
- G. Class 1 Control Circuits: Type THHN/THWN-2, in raceway.
- H. Class 2 Control Circuits: Type THHN/THWN-2, in raceway.

3.3 **INSTALLATION OF CONDUCTORS AND CABLES**

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

3.4 **CONNECTIONS**

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.
 - 1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 **FIELD QUALITY CONTROL**

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
 - 1. Perform visual and mechanical inspection of all conductors.
 - 2. Perform thermal image inspection of all service, feeder and branch circuit conductor terminations after system is under full use by Owner.
- C. Test Reports: Prepare a written report to record the following:
 - 1. Any conductors showing damage to conductor or insulation.
 - 2. Any conductor termination with poor contact or at improper torque.
 - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- D. Remove and replace malfunctioning units and retest.

END 26 0519

1. GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Low-voltage control cabling.
 - 2. Control-circuit conductors.
 - 3. Identification products.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. IDC: Insulation displacement connector.
- C. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.
- D. Open Cabling: Passing telecommunications cabling through open space (e.g., between the studs of a wall cavity).

1.4 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 50 or less.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Test cables upon receipt at Project site.
 - 1. Test each low voltage cable for open and short circuits.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient

temperature and humidity conditions at occupancy levels during the remainder of the construction period.

2. PRODUCTS

2.1 PATHWAYS

- A. Support of Open Cabling: NRTL labeled for support of cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
- B. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." Flexible metal conduit shall not be used.
 - 1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.

2.2 LOW-VOLTAGE CONTROL CABLE

- A. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.
 - 1. Size and configuration as recommended by the manufacturer.
 - 2. PVC insulation.
 - 3. PVC jacket.
 - 4. Flame Resistance: Comply with NFPA 262.
 - 5. All cabling shall be furnished and installed per equipment manufacturer's recommendations.

2.3 CONTROL-CIRCUIT CONDUCTORS

- A. Class 1 Control Circuits: Stranded copper, Type THHN/THWN, in raceway, complying with UL 83.
- B. Class 2 Control Circuits: Stranded copper, Type THHN/THWN, in raceway or power-limited cable, concealed in building finishes, complying with UL 83.
- C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or Type TF, complying with UL 83.

2.4 IDENTIFICATION PRODUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Brady Corporation.
 - 2. CommScope
 - 3. HellermannTyton.
 - 4. Kroy LLC.
 - 5. Panduit Corp.
- B. Comply with UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

3. EXECUTION

3.1 INSTALLATION OF PATHWAYS

- A. Install manufactured conduit sweeps and long-radius elbows if possible.
- B. Pathway Installation in Equipment Rooms:
 - 1. Secure conduits to backboard if entering room from overhead.
 - 2. Extend conduits 3 inches above finished floor when entering from under floor.
 - 3. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

3.2 INSTALLATION OF CONDUCTORS AND CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
 - 1. Terminate all conductors; no cable shall contain un-terminated elements. Make terminations only at indicated outlets and terminals.
 - 2. Cables may not be spliced. Secure and support cables at intervals not exceeding 60 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 - 3. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii.
 - 4. Do not install bruised, kinked, scored, deformed, or abraded cable. Remove and discard cable if damaged during installation and replace it with new cable.
 - 5. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
- C. Installation of Control-Circuit Conductors:
 - 1. Install wiring in raceways. Comply with requirements specified in Division 26 Section "Raceway and Boxes for Electrical Systems."
- D. Open-Cable Installation:
 - 1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
 - 2. Suspend copper cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
 - 3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.
- E. Separation from EMI Sources:
 - 1. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.

2. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
3. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
4. Separation between Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
5. Separation between Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.3 CONTROL-CIRCUIT CONDUCTORS

A. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits, No 14 AWG.
2. Class 2 low-energy, remote-control, and signal circuits, No. 16 AWG.
3. Class 3 low-energy, remote-control, alarm, and signal circuits, No 12 AWG.
4. Minimum sizes may be modified if manufacturer's recommendations are different.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Visually inspect cable placement, cable termination, grounding and bonding, equipment and labeling of all components.

C. End-to-end cabling will be considered defective if it does not pass inspections.

END 26 0523

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes grounding and bonding systems and equipment.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans showing dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:
 1. Ground rods.
 2. Ground rings.
 3. Grounding arrangements and connections for separately derived systems.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.
 1. In addition to items specified in Section 01 7823 "Operation and Maintenance Data," include the following:
 - a. Plans showing as-built, dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:
 - 1) Ground rods.
 - 2) Ground rings.
 - 3) Grounding arrangements and connections for separately derived systems.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 MANUFACTURERS

2.3 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Stranded Conductors: ASTM B 8.
2. Sizes and types of conductors in four subparagraphs below are typical examples. 28-kcmil bonding cable in "Bonding Cable" Subparagraph below is slightly larger than No. 6 AWG.
3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.4 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- C. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.
- D. Cable-to-Cable Connectors: Compression type, copper or copper alloy.
- E. Conduit Hubs: Mechanical type, terminal with threaded hub.
- F. Ground Rod Clamps: Exothermic or one-shot compression type, copper or copper alloy, terminal with hex head bolt.
- G. Straps: Solid copper, copper lugs. Rated for 600 A.
- H. Tower Ground Clamps: Mechanical type, copper or copper alloy, terminal one two-piece clamp.
- I. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.
- J. Water Pipe Clamps:
 1. Mechanical type, two pieces with zinc-plated bolts.
 - a. Material: Tin-plated aluminum.
 - b. Listed for direct burial.
 2. U-bolt type with malleable-iron clamp and copper ground connector.

2.5 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet, minimum.
- B. Metal building frame, with minimum 10 feet in direct contact with earth, vertically.
- C. Concrete encased reinforcement bar; 1/2 inch by 20 feet, minimum.
- D. Metal underground water pipe.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 4 AWG minimum.
 - 1. Bury at least 24 inches below grade.
 - 2. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct-bank installation.
- B. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors.
 - 3. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.
- B. Grounding Handholes: Install a driven ground rod through handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, non-shrink grout.
- C. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches from the foundation.

3.4 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.
 - 4. Single-phase motor and appliance branch circuits.
 - 5. Three-phase motor and appliance branch circuits.

6. Flexible raceway runs.

- C. Water Heater and Heat-Tracing Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

3.5 FENCE GROUNDING

- A. Fence Grounding: Install at maximum intervals of 40 feet except as follows:
1. Gates and Other Fence Openings: Ground fence on each side of opening.
 - a. Bond metal gates to gate posts.
 - b. Bond across openings, with and without gates, except at openings indicated as intentional fence discontinuities. Use No. 2 AWG wire and bury it at least 18 inches below finished grade.
- B. Fences Enclosing Electrical Power Distribution Equipment or Mechanical Equipment: Ground as required by IEEE C2 unless otherwise indicated.
- C. Grounding Method: At each grounding location, drive a grounding rod vertically until the top is 6 inches below finished grade. Connect rod to fence with No. 6 AWG conductor. Connect conductor to each fence component at grounding location.
- D. Bonding Method for Gates: Connect bonding jumper between gate post and gate frame.

3.6 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor and install in conduit.
- C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 2. Use exothermic welds for all below-grade connections.
 3. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

G. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
4. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

3.7 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections with the assistance of a factory-authorized service representative.
- C. Tests and Inspections:
 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.

2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at individual ground rods. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method or the attached rod technique according to IEEE 81.
 4. Prepare dimensioned Drawings locating each ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- D. Grounding system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.
- F. Report measured ground resistances that exceed the following values:
1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 3 ohms.
 2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 3 ohms.
 3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
 4. Substations and Pad-Mounted Equipment: 3 ohms.
- G. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END 26 0526

Section 26 0529
Hangers and Supports for Electrical Systems

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Hangers and supports for electrical equipment and systems.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- C. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel slotted support systems.

1.6 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

1.7 COORDINATION

- A. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Tyco International, Ltd.
 - g. Wesanco, Inc.
 - 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 3. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-5.
 - 4. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Verify suitability of fasteners in subparagraph below for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) thick.
 - 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti Inc.
 - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
 - 3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
 - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 - 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
 - 6. Toggle Bolts: All-steel springhead type.
 - 7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as scheduled in NECA 1, where its Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with two-bolt conduit clamps, single-bolt conduit clamps, or single-bolt conduit clamps using spring friction action for retention in support channel.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts, Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69, or Spring-tension clamps.
 - 6. To Light Steel: Sheet metal screws.

7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- B. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Touchup: Comply with requirements in painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END 26 0529

Section 26 0533
Raceway and Boxes For Electrical Systems

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. FMC: Flexible metal conduit.
- C. IMC: Intermediate metal conduit.
- D. LFMC: Liquidtight flexible metal conduit.
- E. RSC/RGC/RMC: Rigid steel conduit / Rigid galvanized conduit/Rigid metal conduit.
- F. PVC/RNC: Polyvinylchloride / Rigid nonmetallic conduit.

1.4 QUALITY ASSURANCE

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

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Alflex Inc.
 - 3. Allied Tube & Conduit; a Tyco International Ltd. Co.
 - 4. Anamet Electrical, Inc.; Anaconda Metal Hose.
 - 5. Electri-Flex Co.
 - 6. O-Z Gedney; a unit of General Signal.
 - 7. Republic Conduit, Inc.
 - 8. SP Products, Inc.
 - 9. Wheatland Tube Company.

- B. Rigid Steel Conduit: ANSI C80.1.
- C. IMC: ANSI C80.6.
- D. EMT: ANSI C80.3.
- E. FMC: Zinc-coated steel or aluminum.
- F. LFMC: Flexible steel conduit with PVC jacket.
- G. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
 - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
 - 2. Fittings for EMT: Steel, set-screw or compression type.

2.2 NONMETALLIC CONDUIT AND TUBING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Anamet Electrical, Inc.; Anaconda Metal Hose.
 - 3. Arco Corp.
 - 4. CANTEX Inc.
 - 5. CertainTeed Corp.; Pipe & Plastics Group.
 - 6. Condux International, Inc.
 - 7. ElecSYS, Inc.
 - 8. Electri-Flex Co.
 - 9. Lamson & Sessions; Carlon Electrical Products.
 - 10. Manhattan/CDT/Cole-Flex.
 - 11. RACO; Hubbell Co.
 - 12. Thomas & Betts Corp.
- B. RNC: NEMA TC2, Type EPC-40-PVC, unless otherwise indicated.
- C. Fittings for RNC: NEMA TC 3; match to conduit or tubing type and material.

2.3 METAL WIREWAYS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Cooper B-Line, Inc.
 - 2. Hoffman.
 - 3. Square D; Schneider Electric.
- B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, unless otherwise indicated.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

- D. Wireway Covers: Screw-cover type unless specifically noted otherwise on the drawings.
- E. Finish: Manufacturer's standard enamel finish.

2.4 SURFACE RACEWAYS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Hubbell
 - 2. Panduit
 - 3. Thomas & Betts Corp.
 - 4. Wiremold Company; Legrand.
- B. Surface metal raceways: Galvanized steel with snap-on covers. Manufacturer's standard enamel finish color with final field applied paint color selected by Owner to match mounting surface.

2.5 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
 - 2. EGS/Appleton Electric.
 - 3. Erickson Electrical Equipment Company.
 - 4. Garvin Industries, Inc.
 - 5. Hoffman.
 - 6. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
 - 7. O-Z/Gedney; a unit of General Signal.
 - 8. RACO; a Hubbell Company.
 - 9. Robroy Industries, Inc.; Enclosure Division.
 - 10. Scott Fetzer Co.; Adalet Division.
 - 11. Spring City Electrical Manufacturing Company.
 - 12. Thomas & Betts Corporation.
 - 13. Wiremold Company; Legrand
 - 14. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.
- B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- C. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- D. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
 - 1. Exposed Conduit: Rigid steel or IMC conduit.
 - 2. Concealed Conduit, Aboveground: RNC, Type EPC-40-PVC.

3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp, oily, or wet locations.
5. Damp or Wet Locations: Rigid steel conduit or IMC.
6. Raceways for Communications Cable in Spaces Used for Environmental Air: EMT.
7. Raceways for Concealed General Purpose Distribution of Low-Voltage and Communications Cable: EMT.
8. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, nonmetallic in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.2 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Arrange stub-ups so curved portions of bends are not visible above the finished slab.
- E. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.
- F. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
- G. Raceway Terminations at locations subject to moisture or vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.
- H. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- I. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for recessed and semi-recessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in all damp or wet location applications in this scope of work where the conduit is exposed.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom for pipe less than 6 inches in nominal diameter.
2. Install structural backfill, where not encased in concrete.
3. After installing conduit, backfill and compact. Start at tie-in point and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. Install continuous warning ribbon after 12" of backfill have been placed over the conduit. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with compaction equal to or greater than area being excavated.
4. Install manufactured duct elbows for stub-ups at equipment and at building entrances, unless otherwise indicated. Provide RGS factory elbows or concrete encase PVC elbows for stub-up ducts through the length of the elbow.

B. Concrete-Encased Conduit:

1. Provide conduit supports to allow concrete to flow around conduit without restriction.
2. Concrete around conduits containing medium voltage cables shall be tinted RED.
3. Provide continuous warning ribbon 12" above top of conduit(s). Provide second warning ribbon at 12" below final grade during backfill above concrete.

3.4 PROTECTION

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

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to paint finishes with matching touchup coating recommended by manufacturer.

END 26 0533

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
 - 2. Grout.
 - 3. Silicone sealants.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Wall Sleeves:
 - 1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
- B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.
- C. Sleeves for Rectangular Openings:
 - 1. Material: Galvanized sheet steel.
 - 2. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
 - b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 GROUT

- A. Description: Non-shrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

2.3 SILICONE SEALANTS

- A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
- B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
 - a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 07 9200 "Joint Sealants."
 - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
- D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
 2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.
- E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

END 26 0544

Section 26 0553
Identification for Electrical Systems

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Identification for raceway.
 - 2. Panelboard circuit directories.
 - 3. Identification for conductors and communication and control cable.
 - 4. Equipment identification labels.
 - 5. Wiring device circuit identification labels.
 - 6. Miscellaneous identification products.

1.3 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Comply with 29 CFR 1910.145.

1.4 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT IDENTIFICATION LABELS

- A. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray or black background. Minimum letter height shall be 3/8 inch.
- B. See drawings for specific identification requirements for panelboards and related equipment.

2.2 WIRING DEVICE LABELS

- A. Embossed, clear adhesive tape, with 1/4" high black (depending on cover plate color selection) lettering with circuit number and panel identification for electrical devices (receptacles and switches). Labels shall be located on the face of the device cover plate, unless noted otherwise.
- B. All labels shall be machine made and printed.

2.3 PANEL DIRECTORIES

- A. Provide panel circuit directory (panel schedule) cards for each new panelboard.
- B. Provide new panel circuit directory card for each existing panelboard where circuit modifications have been made during this project. Verify and correct existing circuit information, where possible, and include in new directory.
- C. Reference section 26 2416 for additional circuit directory requirements.
- D. Panel circuit directories shall be machine printed. Identify spare breakers as "SPARE". Identify available breaker space as "SPACE".

2.4 PAINT

- A. Aerosol spray paint:
 - 1. Color to match system color code.

2.5 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength: 50 lb, minimum.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black, except where used for color-coding.
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Power-Circuit Conductor Identification: For primary and secondary conductors No. 1/0 AWG and larger in vaults, pull and junction boxes, manholes, and handholes use color-coding conductor tape marker tape. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.
- B. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use color-coding conductor tape. Identify each ungrounded conductor according to source and circuit number.
- C. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to

disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

- a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where 2 lines of text are required, use labels 2 inches high.
- b. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.

2. Equipment to Be Labeled:

- a. Switchboards, Transformers, Panelboards, electrical cabinets, and enclosures.
- b. Control devices.
- c. Motor Controllers
- d. Equipment safety disconnect switches
- e. Equipment furnished by the Electrical Contractor

3.2 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification materials to surfaces that require finish after completing finish work.

D. Conduit/raceway color system identification.

1. System Identification Color for conduit (Allied® True Color™ or equivalent):

- a. Provide red colored conduit, where conduit is used for new fire alarm system cabling.
- b. Provide blue colored conduit, where conduit is used for new or rerouted data system cabling.
- c. Provide orange colored conduit for all new fiber optic cabling.
- d. Provide white colored conduit, where conduit is used for new or rerouted control systems cabling.

E. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors.

1. Color shall be factory applied or, for sizes larger than No. 10 AWG if authorities having jurisdiction permit, field applied.

2. Colors for 208/120-V Circuits:

- a. Phase A: Black.
- b. Phase B: Red.
- c. Phase C: Blue.

3. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply

last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

- F. Apply aerosol spray paint to exposed junction box covers, of specific systems, to match conduit color coding in unfinished areas.

END 26 0553

Section 26 2416
Panelboards

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Distribution panelboards.
 - 2. Lighting and appliance branch-circuit panelboards.

1.3 SUBMITTALS

- A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
 - 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
 - 3. Detail bus configuration, current, and voltage ratings.
 - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
 - 5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 6. Include wiring diagrams for power, signal, and control wiring.
- C. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.
- D. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals.
 - 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
 - 2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with NEMA PB 1.
- E. Comply with NFPA 70.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
- B. Handle and prepare panelboards for installation according to NECA 407 and NEMA PB 1.

1.6 COORDINATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.7 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Keys: Two spares for each type of panelboard cabinet lock.

PART 2- PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

- A. Enclosures: Flush- and surface-mounted cabinets.
 - 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - b. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
 - 2. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
 - 3. Finishes:
 - a. Panels and Trim: Steel factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - b. Back Boxes: Galvanized steel.
 - 4. Directory Card: Inside panelboard door, mounted in transparent card holder.
- B. Incoming Mains Location: As required for each specific instance. Field verify prior to order.
- C. Phase, Neutral, and Ground Buses:
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - 2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
- D. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - 2. Main and Neutral Lugs: Mechanical type.
 - 3. Ground Lugs and Bus-Configured Terminators: Mechanical type.
- E. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

- F. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 DISTRIBUTION PANELBOARDS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide products indicated on Drawings.
- B. Panelboards: NEMA PB 1, power and feeder distribution type.
- C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
 - 1. For doors more than 36 inches high, provide two latches, keyed alike.
- D. Mains: As indicated on the drawings.
- E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
- F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide products indicated on Drawings.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: As indicated on the drawings.
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- E. Doors: Hinged Door-in-Door with concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings.
- B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Receive, inspect, handle, and store panelboards according to NECA 407 and NEMA PB 1.1.
- B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

- C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install panelboards and accessories according to NECA 407 and NEMA PB 1.1.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
- C. Mount top of trim a maximum of 90 inches above finished floor unless otherwise indicated.
- D. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- E. Install overcurrent protective devices and controllers not already factory installed.
- F. Install filler plates in unused spaces.
- G. Stub four 1-inch empty conduits from a recessed flush panelboard into accessible ceiling space or space designated to be ceiling space in the future.
- H. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.
- I. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 26 Section "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads after balancing panelboard loads;
 - 1. Incorporate Owner's room designations. Obtain approval before installing.
 - 2. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
 - 3. Leave locations of spare breakers or panel spaces blank. Indicate spare breaker locations in pencil.
 - 4. For existing panelboards: Revise identification of breakers or switches to indicate modifications to loads, circuit uses, or to correct inaccuracies found.
 - 5. Directory circuit identifications shall comply with NEC 408.4. Load descriptions in panel schedules furnished on drawings shall not be considered sufficient.
- C. Spaces in new panelboards shall be identified as follows:
 - 1. Each single pole space shall have a separate identification.
 - 2. Example: The left side of a 42-space panelboard shall use odd numbers 1-41, in descending order, from top to bottom. The right side of the panelboard shall use even numbers 2-42, in descending order, from top to bottom.
 - 3. Multi-pole breakers or spaces shall use numbers from all spaces occupied (i.e. a 2-pole space or breaker shall be identified using both single pole spaces taken up). Multi-pole breakers and spaces shall not be identified using a single number.
 - 4. Circuits with emergency loads shall be marked with highlighter type marker.
 - 5. Circuits with fire alarm equipment loads shall have red handle lock device.
- D. Panelboard Nameplates:

1. Label each panelboard with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems" and in drawing details.
2. Include power source on panelboard nameplate to satisfy requirement of NEC 408.4.

E. Distribution Panelboard Device Nameplates:

1. Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems" and in drawing details.
2. Include power source on panelboard nameplate to satisfy requirement of NEC 408.4.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform visual and mechanical inspection. Test proper function of all devices and moving parts.
2. Perform infrared scan under load, on all points of termination, and record.
3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges.

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.

1. Measure as directed during period of normal system loading.
2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

END 26 2416

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

- 1. Receptacles, tamper-resistant receptacles, receptacles with integral GFCI, and associated device plates.
- 2. Wall-switches and occupancy sensors not included in Section 26 0923.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.
- C. Samples: When requested during product submittals, furnish one of each type of device and wall plate requested, in each color requested.
- D. Field quality-control test reports.
- E. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

1.6 COORDINATION

- A. Receptacles for Owner-Furnished Equipment: Match plug configurations.
 - 1. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers' Names: As indicated on the drawings.

2.2 STRAIGHT BLADE RECEPTACLES

- A. Convenience Receptacles, Specification Grade 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.

2.3 GFCI RECEPTACLES

- A. General Description: Specification grade Straight blade, feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

2.4 SNAP SWITCHES

- A. Comply with NEMA WD 1 and UL 20.
- B. Switches, 120/277 V, 20 A:

2.5 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Unfinished Spaces: Galvanized steel.
 - 3. Material for Wet Locations: Thermoplastic or cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

2.6 FINISHES

- A. Color: Wiring device catalog numbers in Section Text do not designate device color.
 - 1. Wiring Devices: Reference Material Schedule on drawings and provide devices and device cover plates in manufacturer's standard colors, as selected by Architect.
 - 2. Minimum color selections: Black, Gray, White, Ivory, Light Almond, Red.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- B. Coordination with Other Trades:
 - 1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
 - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
 - 1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
 - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
 - 4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailing existing conductors is permitted provided the outlet box is large enough.
- D. Device Installation:
 - 1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
 - 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
 - 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
 - 4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
 - 5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
 - 6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
 - 7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
 - 8. Tighten unused terminal screws on the device.
 - 9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.
- E. Receptacle Orientation:
 - 1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.

- F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.

3.2 IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."

- 1. Receptacles: Identify panelboard and circuit number from which served. Use machine lettered black, minimum 1/8" letters with a clear background on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

- 1. Test Instruments: Use instruments that comply with UL 1436.
- 2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:

- 1. Line Voltage: Acceptable range is 105 to 132 V.
- 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
- 3. Ground Impedance: Values of up to 2 ohms are acceptable.
- 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
- 5. Using a test plug, verify that the device and its outlet box are securely mounted.
- 6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

END 26 2726

Section 26 2813
Fuses

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Cartridge fuses rated 600 V ac and less for use in the following:
 - a. Switchboards.
 - b. Enclosed controllers.
 - c. Enclosed switches.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:
 - 1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
 - a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
 - b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
 - 2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
 - 3. Current-limitation curves for fuses with current-limiting characteristics.
 - 4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse. Submit [in electronic format suitable for use in coordination software] and in PDF format.
 - 5. Coordination charts and tables and related data.
 - 6. Fuse sizes for elevator feeders and elevator disconnect switches.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 7700 "Closeout Procedures," Section 01 7823 "Operation and Maintenance Data," include the following:
 - 1. Ambient temperature adjustment information.
 - 2. Current-limitation curves for fuses with current-limiting characteristics.
 - 3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse used on the Project. Submit in electronic format suitable for use in coordination software and in PDF format.
 - 4. Coordination charts and tables and related data.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

PART 2 - PRODUCTS

2.1 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.
 - 1. Type RK-1: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
 - 2. Type RK-5: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
 - 3. Type J: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
 - 4. Type L: 600-V, 601- to 6000-A rating, 200 kAIC, time delay.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA FU 1 for cartridge fuses.
- D. Comply with NFPA 70.
- E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.
- B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.
- C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

- A. Cartridge Fuses:
 - 1. Feeders: Class L, time delay.
 - 2. Motor Branch Circuits: Class RK1, time delay.
 - 3. Large Motor Branch (601-4000 A): Class L, time delay.
 - 4. Other Branch Circuits: Class RK1, time delay.

3.3 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.
- B. Install spare-fuse cabinet(s) in location shown on the Drawings or as indicated in the field by Architect and Owner.

3.4 IDENTIFICATION

- A. Install labels complying with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems" and indicating fuse replacement information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

END 26 2813

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Fusible switches.
 - 2. Nonfusible switches.
 - 3. Molded-case circuit breakers (MCCBs).
 - 4. Enclosures.

1.3 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
 - 1. Enclosure types and details for types other than NEMA 250, Type 1.
 - 2. Current and voltage ratings.
 - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
 - 4. Include evidence of a nationally recognized testing laboratory (NRTL) listing for series rating of installed devices.
 - 5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
 - 6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF and electronic format.
- B. Shop Drawings: For enclosed switches and circuit breakers.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Include wiring diagrams for power, signal, and control wiring.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 01 7823 "Operation and Maintenance Data," include the following:

- a. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
- b. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF and electronic format.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
 - 2. Fuse Pullers: Two for each size and type.

1.7 WARRANTY

- A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.
- B. Product Selection for Restricted Space: Contractor shall verify existing condition dimensions prior to product submittal. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- D. Comply with NFPA 70.

2.2 FUSIBLE SWITCHES

- A. Type HD, Heavy Duty:
 - 1. Single throw.
 - 2. Three pole.
 - 3. 600-V ac.
 - 4. 1200 A and smaller.
 - 5. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses.
 - 6. Lockable handle with capability to accept three padlocks and interlocked with cover in closed position.
- B. Accessories:
 - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 - 3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.

4. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open. Contact rating - 120-V ac.
5. Hookstick Handle: Allows use of a hookstick to operate the handle.
6. Lugs: Mechanical type, suitable for number, size, and conductor material.
7. Service-Rated Switches: Labeled for use as service equipment.

2.3 NON-FUSIBLE SWITCHES

- A. Type HD, Heavy Duty, Two or Three Pole, Single Throw, 600-V ac or 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- B. Accessories:
 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
 4. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open. Contact rating - 120-V ac.
 5. Hookstick Handle: Allows use of a hookstick to operate the handle.
 6. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.4 MOLDED-CASE CIRCUIT BREAKERS

- A. Circuit breakers shall be constructed using glass-reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.
- B. Circuit breakers shall have a toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. The circuit-breaker handle shall be over center, be trip free, and reside in a tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon shall be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit-breaker tripping mechanism for maintenance and testing purposes.
- C. The maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker. Circuit breaker/circuit breaker or Fuse/circuit breaker combinations for series connected interrupting ratings shall be listed by UL as recognized component combinations. Any series rated combination used shall be marked on the end-use equipment along with the statement "Caution - Series Rated System. _____ Amps Available. Identical Replacement Component Required."
- D. MCCBs shall be equipped with a device for locking in the isolated/open position.
- E. Lugs shall be suitable for 140 deg F rated wire on 125-A circuit breakers and below.
- F. Standards: Comply with UL 489 and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- G. Thermal-Magnetic Circuit Breakers: Inverse time-current thermal element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- H. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

- I. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
 - 1. Instantaneous trip.
 - 2. Long- and short-time pickup levels.
 - 3. Long- and short-time time adjustments.
 - 4. Ground-fault pickup level, time delay, and I-squared t response.
- J. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.
- K. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.
- L. Ground-Fault Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
- M. Ground-Fault Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).
- N. Features and Accessories:
 - 1. Standard frame sizes, trip ratings, and number of poles.
 - 2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
 - 3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.

2.5 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
- B. Enclosure Finish: The enclosure shall be [finished with] gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (NEMA 250 Type 1) gray baked enamel paint, electrodeposited on cleaned, phosphatized galvanized steel (NEMA 250 Types 3R, 12).
- C. Conduit Entry: NEMA 250 Types 4, 4X, and 12 enclosures shall contain no knockouts. NEMA 250 Types 7 and 9 enclosures shall be provided with threaded conduit openings in both endwalls.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Commencement of work shall indicate Installer's acceptance of the areas and conditions as satisfactory.

3.2 PREPARATION

- A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Architect and Owner no fewer than two weeks in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without Architect's and Owner's written permission.
4. Comply with NFPA 70E.

3.3 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

- A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.
1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
 2. Outdoor Locations: NEMA 250, Type 3R .
 3. Kitchen Pool Areas: NEMA 250, Type 4X, stainless steel.
 4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
 5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

3.4 INSTALLATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- C. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- D. Install fuses in fusible devices.
- E. Comply with NFPA 70 and NECA 1.

3.5 IDENTIFICATION

- A. Comply with requirements in Section 26 0553 "Identification for Electrical Systems."
1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections with the assistance of a factory-authorized service representative.
- B. Tests and Inspections for Switches:
1. Visual and Mechanical Inspection:
 - a. Inspect physical and mechanical condition.
 - b. Inspect anchorage, alignment, grounding, and clearances.
 - c. Verify that the unit is clean.
 - d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
 - e. Verify that fuse sizes and types match the Specifications and Drawings.
 - f. Verify that each fuse has adequate mechanical support and contact integrity.

- g. Inspect bolted electrical connections for high resistance using one of the two following methods:
 - 1) Use a low-resistance ohmmeter.
 - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
 - a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
- h. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on the Drawings.
- i. Verify correct phase barrier installation.
- j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

2. Electrical Tests:

- a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
- b. Measure contact resistance across each switchblade fuseholder. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.

C. Tests and Inspections for Molded Case Circuit Breakers:

1. Visual and Mechanical Inspection:

- a. Verify that equipment nameplate data are as described in the Specifications and shown on the Drawings.
- b. Inspect physical and mechanical condition.
- c. Inspect anchorage, alignment, grounding, and clearances.
- d. Verify that the unit is clean.
- e. Operate the circuit breaker to ensure smooth operation.
- f. Inspect bolted electrical connections for high resistance using one of the two following methods:
 - 1) Use a low-resistance ohmmeter.
 - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

- a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.

g. Inspect operating mechanism, contacts, and chutes in unsealed units.

2. Electrical Tests:

- a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
- b. Perform a contact/pole resistance test. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.

3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

4. Perform the following infrared scan tests and inspections and prepare reports:

- a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
- b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.

5. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

3.7 ADJUSTING

A. Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges.

END 26 2816

Section 26 5119
LED Interior Lighting

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Interior solid-state luminaires that use LED technology.
- 2. Lighting fixture supports.

B. Related Requirements:

- 1. Section 26 0923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. LED: Light-emitting diode.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

- 1. Arrange in order of luminaire designation.
- 2. Include data on features, accessories, and finishes.
- 3. Include physical description and dimensions of luminaires.
- 4. Include emergency lighting units, including batteries and chargers.
- 5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
- 6. When requested: Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing and Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps and accessories identical to those indicated for the lighting fixture as applied in this Project IES LM-79 and IES LM-80.

- a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Product Schedule: For luminaires: Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Product Certificates: For each type of luminaire.

C. Product Test Reports: For each luminaire, for tests performed by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency.

D. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

- 1. Provide a list of all fixture types used on Project; use ANSI and manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

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

- 1. LED Drivers: Ten for every 100 of each type and rating installed. Furnish at least one of each type.
- 2. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Provide luminaires from a single manufacturer for each luminaire type.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.10 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: Five year(s) parts and labor from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

2.2 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
- C. Recessed Fixtures: Comply with NEMA LE 4.
- D. CRI of minimum 80; CCT at 4000 K or as otherwise indicated in Luminaire Schedule.
- E. Minimum Rated light engine life of 70% light output at 70,000 hours, unless otherwise indicated on Luminaire Schedule description and basis of design model number.
- F. Luminaires dimmable from 100 percent to 10 percent of maximum light output unless indicated otherwise in Luminaire Schedule.
- G. Internal driver unless indicated otherwise in Luminaire Schedule.
- H. Nominal Operating Voltage: 120 V and 277 V ac.
 - 1. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
- I. Housings:
 - 1. Steel, Extruded or cast-aluminum housings and heat sink.
 - 2. Clear anodized, powder-coat or painted finish as noted.

2.3 DOWNLIGHT

- A. Minimum lumens and minimum allowable efficacy (lumens per watt) as defined in luminaire schedule or as indicated by basis of design model.
- B. Universal mounting bracket.
- C. Integral junction box with conduit fittings.

2.4 LINEAR INDUSTRIAL

- A. Minimum lumens and minimum allowable efficacy (lumens per watt) as defined in luminaire schedule or as indicated by basis of design model.

2.5 RECESSED LINEAR

- A. Minimum lumens and minimum allowable efficacy (lumens per watt) as defined in luminaire schedule or as indicated by basis of design model.

B. Integral junction box with conduit fittings.

2.6 STRIP LIGHT

A. Minimum lumens and minimum allowable efficacy (lumens per watt) as defined in luminaire schedule or as indicated by basis of design model.

B. Integral junction box with conduit fittings.

2.7 SURFACE MOUNT, LINEAR

A. Minimum lumens and minimum allowable efficacy (lumens per watt) as defined in luminaire schedule or as indicated by basis of design model.

B. Integral junction box with conduit fittings.

2.8 SURFACE MOUNT, NONLINEAR

A. Minimum lumens and minimum allowable efficacy (lumens per watt) as defined in luminaire schedule or as indicated by basis of design model.

B. Integral junction box with conduit fittings.

2.9 SUSPENDED, LINEAR

A. Minimum lumens and minimum allowable efficacy (lumens per watt) as defined in luminaire schedule or as indicated by basis of design model.

2.10 SUSPENDED, NONLINEAR

A. Minimum lumens and minimum allowable efficacy (lumens per watt) as defined in luminaire schedule or as indicated by basis of design model.

B. Integral junction box with conduit fittings.

2.11 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit complete repair without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during repair and when secured in operating position.

C. Diffusers and Globes:

1. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 2. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
- D. Driver Housings:
1. Extruded or cast-aluminum housing and heat sink.
- E. Fixture Housings:
1. Clear anodized, powder-coat or painted finish as noted on the schedule.
- F. Factory-Applied Labels: Comply with UL 1598. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
1. Label shall include the following lamp characteristics:
 - a. "USE ONLY" and include specific lamp type.
 - b. CCT and CRI for all luminaires.

2.12 METAL FINISHES

- A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.13 LUMINAIRE FIXTURE SUPPORT COMPONENTS

- A. Comply with requirements in Section 26 0529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch threaded steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
- C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gauge.
- D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

- A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting.

3.3 INSTALLATION

- A. Comply with NECA 1.

- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

- C. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and repair.
3. Provide support for luminaire without causing deflection of ceiling or wall.
4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.

- D. Flush-Mounted Luminaire Support:

1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
3. Trim ring flush with finished surface.

- E. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls.
2. Do not attach luminaires directly to gypsum board.

- F. Ceiling-Mounted Luminaire Support:

1. Ceiling mount with two 5/32-inch- diameter aircraft cable supports adjustable to 120 inches in length, unless otherwise required by particular installation conditions.

- G. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing, rod or wire support for suspension for each unit length of luminaire chassis, including one at each end.
4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

- H. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.

3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.
 4. Connect to associated above-ceiling outlet box with flexible whip, less than 6'-0" in length to allow placement adjustment to each adjacent ceiling grid spaces.
- I. Comply with requirements in Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.4 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
 2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections.
- C. Prepare test and inspection reports.

3.6 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.
1. During adjustment visits, inspect all luminaires. Replace drivers or luminaires that are defective.
 2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 3. Adjust the aim of luminaires in the presence of the Architect.

END 26 5119

1. GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

- 1. Exterior luminaires with LED's and drivers.
- 2. Luminaire-mounted photoelectric relays.

- B. Related Sections include the following:

- 1. Division 26 Section "Interior Lighting" for exterior luminaires normally mounted on exterior surfaces of buildings.

1.3 DEFINITIONS

- A. CRI: Color-rendering index.
- B. Luminaire: Complete lighting fixture, including LED light engine.

1.4 SUBMITTALS

- A. Product Data: For each luminaire and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:
 - 1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
 - 2. Details of attaching luminaires and accessories.
 - 3. Details of installation and construction.
 - 4. Luminaire materials.
 - 5. Photometric data based on laboratory tests of each luminaire type, complete with indicated, drivers, and accessories.

- a. For indicated luminaires, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
 - b. Photometric data shall be certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
- 6. Photoelectric relays.
- 7. Drivers, including energy-efficiency data.
- 8. LED's, including life, output, and energy-efficiency data.
- 9. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.
- B. Shop Drawings:
 - 1. Wiring Diagrams: Power and control wiring.
- C. Qualification Data: For agencies providing photometric data for lighting fixtures.
- D. Field quality-control test reports.
- E. Operation and Maintenance Data: For luminaires and poles to include in emergency, operation, and maintenance manuals.
- F. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Comply with IEEE C2, "National Electrical Safety Code."

- E. Comply with NFPA 70.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.
 - 1. Warranty Period for Luminaires: Five years from date of Substantial Completion.
 - 2. Warranty Period for Metal Corrosion: Five years from date of Substantial Completion.
 - 3. Warranty Period for Color Retention: Five years from date of Substantial Completion.
 - 4. Warranty Period for LED Engines: Replace fuses that fail within 5 years from date of Substantial Completion.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Glass and Plastic Lenses, Covers, and Other Optical Parts: 10 for every 100 of each type and rating installed. Furnish at least one of each type.

2. PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Product: The design of each item of exterior luminaire and its support is based on the product named on the drawings. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers listed.

2.2 LUMINAIRES, GENERAL REQUIREMENTS

- A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.
- B. Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.

- C. Metal Parts: Free of burrs and sharp corners and edges.
- D. Sheet Metal Components: Corrosion-resistant aluminum, unless otherwise indicated. Form and support to prevent warping and sagging.
- E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.
- F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit repair without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during maintenance and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect driver when door opens.
- G. Exposed Hardware Material: Stainless steel.
- H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
- I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.
- J. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
- K. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
- L. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process with support materials.
- M. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax.
3. Class I, Clear Anodic Finish: AA-M32C22A41 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
4. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.
 - a. Color: As selected by Architect from manufacturer's full range.

2.3 SUPPORT COMPONENTS, GENERAL REQUIREMENTS

- A. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts, unless otherwise indicated.
- B. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.
 1. Materials: Shall not cause galvanic action at contact points.

3. EXECUTION

3.1 LUMINAIRE INSTALLATION

- A. Fasten luminaire to indicated structural supports.
 1. Use fastening methods and materials defined for the application and approved by manufacturer.
- B. Adjust luminaires that require field adjustment or aiming.

3.2 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.
 1. Verify operation of photoelectric controls.

END OF SECTION

**ATTACHMENT A –
INSURANCE REQUIREMENTS**

ATTACHMENT A.6
INSURANCE REQUIREMENTS
ROUTINE CONSTRUCTION, MAINTENANCE AND REPAIR PROJECTS

Contractor shall obtain insurance of the types and in the amounts listed below.

A. COMMERCIAL GENERAL AND UMBRELLA LIABILITY INSURANCE

Contractor shall maintain commercial general liability (CGL) and, if necessary, commercial umbrella insurance with a limit of not less than \$1,000,000 each occurrence. If such CGL insurance contains a general aggregate limit, it shall apply separately to this project/location.

CGL insurance shall be written on Insurance Services Office (ISO) occurrence form CG 00 01 10 93, or a substitute form providing equivalent coverage, and shall cover liability arising from premises, operations, independent contractors, products-completed operations, personal injury and advertising injury, and liability assumed under an insured contract (including the tort liability of another assumed in a business contract).

Owner shall be included as an insured under the CGL, using ISO additional insured endorsement CG 20 10 or a substitute providing equivalent coverage, and under the commercial umbrella, if any. This insurance shall apply as primary insurance with respect to any other insurance or self-insurance afforded to Owner.

There shall be no endorsement or modification of the CGL limiting the scope of coverage for liability arising from pollution, explosion, collapse, or underground property damage.

B. CONTINUING COMPLETED OPERATIONS LIABILITY INSURANCE

Contractor shall maintain commercial general liability (CGL) and, if necessary, commercial umbrella liability insurance with a limit of not less than \$1,000,000 each occurrence for at least one (1) year following substantial completion of the work.

Continuing CGL insurance shall be written on ISO occurrence form CG 00 01 10 93, or substitute form providing equivalent coverage, and shall, at minimum, cover liability arising from products-completed operations and liability assumed under an insured contract.

Continuing CGL insurance shall have a products-completed operations aggregate of at least two times its each occurrence limit.

Continuing commercial umbrella coverage, if any, shall include liability coverage for damage to the insured's completed work equivalent to that provided under ISO form CG 00 01.

C. BUSINESS AUTO AND UMBRELLA LIABILITY INSURANCE

Contractor shall maintain business auto liability and, if necessary, commercial umbrella liability insurance with a limit of not less than \$1,000,000 each accident. Such insurance shall cover liability arising out of any auto including owned, hired and non-owned autos.

Business auto insurance shall be written on Insurance Services Office (ISO) form CA 00 01, CA 00 05, CA 00 12, CA 00 20, or a substitute form providing equivalent liability coverage. If necessary, the policy shall be endorsed to provide contractual liability coverage equivalent to that provided in the 1990 and later editions of CA 00 01.

D. WORKERS COMPENSATION INSURANCE

Contractor shall maintain workers compensation as required by statute and employers liability insurance. The commercial umbrella and/or employers liability limits shall not be less than \$1,000,000 each accident for bodily injury by accident or \$1,000,000 each employee for bodily injury by disease.

If Owner has not been included as an insured under the CGL using ISO additional insured endorsement CG 20 10 under the Commercial General and Umbrella Liability Insurance required in this Contract, the Contractor waives all rights against Owner and its officers, officials, employees, volunteers and agents for recovery of damages arising out of or incident to the Contractor's work.

E. GENERAL INSURANCE PROVISIONS

- 1. Evidence of Insurance.** Prior to beginning work, Contractor shall furnish Owner with a certificate(s) of insurance and applicable policy endorsement(s), executed by a duly authorized representative of each insurer, showing compliance with the insurance requirements set forth above.

All certificates shall provide for 30 days written notice to Owner prior to the cancellation or material change of any insurance referred to therein. Written notice to Owner shall be by certified mail, return receipt requested.

Failure of Owner to demand such certificate, endorsement or other evidence of full compliance with these insurance requirements or failure of Owner to identify a deficiency from evidence that is provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.

Owner shall have the right, but not the obligation, of prohibiting Contractor or any subcontractor from entering the project site until such certificates or other evidence that insurance has been placed in complete compliance with these requirements is received and approved by Owner.

Failure to maintain the required insurance may result in termination of this Contract at Owner's option.

With respect to insurance maintained after final payment in compliance with a requirement above, an additional certificate(s) evidencing such coverage shall be promptly provided to Owner whenever requested.

Contractor shall provide certified copies of all insurance policies required above within 10 days of Owner's written request for said copies.

- 2. Acceptability of Insurers.** For insurance companies which obtain a rating from A.M. Best, that rating should be no less than A VII using the most recent edition of the A.M. Best's Key Rating Guide. If the Best's rating is less than A VII or a Best's rating is not obtained, the Owner has the right to reject insurance written by an insurer it deems unacceptable.
- 3. Cross-Liability Coverage.** If Contractor's liability policies do not contain the standard ISO separation of insureds provision, or a substantially similar clause, they shall be endorsed to provide cross-liability coverage.
- 4. Deductibles and Self-Insured Retentions.** Any deductibles or self-insured retentions must be declared to the Owner. At the option of the Owner, the Contractor may be asked to eliminate such deductibles or self insured retentions as respects the Owner, its officers, officials, employees, volunteers and agents or required to procure a bond guaranteeing payment of losses and other related costs including but not limited to investigations, claim administration and defense expenses.
- 5. Subcontractors.** Contractor shall cause each subcontractor employed by Contractor to purchase and maintain insurance of the type specified above. When requested by the Owner, Contractor shall furnish copies of certificates of insurance evidencing coverage for each subcontractor.

F. INDEMNIFICATION

To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner and the Architect and their officers, officials, employees, volunteers and agents from and against all claims, damages, losses and expenses including but not limited legal fees (attorney's and paralegal's fees and court costs), arising

out of or resulting from the performance of the Contractor's work, provided that any such claim, damage, loss or expense (1) is attributable to bodily injury, sickness, disease or death, or injury to or destruction of tangible property, other than the work itself, including the loss of use resulting therefrom and (2) is caused in whole or in part by any wrongful or negligent act or omission of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, except to the extent it is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in this Paragraph. Contractor shall similarly protect, indemnify and hold and save harmless the Owner, its officers, officials, employees, volunteers and agents against and from any and all claims, costs, causes, actions and expenses including but not limited to legal fees, incurred by reason of Contractor's breach of any of its obligations under, or Contractor's default of, any provision of the Contract.

SAMPLE LIABILITY INSURANCE ENDORSEMENT

The following spaces preceded by an asterisk (*) need not be completed if this endorsement and policy have the same inception date.

ATTACHED TO AND FORMING PART OF POLICY NUMBER	*EFFECTIVE DATE OF ENDORSEMENT	*ISSUED TO
--	-----------------------------------	------------

This endorsement changes the policy. Please read it carefully.

AUTOMATIC ADDITIONAL INSUREDS

The following provision is added to (SECTION II), Who Is An Insured.

5. Any entity you are required in a written contract (hereinafter called Additional Insured) to name as an insured is an insured but only with respect to liability arising out of your premises, “your work” for the Additional Insured, or acts or omissions of the Additional Insured in connection with the general supervision of “your work” to the extent set forth below.
 - a. The Limits of Insurance provided on behalf of the Additional Insured are not greater than those required by such contract.
 - b. The coverage provided to the Additional Insured(s) is not greater than that customarily provided by the policy forms specified in and required by the contract.
 - c. All insuring agreements, exclusions and conditions of this policy apply.
 - d. In no event shall the coverages or Limits of Insurance in this Coverage Form be increased by such contract.

Except when required otherwise by contract, this insurance does not apply to:

- 1) “Bodily injury” or “property damage” occurring after
 - a) All work on the project (other than service, maintenance or repairs) to be performed by or on behalf of the Additional Insured(s) at the site of the covered operations has been completed; or
 - b) That portion of “your work” out of which the injury or damage arises has been put to its intended use by any person or organization other than another contractor or subcontractor engaged in performing operations for a principal as a part of the same project.
- 2) “Bodily injury” or “property damage” arising out of any act or omission of the Additional Insured(s) or any of their employees, other than the general supervision of work performed for the Additional Insured(s) by you.
- 3) “Property damage” to
 - a) Property owned, used or occupied by or rented to the Additional Insured(s);
 - b) Property in the care, custody or control of the Additional Insured(s) or over which the Additional Insured(s) is for any purpose exercising physical control; or

- c) “Your work” for the Additional Insured(s).

With respect to Additional Insureds who are architects, engineers or surveyors, this insurance does not apply “bodily injury”, “property damage”, “personal injury” or “advertising injury” arising out of the rendering of or the failure to render any professional services by or for you, including:

- a) The preparing, approving, or failing to prepare or approve maps, drawings, opinions, reports, surveys, change orders, designs or specifications; and
- b) Supervisory, inspection or engineering services.

Any coverages provided hereunder shall be excess over any other valid and collectible insurance available to the Additional Insured(s) whether primary, excess, contingent or on any other basis unless a contract specifically requires that this insurance be primary or you request that it apply on a primary basis.

No person or organization is an Additional Insured with respect to the conduct of any current or past partnership or joint venture that is not shown as a Named Insured in the Declarations.

END OF ATTACHMENT A.6

**ATTACHMENT B –
SOLICITATION AND HIRING FOR QUALIFYING CONSTRUCTION CONTRACTS & FORMS**

- QUALIFYING CONSTRUCTION CONTRACTS POLICY
- SUMMARY SHEET
- CERTIFICATE OF EQUAL EMPLOYMENT OPPORTUNITY COMPLIANCE FOR CONTRACTORS & VENDORS
- WORKFORCE PROFILE AND INSTRUCTIONS
- COMPANY OWNERSHIP CERTIFICATION
- MINORITY/WOMEN OWNED CONTACT SHEET
- CONTRACTOR/SUBCONTRACTOR WORKFORCE PLAN
- APPENDIX A OF 44 ILL ADMIN CODE 750

SECTION III BUSINESS

5.00 SOLICITATION AND HIRING FOR QUALIFYING CONSTRUCTION CONTRACTS

.01 OBJECTIVE

The Peoria Park District Staff and Board believe that diversity and equity are central to our mission. Diversity of race, color, gender, disability, age, and culture in our employees and those we work with is important to fairly represent the same diversity in our community. The differing perspectives available from a diverse workforce are important to solving the complex problems of our community.

As one of the four pillars of the **Peoria Park District's 4-Pronged Approach to Equity** document, **Pillar #3** is to **Actively Promote and Encourage the Diversity, Equity and Inclusiveness of Peoria Park District funded Contractors and Suppliers.**

The Peoria Park District actively promotes and encourages maximum participation of minorities and women on Peoria Park District construction, procurement, and maintenance contracts to ensure that those we serve and those we work with look like the residents of our community.

This goal is established with the following objectives in mind:

- (A) To ensure that construction contracts are awarded and administered in a nondiscriminatory manner;
- (B) To meet the goals and requirements of the Illinois Human Rights Act ("Act") which requires that every party to a public contract and every eligible bidder shall refrain from unlawful discrimination and undertake affirmative action to assure equality of employment opportunity and eliminate the effects of past discrimination (775 ILCS 5/2-105(A)(1) and of the Illinois Administrative Code ("Code") which requires public contractors and subcontractors to determine if minority persons or women are underutilized in any job classification and, if such underutilization exists, to take appropriate affirmative action to rectify underutilization (44 Ill Admin Code 750.110 and 750.120);
- (C) To promote the District's use of Minority-Owned and Women-Owned Businesses by removing barriers and encouraging a level playing field on which such businesses can compete fairly for construction contracts;
- (D) To strive to increase capacity and participation of minority and women labor as well as Minority-Owned and Women-Owned Businesses for Peoria Park District construction projects; and
- (E) To ensure that goals for Minority-Owned and Women-Owned Businesses are narrowly tailored in accordance with applicable law.

The Park Board recognizes that it is required to comply with applicable bidding laws, federal and state constitutions, statutes, and rules and regulations, as well as any applicable local ordinances.

.02 DEFINITIONS

For the purpose of this Policy, the terms set forth below shall have the following definitions:

"Minority Person" shall mean a person who is a citizen or lawful permanent resident of the United States and who is any of the following: (a) American Indian or Alaska Native (a person having origins in any of the original peoples of North and South America, including Central America, and who maintains tribal affiliation or community attachment); (b) Asian (a person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent, including, but not limited to, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam); (c) Black or African American (a person having origins in any of the black racial groups of Africa); (d) Hispanic or Latino (a person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin, regardless of race); and (e) Native Hawaiian or Other Pacific Islander (a person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands).

"Woman" shall mean a person who is a citizen or lawful permanent resident of the United States and who is of the female gender.

"Minority-Owned Business" means a business which is at least 51% owned by one or more minority persons, or in the case of a corporation, at least 51% of the stock in which is owned by one or more minority persons; and the management and daily operations of which are controlled by one or more of the minority individuals who own it.

"Women-Owned Business" means a business which is at least 51% owned by one or more women, or in the case of a corporation, at least 51% of the stock in which is owned by one or more women; and the management and daily operations of which are controlled by one or more of the women who own it.

"Qualifying Construction Contract" or "Qualifying Construction Contracts" means any any or all construction projects with an estimated total base cost of \$50,000 or more.

"Responsible Bidder" means a person who has the capability in all respects to perform fully the contract requirements and who has the integrity and reliability that will assure good faith performance. Past performance may be considered as a part of this analysis. This further requires that the bidder is in compliance with the Act and Code.

"Responsive Bidder" means a person who has submitted a bid that conforms in all material respects to the invitation for bids.

"Subcontractor" includes any sub-subcontractors or any more remote contractors on the job.

Any definition above or herein that is not consistent with existing or subsequently added or amended provisions of the Act or Code shall be deemed modified to be consistent with the Act or Code. Any term used herein but not explicitly defined shall have the same meaning as in the Act or Code.

.03 PARTICIPATION GOALS AND AFFIRMATIVE STEPS

(A) Goals:

It is a goal of the Peoria Park District to ensure that the goals and provisions of the Act and Code are met and to encourage participation of minorities and women on Park District Qualifying Construction Projects.

Peoria Park District shall as permitted by law:

(1) endeavor to award not less than 20% of the total dollar amount of the Park District's Qualifying Construction Contracts to Minority-owned Businesses and not less than 5% of the total dollar amount of the Park District's Qualifying Construction Contracts to Women-owned Businesses ("Participation Goals"); and

(2) endeavor to ensure that a minimum of 20% of the total hours worked on any Qualifying Construction Contract are performed by Minority Persons and a minimum of 5% of the total hours worked are performed by Women ("Workforce Goals").

(B) Affirmative Steps:

Peoria Park District shall take the following affirmative steps to ensure that the aforesaid goals are met in respect to Qualifying Construction Projects:

1) Require that all contractors and subcontractors, as a part of their bid submission documents, provide information demonstrating that the contractor or subcontractor has examined all of its job classifications to determine if minority persons or women are underutilized in any classification, and if so, what affirmative action was taken to rectify that underutilization. (44 Ill Admin Code 750.110 (b) and 750.120);

2) Require that if a contractor or subcontractor hires additional employees in order to perform the contract or portion of the contract, it will determine the availability of minorities and women in the areas from which it might reasonably recruit and will hire for each job classification in a way that minorities and women are not underutilized (44 Ill Admin Code 750.110(c) and 120);

3) Include as a part of all contracts, and require as a part of all subcontracts, the Equal Opportunity Clause set forth in Appendix A of 44 Ill Admin Code 750;

4) Place qualified Minority-Owned and Women-Owned Businesses on solicitation lists;

5) Require that Minority-Owned and Women-Owned Businesses are solicited whenever they are potential sources, at varying sizes of projects;

6) Include in all advertisements for bid (legal notice in the Peoria Journal Star), "Bidders are also advised that contract documents for this project include the non-discrimination, equal opportunity and affirmative action provisions in the Human Rights Act and rules and regulations of

the Department of Human Rights. The Peoria Park District is an EEO organization and encourages participation by minority and female-owned firms.”

- 7) Notify applicable plan rooms and diverse agencies which have specific outreach and contacts with local Minority-Owned Businesses or Women-Owned Businesses of current projects out for bid to encourage the broadest notification to Minority-Owned Businesses and Women-Owned Businesses;
- 8) Include in all bid documents, a current list of Minority-Owned and Women-Owned Businesses for general contractors to be able to contact;
- 9) Provide access to a website for free download ability of bid documents for all contractors, including Minority-Owned Businesses and Women-Owned Business;
- 10) When economically feasible and legally permissible, divide construction projects into smaller tasks or quantities to permit maximum participation by Minority-Owned and Women-Owned Businesses;
- 11) Establish project and delivery schedules, when feasible, that encourage participation by Minority-Owned and Women-Owned Businesses;
- 12) Provide the following documentation in staff recommendations to the Park Board: all contractors and agencies notified of the work, all contractors known to download the bid documents, all contractors that bid on the work, which contractors and subcontractors are minority or women owned; the racial, ethnic, and gender breakdown of the contractor and subcontractor workforce on the form provided by PPD; and whether the contractor or subcontractor has violated any law or ordinance, failed to follow any PPD policies, or breached any contract with the PPD in the past;
- 13) Track final statistics of Peoria Park District construction projects for Minority-Owned Businesses and Women-Owned Businesses and workforce participation numbers quarterly and annually;
- 14) Require the general contractor on Qualifying Construction Contracts, if subcontracts are to be let, to follow the Good Faith Effort requirements defined below.

Good Faith Effort is defined as follows:

A good faith effort means the contractor actively and aggressively sought participation by Minority-Owned and Women-Owned Businesses and/or employment of Minority Persons and Women and to meet all requirements of the Act and Code.

Evidence of good faith effort includes, as appropriate:

- Meeting the requirements of the Act and Code as set forth above on an ongoing basis
- Based on the trades and availability of contractors required to complete the project, a

minimum of three minority/women owned firms must be contacted. The Park District's list of minority/women owned firms will be included in all bid documents.

- The bidder shall negotiate in good faith with the potential minority/women owned firms by not imposing any conditions which are not similarly imposed on all other subcontractors and suppliers, or by denying benefits ordinarily conferred on subcontractors or suppliers for the type of work for which bids were solicited. Minority and women owned businesses must be notified at least 3 business days prior to bid opening to allow adequate time to review and provide bid.
- On all Qualifying Construction Contracts, the bidder must complete and include in the bid, the **Minority/Women Owned Contact Sheet** form. This form will include name of companies contacted, the time and date companies were contacted, the method by which the companies were contacted, the response by the companies contacted, the area of work the companies were contacted about, and bid amounts received from the companies along with other comments.
- The low bidder shall provide to the Park District upon request, copies of all correspondence including without limitation, faxes, letters, text messages, and emails sent to minority/women owned firms.
- Assisting interested Minority-owned and Women-owned Businesses in obtaining bonding, lines of credit and insurance;
- Seeking services from available minority and women community organizations, contractors' groups, business assistance offices and other organizations, as appropriate, to provide assistance in recruiting Minority owned and Women-owned Businesses;
- Providing payroll records or other evidence showing the percentage of Minority Persons and Women employees;
- If a Minority-owned or Women-owned Business is rejected, providing sound reasons for rejection;
- Assisting interested Minority-owned and Women-owned Businesses in obtaining necessary equipment, supplies or materials;
- Placing qualified Minority-Owned and Women-Owned Businesses on solicitation lists;
- Ensuring that Minority-Owned and Women-Owned Businesses are solicited whenever they are potential sources, at varying sizes of projects; and
- When economically feasible and legally permissible, dividing construction projects into smaller tasks or quantities to permit maximum participation by Minority-Owned and Women-Owned Businesses

- All other good faith efforts or evidence of due diligence to meet the Park District's Workforce Goals;

.04 CONTRACT BID DOCUMENTS AND AWARD

The Park District shall include within the bid documents for each Qualifying Construction Contract:

- (A) A copy of this policy (Section 5.00);
- (B) An identification of what documents are required to be submitted as a part of the bid under this policy;
- (C) Such documents as will assist in determining compliance with this policy (including without limitation, Company Ownership Form, EEO Form, Workforce Profile, Minority/Women Owned Contact Sheet, Contractor/Subcontractor Workforce Plan);
- (D) A requirement that the contractor meet the Park District's Workforce Goals or provide evidence of a good faith effort toward meeting the goals;
- (E) Appendix A of 44 Ill Admin Code 750;
- (F) Notice that all subcontracts must make reference to and incorporate the provisions of this policy. To the extent a subcontract does not reference and incorporate the provisions of this policy, the contractor will be deemed in breach of contract and in violation of this policy, and shall be subject to the provisions of Section .05. below; and
- (G) Such other documents as deemed appropriate.

Contracts will be awarded to the lowest Responsible and Responsive Bidder. Bids or proposals submitted without the required documentation identified in this policy are considered unresponsive and will be rejected.

.05 PROGRAM ADMINISTRATION

- (A) The Executive Director or designee shall administer and enforce the provisions of this policy;
- (B) The Park District Board, prior to voting on an applicable contract award, shall be provided information showing the bidder's compliance with this policy;
- (C) The Executive Director or designee shall monitor, track, and report contractors' compliance with this policy over the contract duration to ensure compliance with this policy, including prompt reporting of potential violations to the DEIA Committee and Park District Board. The Park District Board, after five (5) days' notice to the contractor and allowing the

contractor to make a presentation to the Park District Board, shall make a final determination of whether a violation has occurred and what penalty or remedy should be imposed for such violation. Potential penalties or remedies include, but are not limited to, termination of any contract or subcontract, corrective action steps, PPD's contractual remedies, or that the PPD will not consider that contractor to be a responsible bidder, in accordance with Section 8-1(c) of the Park District Code, 70 ILCS 1205/8-1(c), until that contractor provides evidence of making a good faith effort toward meeting these goals, or any combination of penalties and remedies that the Board deems appropriate. The decision of the Park Board is final. The Park Board shall promptly report its decision to the DEIA Committee.

- (D) The Executive Director or designee shall submit a quarterly report with statistics of Peoria Park District construction projects for Minority- Owned Businesses and Women-Owned Businesses and workforce participation numbers to DEIA Committee and to the Park Board for review; and
- (E) The Executive Director or designee shall submit an annual report to the DEIA Committee and Park Board of final statistics of Peoria Park District construction projects for Minority-Owned Businesses and Women-Owned Businesses and workforce participation numbers.

SUMMARY SHEET

SOLICITATION AND HIRING FOR QUALIFYING CONSTRUCTION CONTRACTS

(Construction Projects of \$50,000.00 or more)

1. Goals

Bidder must meet Park District's goals stated below or provide evidence of good faith effort toward meeting the goals to be considered a Responsible and Responsive Bidder.

- Not less than 20% of the total dollar amount of the Contract awarded to go to Minority-owned Businesses
- Not less than 5% of the total dollar amount of the Contract awarded to go to Women-owned Businesses
- Not less than 20% of total hours worked on the job to be by Minority Persons
- Not less than 5% of total hours worked on the job to be by Women

Prior to award, Bidder may be asked to attend a Park Board meeting to review goals and good faith efforts.

2. Required bid documents

The following forms are required with each bid submission. Failing to submit the forms may result in the bid being non-responsive.

- Bid Form
- Subcontractors List
- Certification of Compliance of Listed Provisions and Laws
- W-9
- Bid Bond
- Company Ownership Certification
- Certificate of Equal Employment Opportunity Compliance for Contractors and Vendors
- Workforce Profile
- Minority/Women Owned Contact Sheet
- Contractor/Subcontractor Workforce Plan

3. Required project administrative documents

- Signed Agreement Between Owner & Contractor
- Labor & Material Bond and Performance Bond
- Insurance
- Proof of Certified Payroll submitted to IDOL
- Lien Waivers
- Contractor Affidavit
- Contractor/Subcontractor Workforce Plan

4. Notice to Subcontractors

All subcontracts must make reference to and incorporate the provisions of this Qualifying Construction Contracts Policy. To the extent a subcontract does not reference and incorporate the provisions of the policy, the contractor will be deemed in breach of contract and in violation of this policy, and shall be subject to penalties or remedies stated below.

