SA&I 1-4040 (2000)

Canadian County, Oklahoma
COUNTY PURCHASING OFFICE
Canadian County Court House
El Reno, Oklahoma
Phone: (405) 295-6125

INVITATION TO BID

DATE ISSUED
March 28, 2016

PLEASE REVIEW TERMS AND CONDITIONS ON REVERSE SIDE RELATING TO SUBMISSION OF THIS BID.
Notarized Affidavit completions and signature required on reverse side.

BID NUMBER	BID CLOSING DATE AND HOUR	REQUIRED DELIVERY DATE
#2016-#13 Chiller/Boiler System / Children's Justice Center	April 25, 2016 at 9:30 am	SEE SPECIFICATIONS _____ Days after award of Purchase Order

TERMS
Net, FOB Bids will be received beg. 9:30am Tuesday April 19 until April 25, 2016 at 9:30am

DATE OF DELIVERY:
SEE SPECIFICATIONS

ITEM	QUANTITY	UNIT OF ISSUE	DESCRIPTION	UNIT PRICE	TOTAL
1 or more			Canadian County Children's Justice Center is seeking bids for a chiller/boiler system. Specifications attached. The Board of Canadian County Commissioners reserves the right to reject any and all bids or to award all or any portion of the items bid. All data will be considered in the awarding of the bid including the delivery time. *The reverse of this sheet must be completed and returned or the bid will be rejected.* Contact person: Jamie Girard, Director of Operations 7905 E Hwy 66 El Reno, OK 73036 (405) 202-3469		$ _____ Total

APPROVED

Date: Mar. 28, 2016

Officer or Department Head

STATE OF OKLAHOMA
CANADIAN COUNTY
FILED OR RECORDED

MAR 28 2016

SHELLEY DICKERSON
COUNTY CLERK
160167

TERMS AND CONDITIONS

1. Sealed bids will be opened in the Commissioner's Conference Room, Canadian County Courthouse, 201 N. Choctaw Avenue, El Reno, Oklahoma, at the time and date shown on the invitation to bid form.

2. Late bids will not be considered. Bids must be received in sealed envelopes (one to an envelope) with bid number and closing date written on the outside of the envelope.

3. Unit prices will be guaranteed correct by the bidder.

4. Firm prices will be F.O.B. destination.

5. Purchases by Canadian County, Oklahoma, are not subject to state or federal taxes.

6. This bid is submitted as a legal offer and any bid when accepted by the County constitutes a firm contract.

7. Oklahoma laws require each bidder submitting a bid to a county for goods or services to furnish a notarized sworn statement of non-collusion. A form is supplied below.

8. Bids will be firm until 05/25/2016 (DATE)

AFFIDAVIT: I, the undersigned, of lawful age, being first duly sworn on oath say that he (she) is the agent authorized by the bidder to submit the above bid. Affiant further states that the bidder has not been a party to any collusion among bidders in restraint of freedom of competition by agreement to bid at a fixed price or to refrain from bidding; or with any state official or employee as to quantity; quality or price in the prospective contract or any other terms of said prospective contract; or in any discussions between bidders and any state official concerning exchange of money or other thing of value for special consideration in the letting of a contract; that the bidder/contractor has not paid, given or donated or agreed to pay, give or donate to any officer or employee of the State of Oklahoma (or other entity) any money or other thing of value, either directly or indirectly in the procuring of the award of a contract pursuant to this bid.

Subscribed and sworn before this _____ day

of _____, 20____

My commission expires _____

_____
NOTARY PUBLIC (CLERK OR JUDGE)

(SEAL)

Firm: _____

Signed by: _____ Title: _____
(Manual Signature of Undersigned)

Address: _____ Phone: _____

City: _____ State: _____

Zip: _____

Please mail sealed bids to:
Canadian County Clerk's Office
Attn: Purchasing
PO Box 458
El Reno, OK 73036

Street Address:
201 N Choctaw Avenue
El Reno, OK 73036

NOTE: Other terms and conditions can be added at the discretion of the county officers

Canadian County
Purchasing

Bid Specifications

Date Issued: March 28, 2016
Bid Number: **2016-#13**
Closing Date: April 25, 2016 at 9:30am
PO Box 458, 201 N. Choctaw Ave., El Reno, OK 73036
Opening Date: April 25, 2016 at 9:30am
Commissioner's Meeting Room, 201 N. Choctaw Ave., El Reno, OK 73036

~ SPECIFICATIONS~

Chiller/Boiler System / Children's Justice Center

Canadian County Children's Justice Center is seeking bids for a Chiller/Boiler System.

Mandatory Pre-bid Conference is set for Wednesday, April 6, 2016 @ 1:00pm at the Canadian County Children's Justice Center located at 7905 E Hwy 66, El Reno, OK 73036.

Bids will be received beginning at 9:30am on Tuesday, April 19, 2016 until 9:30am on Monday, April 25, 2016.

Bids shall be accompanied by:

- A certified check, cashier's check or bid bond equal to five percent (5%) of the bid, which shall be deposited with the awarding public agency as a guaranty; or

  An irrevocable letter of credit terms the Construction and Properties Division of the Office of Management and Enterprise Services prescribes, issued by a financial institution insured by the Federal Deposit Insurance Corporation or the Federal Savings and Loan Insurance Corporation for the benefit of the state, on behalf of the awarding public agency, in an amount equal to five percent (5%) of the bid. The awarding public agency shall deposit the irrevocable letter of credit with Division.

- Business Relationships Affidavit

Awarded vendor shall provide:

- Contract
- Payment/Performance Bond
- Insurance – Contractor must provide evidence of public liability and workers' compensation insurance during construction in reasonable amounts.

(Please review Title 61 O.S. § 101-138 for full disclosure)

SEE SPECIFICATIONS ATTACHED.