5. Violation & Penalties

During construction, not meeting self-stated goals listed on "Contractor/Subcontractor Workforce Plan" or "Minority/Women Owned Contact Sheet" shall appear to be a violation. This will result in the following:

- Staff will notify contractor and request additional information and corrective action steps

- Staff will give notice to the Diversity, Equity, Inclusion, & Accessibility (DEIA) Committee and the Park District Board
- The Park District Board, after 5 days' notice to the contractor and allowing the contractor to make a presentation to the Park District Board, shall make a final determination of whether a violation has occurred and what penalty or remedy should be imposed for such violations
- Potential penalties or remedies include:
 - Corrective action steps
 - Termination of any contract or subcontract
 - PPD's contractual remedies
 - PPD will not consider that contractor to be a responsible bidder on future projects until contractor provides evidence of making a good faith effort toward meeting these goals, or any combination of penalties and remedies that the Board deems appropriate.

The decision of the Park Board is final.



**Peoria Park District
Certificate of Equal Employment Opportunity Compliance for Contractors & Vendors**

The Peoria Park District is an Equal Opportunity Employer and it agrees with each of the provisions below and requires that all suppliers, contractors, subcontractors, and vendors doing business with the Park District be Certified Equal Employment Opportunity Employers in compliance with the Illinois Human Rights Act and such regulations promulgated thereunder, and, that any and all suppliers, contractors, subcontractors or vendors who are found to be in non-compliance with the Illinois Human Rights Act or said regulations may be declared ineligible for future contracts with this Park District; and, that each and every supplier, contractor, subcontractor or vendor does at all times in connection with any dealings with this Park District agree as follows:

- 1) That it will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, marital status, order of protection status, national origin or ancestry, citizenship status, age, physical or mental disability unrelated to ability, military status or an unfavorable discharge from military service; and,

further, that it will examine all job classifications to determine if minority persons or women are underutilized and will take appropriate affirmative action to rectify any underutilization [44 Ill Admin Code 750.110(b)].

- 2) That, if it hires additional employees in order to perform this contract or any portion of this contract, it will determine the availability (in accordance with the Illinois Department of Human Rights Rules and Regulations) of minorities and women in the areas from which it may reasonably recruit and it will hire for each job classification for which employees are hired in a way that minorities and women are not underutilized.
- 3) That, in all solicitations or advertisements for employees placed by it or on its behalf, it will state that all applicants will be afforded equal opportunity without discrimination because of race, color, religion, sex, sexual orientation, marital status, order of protection status, national origin or ancestry, citizenship status, age, physical or mental disability unrelated to ability, military status or an unfavorable discharge from military service.
- 4) That it will send to each labor organization or representative of workers with which it has or is bound by a collective bargaining or other agreement or understanding, a notice advising the labor organization or representative of the contractor's obligations under the Illinois Human Rights Act and the Department's Rules and Regulations. If any labor organization or representative fails or refuses to cooperate with the contractor in its efforts to comply with such Act and Rules and Regulations, the contractor will promptly notify the Peoria Park District and will recruit employees from other sources when necessary to fulfill its obligations under the contract.
- 5) That it will submit reports as required by the Department's Rules and Regulations, furnish all relevant information as may from time to time be requested by the Department or the Peoria Park District, and in all respects comply with the Illinois Human Rights Act and the Department's Rules and Regulations.
- 6) That it will permit access to all relevant books, records, accounts and work sites by personnel of the Peoria Park District and the Department for purposes of investigation to ascertain compliance with the Illinois Human Rights Act and the Department's Rules and Regulations.
- 7) That it will include verbatim or by reference the provisions of this clause in every subcontract awarded under which any portion of the contract obligations are undertaken or assumed, so that the provisions will be binding upon the subcontractor. In the same manner as with other provisions of this contract, the contractor will be liable for compliance with applicable provisions of this clause by subcontractors; and further it will promptly notify the Peoria Park District and the Department in the event any subcontractor fails or refuses to comply with the provisions. In addition, the contractor will not utilize any subcontractor declared by the Illinois Human Rights Commission to be ineligible for contracts or subcontracts with the State of Illinois or any of its political subdivisions or municipal corporations.

Failure to properly complete and sign this form, certifying that the Company will agree to the above provisions of the Illinois Human Rights Act as well as the items below will result in it being returned unprocessed thereby resulting in a delay or denial of eligibility to be awarded work with the Peoria Park District.

The Company certifies that it has a written sexual harassment policy meeting the Illinois Human Rights Act and Illinois Department of Human Rights requirements.

Company Name

Company Address

Signature of Company Official

Name / Title

Telephone Number & Fax Number

Email Address

WORKFORCE PROFILE

Job Classifications	Black Employees		White Employees		Hispanic Employees		Native American Employees		Asian Employees		Other Employees		TOTAL EMPLOYEES	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
1. Officials, Managers, Supervisors														
2. Professionals														
3. Technicians														
4. Sales														
5. Office/Clerical														
6. White Collar Trainees:														
7. Skilled Crafts:														
8. Apprentices:														
9. On-the-job Trainees:														
10. Semi-skilled														
11. Service Workers														
12. Unskilled														
TOTALS														

Company Name: _____

WORKFORCE PROFILE INSTRUCTIONS

RACE/ETHNIC IDENTIFICATION

WHITE (not of Hispanic origin): All persons having origins in any of the original peoples of Europe, North Africa, or the Middle East.

BLACK (not of Hispanic origin): All persons having origins in any of the Black racial groups of Africa.

HISPANIC: All persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race.

ASIAN or PACIFIC ISLANDER: All persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands. This area includes, for example, China, India, Japan, Korea, the Philippine Islands, and Samoa.

NATIVE AMERICAN or ALASKAN NATIVE: All persons having origins in any of the original peoples of North America, and who maintain cultural identification through tribal affiliation or community recognition.

DESCRIPTION OF JOB CLASSIFICATIONS

OFFICIALS, MANAGERS, AND SUPERVISORS - Occupations requiring administrative personnel who set broad policies, and exercise over-all responsibility for the execution of these policies, and direct individual departments or special phases of a firm's operations. Includes: officials, executives, middle management, plant managers, department managers/superintendents, salaried foremen who are members of management, purchasing agents and buyers, and kindred workers.

PROFESSIONALS - Occupations requiring either college graduation or experience of such kind and amount as to provide a comparable background. Includes: accountants/auditors, airplane pilots and navigators, architects, artists, chemists, designers, dietitians, editors, engineers, lawyers, librarians, mathematicians, natural scientists, personnel and labor relations workers, physical scientists, physicians, social scientists, teachers, and kindred workers.

TECHNICIANS - Occupations requiring combination of basic scientific knowledge and manual skill which can be obtained through about 2 years of post high school education, such as is offered in many technical institutes and junior colleges, or through equivalent on-the-job training. Includes: drafters, engineering aids, junior engineers, scientific assistants, surveyors, technical illustrators, technicians (medical, dental, electronic physical sciences), and kindred workers.

SALES WORKERS - Occupations engaging wholly or primarily in direct selling. Includes: advertising agents/salespersons, insurance agents/brokers, real estate agents/brokers, stock and bond salespersons, demonstrators, salespersons and sales clerks, and kindred workers.

OFFICE AND CLERICAL WORKERS - Includes all clerical type work regardless of level of difficulty, where the activities are predominantly non-manual though some manual work not directly involved with altering or transporting the products is included. Includes: bookkeepers, cashiers, collectors (bills and accounts), messengers and office couriers, office machine operators, shipping and receiving clerks, stenographers, typist and secretaries, telegraph and telephone operators, and kindred workers.

WHITE COLLAR TRAINEES - Persons engaged in formal training for official, managerial, professional, technical, sales, office and clerical occupations.

SKILLED CRAFTS - Manual worker of relatively high skill level having a thorough and comprehensive knowledge of the processes involved in their work. Exercise considerable independent judgment and usually receive an extensive period of training. Includes: the building trades hourly paid foremen and leadmen who are not members of management, mechanics and repairmen, skilled machining occupations, compositors and typesetters, electricians, engravers, job setters (metal), motion picture projectionists, pattern and model makers, stationary engineers, tailors and tailoresses, and kindred workers.

APPRENTICES - Persons employed in a program including work training and related instruction to learn a trade or craft which is traditionally considered an apprenticeship, regardless of whether the program is registered with a Federal or State agency.

ON-THE-JOB TRAINEES - Persons engaged in formal training for craftsmen when not trained under apprentice programs; semi-skilled, unskilled and service occupations.

SEMI-SKILLED WORKERS - Workers who operate machine or processing equipment or perform other factory-type duties of intermediate skill level which can be mastered in a few weeks and require only limited training.

SERVICE WORKERS - Workers in both protective and non-protective service occupations. Includes: attendants (hospital and other institution, professional and personal service), barbers, charwomen and cleaners, cooks (except household), counter and fountain workers, elevator operators, fire fighters, guards, watchmen and doorkeepers, stewards, janitors, police officers and detectives, porters, waiters and waitresses, and kindred workers.

UNSKILLED WORKERS - Workers in manual occupations which generally require no special training. Perform elementary duties that may be learned in a few days and require the application of little or no independent judgement. Includes: garage laborers, car washers and greasers, gardeners (except farm) and groundskeepers, longshoremen and stevedores, lumbermen, craftsmen and wood choppers, laborers performing lifting, digging, mixing loading and pulling operations, and kindred workers.



PEORIA PARK DISTRICT

Company Ownership Certification

In compliance with Illinois Public Act 102-265, and Peoria Park District policy, disclosure of the information requested in this form is required by the Peoria Park District. Failure to properly complete and sign this form will result in it being returned unprocessed thereby resulting in a delay or denial of Company's eligibility to transact business with Peoria Park District.

Please answer all questions. Note, Company may answer "Yes" to more than one category.

- **Is the Company a Minority Owned Business?** YES NO

Check One:

Company holds Certification for this classification, or

Company is self-certifying

- **Is the Company a Woman Owned Business?** YES NO

Check One:

Company holds Certification for this classification, or

Company is self-certifying

- **Is the Company a Disability-Owned Business?** YES NO

Check One:

Company holds Certification for this classification, or

Company is self-certifying

- **Is the Company a Veteran Owned Business?** YES NO

Check One:

Company holds Certification for this classification, or

Company is self-certifying

- **Is the Company a Service Disabled Veteran Owned Business?** YES NO

Check One:

Company holds Certification for this classification, or

Company is self-certifying

Does Company qualify as a small business under federal Small Business Administration? YES NO

<https://www.sba.gov/document/support-table-size-standards>

Please list the name(s) of the Company majority owner(s): _____

Does Company have any parent and/or subsidiary companies? YES NO

If yes, please list all companies: _____

By signing this form, the Company and the individual signing below attest that the above questions have been answered truthfully, to the best of their knowledge.

Company Name

Company Address

Signature of Company Official

Name / Title

Telephone Number & Fax Number

Email Address



PEORIA PARK DISTRICT

Definitions for Company Ownership Certification

- Selected Classification of Owned Business means a business which is at least 51% owned by one or more persons of the selected ownership classification (i.e. minority, women, veteran, etc.), or in the case of a corporation, at least 51% of the stock in which is owned by one or more persons of the selected ownership classification; and the management and daily operations of which are controlled by one or more of the selected ownership classification individuals who own it.
- Control means the exclusive or ultimate and sole control of the business including, but not limited to, capital investment and all other financial matters, property, acquisitions, contract negotiations, legal matters, officer-director-employee selection and comprehensive hiring, operating responsibilities, cost-control matters, income and dividend matters, financial transactions and rights of other shareholders or joint partners. Control shall be real, substantial and continuing, no pro forma. Control shall include the power to direct or cause the direction of the management and policies of the business and to make the day-to-day as well as major decisions in matters of policy, management and operations. Control shall be exemplified by possessing the requisite knowledge and expertise to run the particular business and control shall not include simple majority or absentee ownership.
- Minority person shall mean a person who is a citizen or lawful permanent resident of the United States and who is any of the following:
 - a) American Indian or Alaska Native (a person having origins in any of the original peoples of North and South America, including Central America, and who maintains tribal affiliation or community attachment).
 - b) Asian (a person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent, including, but not limited to, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam).
 - c) Black or African American (a person having origins in any of the black racial groups of Africa).
 - d) Hispanic or Latino (a person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin, regardless of race).
 - e) Native Hawaiian or Other Pacific Islander (a person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands).
- Woman shall mean a person who is a citizen or lawful permanent resident of the United States and who is of the female gender.
- Veteran means a person who (i) has been a member of the armed forces of the United States or, while a citizen of the United States, was a member of the armed forces of allies of the United States in time of hostilities with a foreign country and (ii) has served under one or more of the following conditions: (a) the veteran served a total of at least 6 months; (b) the veteran served for the duration of hostilities regardless of the length of the engagement; (c) the veteran was discharged on the basis of hardship; or (d) the veteran was released from active duty because of a service connected disability and was discharged under honorable conditions.
- Service-Disabled Veteran means a veteran who has been found to have 10% or more service-connected disability by the United States Department of Veterans Affairs or the United States Department of Defense.
- A Person with a Disability means a person who is a citizen or lawful resident of the United States and is a person qualifying as being disabled, meaning a person with a severe physical or mental disability that:
 - a) results from: amputation, arthritis, autism, blindness, burn injury, cancer, cerebral palsy, Crohn's disease, cystic fibrosis, deafness, head injury, heart disease, hemiplegia, hemophilia, respiratory or pulmonary dysfunction, an intellectual disability, mental illness, multiple sclerosis, muscular dystrophy, musculoskeletal disorders, neurological disorders, including stroke and epilepsy, paraplegia, quadriplegia and other spinal cord conditions, sickle cell anemia, ulcerative colitis, specific learning disabilities, or end stage renal failure disease; and
 - b) substantially limits one or more of the person's major life activities.Another disability or combination of disabilities may also be considered as a severe disability for the purposes of item (a) of this subdivision if it is determined by an evaluation of the rehabilitation potential to cause a comparable degree of substantial functional limitation similar to the specific list of disabilities listed in item (a) of this subdivision.
- Certification means a determination made by the Business Enterprise Council for Minorities, Women, and Persons with Disabilities, or by one delegated authority from the Council to make certifications, or by a State agency with statutory authority to make such a certification, that a business entity is a business owned by a minority, woman, or person with a disability for whatever purpose.

Contractor/Subcontractor Workforce Plan

Initial Bid/Estimating Date: _____ Progress Reporting Date: _____

Check appropriate status:

_____ Contractor
 _____ Subcontractor

Company Name: _____

Address: _____

Contact Person: _____ Phone: _____

Project: _____

Date Work Started: _____ Percent Complete: _____ %

Job Categories (by Trade)	Total Est. Hrs. (Bid)	# Crew (Head Ct.)	# Minority (Head Ct.)	# Female (Head Ct.)	Planned Minority Hrs.	Planned Female Hrs.	Actual Minority Hrs. to date	Actual Female Hrs. to date
Example: Carpenter	1,000	4	1	0	250	0		
Example: Painter	300	3	1	1	100	100		
Total								

Document Purpose:

This document is a tool to estimate the number and areas of work concerning minority and female labor hours anticipated on this job.

The apparent low bidder and their subcontractors listed on the bid documents shall submit this form within one week after bid opening to the Peoria Park District.

This tool is also a means of tracking the minority and female hours on this job. This document shall be attached to each invoice to show actual minority and female hours on this job.

<i>Job Categories (by Trade)</i>	<i>List of Workers Trade Name</i>
<i>Total Est. Hrs. (Bid)</i>	<i>Total hours of each of the trade listed</i>
<i># Crew (Head Ct.)</i>	<i>Total crew head count of each of the trade listed</i>
<i># Minority (Head Ct.)</i>	<i>Total Minority head count (it is subset of Total Crew #)</i>
<i># Females (Head Ct.)</i>	<i>Total Female head count (it is subset of Total Crew #)</i>
<i>Planned Minority Hrs.</i>	<i>Planned Minority hours of each of the trade listed</i>
<i>Planned Female Hrs.</i>	<i>Planned Female hours of each of the trade listed</i>

APPENDIX A OF 44 IL ADMIN CODE 750
EQUAL EMPLOYMENT OPPORTUNITY

In the event of the contractor's non-compliance with the provisions of this Equal Employment Opportunity Clause or the Act, the contractor may be declared ineligible for future contracts or subcontracts with the State of Illinois or any of its political subdivisions or municipal corporations, and the contract may be cancelled or voided in whole or in part, and other sanctions or penalties may be imposed or remedies invoked as provided by statute or regulation. During the performance of this contract, the contractor agrees as follows:

- 1) That he or she will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, marital status, order of protection status, national origin or ancestry, citizenship status, age, physical or mental disability unrelated to ability, military status or an unfavorable discharge from military service; and, further, that he or she will examine all job classifications to determine if minority persons or women are underutilized and will take appropriate affirmative action to rectify any underutilization.
- 2) That, if he or she hires additional employees in order to perform this contract or any portion of this contract, he or she will determine the availability (in accordance with this Part) of minorities and women in the areas from which he or she may reasonably recruit and he or she will hire for each job classification for which employees are hired in a way that minorities and women are not underutilized.
- 3) That, in all solicitations or advertisements for employees placed by him or her or on his or her behalf, he or she will state that all applicants will be afforded equal opportunity without discrimination because of race, color, religion, sex, sexual orientation, marital status, order of protection status, national origin or ancestry, citizenship status, age, physical or mental disability unrelated to ability, military status or an unfavorable discharge from military service.
- 4) That he or she will send to each labor organization or representative of workers with which he or she has or is bound by a collective bargaining or other agreement or understanding, a notice advising the labor organization or representative of the contractor's obligations under the Act and this Part. If any labor organization or representative fails or refuses to cooperate with the contractor in his or her efforts to comply

with the Act and this Part, the contractor will promptly notify the Department and the contracting agency and will recruit employees from other sources when necessary to fulfill its obligations under the contract.

- 5) That he or she will submit reports as required by this Part, furnish all relevant information as may from time to time be requested by the Department or the contracting agency, and in all respects comply with the Act and this Part.
- 6) That he or she will permit access to all relevant books, records, accounts and work sites by personnel of the contracting agency and the Department for purposes of investigation to ascertain compliance with the Act and the Department's Rules and Regulations.
- 7) That he or she will include verbatim or by reference the provisions of this clause in every subcontract awarded under which any portion of the contract obligations are undertaken or assumed, so that the provisions will be binding upon the subcontractor. In the same manner as with other provisions of this contract, the contractor will be liable for compliance with applicable provisions of this clause by subcontractors; and further it will promptly notify the contracting agency and the Department in the event any subcontractor fails or refuses to comply with the provisions. In addition, the contractor will not utilize any subcontractor declared by the Illinois Human Rights Commission to be ineligible for contracts or subcontracts with the State of Illinois or any of its political subdivisions or municipal corporations.

**ATTACHMENT C –
DIRECTORY OF MINORITY & WOMEN OWNED BUSINESS ENTERPRISES**

Directory of Minority & Women Owned Business Enterprises Peoria Park District

MBE-Minority Owned Business Enterprise • WBE-Women Owned Business Enterprise • DOB-Persons with Disability Owned Business Enterprise
VOB-Veteran Owned Business Enterprise • SDV-Service Disabled Veteran Owned Business Enterprise

3 Keys Construction (MBE) Tray Keys	General Construction 2314 Lehman Rd, Peoria, IL 61604	309-472-2721 traykeys@gmail.com
A. Lucas & Sons Steel (WBE) Margaret Hanley	Structural Steel Fabrication 1328 SW Washington, Peoria, IL 61602	309-673-8547 Margaret@alucasiron.com
Ace In The Hole (WBE) Willa Warnkes-Sipp	Asphalt 15820 McDonald Rd, Hanna City, IL 61536	309-231-4556 patchem1@yahoo.com
Adams Septic & Sewer Services Inc (WBE) Michelle Adams	Septic and Sewer Contractor 1641 N Tiber Ridge Ct, East Peoria, IL 61611 adamssepticsewer@sbcglobal.net	309-691-6113
AFE Construction LLC (MBE/WBE) Tommy and Monica Arbuckle	General Contractor 2216 W Altorfer Dr, Suite #2, Peoria, IL 61615	309-473-8688 309-208-3092 Cell admin@afeconstruction.net tommy@afeconstruction.net
Agile Supply Company (MBE)	Commercial Building Materials 706 West Bradley Ave, Urbana, IL 61801	217-729-2686 sales@agilesupplycompany.com
Alexander Brothers Construction Co (MBE) Arielle Alexander	Concrete, Demolition, Excavation, Landscaping PO Box 1508, Peoria, IL 61605 alexanderbrothers1997@gmail.com	309-713-3010
Alexander & Sons Construction (MBE) Leonard Alexander	Driveways, Curbs, Foundations, Layouts, Sidewalks, etc. 2415 N. Linn Street, Peoria, IL 61604 Leonardalexander1467@yahoo.com	773-628-9064 Cell
Allworld Project Management LLC (MBE) Ronnie Foster Jr	Highway, Street & Bridge Construction, Water & Sewer Line and Related Construction, Landscaping, Civil Engineering 415 South Front Street, Suite 121, Memphis, TN 38103	901-881-2985 info@allworldmail.com
Architectural Design Group, Inc (WBE) Deborah Jean Baker	Architect Services 800 SW Adams St, Peoria, IL 61602	309-672-6498 dbaker@archdesigngrp.com
Bautista Electric Enterprises Inc (MBE)	Electrical 1204 W Eads St, Urbana, IL 61801	217-637-0659 Bautistaelectricinc@gmail.com
Ben Hendricks Trucking Inc (WBE) Miranda Hendricks	Trucking, Freight 460 W Vine St, Canton, IL 61520 benhendrickstrucking@gmail.com	815-289-7994 309-647-6878
Black Squirrel Contracting (MBE) Joshua Wessels	Concrete, Painting 2037 N Aspen Road, Peoria, IL 61604	309-369-7817 blackssquirrel@yahoo.com
BMI Contractors & Assoc (MBE) Sammy Hobson	Excavation, Concrete, Demolition 1123 MacQueen, Peoria, IL 61604	309-657-4469 bmicontractors@yahoo.com
BOWA Group, The (MBE) Lee Fantroy	General 7050 S Stony Island Ave, Chicago, IL 60649	312-238-9899 lfantroy@thebowagroup.com
BPI Testing LLC (WBE)	HVAC Building Testing Services 2911 Gill Street, Ste 1A, Bloomington, IL 61704	309-663-1500 bpi@bpitestingllc.com
Braun Excavating Inc (WBE) Teresa Braun	Demolition, Digging of Footings, Excavation, Pipe Laying 24 Gulf Stream, Bartonville, IL 61607	309-697-5454
Brown Procurement & Consulting (MBE)	Electrical Supply 4002 Crowwood Dr, Apt 104, Champaign, IL 61822	217-418-2689 marcus@brown-pc.com
Buddy's Grounds Maintenance Inc (MBE) Dexter Davis	Landscaping PO Box 1125, Bloomington, IL 61702	309-824-9211 Dexterdavis2@aol.com
Built United (MBE) John Sutherland	General Contractor, Carpentry 921 S. Bosch Rd, Unit B, Peoria, IL 61607	309-699-9191 john@builtunited.com

Burnside Brothers Construction (MBE) Terry Burnside	Landscaping, General Construction 3563 SW Adams, Peoria, IL 61605	309-922-9390 terryburnside@hotmail.com
C Lindsay Sealcoating (MBE)	Paving & Asphalt Serving Peoria & Surrounding Areas	309-291-9352 309-453-8162 clindsay44@yahoo.com
C & G Concrete Construction Co Inc (WBE) Patricia Slusher	Concrete East Peoria, IL 61611	309-699-0384 309-208-4601 Cell Rodney@cngconcrete.com tricia@cngconcrete.com
CAD Construction (WBE) Kerry Keller	General Contractor 150 S Baer Rd, Tremont, IL 61568 admin@cadconstructioninc.com	309-925-2092
Central IL Consulting (WBE) Jessica Youngman	Land Surveying 416 Germantown Rd, Germantown, IL 61548	309-383-3156 youngman@mtco.com
Central Landscaping (WBE) Donna Brandenburg	Seeding, Landscaping 12512 Mendell Rd, Princeville, IL 61559	309-385-4832
CJL Landscaping Inc (WBE) Rebecca Kelch	Landscaping 10902 W US Highway 150, Brimfield, IL 61517	309-691-9200 Meinders_81@yahoo.com jrdoering@att.net
Clevenger Contractors Inc (WBE) Verlee Clevenger, Misty L. Daham	Guardrail, Bridge Rail, Seeding, Fencing 355 Naples Rd, PO Box 19, Bluffs, IL 62621	217-754-3411 clever@irtc.net
CNS Forestry & Landscaping (WBE)	Forestry & Landscaping 1813 1000 th St, Lincoln, IL 62656	217-792-3808
Concrete to Perfection (MBE/WBE) Elonda Whitfield	Concrete (Repair, Design, Protect, Patching) and Counter Tops 3510 N Kingston Dr Unit 21, Peoria, IL 61604 concretetoperfection@gmail.com	309-681-9508 309-472-0215 Cell
Cook Fasser (WBE)	Roofing Supplies 5835 N Galena Road, #201, Peoria, IL 61614	309-682-1600 manderson@cookfasser.com
Cordova Construction (WBE) Tina Christopher	Landscaping, Dirt Work, Concrete Removal, Curb & Gutter Removal, Sidewalk Removal 2424 N Ellory Road, Peoria, IL 61615	309-208-3448 Cell tinac18827@yahoo.com
Cranford Plumbing (WBE)	Plumbing PO Box 755, Dunlap, IL 61525	309-697-3484
CSS (Construction Specialties & Services) (MBE) Dave Suzuki	Building Specialties, Design, Engineering, Estimating PO Box 120703, Peoria, IL 61614	309-685-8453 css@sai-x.com cssco@sai-x.com
Custom Underground Inc (WBE) Diane Feuchter	Directional Boring, Fiber Optic Splicing, Utility Construction 9907 W US Highway 150, Edwards, IL 61528	309-683-3677 mail@customug.com
CWG Inc (WBE) Teresa Gustafson	Demolition, Excavation, Trucking 24635 Cooper Rd, Morton, IL 61550	309-208-5461 Cell 309-208-8899 Cell
Dashco, Inc (WBE)	Insulation, siding, windows, soffits, gutters, rain/gutter guard 4901 S Becker Dr, Bartonville, IL 61607	309-633-1383 debbie@dashco.site
DECA Realty & DECA Properties (MBE) Eddie J. Washington	Real Estate Broker, Appraiser & Properties 417 W Main, Peoria, IL 61606	309-637-3322 washingtoned48@gmail.com
Design Air Inc (MBE) Courtney Eston	Commercial Air Duct Cleaning 6625 N Big Hollow Rd # 312, Peoria, IL 61615	309-693-8632 cle@designair-inc.com
Drummond Construction LLC (MBE) Charles Drummond	Sewage and stormwater treatment works or nonpoint source projects 1609 S Griswold, Peoria IL 61605	309-643-2757 drummondcharles9@gmail.com
E & D Trucking and Hauling Inc (MBE) Eddie Proctor	Trucking/Hauling 1913 N Idaho, Peoria, IL 61604	309-251-6736 Cell
Earth Care Unlimited Inc (WBE) Monica Thornley	Landscaping, Seeding, Sodding 3108 Panther Grove Rd, Ashland, IL 62612 earthcareunlimited@yahoo.com	217-452-7370 217-414-4321

Elite Armour Roofing (WBE)	Roofing, Siding, Gutters, Fascia, Soffits Dunlap, IL	800-327-4987 elitearmourroofing@gmail.com
Foster-Jacob Electric (WBE) Emily Rudesill	Electrical 826 W Main St, Peoria, IL 61606	309-674-8129 emilyj@fosterjacob.com
Fosters Custom Painting (WBE)	Painter Peoria, IL fosterscustompainting@yahoo.com	309-208-7538
Fritch Heating & Cooling (WBE)	HVAC 1004 NE Adams, Peoria, IL 61603	309-671-5360
G.A. Rich & Sons (WBE)	Mechanical and Utility Contractor, Commercial Plumbing 204 S Perry, Deer Creek, IL 61733	309-447-6231 info@garich.com
Garza Heating & Cooling (MBE)	HVAC 1304 S Western Ave, Peoria, IL 61605	309-645-6294 carlosgarza@gmail.com
General Fence Company (MBE) Stephanie Guerrero	Fencing 2305 W. Mound Road, Decatur, IL 62526 stephanie@generalfence.comcastbiz.net	217-877-3831
Get Current Electrical Services (MBE) Richard Rhodes	Electrical 4210 N Northbrook Ct	309-989-7931 gces.inc@yahoo.com
Horowitz Concrete (WBE)	Concrete 128 Legion Lane, East Peoria, IL 61611	309-208-4757
Ronald A. Givens & Associates (MBE) Ronald A. Givens	Insurance & Investments 2616 N Lehman, Peoria, IL 61602	309-685-4588
GIVSCO Construction (MBE) Ronald Givens	General Contractor 2323 Lakeshore Dr, Suite B, Pekin, IL 61554	309-620-9127 info@givSCO.com
Gutters & More (WBE) Kris Rainey	Gutters 157 Thunderbird Ln, East Peoria, IL 61611	309-694-4000 ksr@gutters-more.com
H & S Mechanical Inc (WBE) Tara Howard	Mechanical, Structural Steel and Electrical Contractor 5607 S Washington St, Bartonville, IL 61607	309-696-7066 tara@hsmechanicalinc.com
Hancock Trucking Inc (WBE) Nancy Hancock	Trucking/Hauling 30570 Hancock Road, Mackinaw, IL 61755	309-447-6733
Hanley Industrial Services (VOB) Jim Hanley	Drafting & Design, Metal Supplies (Incl. Fabricated Steel), Highway Products, Consulting 8811 N. Industrial Road, Suite A, Peoria, IL 61615 jim@hanleyindustrialservices.com	309-261-9941
Hermann & Associates (WBE) Alisha Hermann	Consultant Engineering 4603 N Galena Rd, Peoria Heights, IL 61616 ahermann@hermannassoc.com	309-687-5566
Illinois Mechanical Service & Design (WBE) Beth Ward	HVAC PO Box 10494, Peoria, IL 61612	309-713-3640 309-713-2995 Fax service@illmsd.com
Infrastructure Engineering (MBE)	Civil Engineering 456 Fulton St, Suite 256, Peoria, IL 61602 eandrews@infrastructure-eng.com	309-637-9200 309-637-9210
Intech Innovations (SDV) John McCrary	Audio/Video Design and Integration Washington, IL 61571 jmccrary@intechinnovations.com	309-481-4361
Interlock Brick Paving (WBE) Chris Joos	Hardscaping, Landscaping, Excavating PO Box 6, Morton, IL 61550 chris@interlockbrickpaving.com	309-696-9264
JC Construction (MBE) Frank Coates	General 1810 Stever, Peoria, IL 61605	309-303-3919 Cell
JD Traffic Inc (WBE)	Traffic Control Equipment 4200 S Ricketts Ave, Bartonville, IL	309-966-4494 Jordan@JD-Traffic.com

JM Industrial Supply (MBE/VOB) Ron Given	Maintenance Items, Tools, Soaps 2323 Lakeshore, Pekin, IL 61554	309-346-5796 sales@jimindsupply.com
Jones Electrical Contractors Inc (MBE/VOB) Ronald Jones	Electrical 5611 W Rachael Dr, Peoria, IL 61615	309-339-7690 rj@joneselectricalco.com
JTC Traffic Safety (MBE)	Traffic Control and Sign-Making Services 7623 N Crestline Dr, Peoria, IL 61615	309-213-1552 jefft@jtctrfficsafety.com
Kadilex Construction Inc (MBE)	Rebar Installation P.O. Box 348 Wood River, IL 62095	618-216-2621 info@kadilexconstruction.com
Kelley Ironworks (WBE) Tania Hoerr	Fencing, Railings and Ironwork 4303 N Main St, East Peoria, IL 61611	309-697-9870 309-208-5207 Cell tania@kelleyiron.com
Kemper Construction (WBE)	General Contractor 423 Enterprise Dr, Canton, IL 61520	309-647-3836
Kerry Brown Trucking (MBE) Leo K. Brown	Tandem, Semi Dump, General Hauling Peoria, IL	309-251-6089 Cell leok.brown1957@gmail.com
Kreiling Roofing Co (WBE)	Residential & Commercial single ply, BUR, coatings, metal roofing, shingles, tile, slate, wood shake, with custom sheet metal details and copper work 2335 W Altorfer Dr, Peoria, IL 61615	309-673-3649 kdimler@kreiling.com
Lewis Michael Construction (MBE/WBE) Andre McKnight	Janitorial & Construction Clean-Up 2000 W Pioneer Parkway, Ste 7, Peoria, IL61615	309-686-7107 lmcm2@comcast.net
LIZZ Trucking & Hauling (MBE) Brandon Hines	Trucking/Hauling Peoria, IL 61604	309-208-5942 lizztrucking@yahoo.com
Los Amigos Concrete Construction (MBE)	Concrete Peoria, IL	309-863-6495 Eddievega599@yahoo.com
LNR Construction (MBE) Lavael Randle Sr	General Construction 2200 N Linsley St, Peoria, IL 61605	309-678-3314 Cell
M & A Plumbing (MBE) Michael Abner	Plumbing 6216 N Devonshire Avenue, Peoria, IL 61615	309-689-0133 mabner1953@icloud.com
McGinnis Transportation (WBE) Beth McGinnis	Trucking, Tandem, 24" Box Truck 336 Riverview Drive, Creve Coeur, IL 61610	309-369-4465
Millennia Professional Services of IL (MBE) Thomas Ngo	Civil Engineering, Surveying, Materials Testing 850 N Main St., Morton, IL 61550	309-321-8141 tngo@millennia.pro
Molleck Electric (WBE)	Electrical 14926 W Winchester Dr, Brimfield, IL 61517	309-446-3483 dmolleck@yahoo.com
Montefusco HVAC (WBE) Lisa Rhoades	HVAC 2400 W Park 74 Drive, Peoria, IL 61615	309-691-7400 309-208-6233 lisa@montefuscohvac.com
Murillo Concrete (MBE) Javier Murillo	Concrete Dunlap, IL	309-397-6852 murilloconcrete@gmail.com
Ogborn Plumbing (WBE)	Plumbing 311 Peach, Washington, IL 61571	309-745-5763
Peoria Brick Company (WBE)	Brick and Stone Supply 501 Cole Street, East Peoria, IL 61611	309-699-1116 info@peoriabrick.com
Peoria Metro Construction Inc (WBE) Courtney Meischner	General Contractor, Concrete Contractor 1925 S Darst St, Peoria, IL 61607	309-671-1466 info@peoriametro.com
Phoenix Corporation (WBE)	Trucking and Excavating 1006 Rosehill Rd. Port Byron IL 61275	309-523-3687 estimating@phoenixcorp.org
Pizano Electric Inc (MBE)	Electrical 716 24th St. Rock Island, IL 61201	309-373-7808 pizanoelectrical@gmail.com
Point Construction Company (MBE) Juan Madrigal	Roofing, Siding, Carpentry Peoria, IL 61614	309-635-9074 jjm025@gmail.com

Porter, V. L. (MBE) Vincent Porter	Concrete, General 500 W North, Suite 10, Springfield, IL 62704	217-744-8050
Prairie Engineers of Illinois PC (WBE) Colleen Ayars	Civil Engineering, Surveying, Environmental Consulting 926 SW Adams Street, Suite 120, Peoria, IL 61602 www.prairieengineers.com	309-839-2642
Quick Electrical Contractors Inc (WBE) Lisa Quick	Electrical 445 Carter St, PO Box 49, Fairview, IL 61432	309-778-2000 lq@quickelectric.net
Rainforcing Roofing and Exteriors (MBE/WBE)	Roofing, Siding, Gutters 2617 N Sheridan Rd, Peoria, IL	309-989-3279 rainforcing.roof2022@gmail.com
Reign Construction (MBE/WBE) Bridget Booker	Iron Worker, Structural, Bridges, Rebar, Fabrication, Welding, Rigging, and Ornamental 801 W Main St, Suite A118, Peoria, IL 61606 bridget@reignconstructioninc.com	309-495-7284 309-750-4846 Cell
RNS Electric Inc (WBE) Regina Slonneger	Electrical 28558 Irish Lane, Washington, IL 61571	309-444-5200 gina@rnslectricinc.com ty@rnslectricinc.com
Rustic Oaks Lawn & Landscaping (MBE) Kameron Velasquez	Concrete, Landscape Design, Installation, and Maintenance East Peoria, IL 61611 office@rusticoakslandscaping.com	309-966-0689
Searle Trucking Inc (WBE) Debbie Searle	Trucking/Hauling, Trailors, Flat Dump PO Box 1084, Peoria, IL 61653	309-686-0708 searletrkn@comcast.net
Serenity Electric (MBE)	Electrical PO Box 6521, Peoria, IL 61601 jamestaylor1955@yahoo.com	309-363-5067 Cell
Sheridan Road Lumber (WBE)	Lumber and Materials Provider 6600 N Sheridan Road, Peoria, IL 61614	309-691-0858 info@srlico.com
Sierra Glass Company (MBE)	Glass Supply 301 N. Neil Street Suite 400, Champaign, IL 61820 antwuan@sierraglasscompany.com	217-239-0644
Standard Heating & Cooling (WBE)	HVAC 906 SW Adams, Peoria, IL 61602	309-671-5417 bewalt@standardheat.com
Stoops Plumbing (WBE) Jennifer Stoops	Plumbing PO Box 320, Mackinaw, IL 61755	309-494-9500 jennifer@stoopsplumbing.com
Tabitha Ventures Inc (MBE) Edward O Taiwo	General Construction & Management 2217 N Woodcrest Dr #3E, Dunlap, IL 61525	309-692-1473 info@tabithainc.com
Thompson Brothers Inc (MBE) Todd Thompson	General Carpentry and Construction, Interior Finish Work, Millwork PO Box 313, Pekin, IL 61555	309-613-0254 office@tbrosinc.com
Thornton Rave Construction (MBE)	Asphalt Patching, Concrete Flatwork, Landscaping 1208 Philo Rd, Urbana, IL 61801 admin@thorntonraveconstruction.com	217-904-9910
Tiles in Style LLC (MBE/WBE) dba Taza Supplies dba Taza Construction	Flooring Solutions Construction Materials General Construction 16940 Vincennes Ave, South Holland, IL	sales@tilesinstyle.com sales@tazasupplies.com sales@tazaconstruction.com 877-817-2841
Titan Industries (WBE)	Steel Fabrication 100 Prospect Dr, Deer Creek, IL 61733	309-440-1010 info@titanind.us
TSI Commercial Floor Covering (WBE)	Flooring 3611 N Staley Rd, Suite #1, Champaign, IL 61822	217-328-7321 marci.smith@tsicfcaer.com
Universal Paintings and Coatings (WBE)	Painting & Wallpapering 390 Wildwood Dr, Groveland, IL 61535	309-253-1569 universalcoatingsllc@gmail.com
Varsity Striping & Construction (WBE) Katherine Doughty	Pavement Marking 2601 Cardinal Rd, Champaign, IL 61821 bkemper@varsitystriping.com	217-352-2203

Veya Inc (MBE)	Concrete, Curbs & Gutters, Excavation 601 S. Country Fair Drive, Champaign, IL 61821	217-607-1500
Western Asphalt Inc (WBE)	Environmental Remediation & Restoration, Excavation, Demolition 2665 Prairie College Rd. Jacksonville, IL 62650	217-243-3822 info@workwithwestern.com
Will Heating & Cooling (MBE)	HVAC 2825 Humboldt, Peoria IL 61605	309-839-5280 dallaswilliams73@gmail.com
Willis Electric (WBE) Phyllis Willis	Electrical PO Box 545, Chillicothe, IL 61523	309-579-2926 309-208-3415 Cell willis@mediacombb.net

**ATTACHMENT D –
PREVAILING WAGES FOR PEORIA COUNTY – ILLINOIS DEPARTMENT OF LABOR**

Peoria County Prevailing Wage Rates posted on 3/3/2025

Trade Title	Rg	Type	C	Base	Foreman	Overtime					Pension	Vac	Trng	Other Ins	Add OT 1.5x owed	Add OT 2.0x owed
						M-F	Sa	Su	Hol	H/W						
ASBESTOS ABT-GEN	All	BLD		34.50	36.00	1.5	1.5	2.0	2.0	8.70	22.90	0.00	0.80	0.00	2.17	4.34
ASBESTOS ABT-GEN	All	HWY		36.45	37.95	1.5	1.5	2.0	2.0	8.70	26.92	0.00	0.80	0.00	3.81	7.62
ASBESTOS ABT-MEC	All	BLD		33.43	37.19	1.5	1.5	2.0	2.0	15.84	14.47	0.00	0.90		2.33	4.66
BOILERMAKER	All	BLD		45.23	48.23	1.5	1.5	2.0	2.0	7.07	24.29	0.00	2.19	0.00	0.00	0.00
BRICK MASON	All	BLD		39.30	41.66	1.5	1.5	2.0	2.0	12.20	14.75	0.00	1.05		0.00	0.00
CARPENTER	All	BLD		38.07	40.82	1.5	1.5	2.0	2.0	9.70	21.79	0.00	0.80	0.00	15.75	31.49
CARPENTER	All	HWY		39.97	42.22	1.5	1.5	2.0	2.0	9.70	24.00	0.00	0.77	0.00	0.00	0.00
CEMENT MASON	All	BLD		34.31	36.06	1.5	1.5	2.0	2.0	9.00	23.22	0.00	0.83		0.00	0.00
CEMENT MASON	All	HWY		37.31	39.31	1.5	1.5	2.0	2.0	9.00	23.02	0.00	0.77	0.00	0.00	0.00
CERAMIC TILE FINISHER	All	BLD		36.13		1.5	1.5	2.0	2.0	12.20	14.75	0.00	1.04		0.00	0.00
ELECTRIC PWR EQMT OP	All	ALL		55.13	65.42	1.5	1.5	2.0	2.0	8.90	15.43	0.00	0.55	0.00	0.00	0.00
ELECTRIC PWR GRNDMAN	All	ALL		37.46	65.42	1.5	1.5	2.0	2.0	8.37	10.49	0.00	0.37	0.00	0.00	0.00
ELECTRIC PWR LINEMAN	All	ALL		61.36	65.42	1.5	1.5	2.0	2.0	9.09	17.18	0.00	0.61	0.00	0.00	0.00
ELECTRIC PWR TRK DRV	All	ALL		39.31	65.42	1.5	1.5	2.0	2.0	8.43	11.01	0.00	0.39	0.00	0.00	0.00
ELECTRICIAN	All	BLD		44.10	47.60	1.5	1.5	2.0	2.0	9.63	16.07	0.00	0.90		0.00	0.00
ELECTRONIC SYSTEM TECH	All	BLD		34.59	37.59	1.5	1.5	2.0	2.0	8.85	14.06	0.00	0.40		0.00	0.00
ELEVATOR CONSTRUCTOR	All	BLD		57.99	65.24	2.0	2.0	2.0	2.0	16.27	21.36	4.64	0.80		0.00	0.00
GLAZIER	All	BLD		39.74	41.74	1.5	1.5	1.5	2.0	15.27	11.21	0.00	1.30	0.00	0.00	0.00
HEAT/FROST INSULATOR	All	BLD		45.91	48.66	1.5	1.5	2.0	2.0	15.84	16.71	0.00	0.90		3.45	6.90
IRON WORKER	All	BLD		37.35	39.25	1.5	1.5	2.0	2.0	12.31	19.76	0.00	0.86	0.00	0.00	0.00
IRON WORKER	All	HWY		44.14	46.14	1.5	1.5	2.0	2.0	12.31	19.76	0.00	1.11	0.00	0.00	0.00
LABORER	All	BLD		32.50	34.00	1.5	1.5	2.0	2.0	8.70	22.90	0.00	0.80	0.00	2.17	4.34
LABORER	All	HWY		35.70	37.20	1.5	1.5	2.0	2.0	8.70	26.92	0.00	0.80	0.00	3.81	7.62
LABORER, SKILLED	All	BLD		32.90	34.40	1.5	1.5	2.0	2.0	8.70	22.90	0.00	0.80	0.00	2.17	4.34
LABORER, SKILLED	All	HWY		36.00	37.50	1.5	1.5	2.0	2.0	8.70	26.92	0.00	0.80	0.00	3.81	7.62
LATHER	All	BLD		38.07	40.82	1.5	1.5	2.0	2.0	9.70	21.79	0.00	0.80	0.00	15.75	31.49
MACHINERY MOVER	All	HWY		44.14	46.14	1.5	1.5	2.0	2.0	12.31	19.76	0.00	1.11	0.00	0.00	0.00

Peoria County Prevailing Wage Rates posted on 3/3/2025

MACHINIST	All	BLD		58.39	62.39	1.5	1.5	2.0	2.0	9.93	8.95	1.85	1.47		0.00	0.00
MARBLE FINISHER	All	BLD		36.13		1.5	1.5	2.0	2.0	12.20	14.75	0.00	1.04		0.00	0.00
MARBLE MASON	All	BLD		39.71	42.09	1.5	1.5	2.0	2.0	12.20	14.75	0.00	1.06		0.00	0.00
MILLWRIGHT	All	BLD		37.25	40.00	1.5	1.5	2.0	2.0	9.70	22.98	0.00	0.80	0.00	16.34	32.68
MILLWRIGHT	All	HWY		41.00	43.25	1.5	1.5	2.0	2.0	9.70	23.62	0.00	0.77	0.00	0.00	0.00
OPERATING ENGINEER	All	BLD	1	46.67	49.67	1.5	1.5	2.0	2.0	12.60	24.15	0.00	3.60	0.00	0.00	0.00
OPERATING ENGINEER	All	BLD	2	43.14	49.67	1.5	1.5	2.0	2.0	12.60	24.15	0.00	3.60	0.00	0.00	0.00
OPERATING ENGINEER	All	BLD	3	37.36	49.67	1.5	1.5	2.0	2.0	12.60	24.15	0.00	3.60	0.00	0.00	0.00
OPERATING ENGINEER	All	HWY	1	46.67	49.67	1.5	1.5	2.0	2.0	12.60	24.15	0.00	3.60	0.00	0.00	0.00
OPERATING ENGINEER	All	HWY	2	43.14	49.67	1.5	1.5	2.0	2.0	12.60	24.15	0.00	3.60	0.00	0.00	0.00
OPERATING ENGINEER	All	HWY	3	37.36	49.67	1.5	1.5	2.0	2.0	12.60	24.15	0.00	3.60	0.00	0.00	0.00
PAINTER	All	ALL		41.00	43.00	1.5	1.5	1.5	2.0	14.53	11.87	0.00	1.40	0.00	0.00	0.00
PAINTER - SIGNS	All	BLD		46.76	52.53	1.5	1.5	2.0	2.0	8.20	16.81	0.00	0.00	0.00	0.00	0.00
PILEDRIVER	All	BLD		40.07	42.82	1.5	1.5	2.0	2.0	9.70	21.79	0.00	0.80	0.00	15.75	31.49
PILEDRIVER	All	HWY		40.97	43.22	1.5	1.5	2.0	2.0	9.70	24.00	0.00	0.77	0.00	0.00	0.00
PIPEFITTER	All	BLD		41.10	45.62	1.5	1.5	2.0	2.0	9.45	16.74	0.00	1.40		0.00	0.00
PLASTERER	All	BLD		33.00	35.00	1.5	1.5	2.0	2.0	9.00	23.85	0.00	0.98		0.00	0.00
PLUMBER	All	BLD		38.80	42.29	1.5	1.5	2.0	2.0	9.45	17.98	0.00	1.45	0.00	0.00	0.00
ROOFER	All	BLD		36.00	40.50	1.5	1.5	2.0	2.0	10.75	13.04	0.00	0.30	0.00	0.00	0.00
SHEETMETAL WORKER	All	BLD		39.50	41.48	1.5	1.5	2.0	2.0	11.82	19.98	0.00	1.26	0.00	0.00	0.00
SIGN HANGER	All	HWY		44.14	46.14	1.5	1.5	2.0	2.0	12.31	19.76	0.00	1.11	0.00	0.00	0.00
SPRINKLER FITTER	All	BLD		47.09	50.09	1.5	1.5	2.0	2.0	11.45	14.92	0.00	0.52		0.00	0.00
STEEL ERECTOR	All	HWY		44.14	46.14	1.5	1.5	2.0	2.0	12.31	19.76	0.00	1.11	0.00	0.00	0.00
STONE MASON	All	BLD		39.30	41.66	1.5	1.5	2.0	2.0	12.20	14.75	0.00	1.05		0.00	0.00
TERRAZZO FINISHER	All	BLD		36.13		1.5	1.5	2.0	2.0	12.20	14.75	0.00	1.04		0.00	0.00
TERRAZZO MASON	All	BLD		39.71	42.09	1.5	1.5	2.0	2.0	12.20	14.75	0.00	1.06		0.00	0.00
TILE MASON	All	BLD		39.71	42.09	1.5	1.5	2.0	2.0	12.20	14.75	0.00	1.06		0.00	0.00
TRUCK DRIVER	All	ALL	1	43.24	47.60	1.5	1.5	2.0	2.0	16.27	7.75	0.00	0.25	0.00	0.00	0.00
TRUCK DRIVER	All	ALL	2	43.38	47.60	1.5	1.5	2.0	2.0	16.27	7.75	0.00	0.25	0.00	0.00	0.00
TRUCK DRIVER	All	ALL	3	44.10	47.60	1.5	1.5	2.0	2.0	16.27	7.75	0.00	0.25	0.00	0.00	0.00

Peoria County Prevailing Wage Rates posted on 3/3/2025

TRUCK DRIVER	All	ALL	4	44.49	47.60	1.5	1.5	2.0	2.0	16.27	7.75	0.00	0.25	0.00	0.00	0.00
TRUCK DRIVER	All	ALL	5	45.59	47.60	1.5	1.5	2.0	2.0	16.27	7.75	0.00	0.25	0.00	0.00	0.00
TRUCK DRIVER	All	O&C	1	34.59	38.08	1.5	1.5	2.0	2.0	16.27	7.75	0.00	0.25	0.00	0.00	0.00
TRUCK DRIVER	All	O&C	2	35.06	38.08	1.5	1.5	2.0	2.0	16.27	7.75	0.00	0.25	0.00	0.00	0.00
TRUCK DRIVER	All	O&C	3	35.28	38.08	1.5	1.5	2.0	2.0	16.27	7.75	0.00	0.25	0.00	0.00	0.00
TRUCK DRIVER	All	O&C	4	35.59	38.08	1.5	1.5	2.0	2.0	16.27	7.75	0.00	0.25	0.00	0.00	0.00
TRUCK DRIVER	All	O&C	5	36.47	38.08	1.5	1.5	2.0	2.0	16.27	7.75	0.00	0.25	0.00	0.00	0.00
TUCK POINTER	All	BLD		39.30	41.66	1.5	1.5	2.0	2.0	12.20	14.75	0.00	1.05		0.00	0.00

Legend

Rg Region

Type Trade Type - All,Highway,Building,Floating,Oil & Chip,Rivers

C Class

Base Base Wage Rate

OT M-F Unless otherwise noted, OT pay is required for any hour greater than 8 worked each day, Mon through Fri. The number listed is the multiple of the base wage.

OT Sa Overtime pay required for every hour worked on Saturdays

OT Su Overtime pay required for every hour worked on Sundays

OT Hol Overtime pay required for every hour worked on Holidays

H/W Health/Welfare benefit

Vac Vacation

Trng Training

Other Ins Employer hourly cost for any other type(s) of insurance provided for benefit of worker.

Explanations PEORIA COUNTY

The following list is considered as those days for which holiday rates of wages for work performed apply: New Years Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day, Christmas Day and Veterans Day in some classifications/counties. Generally, any of these holidays which fall on a Sunday is celebrated on the following Monday. This then makes work performed on that Monday payable at the appropriate overtime rate for holiday pay. Common practice in a given local may alter certain days of celebration. If in doubt, please check with IDOL.

Oil and chip resealing (O&C) means the application of road oils and liquid asphalt to coat an existing road surface, followed by application of aggregate chips or gravel to coated surface, and subsequent rolling of material to seal the surface.

EXPLANATION OF CLASSES

Peoria County Prevailing Wage Rates posted on 3/3/2025

ASBESTOS - GENERAL - removal of asbestos material/mold and hazardous materials from any place in a building, including mechanical systems where those mechanical systems are to be removed. This includes the removal of asbestos materials/mold and hazardous materials from ductwork or pipes in a building when the building is to be demolished at the time or at some close future date.

ASBESTOS - MECHANICAL - removal of asbestos material from mechanical systems, such as pipes, ducts, and boilers, where the mechanical systems are to remain.

CERAMIC TILE FINISHER, MARBLE FINISHER, TERRAZZO FINISHER

Assisting, helping or supporting the tile, marble and terrazzo mechanic by performing their historic and traditional work assignments required to complete the proper installation of the work covered by said crafts. The term "Ceramic" is used for naming the classification only and is in no way a limitation of the product handled. Ceramic takes into consideration most hard tiles.

ELECTRONIC SYSTEMS TECHNICIAN

Installation, service and maintenance of low-voltage systems which utilizes the transmission and/or transference of voice, sound, vision, or digital for commercial, education, security and entertainment purposes for the following: TV monitoring and surveillance, background/foreground music, intercom and telephone interconnect, field programming, inventory control systems, microwave transmission, multi-media, multiplex, radio page, school, intercom and sound burglar alarms and low voltage master clock systems.

Excluded from this classification are energy management systems, life safety systems, supervisory controls and data acquisition systems not intrinsic with the above listed systems, fire alarm systems, nurse call systems and raceways exceeding fifteen feet in length.

LABORER, SKILLED - BUILDING

The skilled laborer building (BLD) classification shall encompass the following types of work, irrespective of the site of the work: cutting & acetylene torch, gunnite nozzlemen, gunnite pump men & pots, kettlemen & carriers of men handling hot stuff, sandblaster nozzle men, sandblasting pump men & pots, setting up and using concrete burning bars, wood block setters, underpinning & shoring of existing buildings, and the unload-ing and handling of all material coated with creosote.

LABORER, SKILLED - HIGHWAY

The skilled laborer heavy & highway (HWY) classification shall encompass the following types of work,irrespective of the site of the work: jackhammer & drill operator, gunite pump & pot man, puddlers, vibrator men, wire fabric placer, sandblast pump & pot man, strike off concrete, unloading, handling & carrying of all creosoted piles, ties or timber, concrete burning bars, power wheelbarrows or buggies, asphalt raker, brickset-ters, cutting torchman (electric & acetylene), men setting lines to level forms, form setters, gunite nozzle man & sandblasting nozzle man, power man, and rip-rapping by hand.

TRUCK DRIVER - BUILDING, HEAVY AND HIGHWAY CONSTRUCTION Class 1. Drivers on 2 axle trucks hauling less than 9 ton. Air

Peoria County Prevailing Wage Rates posted on 3/3/2025

compressor and welding machines and brooms, including those pulled by separate units, truck driver helpers, warehouse employees, mechanic helpers, greasers and tiremen, pickup trucks when hauling materials, tools, or workers to and from and on-the-job site, and fork lifts up to 6,000 lb. capacity.

Class 2. Two or three axle trucks hauling more than 9 ton but hauling less than 16 ton. A-frame winch trucks, hydrolift trucks, vactor trucks or similar equipment when used for transportation purposes. Fork lifts over 6,000 lb. capacity, winch trucks, four axle combination units, and ticket writers.

Class 3. Two, three or four axle trucks hauling 16 ton or more. Drivers on water pulls, articulated dump trucks, mechanics and working forepersons, and dispatchers. Five axle or more combination units.

Class 4. Low Boy and Oil Distributors.

Class 5. Drivers who require special protective clothing while employed on hazardous waste work.

TRUCK DRIVER - OIL AND CHIP RESEALING ONLY.

This shall encompass laborers, workers and mechanics who drive contractor or subcontractor owned, leased, or hired pickup, dump, service, or oil distributor trucks. The work includes transporting materials and equipment (including but not limited to, oils, aggregate supplies, parts, machinery and tools) to or from the job site; distributing oil or liquid asphalt and aggregate; stock piling material when in connection with the actual oil and chip contract. The Truck Driver (Oil & Chip Resealing) wage classification does not include supplier delivered materials.

OPERATING ENGINEERS - BUILDING

Class 1. Cranes; Overhead Cranes; Gradall; All Cherry Pickers; Mechanics; Central Concrete Mixing Plant Operator; Road Pavers (27E - Dual Drum - Tri Batchers); Blacktop Plant Operators and Plant Engineers; 3 Drum Hoist; Derricks; Hydro Cranes; Shovels; Skimmer Scoops; Koehring Scooper; Drag Lines; Backhoe; Derrick Boats; Pile Drivers and Skid Rigs; Clamshells; Locomotive Cranes; Dredge (all types) Motor Patrol; Power Blades - Dumore - Elevating and similar types; Tower Cranes (Crawler-Mobile) and Stationary; Crane-type Backfiller; Drott Yumbo and similar types considered as Cranes; Caisson Rigs; Dozer; Tournadozer; Work Boats; Ross Carrier; Helicopter; Tournapulls - all and similar types; Scoops (all sizes); Pushcats; Endloaders (all types); Asphalt Surfacing Machine; Slip Form Paver; Rock Crusher; Heavy Equipment Greaser; CMI, CMI Belt Placer, Auto Grade & 3 Track and similar types; Side Booms; Multiple Unit Earth Movers; Creter Crane; Trench Machine; Pump-crete-Belt Crete-Squeeze Cretes-Screw-type Pumps and Gypsum; Bulker & Pump - Operator will clean; Formless Finishing Machine; Flaherty Spreader or similar types; Screed Man on Laydown Machine; Wheel Tractors (industrial or Farm-type w/Dozer-Hoe-Endloader or other attachments); F.W.D. & Similar Types; Vermeer Concrete Saw.

Class 2. Dinkeys; Power Launches; PH One-pass Soil Cement Machine (and similar types); Pugmill with Pump; Backfillers; Euclid Loader; Forklifts; Jeeps w/Ditching Machine or other attachments; Tuneluger; Automatic Cement and Gravel Batching Plants; Mobile Drills (Soil Testing) and similar types; Gurries and Similar Types; (1) and (2) Drum Hoists (Buck Hoist and Similar Types); Chicago Boom; Boring Machine & Pipe Jacking Machine; Hydro Boom; Dewatering System; Straw Blower; Hydro Seeder; Assistant Heavy Equipment Greaser on Spread; Tractors (Track type) without Power Unit pulling Rollers; Rollers on Asphalt -- Brick

Peoria County Prevailing Wage Rates posted on 3/3/2025

Macadem; Concrete Breakers; Concrete Spreaders; Mule Pulling Rollers; Center Stripper; Cement Finishing Machines & CMI Texture & Reel Curing Machines; Cement Finishing Machine; Barber Green or similar loaders; Vibro Tamper (All similar types) Self-propelled; Winch or Boom Truck; Mechanical Bull Floats; Mixers over 3 Bag to 27E; Tractor pulling Power Blade or Elevating Grader; Porter Rex Rail; Clary Screed; Truck Type Hoptoe Oilers; Fireman; Spray Machine on Paving; Curb Machines; Truck Crane Oilers; Oil Distributor; Truck-Mounted Saws.

Class 3. Air Compressor; Power Subgrader; Straight Tractor; Trac Air without attachments; Herman Nelson Heater, Dravo, Warner, Silent Glo, and similar types; Roller: Five (5) Ton and under on Earth or Gravel; Form Grader; Crawler Crane & Skid Rig Oilers; Freight Elevators - permanently installed; Pump; Light Plant; Generator; Conveyor (1) or (2) - Operator will clean; Welding Machine; Mixer (3) Bag and Under (Standard Capacity with skip); Bulk Cement Plant; Oiler on Central Concrete Mixing Plant.

OPERATING ENGINEERS - HEAVY AND HIGHWAY CONSTRUCTION

CLASS 1. Cranes; Hydro Cranes; Shovels; Crane Type Backfiller; Tower, Mobile, Crawler, & Stationary Cranes; Derricks; Hoists (3 Drum); Draglines; Drott Yumbo & Similar Types considered as Cranes; 360 Degree Swing Excavator (Shears, Grapples, Movacs, etc.); Back Hoe; Derrick Boats; Pile Driver and Skid Rigs; Clam Shell; Locomotive - Cranes; Road Pavers - Single Drum - Dual Drum - Tri Batcher; Motor Patrols & Power Blades - Dumore - Elevating & Similar Types; Mechanics; Central Concrete Mixing Plant Operator; Asphalt Batch Plant Operators and Plant Engineers; Gradall; Caisson Rigs; Skimmer Scoop - Koering Scooper; Dredges (all types); Hoptoe; All Cherry Pickers; Work Boat; Ross Carrier; Helicopter; Dozer; Tournadozer; Tournapulls - all and similar types; Operation of Concrete and all Recycle Machines; Multiple Unit Earth Movers; Scoops (all sizes); Pushcats; Endloaders (all types); Asphalt Surfacing Machine; Slip Form Paver; Rock Crusher; Operation of Material Crusher, Screening Plants, and Tunnel Boring Machine; Heavy Equipment Greaser (top greaser on spread); CMI, Auto Grade, CMI Belt Placer & 3 Track and Similar Types; Side Booms; Asphalt Heater & Planer Combination (used to plane streets); Wheel Tractors (with Dozer, Hoe or Endloader Attachments); CAT Earthwork Compactors and Similar Types; Blaw Knox Spreader and Similar Types; Trench Machines; Pump Crete - Belt Crete - Squeeze Crete - Screw Type Pumps and Gypsum (operator will clean); Creter Crane; Operation of Concrete Pump Truck; Formless Finishing Machines; Flaherty Spreader or Similar Types; Screed Man on Laydown Machine; Vermeer Concrete Saw; Operation of Laser Screed; Span Saw; Dredge Leverman; Dredge Engineer; Lull or Similar Type; Hydro-Boom Truck; Operation of Guard Rail Machine; and Starting Engineer on Pipeline or Construction (11 or more pieces) including: Air Compressor (Trailer Mounted), All Forced Air Heaters (regardless of Size), Water Pumps (Greater than 4-1/2" or Total Discharge Over 4-1/2"), Light Plants, Generators (Trailer Mounted - Excluding Decontamination Trailer), Welding Machines (Any Size or Mode of Power), Conveyor, Mixer (any size), Stud Welder, Power Pac, etc, and Ground Heater (Trailer Mounted).

CLASS 2. Bulker & Pump; Power Launches; Boring Machine & Pipe Jacking Machine; Dinkeys; Operation of Carts, Powered Haul Unit for a Boring Machine; P & H One Pass Soil Cement Machines and Similar Types; Wheel Tractors (Industry or Farm Type - Other); Back Fillers; Euclid Loader; Fork Lifts; Jeep w/Ditching Machine or Other Attachments; Tunneluger; Automatic Cement & Gravel Batching Plants; Mobile Drills - Soil Testing and Similar Types; Pugmill with Pump; All (1) and (2) Drum Hoists; Dewatering System; Straw Blower; Hydro-Seeder; Bump Grinders (self-propelled); Assistant Heavy Equipment Greaser; Apsco Spreader; Tractors (Track-Type) without Power Units Pulling Rollers; Rollers on Asphalt - Brick or Macadam; Concrete Breakers; Concrete Spreaders; Cement Strippers; Cement Finishing Machines & CMI Texture & Reel Curing Machines; Vibro-Tampers (All Similar Types Self-Propelled); Mechanical Bull Floats; Self-Propelled Concrete Saws; Truck Mounted Power Saws; Operation of Curb Cutters; Mixers - Over Three (3) Bags; Winch and Boom Trucks; Tractor Pulling Power Blade or Elevating Grader; Porter Rex Rail;

Peoria County Prevailing Wage Rates posted on 3/3/2025

Clary Screed; Mule Pulling Rollers; Pugmill without Pump; Barber Greene or Similar Loaders; Track Type Tractor w/Power Unit attached (minimum); Fireman; Spray Machine on Paving; Curb Machines; Paved Ditch Machine; Power Broom; Self-Propelled Sweepers; Self-Propelled Conveyors; Power Subgrader; Oil Distributor; Straight Tractor; Truck Crane Oiler; Truck Type Oilers; Directional Boring Machine; Horizontal Directional Drill; Articulating End Dump Vehicles; Starting Engineer on Pipeline or Construction (6 -10 pieces) including: Air Compressor (Trailer Mounted), All Forced Air Heaters (regardless of Size), Water Pumps (Greater than 4-1/2" or Total Discharge Over 4-1/2"), Light Plants, Generators (Trailer Mounted - Excluding Decontamination Trailer), Welding Machines (Any Size or Mode of Power), Conveyor, Mixer (any size), Stud Welder, Power Pac, etc., and Ground Heater (Trailer Mounted).

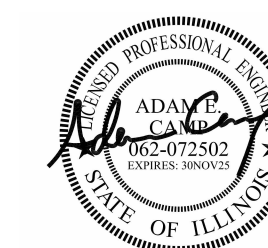
CLASS 3. Straight Framed Truck Mounted Vac Unit (separately powered); Trac Air Machine (without attachments); Rollers - Five Ton and Under on Earth and Gravel; Form Graders; Bulk Cement Plant; Oilers; and Starting Engineer on Pipeline or Construction (3 - 5 pieces) including: Air Compressor (Trailer Mounted), All Forced Air Heaters (regardless of Size), Water Pumps (Greater than 4-1/2" or Total Discharge Over 4-1/2"), Light Plants, Generators (Trailer Mounted - Excluding Decontamination Trailer), Welding Machines (Any Size or Mode of Power), Conveyor, Mixer (any size), Stud Welder, Power Pac, etc., and Ground Heater (Trailer Mounted).

Other Classifications of Work:

For definitions of classifications not otherwise set out, the Department generally has on file such definitions which are available. If a task to be performed is not subject to one of the classifications of pay set out, the Department will upon being contacted state which neighboring county has such a classification and provide such rate, such rate being deemed to exist by reference in this document. If no neighboring county rate applies to the task, the Department shall undertake a special determination, such special determination being then deemed to have existed under this determination. If a project requires these, or any classification not listed, please contact IDOL at 217-782-1710 for wage rates or clarifications.

LANDSCAPING

Landscaping work falls under the existing classifications for laborer, operating engineer and truck driver. The work performed by landscape plantsman and landscape laborer is covered by the existing classification of laborer. The work performed by landscape operators (regardless of equipment used or its size) is covered by the classifications of operating engineer. The work performed by landscape truck drivers (regardless of size of truck driven) is covered by the classifications of truck driver.



DATE: 02/14/25

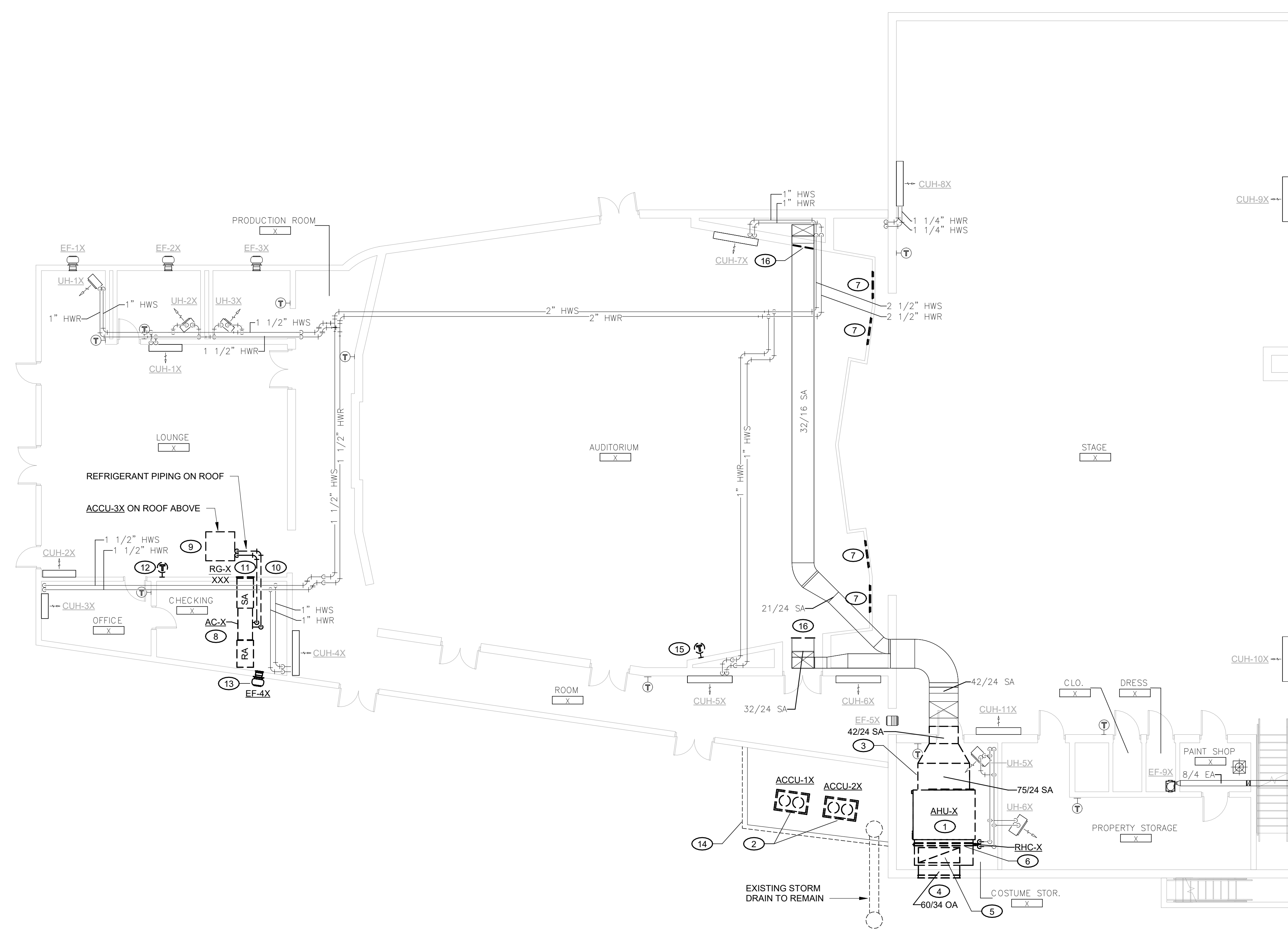
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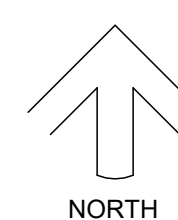
KEDbluestone
707 NE Jefferson Ave.
Peoria, Illinois 61603
309.938.4005
www.KEDbluestone.com

KEYED MECHANICAL NOTES (THIS SHEET):

- 1 DEMOLISH AND REMOVE EXISTING AIR HANDLING UNIT.
- 2 DEMOLISH AND REMOVE EXISTING CONDENSING UNIT.
- 3 DEMOLISH AND REMOVE SECTION OF EXISTING SUPPLY AIR DUCTWORK AS SHOWN ON DRAWING AND PREPARE FOR NEW CONNECTION.
- 4 DEMOLISH AND REMOVE EXISTING OUTSIDE AIR DUCTWORK IN ITS ENTIRETY. PATCH AND SEAL OPENING IN WALL.
- 5 DEMOLISH AND REMOVE EXISTING SECTION OF RETURN AIR DUCTWORK DOWN TO FLOOR BELOW AND PREPARE FOR NEW CONNECTION.
- 6 DEMOLISH AND REMOVE EXISTING HEATING COIL AND PORTION OF EXISTING HOT WATER PIPING AS SHOWN ON DRAWING AND PREPARE FOR NEW CONNECTION.
- 7 DEMOLISH AND REMOVE EXISTING RETURN AIR GRILLE. PREPARE DUCTWORK FOR NEW CONNECTION.
- 8 DEMOLISH AND REMOVE EXISTING AIR HANDLING UNIT AC-2X AND ASSOCIATED SUPPLY AND RETURN AIR DUCTWORK.
- 9 DEMOLISH AND REMOVE EXISTING OUTDOOR CONDENSING UNIT ACCU-3X.
- 10 DEMOLISH AND REMOVE EXISTING REFRIGERANT LINESET.
- 11 DEMOLISH AND REMOVE EXISTING SUPPLY AIR GRILLE.
- 12 DEMOLISH AND REMOVE EXISTING THERMOSTAT ASSOCIATED WITH AC-X.
- 13 DEMOLISH AND REMOVE EXISTING EXHAUST FAN EE-4X. PREPARE OPENING FOR NEW OUTSIDE AIR DUCTWORK.
- 14 DEMOLISH EXISTING CONCRETE EQUIPMENT PAD AND INTEGRATED STORM DRAIN. EXCAVATE AND DEMOLISH CONNECTING STORMLINE AND CAP AT EXISTING TO REMAIN. DEMOLISH EXISTING WOOD FENCE. PROVIDE HAULING AND DISPOSAL OF ALL DEBRIS. EXISTING DOWN SPOUTS HAVE BEEN REROUTED PRIOR TO THIS PROJECT. CARE SHOULD BE TAKEN TO NOT DAMAGE THE RELOCATED STORM PIPING.
- 15 DEMOLISH AND REMOVE EXISTING THERMOSTAT ASSOCIATED WITH RHC-X.
- 16 DEMOLISH AND REMOVE EXISTING SUPPLY AIR GRILLE. PREPARE DUCTWORK FOR NEW CONNECTION.



1 FIRST FLOOR - MECHANICAL DEMOLITION
SCALE: 1/8" = 1'-0"



Revisions:
NO. DATE DESCRIPTION

Project Title:
PEORIA PLAYERS THEATER - HVAC UPGRADE

Drawing Title:
FIRST FLOOR - MECHANICAL DEMOLITION

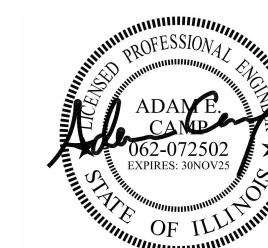
Date: 02/14/25 Drawn By: MMA

Scale: AS NOTED Checked By: AEC

Project Number: 24-114

Page Number:

MD110



DATE: 02/14/25

Consultants:



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Revisions:

NO. DATE DESCRIPTION

Project Title:

PEORIA
PLAYERS
THEATER -
HVAC
UPGRADE

Drawing Title:

BASEMENT -
MECHANICAL
NEW WORK

Date:

02/14/25

Drawn By:

MMA

Scale:

AS NOTED

Checked By:

AEC

Project Number:

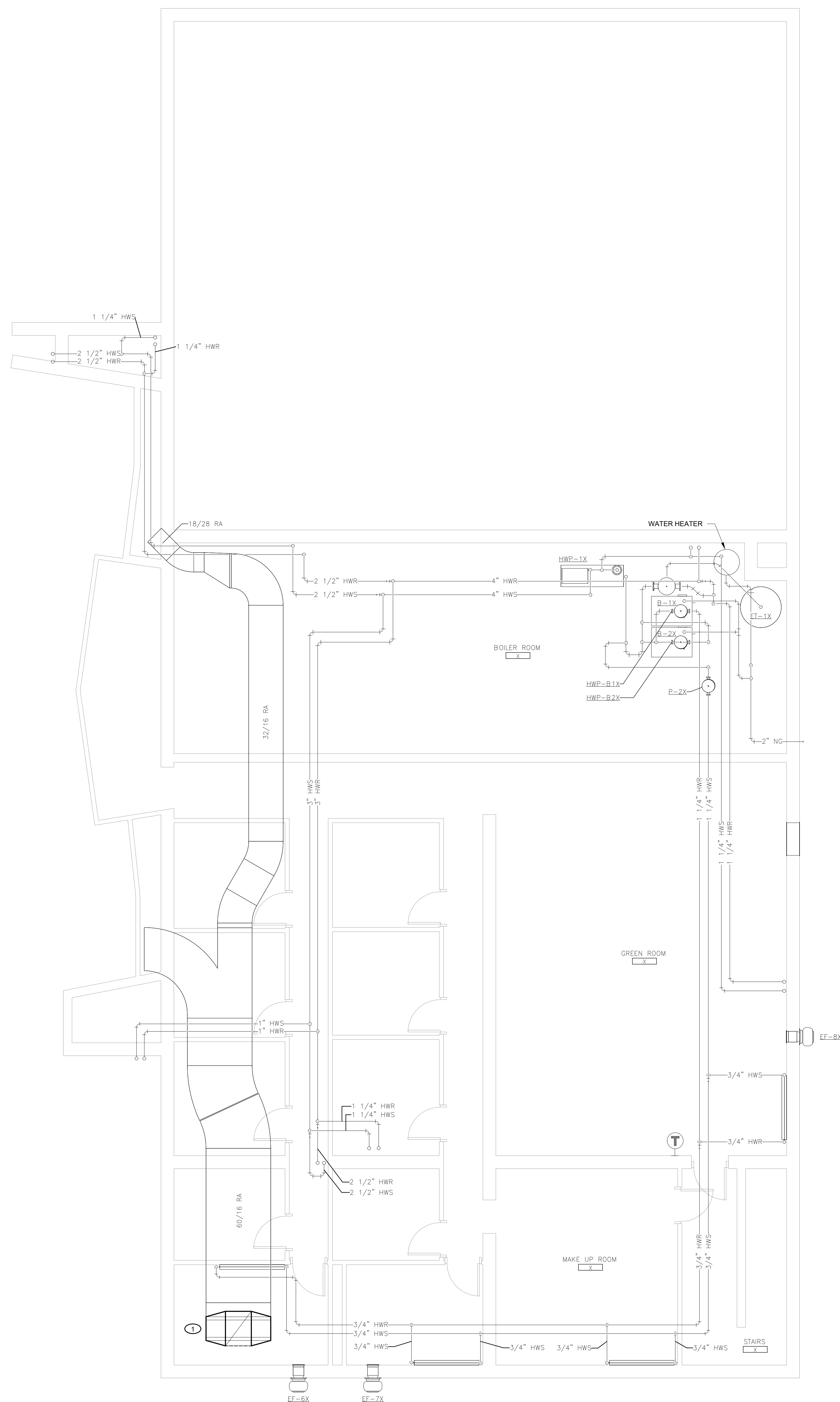
24-114

Page Number:

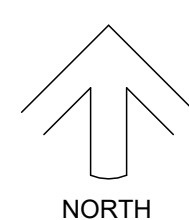
M100

KEYED MECHANICAL NOTES (THIS SHEET):

- ① CONNECT NEW RETURN AIR DUCTWORK FROM ABOVE TO EXISTING RETURN AIR DUCTWORK IN THE BASEMENT.



1 BASEMENT - NEW MECHANICAL
SCALE: 1/4" = 1'-0"



NORTH



DATE: 02/14/25

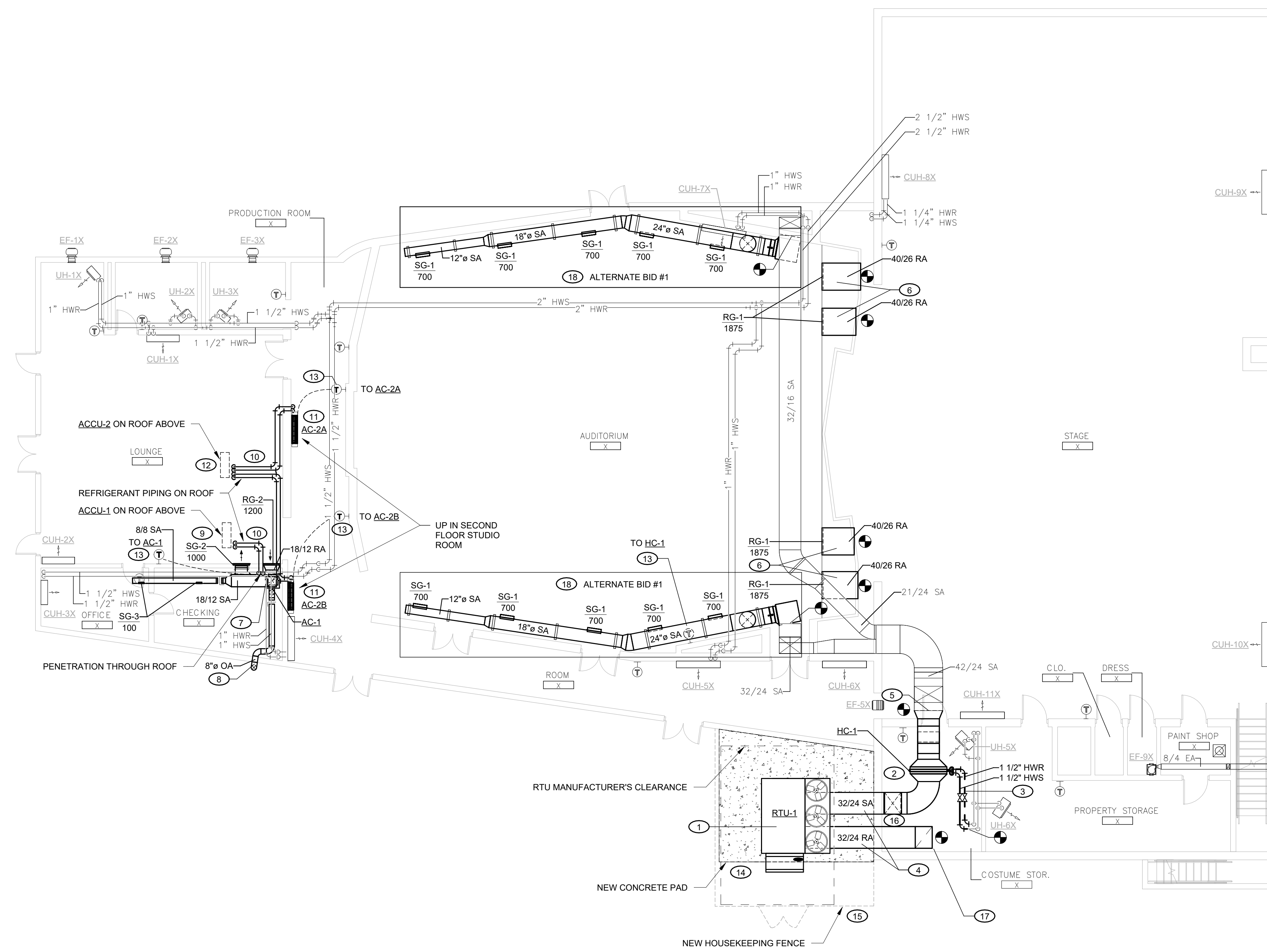
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KEYED MECHANICAL NOTES (THIS SHEET):

- 1 FURNISH AND INSTALL NEW SINGLE ZONE VARIABLE VOLUME ROOFTOP UNIT, RTU-1, ON NEW CONCRETE EQUIPMENT PAD PER MANUFACTURER'S INSTALLATION INSTRUCTIONS. FURNISH AND INSTALL UNIT ON 36" PLENUM CURB.
- 2 FURNISH AND INSTALL NEW HEATING COIL, HC-1, PER MANUFACTURER'S INSTALLATION INSTRUCTIONS. PROVIDE CONTROL VALVE TO MODULATE FLOW THROUGH THE COIL. PROVIDE FREEZE PROTECTION PUMP AND INSTALL PER MANUFACTURER'S INSTALLATION INSTRUCTIONS. SEE DETAIL 1M400.
- 3 FURNISH AND INSTALL NEW HOT WATER SUPPLY AND RETURN PIPING. CONNECT FROM EXISTING PIPING TO NEW HEATING COIL. CONNECT PER DETAIL 1M400.
- 4 FURNISH AND INSTALL NEW SUPPLY AND RETURN EXTERIOR DUCTWORK FROM RTU INSULATED PLENUM CURB TO EXTERIOR WALL. COORDINATE WALL PENETRATION WITH STRUCTURAL LINTEL DETAIL. SEE NON METAL DUCT SPECIFICATION SECTION 233116.
- 5 CONNECT NEW SUPPLY AIR DUCTWORK TO EXISTING SUPPLY AIR DUCTWORK.
- 6 FURNISH AND INSTALL NEW RETURN AIR DUCTWORK EXTENSIONS AND CONNECT TO EXISTING RETURN AIR INTAKE OPENINGS. TERMINATE EXTENSION FLUSH WITH EDGE OF WOOD FRAMED STAGE EXTENSION AND MATCH ADJACENT CONSTRUCTION. FURNISH AND INSTALL HEAVY DUTY BAR RETURN AIR GRILLE. GRILLE SHALL BE PAINTED BLACK AND INTERIOR OF NEW DUCTWORK EXTENSION SHALL BE PAINTED BLACK. PEORIA PARK DISTRICT WILL FRAME AROUND NEW RETURN AIR GRILLES AND REPLACE THE EXISTING FABRIC.
- 7 FURNISH AND INSTALL NEW AIR HANDLING UNIT AC-1 PER MANUFACTURER'S INSTALLATION INSTRUCTIONS. FURNISH AND INSTALL NEW SUPPLY AND RETURN AIR DUCTWORK AS SHOWN ON DRAWINGS. FURNISH AND INSTALL SG-3 SUPPLY AIR GRILLE IN CHECKING OFFICE. SEE DETAIL 2M400.
- 8 FURNISH AND INSTALL NEW OUTSIDE AIR DUCTWORK THROUGH EXISTING PENETRATION FROM DEMOLISHED EXHAUST FAN. SEAL AROUND NEW OUTSIDE AIR DUCTWORK. PROVIDE WEATHERHOOD / BIRD SCREEN AT AIR INLET.
- 9 FURNISH AND INSTALL NEW CONDENSING UNIT ACQU-1 ON ROOF. FURNISH AND INSTALL PIPING PORTAL FOR REFRIGERANT PIPING AND ELECTRICAL CONDUIT (PATE PIPING PORTAL OR EQUAL). PROVIDE ALL MATERIAL, EQUIPMENT, AND LABOR TO FLASH IN PIPING PORTAL / ROOF SUPPORT RAILS TO EXISTING ROOF. ROOFING CONTRACTOR SHALL MEET EXISTING WARRANTY. SEE DETAIL 3M400 AND 4M400.
- 10 FURNISH AND INSTALL NEW REFRIGERANT LINESET. SEE DETAIL 5M400.
- 11 FURNISH AND INSTALL NEW WALL MOUNTED SPLIT SYSTEMS AC-2A AND AC-2B. PROVIDE CONDENSATE DRAIN PIPING TO THE NEAREST FLOOR DRAIN.
- 12 FURNISH AND INSTALL NEW CONDENSING UNIT ACQU-2 ON ROOF. SEE DETAIL 4M400.
- 13 FURNISH AND INSTALL NEW THERMOSTAT.
- 14 FURNISH AND INSTALL NEW SLOPED CONCRETE EQUIPMENT PAD POURED FROM WALL TO WALL WITH EDGE GASKETS AND POURED IN PLACE SEALANT TO PREVENT WALLS FROM PENETRATING BETWEEN WALL OF BUILDING AND NEW PAD. ALL WATER SHALL SHED AWAY FROM BUILDING AND SPILL ONTO GRADE. PREP GROUND PRIOR TO FORMING WITH COMPACTED GRAVEL BASE. SEE DETAIL 6M400.
- 15 FURNISH AND INSTALL 10' TALL OUTDOOR RATED GALVANIZED CHAINLINK FENCE WITH INTERLOCKING PRIVACY SLATS AND 6' 0" DOUBLE DOOR WITH LOCKABLE HATCH.
- 16 WHEN PENETRATING BRICK, PROVIDE (1) L5 X 3 1/2 X 5/16" (LLV) ANGLE (GALVANIZED). PROVIDE A MINIMUM OF 8" OF BEARING ON EACH END. WHEN PENETRATING CMU BLOCK, PROVIDE (2) L5 X 3 1/2 X 5/16" (LLV) ANGLE (GALVANIZED). PROVIDE A MINIMUM OF 8" OF BEARING ON EACH END. GROUT CELL ON EACH END BELOW LINTEL BEARING SOLID. LINTEL SHALL BE STITCH WELDED TOGETHER TOP AND BOTTOM. PROVIDE A BUTT WELD 4" LONG AT 12" O.C. WITH A MINIMUM OF 6" LONG AT EACH END.
- 17 CONNECT NEW RETURN AIR DUCTWORK TO EXISTING RETURN AIR DUCTWORK BELOW.
- 18 ALTERNATE BID #1: FURNISH AND INSTALL NEW EXPOSED SUPPLY AIR DUCTWORK AND DRUM LOUVERS, SG-1. ROUTE DUCTWORK PARALLEL WITH ROOF SLOPING AND WALL ANGLE AS TIGHT AS POSSIBLE, MAINTAINING THE SAME DISTANCE FROM THE TOP OF DUCTWORK TO CEILING. SUPPORT DUCTWORK WITH WALL BRACKETS.



1 FIRST FLOOR - NEW MECHANICAL
SCALE: 1/8" = 1'-0"
NORTH

Revisions:

NO.	DATE	DESCRIPTION

Project Title:
PEORIA PLAYERS THEATER - HVAC UPGRADE

Drawing Title:
FIRST FLOOR - MECHANICAL NEW WORK

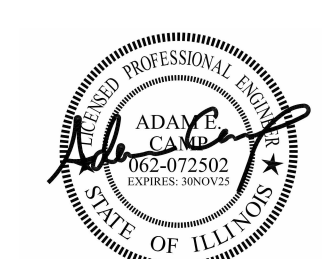
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PEORIA
PLAYERS
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Drawing Title:

MECHANICAL
DETAILS &
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Date:

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Project Number:

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HEATING SYMBOL LEGEND	
SYMBOL	DESCRIPTION
	PIPE CAP / FLANGE
	DDC TEMPERATURE SENSOR
	DUCT STATIC PRESSURE SENSOR
	EXISTING TO BE REMOVED
	NEW CONNECTION TO EXISTING
	BALANCE VALVE
	CONTROL VALVE (2-WAY)
	CONTROL VALVE (3-WAY)
	BALL VALVE
	MANUAL AIR VENT
	ELBOW UP
	ELBOW DOWN
	TEE UP
	TEE DOWN
	UNION (SCREWED)
	DRAIN LINE
	HEATING HOT WATER SUPPLY
	HEATING HOT WATER RETURN

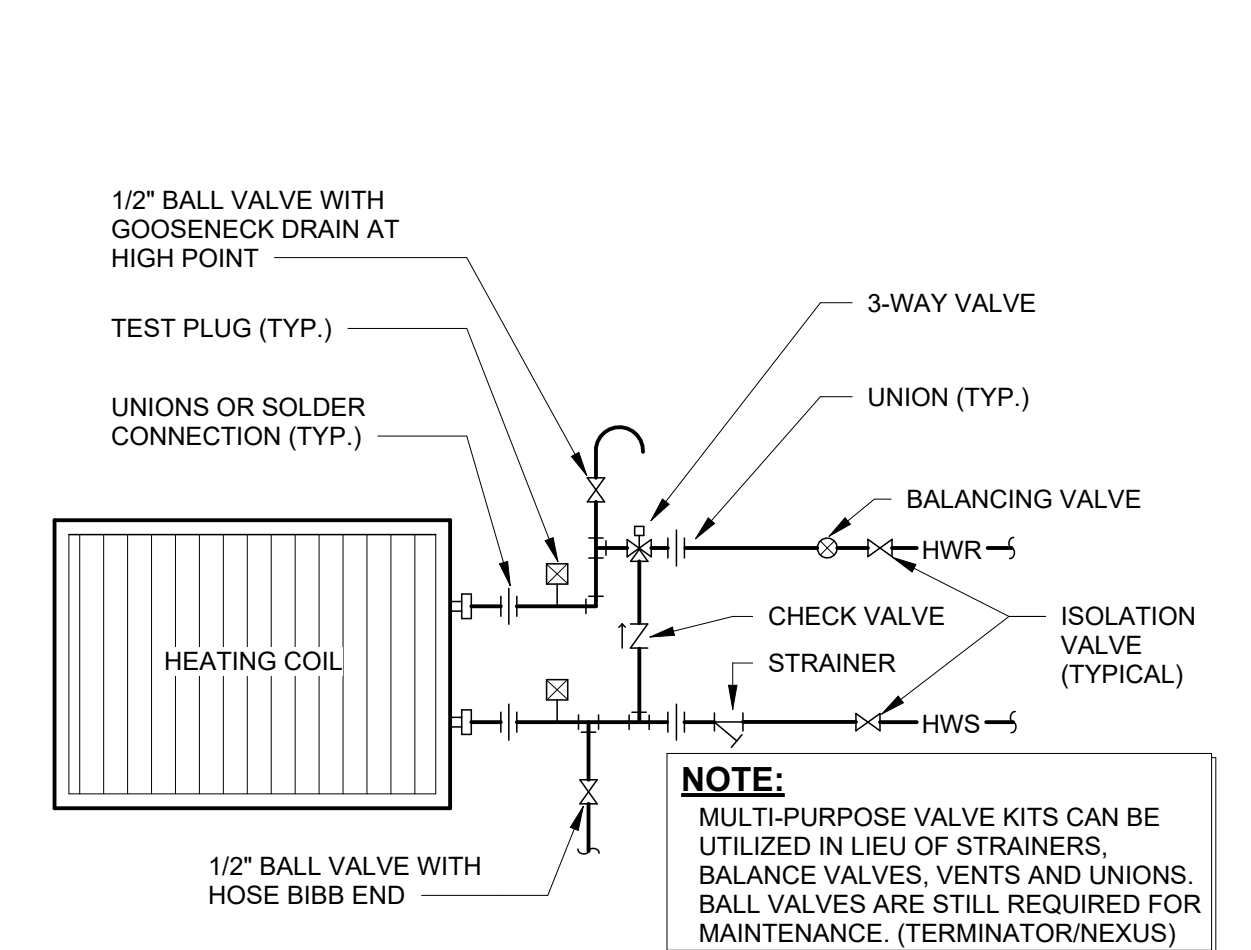
VENTILATING SYMBOL LEGEND	
SYMBOL	DESCRIPTION
	DUCT SECTION, POSITIVE PRESSURE (TOWARD)
	DUCT SECTION, POSITIVE PRESSURE (AWAY)
	DUCT SECTION, NEGATIVE PRESSURE (TOWARD)
	DUCT SECTION, NEGATIVE PRESSURE (AWAY)
	RECTANGULAR DUCT SIZE - FIRST FIGURE IS SIDE SHOWN
	TURNING VANES OR RADIUSED ELBOW
	MOTORIZED DAMPER
	BALANCED DAMPER
	FLEXIBLE DUCT CONNECTION
	FLEXIBLE DUCT (FLEX DIAMETER = DIFFUSER NECK DIAMETER)
	HIGH EFFICIENCY RECTANGULAR TAKE-OFF WITH VOLUME DAMPER
	HIGH EFFICIENCY RECTANGULAR TO ROUND DUCT TAKE-OFF WITH VOLUME DAMPER
	BRANCH DUCT TAKE-OFF WITH VOLUME DAMPER
	AIR TRANSFER DUCT OPENING
	RECTANGULAR TO ROUND TRANSITION (NOTE: THIS SHALL NOT BE A BLANK OFF WITH A STARTING COLLAR)
	INCLINED RISE (IN DIRECTION OF AIR FLOW)
	INCLINED DROP (IN DIRECTION OF AIR FLOW)
	FIRE DAMPER (TYPE-B)
	SUPPLY AIR
	RETURN AIR
	EXHAUST AIR
	OUTDOOR AIR
	PIPE CAP / FLANGE
	DDC TEMPERATURE SENSOR
	DUCT STATIC PRESSURE SENSOR
	EXISTING TO BE REMOVED
	NEW CONNECTION TO EXISTING

GENERAL MECHANICAL NOTES

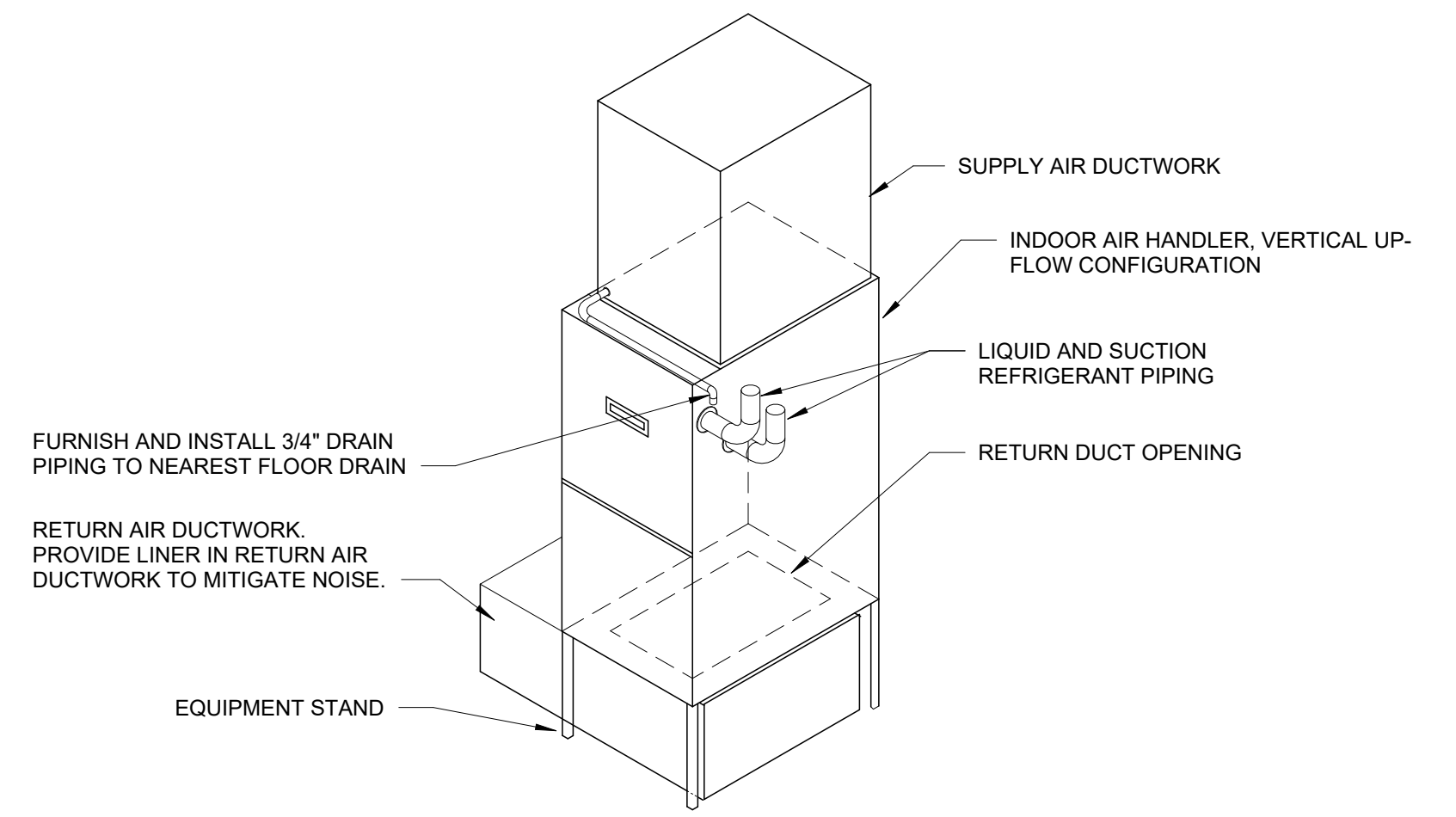
- PROVIDE ALL MATERIALS AND EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE AND OPERABLE HVAC SYSTEMS AS INDICATED ON DRAWINGS, AS SPECIFIED, AND AS REQUIRED BY MOST CURRENT INTERNATIONAL MECHANICAL CODE AND ANY APPLICABLE LOCAL CODES. CONTRACTOR SHALL VISIT THE JOB SITE AND EXAMINE THE DRAWINGS OF OTHER TRADES PRIOR TO BIDDING TO THOROUGHLY FAMILIARIZE HIMSELF WITH EXISTING CONDITIONS AND THE SCOPE OF THE PROJECT. FAILURE TO DO SO DOES NOT RELIEVE THE CONTRACTOR OF THE RESPONSIBILITY TO UNDERSTAND THE SCOPE OR OF UNDERSTANDING ANY FIELD CONDITIONS WHICH COULD BE REASONABLY EXPECTED TO BE KNOWN BY A THOROUGH INVESTIGATION.
- IT IS NOT INTENDED THAT THE DRAWINGS SHOW EVERY DUCT, FITTING, TRANSITION, DAMPER, ETC. AND IT IS UNDERSTOOD THAT WHILE THE DRAWINGS MUST BE FOLLOWED AS CLOSELY AS CIRCUMSTANCES WILL PERMIT, THE PROPER INSTALLATION ACCORDING TO THE TRUE INTENT AND MEANING OF THE DRAWINGS, LOCAL CODES AND STANDARD PRACTICES SHALL BE PROVIDED. FIELD VERIFY ALL EXISTING CONDITIONS PRIOR TO INSTALLATION. REPORT ANY PROBLEMS OR CONFLICTS TO THE OWNER OR ENGINEER.
- ANY MINOR CHANGES IN THE LOCATION OF EQUIPMENT, DUCTS, PIPE CONTROL DEVICES, ETC. FROM THOSE LOCATIONS SHOWN ON THE DRAWINGS SHALL BE MADE WITHOUT EXTRA COST IF SO DIRECTED BY THE OWNERS REPRESENTATIVE OR ENGINEER BEFORE THE INSTALLATION IS MADE. A MINOR CHANGE IN LOCATION SHALL BE CONSIDERED TO BE WITHIN 6" OF THE ORIGINALLY INDICATED LOCATIONS.
- VERIFY ALL DIMENSIONS BY FIELD MEASUREMENTS. VERIFY FINAL LOCATIONS FOR ROUGHINS WITH FIELD MEASUREMENTS AND WITH THE REQUIREMENTS OF THE ACTUAL EQUIPMENT TO BE CONNECTED.
- WHERE MOUNTING HEIGHTS ARE NOT DETAILED OR DIMENSIONED, INSTALL SYSTEMS, MATERIALS AND EQUIPMENT TO PROVIDE THE MAXIMUM HEADROOM POSSIBLE.
- INSTALL SYSTEMS, MATERIALS AND EQUIPMENT LEVEL AND PLUMB, PARALLEL AND PERPENDICULAR TO OTHER BUILDING SYSTEMS AND COMPONENTS WHERE INSTALLED EXPOSED IN FINISHED SPACES AND GIVING RIGHT-OF-WAY PRIORITY TO SYSTEMS REQUIRED TO BE INSTALLED AT A SPECIFIED SLOPE.
- INSTALL ALL HVAC EQUIPMENT IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, CONTRACT DOCUMENTS, AND APPLICABLE CODES AND REGULATIONS.
- ALL OPENINGS IN FIRE WALLS DUE TO DUCTWORK, PIPING AND CONTROL CONDUIT SHALL BE FIRE STOPPED WITH AN APPROVED FIRE STOP MATERIAL. PROVIDE ACCESS DOORS IN DUCTWORK OR WALL SCHEILING FOR OPERATION, ADJUSTMENT AND MAINTENANCE OF ALL FANS, VALVES, COILS, AND MECHANICAL EQUIPMENT. COILS LOCATED IN DUCTWORK TO BE PROVIDED WITH ACCESS DOORS ON OUTLET SIDE OF COIL.
- LOCATIONS AND SIZES OF ALL FLOOR AND WALL OPENINGS SHALL BE COORDINATED WITH ALL OTHER TRADES INVOLVED AND THE OWNER. CONTRACTOR SHALL COORDINATE CEILING DIFFUSER/GRILLE/REGISTER LOCATIONS WITH LIGHTING, FIRE ALARM EQUIPMENT AND FIRE SUPPRESSION SYSTEMS.
- WHERE DEMOLITION WORK OCCURS, CONTRACTOR SHALL PATCH AND SEAL ALL WALLS, FLOORS AND CEILINGS TO MATCH EXISTING. CONTRACTOR SHALL VERIFY WITH OWNER ALL PATCHING MATERIALS AND INSTALLATION METHODS.
- VENTILATING CONTRACTOR SHALL PROVIDE MANUAL BALANCE DAMPERS IN ALL BRANCH TAKE-OFFS TO SUPPLY DIFFUSERS. PROVIDE ADDITIONAL MANUAL BALANCE DAMPERS IN MAIN AND SUB-MAIN DUCTS AS REQUIRED TO ENSURE THE SUPPLY AND RETURN AIR SYSTEMS CAN BE BALANCED TO THE SPECIFIED DESIGN AIRFLOW.
- ALL RECTANGULAR AND/OR ROUND SUPPLY AND RETURN DUCTWORK SHOWN ON THE PLANS MAY BE CONVERTED TO EQUIVALENT ROUND/RECTANGULAR DUCTWORK AT THE DISCRETION OF THE VENTILATING CONTRACTOR. ANY DUCT CONVERSIONS SHALL BE SUBMITTED AS PART OF THE DUCTWORK SHOP DRAWINGS FOR APPROVAL BY THE ENGINEER.
- IN AREAS WHERE A CEILING GRID EXISTS, THE VENTILATING CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVAL AND REPLACEMENT OF EXISTING CEILING GRID AND TILES AS NECESSARY FOR INSTALLATION OF VENTILATING WORK. ANY PORTION OF THE EXISTING TILES OR GRID WHICH BECOME DAMAGED DURING REMOVAL SHALL BE REPLACED BY THE VENTILATING CONTRACTOR.

MECHANICAL DEMOLITION NOTES

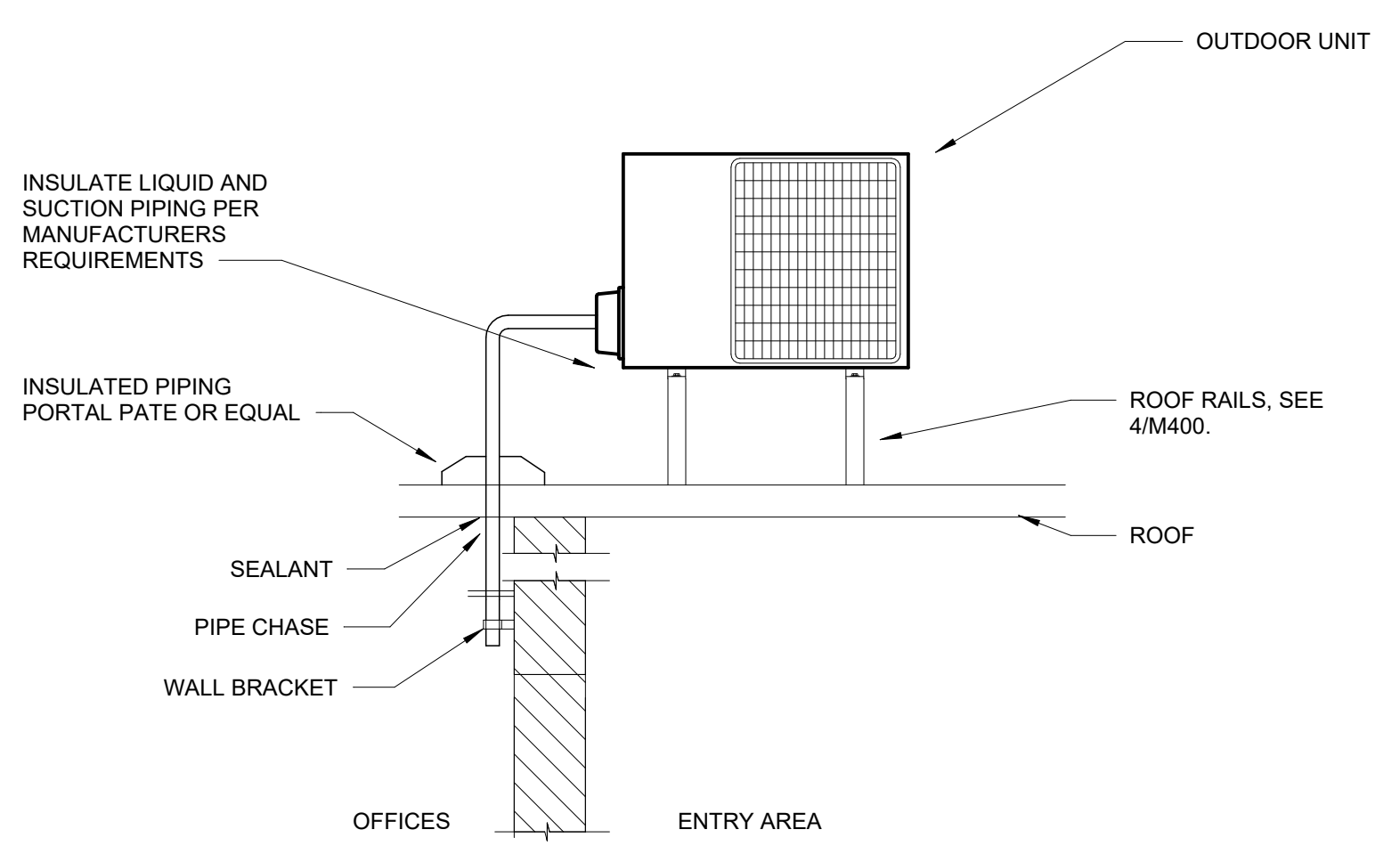
- ALL CONTRACTORS SHALL VERIFY THE EXISTING CONDITIONS AT THE PROJECT SITE BEFORE SUBMITTING COST PROPOSAL. CONTRACTORS ARE ADVISED THAT ALL LOCATIONS ARE APPROXIMATE.
- AN ATTEMPT HAS BEEN MADE TO SHOW ALL HVAC EQUIPMENT, PIPING, DUCTWORK AND DIFFUSERS. ALL CONTRACTORS SHALL VISIT THE SITE TO VERIFY COMPONENTS, LOCATIONS AND SIZES SHOWN OR NOT SHOWN. ALL COMPONENTS INDICATED FOR DEMOLITION NEED TO BE REMOVED AS NOTED ON THE DRAWINGS. IT IS MANDATORY THAT THE EXISTING BUILDING REMAIN IN CONTINUOUS AND UNINTERRUPTED OPERATION DURING REPLACEMENT/UPGRADE OF THE HVAC SYSTEM. THE SPECIFIC AREAS UNDER CONSTRUCTION AT ANY SCHEDULED TIME ARE OBVIOUSLY EXCLUSIVE OF THE STATEMENT. SERVICES TO THE EXISTING BUILDING SHALL BE KEPT ON CONTINUOUS OPERATION INCLUDING DOMESTIC WATER, SANITARY, STORM, STEAM, HEATING HOT WATER, HVAC SUPPLY, RETURN AND EXHAUST DUCTWORK. ANY ABSOLUTELY NECESSARY INTERRUPTION OF THESE SERVICES TO ACCOMPLISH PROJECT CONSTRUCTION SHALL BE ARRANGED WITH THE OWNER, A MINIMUM OF TWO WEEKS IN ADVANCE. TEMPORARY SERVICES SHALL BE FURNISHED AND INSTALLED WHERE NECESSARY TO ACCOMPLISH THIS PURPOSE. TEMPORARIES SHALL BE REMOVED ONLY AFTER NEW PERMANENT SERVICES ARE INSTALLED AND FULLY OPERATIONAL.
- EACH CONTRACTOR SHALL BE RESPONSIBLE FOR THEIR OWN DEMOLITION, REMOVAL, CAPPING, STORING, ABANDONING, DISCONNECTING, RELOCATING AND RECONNECTION OF EXISTING EQUIPMENT AND MATERIAL. ALL CUTTING, PATCHING, REPAIRING, REPLACEMENT AND REFINISHING SHALL MATCH EXISTING SUBSTRATE AS NEARLY AS POSSIBLE. FINISH WORK BY OTHERS.
- EXCEPT WHERE OTHERWISE SHOWN OR NOTED ON THE DRAWINGS, ALL EXISTING EQUIPMENT AND MATERIAL IN AREAS TO BE REMODELED/DIATEDERED SHALL BE REMOVED WHERE THEY INTERFERE WITH PROPOSED NEW CONSTRUCTION AND/OR INTERFERE WITH PROPOSED USAGE OF SPACE BY OWNER AS FOLLOWS:
 - REMOVE ANY PIPES PROTRUDING ABOVE FINISHED FLOOR OR THROUGH WALL AND CAP AND FINISH OVER WITH MATERIAL TO MATCH EXISTING.
 - REMOVE NOTED SUPPLY, WASTE, & VENT PIPING, STEAM, CHILLED WATER, HVAC SUPPLY, RETURN AND EXHAUST AS NOTED. CAP AT NEAREST ACTIVE MAIN. SUPPLY AND RETURN MAINS TO BE CAPPED.
 - IN REMODELED/DIATEDERED AREAS ANY PIPING OR DUCTWORK PASSING THROUGH THE REMODELED AREAS TO SERVE (OR BEING SERVED FROM) EXISTING ADJACENT, REMOTE, OR SURROUNDING ARE THAT ARE TO REMAIN SHALL BE RETAINED AND KEPT OPERATIONAL AND SHALL BE RE-ROUTED IN ALL CASES WHERE THEY INTERFERE WITH ANY NEW WORK OR USAGE TO BE ACCOMPLISHED IN THE REMODELED AREA.



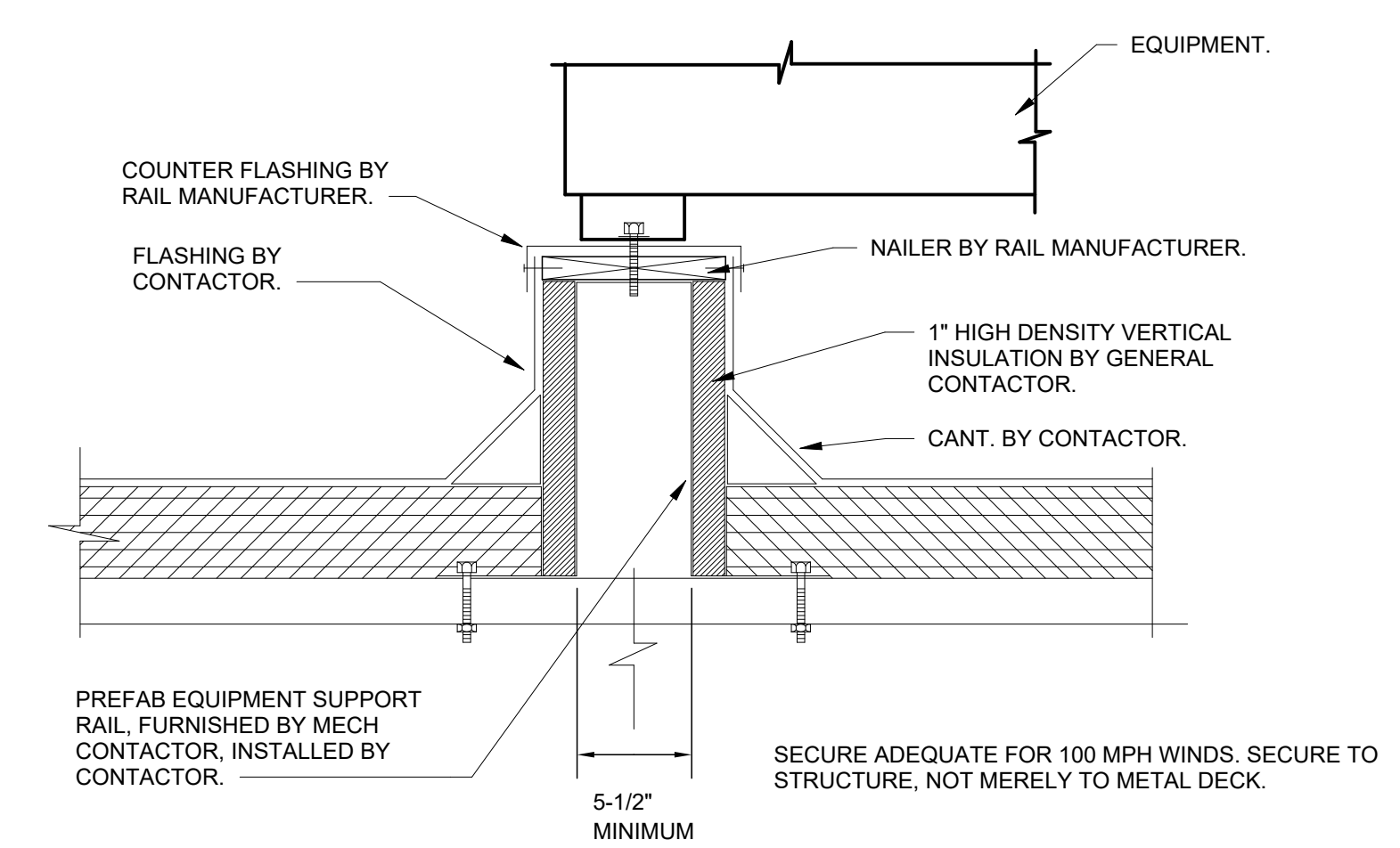
1 HEATING COIL DETAIL
SCALE: NOT TO SCALE



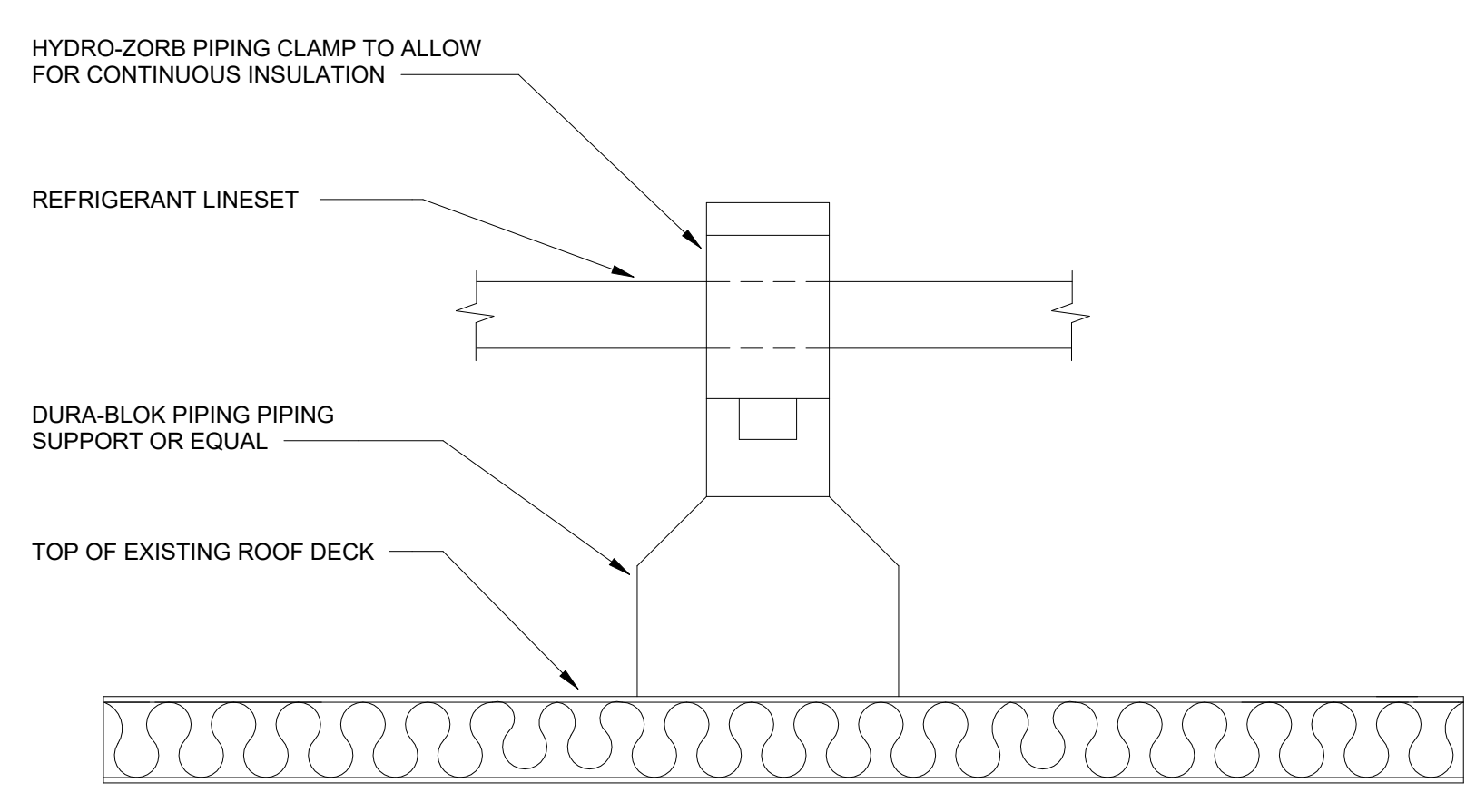
2 AIR HANDLING UNIT DETAIL
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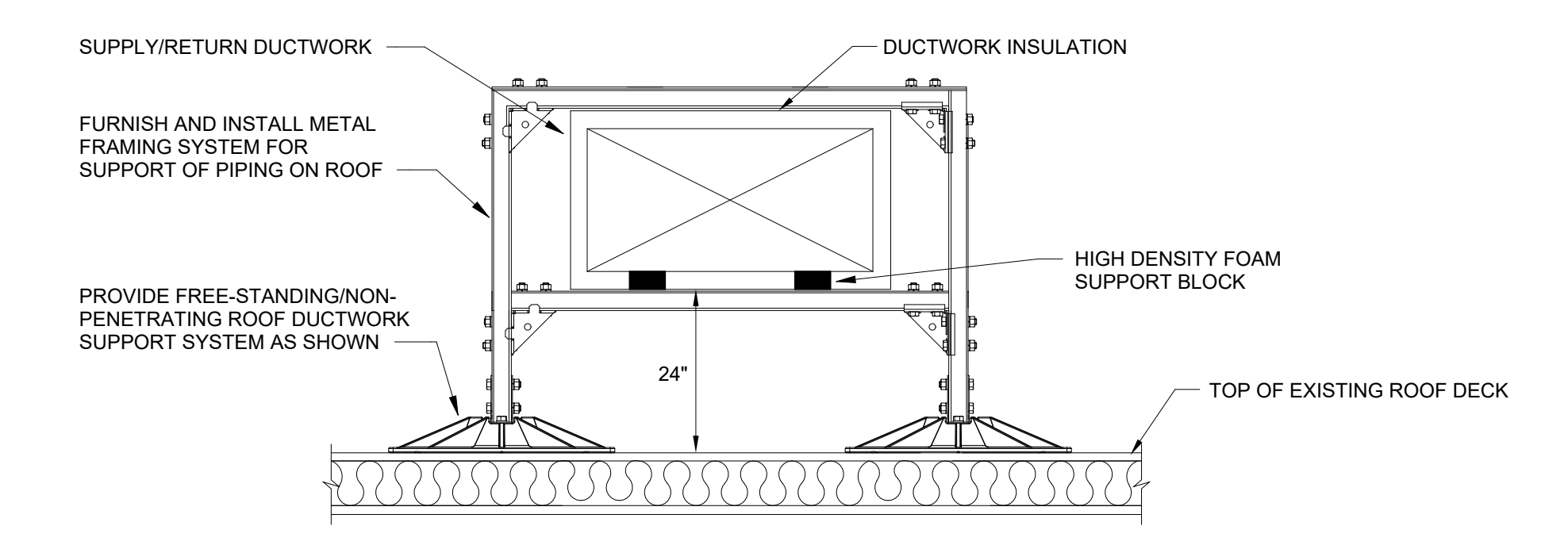
3 OFFICE AND ENTRY SPLIT SYSTEM DETAIL
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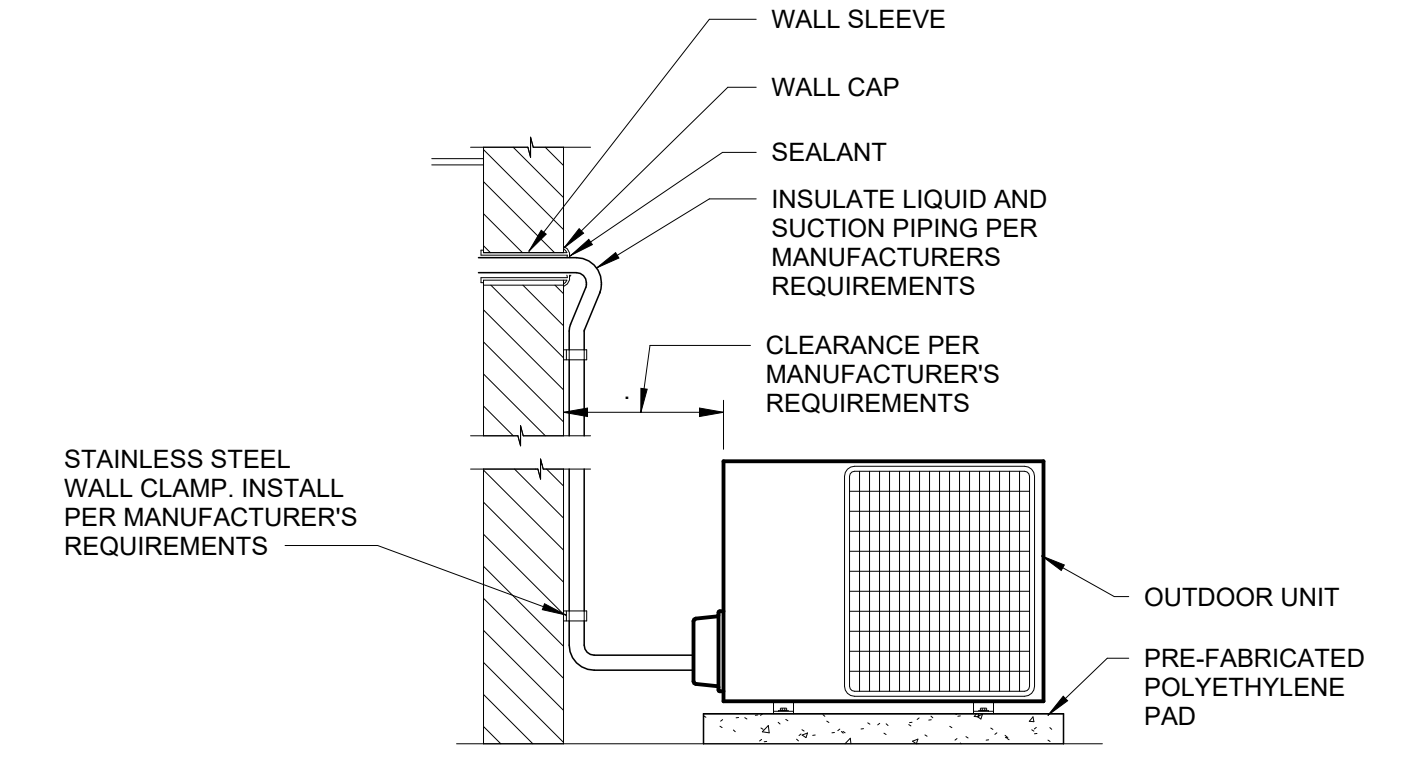
4 ROOF EQUIPMENT SUPPORT RAIL
SCALE: NOT TO SCALE



5 ROOF PIPING SUPPORT DETAIL
SCALE: NOT TO SCALE



6 ROOF DUCTWORK SUPPORT DETAIL
SCALE: NOT TO SCALE



7 2ND FLOOR SPLIT SYSTEM DETAIL
SCALE: NOT TO SCALE



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SINGLE ZONE ROOF TOP UNIT SCHEDULE																								
MARK	DESIGN BASIS		UNIT DESCRIPTION	AREA SERVED	SUPPLY FAN			EXHAUST FAN			COOLING PERFORMANCE - DX - 6 ROW						OUTDOOR AIR (%)	HEATING PERFORMANCE		ELECTRIAL DATA			REMARKS	
	MAKE	MODEL / SERIES			DESIGN AIRFLOW (CFM)	EXT. STATIC (IN. W.C.)	BHP / HP	EXT. STATIC (IN. W.C.)	BHP / HP	REFRIG. TYPE	EER / IEER	TOTAL CAPACITY (BTUH)	SENSIBLE CAPACITY (BTUH)	ENTERING AIR TEMPERATURE (DB)	LEAVING AIR TEMPERATURE (WB)	SEE HEATING COIL SCHEDULE		MCA (AMPS)	MOC (AMPS)	VOLTS	PHASE			
RTU-1	AAON	RNA-020-C	SINGLE ZONE VARIABLE VOLUME	THEATRE	8,000	1.5	6.59 / 7.50	0.75	4.25 / 5	R-410A	12.2 / 15.5	249.8	203.6	79.0	65.2	56.9	55.3	20%	SEE HEATING COIL SCHEDULE	115	125	208	3	SEE NOTES 1 AND 2

NOTES:
1. PROVIDE 30" INSULATED PLENUM CURB WITH SIDE INLET & OUTLET DUCTWORK TAPS, MODULATING HOT GAS REHEAT, DIGITAL SCROLL COMPRESSOR, MULTI-STAGE COOLING, FACTORY CONTROLS W/ BACNET COMPATIBILITY, SINGLE POINT ELECTRICAL CONNECTION, FULL ECONOMIZER AND POWERED EXHAUST.
2. PROVIDE 0 - 10 SIGNAL FOR HEATING COIL CONTROL VALVE, PROVIDE 0 - 10 SIGNAL FOR ENABLE OF HEATING COIL.

DUCT MOUNTED HEATING COIL SCHEDULE																					
TAG	DESIGN BASIS		COOLING AIRFLOW CFM	HEATING AIRFLOW CFM	HEATING COILS	NO. HEIGHT (IN)	COIL LENGTH (IN)	FINNED AREA S.F.	FLOW RATE GPM	EWT F	LWT F	TEMP DROP F	DELTA FLUID TYPE	ROWS	SPACING FPF	EAT F	LAT F	APD IN. W.C. (AT COOLING AIRFLOW)	FLUID PD FT H2O	CAPACITY MBH	REMARKS
	MAKE	MODEL / SERIES																			
HC-1	COLMASTER	HWJ02H08	8000	8000	2	36	54	14.25	20.86	160.00	120.00	40.00	WATER	2	96	52.40	100.00	0.06	7.15	412.3	

GRILLE AND DIFFUSER SCHEDULE											
MARK	DESIGN BASIS		DESCRIPTION	MODULE SIZE	NECK SIZE	AIR PATTERN	FRAME	C.F.M.	S.P. (WATER)	NOISE LEVEL (NC)	REMARKS
	MAKE	MODEL / SERIES									
SG-1	TITUS	DL-SV	LONG THROW, HIGH CAPACITY SPLIT VANE SUPPLY GRILLE WITH ROTATING DRUM	20 X 12	20 X 12	DIRECTIONAL	SEE NOTE 2	700	0.05	13	SEE NOTE 1
SG-2	TITUS	300FL	SUPPLY GRILLE - DOUBLE DEFLECTION - 3/4" SPACING	24 X 16	24 X 16	DIRECTIONAL	SEE NOTE 2	1000	0.03	16	SEE NOTE 1
SG-3	TITUS	300FL	SUPPLY GRILLE - DOUBLE DEFLECTION - 3/4" SPACING	8 X 6	8 X 6	DIRECTIONAL	SEE NOTE 2	100	0.06	16	SEE NOTE 1
RG-1	TITUS	33RL	HEAVY DUTY BAR RETURN GRILLE - SINGLE DEFLECTION 38 DEG - 1/2" SPACING W/ SUPPORT BARS @ 6" O.C.	36 X 24	38 X 24	RETURN	SEE NOTE 2	1875	0.08	16	SEE NOTE 1
RG-2	TITUS	33RL	HEAVY DUTY BAR RETURN GRILLE - SINGLE DEFLECTION 38 DEG - 1/2" SPACING W/ SUPPORT BARS @ 6" O.C.	24 X 16	24 X 16	RETURN	SEE NOTE 2	1200	0.05	15	SEE NOTE 1

NOTES:
1. ALL SUPPLY GRILLES AND DIFFUSERS SHALL BE CONSTRUCTED OF ALUMINUM UNLESS OTHERWISE NOTED.
2. COORDINATE DIFFUSER FRAME TYPE TO ENSURE COMPATIBILITY WITH CEILING AND/OR WALL TYPE, SEE ARCHITECTURAL SHEETS FOR ADDITIONAL INFORMATION.

SPLIT SYSTEM (A/C UNIT)												
MARK	DESIGN BASIS		DESCRIPTION	LOCATION	COOLING RATED CAPACITY BTUH	HEATING RATED CAPACITY BTUH	AIRFLOW CFM	MOTOR			DIMENSIONS LENGTH, HEIGHT DEPTH (IN.)	REMARKS
	MAKE	MODEL						FAN FLA	VOLTS	PHASE		
AC-1	SAMSUNG	AC036	VERTICAL STANDING SPLIT DX AIR HANDLER / EVAPORATOR COIL	CHECKING, OFFICE, LOUNGE	36,000	40,000	901 / 1074 / 1229	1.25	208	1	21 x 48 x 21	SEE NOTES 1 - 3
AC-2A	SAMSUNG	AR12CSD	WALL MOUNTED SPLIT DX AIR HANDLER / EVAPORATOR COIL	UPPER LEVEL	12,000	12,000	250 / 321 / 374 / 427	0.12	208	1	35 x 11-3/4 x 8-7/16	SEE NOTES 1 - 3
AC-2B	SAMSUNG	AR12CSD	WALL MOUNTED SPLIT DX AIR HANDLER / EVAPORATOR COIL	UPPER LEVEL	12,000	12,000	250 / 321 / 374 / 427	0.12	208	1	35 x 11-3/4 x 8-7/16	SEE NOTES 1 - 3

NOTES:
1. PROVIDE MANUFACTURER'S PROGRAMMABLE THERMOSTAT AND FACTORY DISCONNECT SWITCH.
2. PROVIDE LINESET, INSULATION, AND POWER/CONTROL WIRING. LINESET IS 1/4" LIQUID OD AND 3/8" VAPOR OD.
3. THE OUTDOOR UNIT SHALL (ACCU) SUPPLY POWER TO THE INDOOR UNIT (AC).

CONDENSING UNIT SCHEDULE													
MARK	DESIGN BASIS		DESCRIPTION	COOLING PERFORMANCE		HEATING PERFORMANCE		COMPRESSOR MOTOR			REMARKS		
	MAKE	MODEL		CAPACITY MIN (BTUH)	EFFICIENCY SEER / EER	CAPACITY MIN (BTUH)	RATED (BTUH)	UNIT MOC	UNIT MCA	VOLTS		PHASE	
ACCU-1	SAMSUNG	AC036	OUTDOOR CONDENSER / COMPRESSOR UNIT	13,500	36,000	18.7 / 11.5	10,500	40,000	40	33.2	208	1	NOTES 1 - 3
ACCU-2	SAMSUNG	AJ024	OUTDOOR CONDENSER / COMPRESSOR UNIT	6,500	25,000	23 / 14.55	7,500	25,000	40	36.5	208	1	NOTES 1 - 3

NOTES:
1. COOLING PERFORMANCE BASED UPON AHRI COOLING 80/67 INDOOR 95/75 OUTDOOR.
2. INCLUDE MANUFACTURER'S WIND BAFFLE KIT.
3. CONDENSING UNITS FEED POWER THROUGH TO INDOOR UNITS. THE ELECTRICAL INFORMATION IS FOR THE SYSTEM.

Project Title:
PEORIA PLAYERS THEATER - HVAC UPGRADE

Drawing Title:
MECHANICAL SCHEDULES

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KEYED ELECTRICAL NOTES (THIS SHEET):

- 1 REMOVE EXISTING BREAKER SERVING ACC'S BEING REMOVED TO PROVIDE SPACE FOR NEW 125A/3P BREAKER FOR NEW RTU-1. VERIFY BREAKERS AND IDENTIFY AND RECORD ANY SPARES.

Revisions:

NO.	DATE	DESCRIPTION

Project Title:

PEORIA PLAYERS THEATER - HVAC UPGRADE

Drawing Title:

BASEMENT - ELECTRICAL DEMOLITION

Date:

02/14/25

Drawn By:

IRK

Scale:

AS NOTED

Checked By:

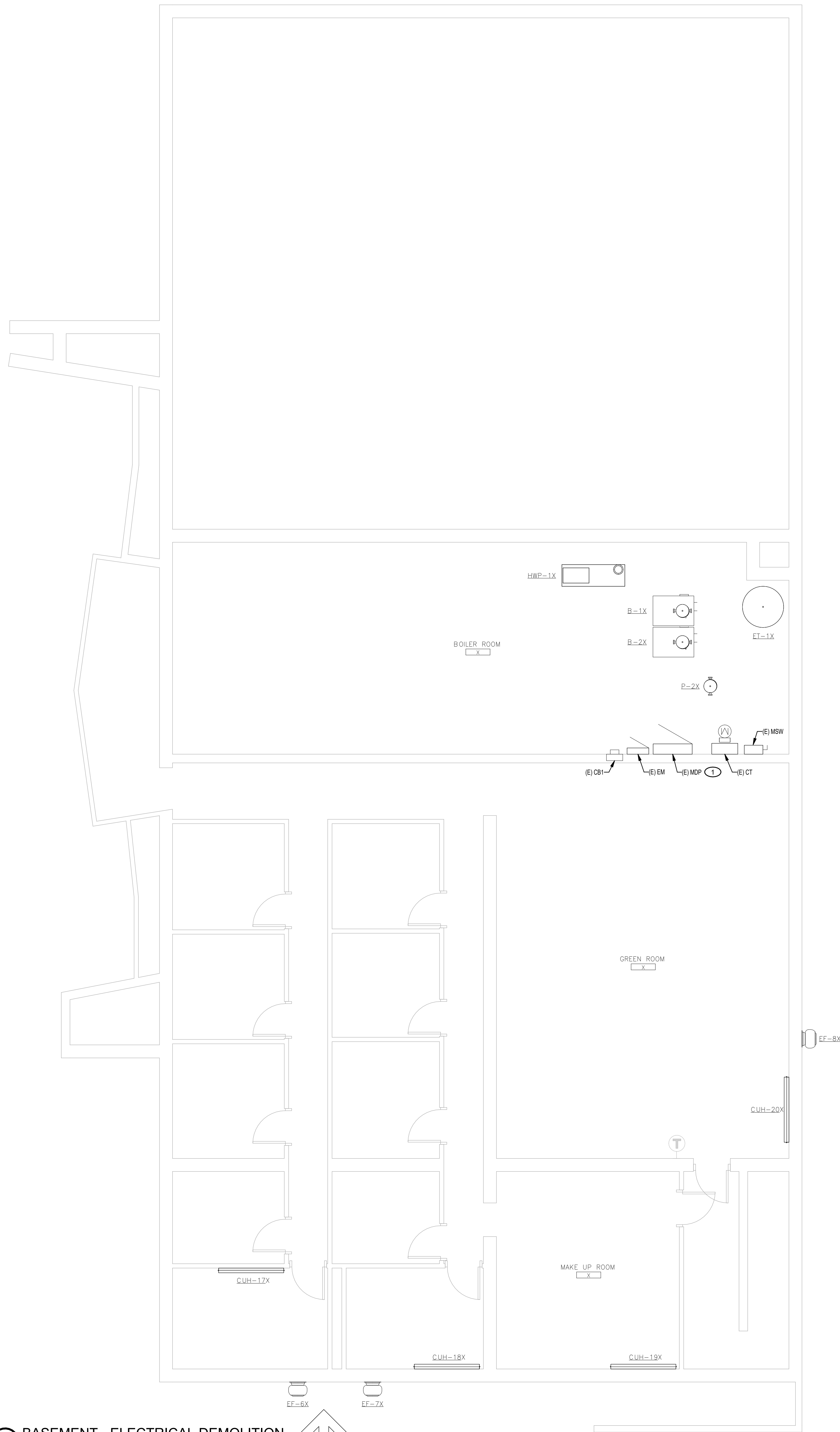
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Project Number:

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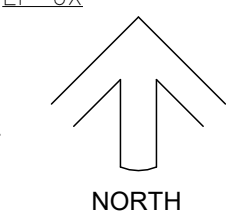
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1 BASEMENT - ELECTRICAL DEMOLITION

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





DATE: 02/14/25

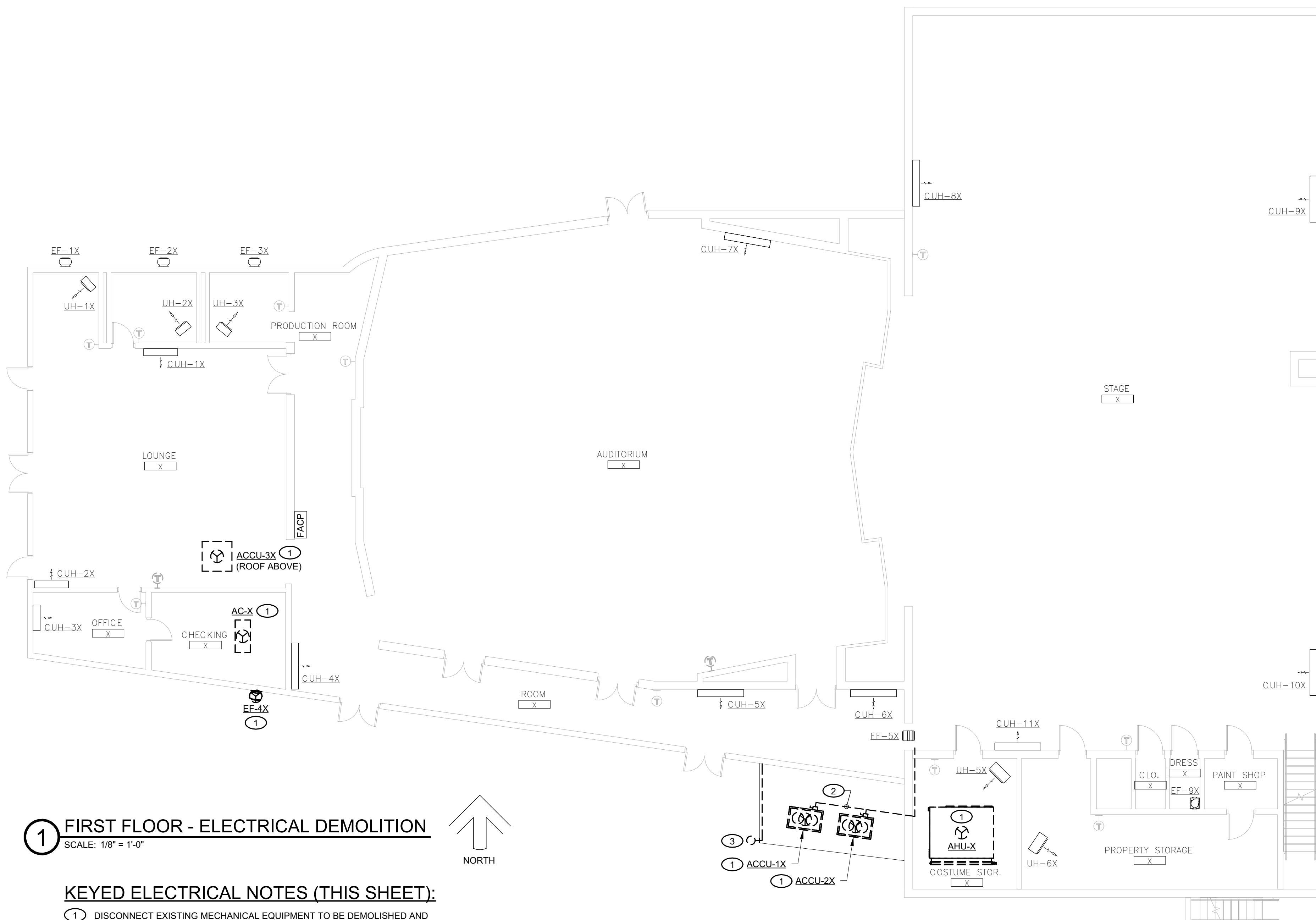
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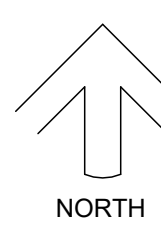
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Revisions:

NO. DATE DESCRIPTION



1 FIRST FLOOR - ELECTRICAL DEMOLITION
SCALE: 1/8" = 1'-0"



KEYED ELECTRICAL NOTES (THIS SHEET):

- 1 DISCONNECT EXISTING MECHANICAL EQUIPMENT TO BE DEMOLISHED AND DEMOLISH ALL ASSOCIATED ELECTRICAL BACK TO ACTIVE SOURCE.
- 2 DISCONNECT AND REMOVE CONDUIT AND CONDUCTORS SERVING ACCU'S BEING REMOVED. EXISTING CONDUIT INSIDE BUILDING WILL REMAIN ONLY IF SIZE IS AT LEAST SIZE REQUIRED FOR NEW RTU-1. ALL CONDUIT SECTIONS THAT HAVE BEEN DAMAGED OR SEPARATED AT COUPLINGS SHALL BE REMOVED AND REPLACED WITH NEW, IF ATTEMPTING TO RE-USE.
- 3 DEMOLISH EXISTING LUMINAIRE AND ALL ASSOCIATED ELECTRICAL BACK TO INSIDE WALL. PROVIDE JUNCTION BOX ON INSIDE WALL TO BEGIN EXTENSION OF CIRCUIT TO NEW LIGHTS AND RECEPTACLE. SEE NEW WORK ELECTRICAL PLAN.

Project Title:

PEORIA
PLAYERS
THEATER -
HVAC
UPGRADE

Drawing Title:

FIRST FLOOR -
ELECTRICAL
DEMOLITION

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KEYED ELECTRICAL NOTES (THIS SHEET):

- ① ADJUST LOCATIONS OF EXISTING BREAKERS AND SPACES TO ALLOW INSTALLATION OF NEW 125A/3P BREAKER TO SERVE NEW RTU-1. FURNISH AND INSTALL BREAKER, TEST, VERIFY ACTIVE/SPARE BREAKERS, AND CREATE NEW PANEL DIRECTORY PER SPECIFICATIONS. CONTRACTOR SHALL HAVE FEEDER ROUTE TO NEW RTU-1 APPROVED BY OWNER PRIOR TO BEGINNING ASSOCIATED WORK.

Revisions:

NO.	DATE	DESCRIPTION

Project Title:

PEORIA PLAYERS THEATER - HVAC UPGRADE

Drawing Title:

BASEMENT - ELECTRICAL NEW WORK

Date:

02/14/25

Scale:

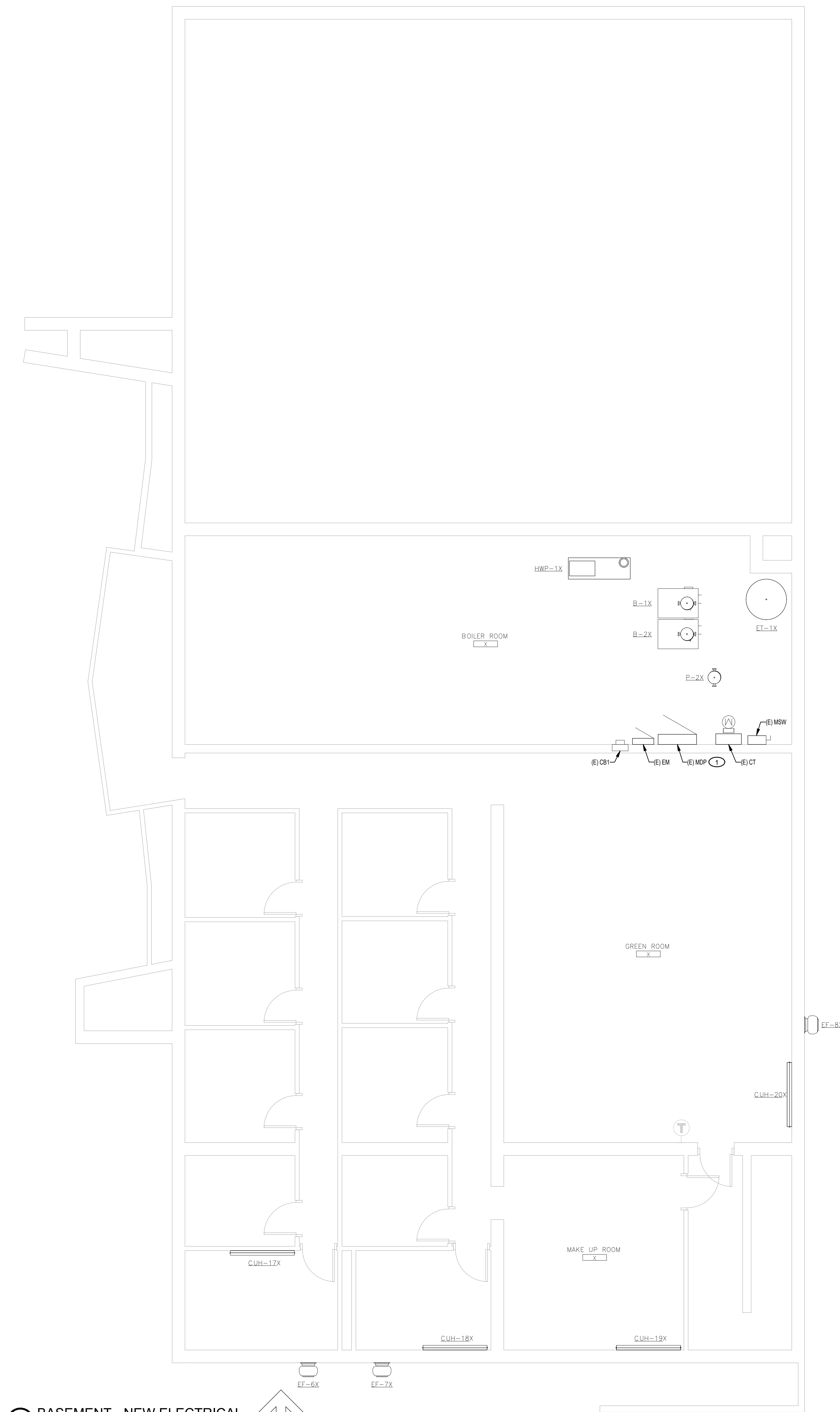
AS NOTED

Project Number:

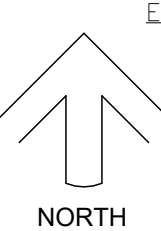
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Page Number:

E100



① **BASEMENT - NEW ELECTRICAL**
SCALE: 1/4" = 1'-0"



NORTH



DATE: 02/14/25

Consultants:



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Revisions:
NO. DATE DESCRIPTION

Project Title:

PEORIA
PLAYERS
THEATER -
HVAC
UPGRADE

Drawing Title:

FIRST FLOOR -
ELECTRICAL
NEW WORK

Date:
02/14/25

Drawn By:
IRK

Scale:
AS NOTED

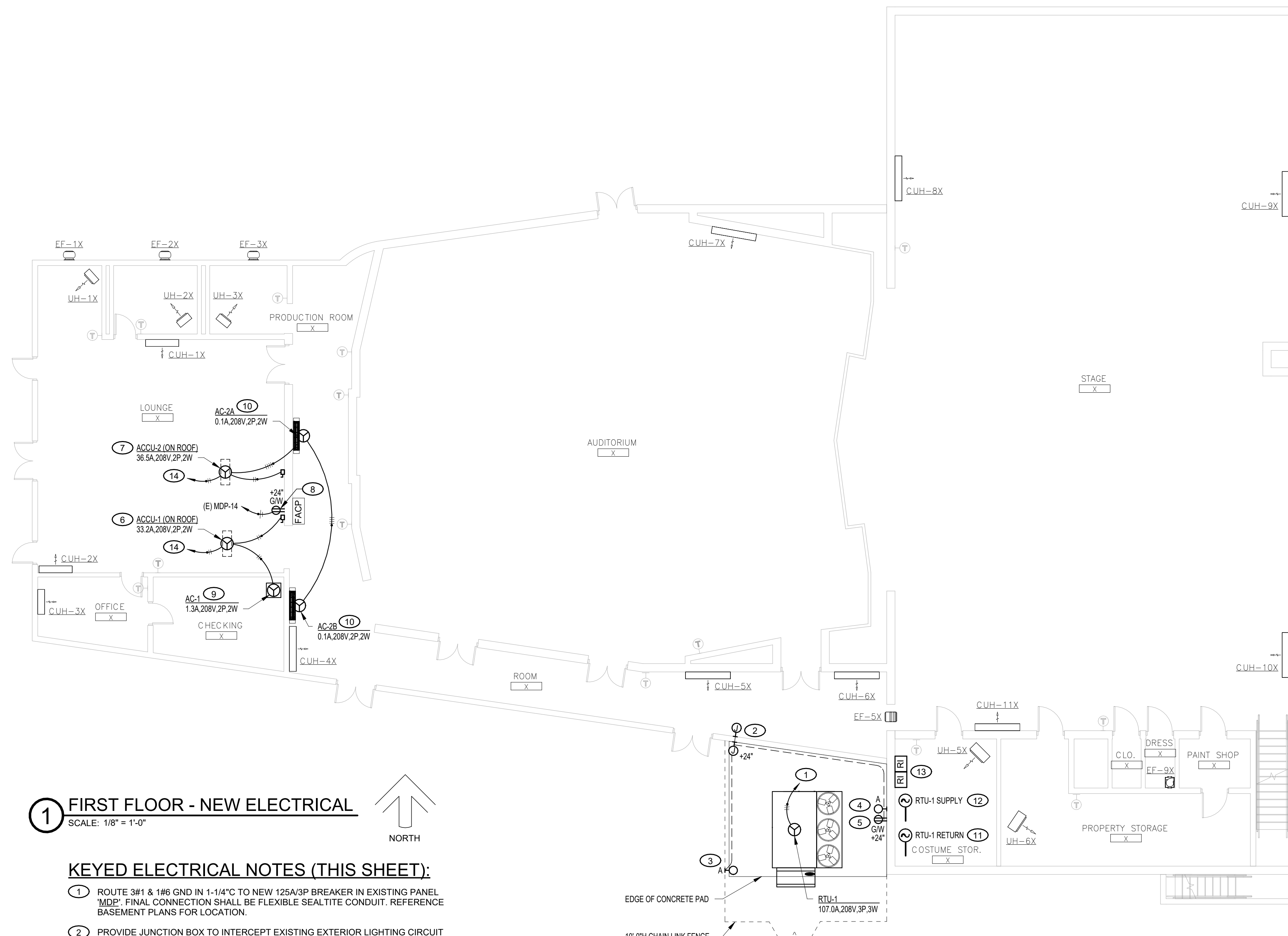
Checked By:
TDC

Project Number:

24-114

Page Number:

E110



1 FIRST FLOOR - NEW ELECTRICAL
SCALE: 1/8" = 1'-0"
NORTH

KEYED ELECTRICAL NOTES (THIS SHEET):

- 1 ROUTE 3#1 & 1#6 GND IN 1-1/4" TO NEW 125A/3P BREAKER IN EXISTING PANEL 'MDP'. FINAL CONNECTION SHALL BE FLEXIBLE SEALTITE CONDUIT. REFERENCE BASEMENT PLANS FOR LOCATION.
- 2 PROVIDE JUNCTION BOX TO INTERCEPT EXISTING EXTERIOR LIGHTING CIRCUIT FOR NEW LIGHTS.
- 3 PROVIDE HARDWARE TO SECURELY MOUNT NEW LIGHT AT TOP RAIL OF FENCE, AT NEAREST POST. ROUTE 2#12 & 1#12 GND IN 3/4" RMC DOWN TO NEW CONCRETE PAD. CONTINUE ROUTE BELOW PAD IN 3/4" PVC TO EXTERIOR JUNCTION BOX.
- 4 SECURELY MOUNT NEW FIXTURE ON EXISTING BRICK EXTERIOR WALL AT 10'-0" ABOVE CONCRETE PAD. ROUTE 3#12 & 1#12 GND IN 3/4" PVC TO EXTERIOR JUNCTION BOX.
- 5 SECURELY MOUNT WEATHERPROOF OUTLET BOX TO EXTERIOR BRICK WALL AT 24" ABOVE CONCRETE PAD. ROUTE 2#12 & 1#12 GND TO EXISTING LIGHTING CIRCUIT. EXTEND 1#12 PHASE CONDUCTOR BACK TO POINT AHEAD OF EXISTING SWITCH FOR UNSWITCHED POWER TO RECEPTACLE.
- 6 ROUTE 2#8 & 1#10 GND IN 3/4" FROM ROOF 'ACCU-1' TO EXTERIOR WALL MOUNTED, NEMA 3R, NON-FUSED SAFETY SWITCH. SEE DETAIL 1, SHEET E500 FOR ADDITIONAL INFORMATION. ROUTE 2#14, 1#14 GND, & 2#16 CONTROL WIRING IN 3/4" TO INDOOR AIR HANDLER. REFERENCE EQUIPMENT INSTALLATION INSTRUCTIONS FOR ADDITIONAL INFORMATION.
- 7 ROUTE 2#8 & 1#10 GND IN 3/4" FROM ROOF 'ACCU-2' TO EXTERIOR WALL MOUNTED, NEMA 3R, NON-FUSED SAFETY SWITCH. SEE DETAIL 1, SHEET E500 FOR ADDITIONAL INFORMATION. ROUTE 2#14, 1#14 GND, & 2#16 CONTROL WIRING IN 3/4" TO INDOOR UNITS. REFERENCE EQUIPMENT INSTALLATION INSTRUCTIONS FOR ADDITIONAL INFORMATION.
- 8 PROVIDE NEC REQUIRED MAINTENANCE RECEPTACLE ON EXTERIOR WALL 24" ABOVE LOWER ROOF.
- 9 PROVIDE POWER AND CONTROL WIRING FOR SPLIT SYSTEM AIR HANDLER, FED FROM ROOF MOUNTED 'ACCU-1'. VERIFY EXACT LOCATION WITH MECHANICAL TRADE.
- 10 PROVIDE POWER AND CONTROL WIRING FOR SPLIT SYSTEM INDOOR UNIT, FED FROM ROOF MOUNTED 'ACCU-2'. VERIFY EXACT LOCATION WITH MECHANICAL TRADE.
- 11 PROVIDE DUCT SMOKE DETECTOR IN RETURN AIR DUCT WITH SHUTDOWN SIGNAL TO 'RTU-1'.
- 12 PROVIDE DUCT SMOKE DETECTOR IN SUPPLY AIR DUCT WITH SHUTDOWN SIGNAL TO 'RTU-1'.
- 13 INSTALL WALL MOUNTED REMOTE INDICATOR / TEST SWITCH FOR EACH DUCT DETECTOR. CLEARLY LABEL TO IDENTIFY ASSOCIATED DETECTOR.
- 14 ROUTE 2#6 & 1#10 GND IN 1" TO NEW 40A/2P BREAKER IN EXISTING PANEL 'MDP'. FINAL CONNECTION SHALL BE FLEXIBLE SEALTITE CONDUIT. REFERENCE BASEMENT PLANS FOR LOCATION.

EXISTING DISTRIBUTION PANELBOARD TO REMAIN

Branch Panel: (E) MDP

Location: BOILER RM
Supply From: (E) CT
Mounting: SURFACE
Enclosure: NEMA 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating: 10,000
Mains Type: MLO
Bus Rating: 400 A
Lugs: STANDARD

Notes:
[SB] SQUARE 'D' NQO

CKT	Circuit Description	Trip	Poles	A	B	C	Poles	Trip	Circuit Description	CKT
1	BOILER RM LIGHTS	20 A	1	0 VA	0 VA			1	20 A EXISTING LOAD OR SPARE	2
3	B-1	15 A	1		1560..	0 VA		1	20 A PHONE SYSTEM	4
5	EXISTING LOAD OR SPARE	20 A	1			0 VA	0 VA	1	20 A EXISTING LOAD OR SPARE	6
7	SPARE	20 A	2	0 VA	0 VA			1	20 A EXISTING LOAD OR SPARE	8
9	--	--	--		0 VA	0 VA		1	30 A STAGE RIGHT OUTLET	10
11	CIRC. PUMP	20 A	1			0 VA	1730..	1	20 A HWP-B1, HWP-B2	12
13	BASEMENT A/C FAN	20 A	1	0 VA	180 VA			1	20 A ROOFTOP ACCU RCPT	14
15	EXISTING LOAD OR SPARE	60 A	2		0 VA	0 VA		1	30 A STAGE OUTLET	16
17	--	--	--			0 VA	0 VA	3	60 A BASEMENT A/C COMPRESSOR	18
19	BASEMENT PANEL	70 A	2	0 VA	0 VA			--	--	20
21	--	--	--		0 VA	0 VA		--	--	22
23	EXISTING LOAD OR SPARE	70 A	3			0 VA	0 VA	2	70 A HALL PANEL	24
25	--	--	--	0 VA	0 VA			--	--	26
27	--	--	--		0 VA	0 VA		3	70 A EXISTING LOAD OR SPARE	28
29	EXISTING LOAD OR SPARE	90 A	3			0 VA	0 VA	--	--	30
31	--	--	--	0 VA	0 VA			--	--	32
33	--	--	--		0 VA	0 VA		2	50 A EXISTING LOAD OR SPARE	34
35	BACKSTAGE A/C	50 A	3			0 VA	0 VA	--	--	36
37	--	--	--	0 VA	2107..			3	35 A P-1	38
39	--	--	--		0 VA	2107..		--	--	40
41	B-2	15 A	1			1560..	2107..	--	--	42
Total Load:				2270 VA	3667 VA	5397 VA				
Total Amps:				19 A	32 A	47 A				

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals
Spare	11171 VA	100.00%	11171 VA	Total Conn. Load: 11333 VA
RCPT	180 VA	100.00%	180 VA	
				Total Est. Demand: 11333 VA
				Total Conn.: 31 A
				Total Est. Demand: 31 A

Notes:
[VB] - ELECTRICAL CONTRACTOR TO VERIFY AND REMOVE CIRCUIT BREAKER SERVING EXISTING ACCU TO BE REMOVED. IDENTIFY AND RECORD ANY SPARES.
[EB] - CONNECT RECEPTACLE TO EXISTING SPARE CIRCUIT BREAKER.

ELECTRICAL EQUIPMENT CONNECTION SCHEDULE

CALLOUT	VOLTAGE	PHASE	LOAD	MCA	MOCP	WIRE SIZE
AC-1	208 V	1	260 VA	1 A		3/4" C, 2#14, 1#14G
AC-2A	208 V	1	166 VA	1 A		3/4" C, 2#14, 1#14G
AC-2B	208 V	1	166 VA	1 A		3/4" C, 2#14, 1#14G
ACCU-1	208 V	1	6906 VA	33 A	40 A	1" C, 2#6, 1#10G
ACCU-2	208 V	1	7592 VA	37 A	40 A	1" C, 2#6, 1#10G
RTU-1	208 V	3	38547 VA	107 A	125 A	1-1/4" C, 3#1, 1#6G

LUMINAIRE SCHEDULE

CALLOUT	SYMBOL	DESCRIPTION	MIN. INITIAL LUMENS	MAX INPUT WATTS	COLOR TEMPERATURE	CRI	MODEL
A	Q	SURFACE MOUNTED LED WALL PACK WITH DARK BRONZE, POWDER COATED, DIE-CAST ALUMINUM HOUSING. HOUSING SHALL BE IP65 RATED FOR WET LOCATIONS AND SPRAY. LIGHT ENGINE SHALL HAVE ≥90% POWER FACTOR, <20% THD, AND L80/100,000 HOUR LIFE SPAN. INCLUDE PHOTOCCELL FOR AUTOMATIC DUSK / DAWN OPERATION. FIXTURE SHALL HAVE MINIMUM 5-YEAR WARRANTY.	4000 LM	32 W	4000 K	80	ACUITY LITHONIA TWPX2-LED-P2-40K-MVOLT- PE-DD8X APPROVED EQUIVALENT FROM: COOPER CURRENT SIGNIFY WILLIAMS

LUMINAIRE SCHEDULE NOTES:

- CONTRACTOR SHALL REFER TO ARCHITECTURAL REFLECTED CEILING PLANS, MECHANICAL SYSTEM PLANS, DETAILS, SECTIONS, AND ELEVATIONS FOR AID IN COORDINATION OF FIXTURE LOCATIONS AND ANY INTERFERENCES.
- CONTRACTOR SHALL PROVIDE COPIES OF COMPLETE FIXTURE SCHEDULES, LIGHTING PLANS, AND LIGHTING SPECIFICATIONS TO ALL SUPPLIERS OR MANUFACTURERS REPRESENTATIVES INVOLVED IN FIXTURE PRICING OR ORDERING. PRIOR TO BID.
- FIXTURES SHALL BE PROVIDED WITH FEATURES, OPTIONS, AND ACCESSORIES REQUIRED FOR COMPLETE INSTALLATION AND THOSE LISTED IN FIXTURE MODEL NUMBERS PROVIDED, SPECS, AND WRITTEN DESCRIPTION. IF CONFLICTS EXIST BETWEEN THESE, NOTIFY A/E FOR CLARIFICATION PRIOR TO BIDDING OR ORDERING.
- NOTIFY A/E IMMEDIATELY OF DISCREPANCIES AND MAKE NECESSARY CORRECTIONS PRIOR TO BIDDING.
- ALL LUMINAIRES SHALL BE CEE CERTIFIED.
- MOUNTING HARDWARE AND SUPPORT CLIPS SHALL BE UL LISTED FOR THE APPLICATION.

MATERIAL SCHEDULE

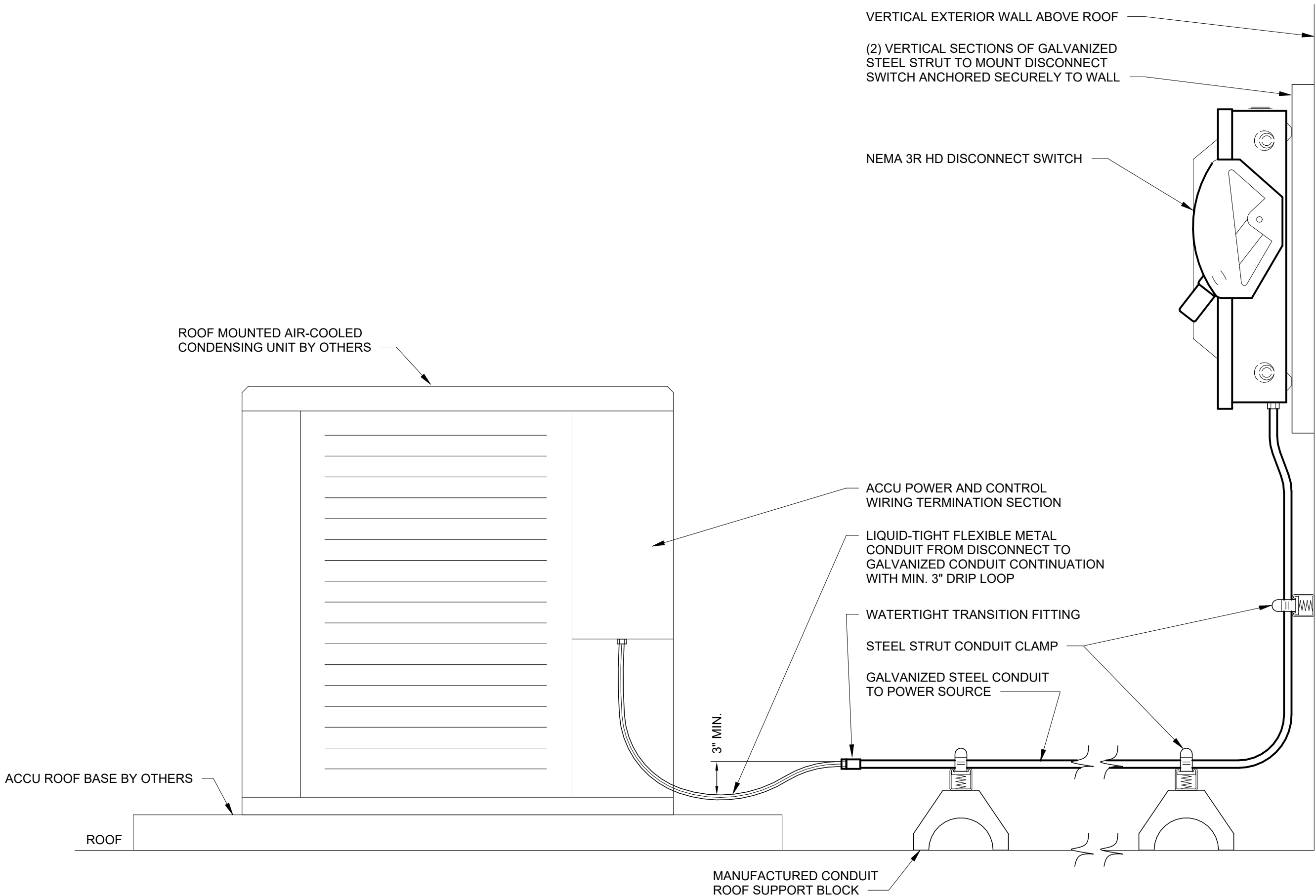
SYMBOL	DESCRIPTION	MANUFACTURER
GW	IN-USE LISTED WEATHER PROOF GROUND FAULT TAMPER RESISTANT NORMAL POWER DUPLEX RECEPTACLE, STRAIGHT BLADE, 20 AMPERE, HOSPITAL GRADE, 3 WIRE GROUNDING TYPE, TEST AND RESET BUTTONS IN THE FACE, NEMA 5-20R, WEATHERPROOF COVERPLATE, NEMA 4 RATED WHILE IN USE.	HUBBELL 8300 WITH IN-USE COVER LEVITON PASS & SEYMOUR COOPER
	ELECTRICAL CONNECTION TO EQUIPMENT. SIZE CONNECTION PER THE NATIONAL ELECTRICAL CODE. COORDINATE EXACT REQUIREMENTS WITH EQUIPMENT SUPPLIER.	
	DISCONNECT SWITCH, 600-VOLT, NON-FUSIBLE, HEAVY DUTY, LOCKABLE IN OFF POSITION, PROVIDE GROUND LUG, UL LISTED, COORDINATE ENCLOSURE NEMA TYPE WITH LOCATION, SIZE AND QUANTITY OF POLES SHALL MATCH EQUIPMENT DEVICE IS SERVING.	SQUARE 'D' CLASS 3110

GENERAL ELECTRICAL NOTES:

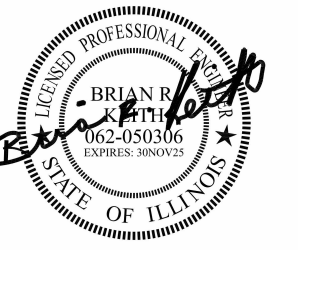
- ALL INSTALLATIONS SHALL BE IN ACCORDANCE WITH ALL FEDERAL, STATE AND LOCAL CODES INCLUDING BUT NOT LIMITED TO THE NATIONAL ELECTRICAL CODE, THE INTERNATIONAL BUILDING CODE, AMERICANS WITH DISABILITIES ACT ACCESSIBILITY GUIDELINES, AND INTERNATIONAL ENERGY CONSERVATION CODE. THE AUTHORITY HAVING JURISDICTION SHALL HAVE THE FINAL DECISION ON ALL INSTALLATIONS AND PRACTICES.
- REFER TO THE MATERIAL SCHEDULE, LUMINAIRE SCHEDULE, AND OTHER ASSOCIATED SCHEDULES AND NOTES FOR MANUFACTURERS AND DESCRIPTIONS OF ELECTRICAL MATERIALS, DEVICES, AND EQUIPMENT.
- ALL ELECTRICAL CONDUCTORS SHALL BE STRANDED COPPER WITH TYPE THHN-THWN INSULATION UNLESS SPECIFICALLY NOTED OTHERWISE. THE MINIMUM WIRE SIZE SHALL BE #12 AWG.
- CIRCUIT IDENTIFICATION NUMBERS ARE TO COORDINATE CIRCUITING WITH THE ASSOCIATED PANEL. THE CIRCUIT NUMBERS SHALL BE FIELD MODIFIED TO BALANCE THE ELECTRICAL LOAD ON ALL PHASES AS EVENLY AS POSSIBLE.
- ALL CIRCUITS REQUIRING NEUTRAL CONDUCTORS SHALL HAVE DEDICATED NEUTRALS. SHARED NEUTRALS ARE NOT ALLOWED.
- A GREEN GROUNDING CONDUCTOR SHALL BE CONNECTED TO ALL LOADS SERVED. THE CONDUCTOR SHALL BE SIZED PER THE NATIONAL ELECTRICAL CODE TO ACCOMMODATE THE LOAD SERVED. ALL GROUNDING CONDUCTORS SHALL BE INSTALLED IN CONDUIT.
- ALL BUILDING WIRING SHALL BE INSTALLED IN CONDUIT. MINIMUM SIZE SHALL BE 3/4".
- MC CABLING IS NOT PERMITTED UNLESS SPECIFICALLY NOTED OTHERWISE.
- ALL CONDUITS SHALL BE CONCEALED IN WALLS, ABOVE CEILING, ETC. WHERE POSSIBLE. ALL CONDUIT ROUTED EXPOSED SHALL BE A PRE-MANUFACTURED SURFACE RACEWAY (IE. WIREMOLD OR EQUAL) WITH THE EQUIVALENT USABLE AREA OF THE SUBSTITUTED CONDUIT. EXPOSED SURFACE RACEWAY SHALL NOT BE PERMITTED WITHOUT PRIOR APPROVAL FROM ARCHITECT/ENGINEER. ALL EXPOSED SURFACE RACEWAY SHALL BE ROUTED PARALLEL AND PERPENDICULAR TO WALLS AND CEILING. SURFACE WIREWAY SHALL BE FACTORY OR FIELD PAINTED TO MATCH MOUNTING SURFACE.
- COORDINATE THE EXACT LOCATION OF ALL DEVICES LOCATED ABOVE OR BELOW COUNTERS, ETC. WITH OTHER TRADES, ARCHITECTURAL ELEVATIONS, AND REVIEWED SUBMITTALS PRIOR TO ROUGH-IN.
- ALL CUTTING AND PATCHING REQUIRED FOR CONDUITS, DEVICES OR OTHER ELECTRICAL EQUIPMENT SHALL BE THE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR.
- ALL PENETRATIONS THROUGH FIRE-RATED WALLS, FLOORS, AND CEILINGS SHALL BE SEALED WITH AN APPROVED FIRE-RATED SYSTEM EQUAL TO OR EXCEEDING THE RATING OF THE MATERIAL PENETRATED.
- COORDINATE LOCATIONS OF ALL ELECTRICAL ITEMS INCLUDING LIGHTING FIXTURES, CEILING MOUNTED DEVICES (OCCUPANCY SENSORS, FIRE ALARM DETECTORS, SPEAKERS, ETC.) WITH EACH OTHER AND WITH ALL SPRINKLER HEADS, AIR SUPPLY DIFFUSER AND AIR RETURN GRILLES. ALL CEILING DEVICES SHALL BE CENTERED IN CEILING TILE.
- COORDINATE ALL MOUNTING OF ELECTRICAL MATERIALS, EQUIPMENT, AND DEVICES REQUIRED FOR EQUIPMENT/DEVICES SUPPLIED BY OTHERS. ELECTRICAL ITEMS SHALL BE MOUNTED TO AVOID ANY INTERFERENCE WITH OTHER EQUIPMENT OPERATION OR ACCESS. ALL INSTALLATIONS OF ELECTRICAL ITEMS FOR EQUIPMENT/DEVICES SUPPLIED BY OTHERS SHALL BE COORDINATED AND APPROVED BY THE SUPPLYING CONTRACTOR PRIOR TO ROUGH-IN.
- BOXES LOCATED ON OPPOSITE SIDES OF FIRE RATED WALLS SHALL BE OFFSET A MINIMUM OF 24" OR A FIRE RATED MATERIAL EQUAL TO OR GREATER THAN THE FIRE WALL MATERIAL RATING SHALL BE INSTALLED ABOVE THE BOX. BOXES LOCATED ON OPPOSITE SIDES OF NON-FIRE RATED WALLS SHALL BE OFFSET A MINIMUM 6".
- REMOVE AND REINSTALL ALL CEILING TILES NECESSARY TO PERFORM REQUIRED ELECTRICAL WORK. ALL CEILING TILES WHICH ARE DAMAGED DURING REMOVAL/REINSTALLATION, SHALL BE REPLACED WITH NEW TILES OF THE SAME MANUFACTURER AND MODEL AS EXISTING TILE.
- FLUSH MOUNT ALL TOGGLE SWITCHES AND FIRE ALARM MANUAL PULL STATIONS 42" ABOVE THE FINISHED FLOOR TO THE CENTER OF THE DEVICE UNLESS OTHERWISE NOTED. MOUNT FIRE ALARM VISUAL AND AUDIBLE/VISUAL UNITS + 80" ABOVE FINISHED FLOOR OR 6" BELOW CEILING, WHICHEVER IS LOWER.
- FLUSH MOUNT ALL RECEPTACLES AND TELECOMMUNICATIONS OUTLETS 18" ABOVE THE FINISHED FLOOR TO THE CENTER OF THE DEVICE UNLESS OTHERWISE NOTED.
- 'A' SUBSCRIPT NEXT TO A DEVICE INDICATES INSTALLATION ABOVE COUNTER.
- 'B' SUBSCRIPT NEXT TO A DEVICE INDICATES INSTALLATION BELOW COUNTER. COORDINATE ALL LOCATIONS WITH ARCHITECTURAL DRAWINGS AND SUBMITTALS. FIELD VERIFY ALL LOCATIONS PRIOR TO ROUGH-IN.
- LINE TYPE KEY:
a. --- NEW WORK BY THE ELECTRICAL CONTRACTOR
b. - - - NEW WORK BY OTHERS OR EXISTING WORK TO REMAIN
c. - - - - EXISTING WORK TO BE DEMOLISHED BY THE ELECTRICAL CONTRACTOR
- INDICATES THE TYPE OF CONDUCTORS IN THE CONDUIT. VERIFY QUANTITY FOR EACH SPECIFIC LOAD SERVED.
GROUND CONDUCTOR
PHASE CONDUCTOR
NEUTRAL CONDUCTOR
- CONDUCTOR TICK MARKS INDICATED ON CONDUITS DO NOT REPRESENT THE QUANTITY OF CONDUCTORS IN THE CONDUIT, BUT THE TYPE ONLY. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING THE REQUIRED QUANTITY OF GROUND, NEUTRAL, PHASE, AND SWITCH LEGS IN EACH CONDUIT.
- ALL REQUEST FOR CHANGE PROPOSALS ON THIS PROJECT SHALL INCLUDE A BREAKDOWN OF MATERIALS, LABOR, AND SUBCONTRACTORS, WITH SUFFICIENT DETAIL FOR ENGINEER EVALUATION. EACH SEPARATE PROPOSAL REQUEST ITEM SHALL INCLUDE SEPARATE MATERIALS AND LABOR BREAKDOWNS. SUPPLIER BACK-UP PRICING SHALL BE INCLUDED ON THE SUPPLIER'S LETTERHEAD. ALL LABOR UNITS ASSOCIATED WITH THE NEW MATERIAL INSTALLATIONS SHALL NOT EXCEED 75% OF THE NECA 1 LABOR UNITS, WITHOUT SPECIFIC PERMISSION.

GENERAL ELECTRICAL DEMOLITION NOTES:

- THE DRAWINGS ARE INTENDED TO INDICATE THE SCOPE OF WORK REQUIRED FOR THIS PROJECT. THEY ARE NOT INTENDED TO INDICATE THE LOCATION OF ALL DEVICES, JUNCTION BOXES, CONDUITS, ETC.. THE CONTRACTOR SHALL VISIT THE SITE PRIOR TO BIDDING TO VERIFY ALL RELEVANT EXISTING CONDITIONS.
- DISCONNECT ALL ELECTRICAL SYSTEMS AS REQUIRED IN FLOORS, WALLS, CEILING AND OTHER STRUCTURES SCHEDULED FOR DEMOLITION.
- ELECTRICAL ITEMS (IE. LIGHTING FIXTURES, RECEPTACLES, SWITCHES, ETC.) REMOVED AND NOT RELOCATED, REMAIN THE PROPERTY OF THE OWNER. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DISPOSAL OF MATERIAL THE OWNER DOES NOT WANT TO REUSE OR RETAIN (IE. FOR MAINTENANCE PROPOSES).
- PROVIDE TEMPORARY WIRING AND ASSOCIATED CONNECTIONS AS REQUIRED TO MAINTAIN EXISTING SYSTEMS OPERATION DURING CONSTRUCTION. ASSUME ALL EQUIPMENT MUST REMAIN OPERATIONAL DURING CONSTRUCTION UNLESS SPECIFICALLY NOTED OTHERWISE.
- THE CONTRACTOR SHALL OBTAIN APPROVAL FROM THE OWNER BEFORE TURNING OFF POWER TO CIRCUITS, FEEDERS, PANELS, ETC. OR DISABLING SYSTEMS IN PART OR WHOLE. COORDINATE ALL OUTAGES WITH OWNER.
- PROTECT WALLS, CEILING, FLOORS, AND OTHER EXISTING FINISH WORK THAT ARE TO REMAIN AND ARE EXPOSED DURING SELECTIVE DEMOLITION OPERATIONS.
- DEMOLISH AND REMOVE EXISTING CONSTRUCTION ONLY TO THE EXTENT REQUIRED BY NEW CONSTRUCTION AND AS INDICATED. USE METHODS REQUIRED TO COMPLETE WORK WITHIN LIMITATIONS OF GOVERNING REGULATIONS AND AS INDICATED IN THESE NOTES.
- WHERE LIGHTS, SWITCHES, RECEPTACLES, OR OTHER ELECTRICAL ITEMS, ARE BEING REMOVED ALL ASSOCIATED CONDUIT AND WIRE BACK TO THE PANEL BOARD OR FEEDER JUNCTION BOX SERVING THE DEVICE SHALL ALSO BE REMOVED, UNLESS THE CONDUIT CAN BE REUSED FOR NEW CONDUCTORS. EXISTING OPENINGS IN WALLS TO REMAIN SHALL BE PATCHED WITH DRYWALL, TAPED AND PAINTED TO MATCH EXISTING CONDITIONS. BLANK COVERPLATES OVER UNUSED OPENINGS IS NOT ALLOWED. ALL ABANDONED CONDUITS EXTENDING FROM WALLS ABOVE CEILING SHALL BE CUT OFF FLUSH WITH THE STUD AND PLUGGED.
- ALL CONDUIT SHALL BE REMOVED WHERE WALLS ARE BEING REMOVED. WHERE CONDUIT IS IN THE CONCRETE SLAB, CUT OFF FLUSH, PULL OUT WIRE, AND PLUG. WHERE CONDUIT IS RUN EXPOSED, ALL ASSOCIATED CLAMPS, SUPPORTS, HANGERS, ETC. SHALL ALSO BE REMOVED. CONDUIT CONCEALED IN WALL CONSTRUCTION MAY BE ABANDONED IN PLACE, IF NOT AFFECTED BY OTHER CONSTRUCTION.
- THIS CONTRACTOR SHALL COORDINATE ALL HIS WORK WITH OTHER CONTRACTORS AT THE JOB SITE BEFORE REMOVING EXISTING AND INSTALLING NEW ELECTRICAL ITEMS.
- EXISTING CONDUIT IN GOOD CONDITION, MAY BE REUSED IN PLACE. RELOCATED EXISTING CONDUIT SHALL NOT BE ALLOWED. BONDING CONDUCTORS SHALL BE INSTALLED IN ALL REUSED CONDUIT TO ASSURE PROPER GROUND PATH.
- EQUIPMENT/DEVICE REMOVAL IN CERTAIN LOCATIONS MAY REQUIRE THE INSTALLATION OF A JUNCTION BOX TO RECONNECT CIRCUITS THAT REMAIN IN OPERATION. EXTEND CONDUIT AND WIRING AS REQUIRED TO MAINTAIN CIRCUIT TO REMAINING EQUIPMENT.
- PROCEED WITH SELECTIVE DEMOLITION SYSTEMATICALLY.
- TRANSPORT DEMOLISHED MATERIALS FROM OWNER'S PROPERTY AND LEGALLY DISPOSE OF THEM.
- REMOVE, STORE, CLEAN, REINSTALL, RECONNECT, AND MAKE OPERATIONAL ALL COMPONENTS INDICATED FOR RELOCATION.
- DO NOT INTERRUPT EXISTING UTILITIES SERVING OCCUPIED OR OPERATING FACILITIES EXCEPT WHEN AUTHORIZED IN WRITING BY OWNER AND AUTHORITIES HAVING JURISDICTION. PROVIDE TEMPORARY SERVICES DURING INTERRUPTIONS TO EXISTING UTILITIES AS ACCEPTABLE BY OWNER AND AUTHORITY HAVING JURISDICTION.
- SEAL ALL UNUSED OPENINGS DUE TO REMOVAL OF ELECTRICAL EQUIPMENT TO MATCH EXISTING CONSTRUCTION. ALL UNUSED OPENINGS IN FIRE RATED WALLS SHALL BE SEALED WITH A UL LISTED FIRE SEALING SYSTEM TO MATCH THE EXISTING FIRE RATING.
- PROPERLY CLOSE ALL UNUSED OPENINGS IN ELECTRICAL ENCLOSURES AND BOXES DUE TO REMOVAL OF ELECTRICAL MATERIALS.
- CONTRACTOR SHALL REMOVE AND INSTALL ALL CEILING TILES AS REQUIRED FOR THE EXECUTION OF ELECTRICAL WORK THAT IS OUTSIDE THE CONTRACT LIMITS OF CONSTRUCTION. CONTRACTOR SHALL REPLACE CEILING TILES WITH IDENTICAL MATERIAL WHERE DAMAGED BY THIS CONTRACTOR. CONTRACTOR SHALL RECORD EXISTING DAMAGE PRIOR TO BEGINNING REMOVAL.
- BALLASTS MANUFACTURED PRIOR TO 1980 CONTAIN PCBs AND SHALL BE DISPOSED OF BY A FEDERAL OR STATE E.P.A. APPROVED METHOD AND IN ACCORDANCE WITH SPECIFICATIONS.
- FLUORESCENT LAMPS CONTAIN MERCURY AND SHALL BE DISPOSED OF BY A FEDERAL OR STATE E.P.A. APPROVED METHOD AND IN ACCORDANCE WITH SPECIFICATIONS.
- WHERE TELECOMMUNICATIONS OUTLETS (VOICE/DATA/CATV ETC.) ARE BEING REMOVED, ALL ASSOCIATED CONDUIT AND WIRE BACK TO THE TERMINATION EQUIPMENT SERVING THE DEVICE SHALL ALSO BE REMOVED.
- WHERE LOW-VOLTAGE SYSTEM CABLING (VOICE/DATA/CATV ETC.) IS EXISTING TO REMAIN, AND SUPPORT METHODS ARE BEING REMOVED, CABLING MUST BE PROPERLY SUPPORTED AND PROTECTED DURING ALL DEMOLITION AND NEW CONSTRUCTION ACTIVITIES. PROVIDE NEW PERMANENT SUPPORT OF ANY CABLING THAT IS NOT OF SUFFICIENT LENGTH FOR EXISTING ROUTE AND A MODIFIED ROUTE IS NECESSARY.



1 ROOF-TOP ACCU W/ WALL MOUNTED DISCONNECT DETAIL
SCALE: NOT TO SCALE



DATE: 02/14/25

Project Title:
PEORIA PLAYERS THEATER - HVAC UPGRADE

Revision:
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Checked By: TDC

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