Special Notation:
Brand names or specific detailed items are for informational purposes only and you may offer any brand that meets or exceeds the specifications.

For Information Contact:

Jamie Girard, Director of Operations

Phone: (405) 202-3469

Hours: Monday – Friday 8:00am to 4:30pm

Address: 7905 E Hwy 66, El Reno, OK 73036

MECHANICAL SPECIFICATIONS

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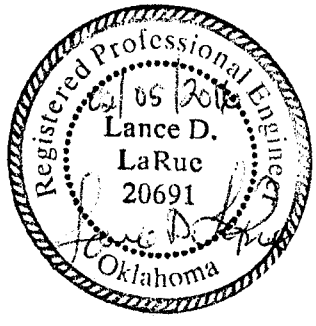
END OF DOCUMENT



SECTION 23 05 93

MECHANICAL & PLUMBING TESTING, ADJUSTING, AND BALANCING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Testing, adjusting, and balancing of all water systems and related equipment (pumps, boiler, fluid cooler, etc...).

1.2 SUBMITTALS

A. Work Plan – Contractor shall submit TAB Work Plan to Owner for review and acceptance prior to substantial completion and/or beginning of TAB work.

B. Draft Reports: Submit for review prior to final acceptance of Project.

C. Test Reports: Submit prior to final acceptance of Project and for inclusion in operating and maintenance manuals. Assemble in soft cover, letter size, 3-ring binder, with table of contents page and tabs, and cover identification. Include reduced scale drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.

1.3 QUALITY ASSURANCE

A. Agencies: Agency shall be NEBB or AABC certified. Submit agency for review and acceptance.

B. Report Forms: AABC MN-1 National Standards for Total System Balance forms

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 EXAMINATION

A. Before starting work, verify systems are complete and operable.

B. Report defects, deficiencies, or abnormal conditions in mechanical systems preventing system balance.

C. Beginning of work means acceptance of existing conditions.

3.2 INSTALLATION TOLERANCES

A. Adjust to within plus or minus 10 percent of design.

3.3 WATER SYSTEMS

A. All water systems shall be tested at 150 psig water pressure and maintained for (4) hours without loss of pressure. All piping systems requiring pipe insulation shall be tested before insulation is applied.

B. The performance of all pumps, boilers, and fluid coolers shall be proven onsite & in accordance with the manufacturer's approved testing methods. Owner's personnel and the Engineer shall be present at all tests. Written verification of such tests shall be provided to turnover.

3.4 FIELD QUALITY CONTROL

A. Verify recorded data represents actually measured or observed conditions.

B. Permanently mark settings of valves, dampers, and other adjustment devices. Set and lock memory stops.

END OF SECTION

SECTION 23 07 00

MECHANICAL INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Piping insulation, jackets and accessories.
   2. Equipment insulation and covering.
   3. Ductwork insulation and jackets.
   4. Internal ductwork insulation.

1.2 SUBMITTALS

A. Product Data: Submit product description, list of materials and thickness for each service or equipment scheduled and locations.

1.3 QUALITY ASSURANCE

A. Maintain one copy of each document on site.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Do not install insulation and related products when ambient temperatures and conditions are not meeting manufacturer's requirements.

B. Maintain temperature before, during, and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.1 PIPE INSULATION

A. Manufacturers:
   1. Childers Products Co.
   2. Johns Manville
   3. Owens Corning
   4. Pittsburgh Corning Corp.
   5. Substitutions: AS APPROVED

B. Man Made Mineral Fiber: ASTM C547; rigid molded, noncombustible.
   1. k (ksi) factor: 0.24 at 75 degrees F (0.035 at 24 degrees C).
   2. Maximum service temperature: 1200 degrees F

3. Vapor Retarder Jacket: White Kraft paper with glass fiber yarn and bonded to aluminized film, secured with self-sealing longitudinal laps and butt strips or with outward clinch expanding staples and vapor retarder mastic.

C. Hydrous Calcium Silicate: ASTM C533; rigid molded, asbestos free, gold color.
1. k (ksi) factor: 0.44 at 300 degrees F (0.064 at 147 degrees C).
2. Maximum Service Temperature: 1200 degrees F (649 degrees C).
3. Tie Wire: Stainless steel with twisted ends on maximum 12 inch (300 mm) centers.

D. Cellular Foam: ASTM C534; flexible, cellular elastomeric, molded or sheet.
1. k (ksi) Value: 0.27 at 75 degrees F (0.04 at 24 degrees C).
2. Maximum Service Temperature: 220 degrees F (104 degrees C).
3. Connection: Waterproof vapor retarder adhesive.

E. Jackets:
1. PVC Plastic: One piece molded type fitting covers and sheet material, off-white color.
   a. Thickness: 10 mil.
   b. Connections: Brush on welding adhesive.
2. Canvas Jacket: UL listed fabric, 6 oz per sq yd (220 g/sq m), plain weave cotton treated with dilute fire retardant lagging adhesive.
3. Aluminum Jacket: 0.025 inch thick sheet, smooth finish, with longitudinal slip joints and 2 inch (50 mm) laps, die shaped fitting covers with factory attached protective liner.
4. Stainless Steel Jacket: Type 304 stainless steel, 0.010 inch thick sheet, smooth or corrugated finish.

2.2 EQUIPMENT INSULATION

A. Flexible Mineral Fiber Blanket: ASTM C553; flexible, noncombustible.
1. k (ksi) factor: 0.25 at 75 degrees F (0.035 at 24 degrees C).
2. Maximum service temperature: 250 degrees F.
3. Density: 2.0 lb/cu ft (32 kg/cu m) density.
4. Vapor Retarder Jacket: Kraft paper with glass fiber yarn and bonded to aluminized film, secured with self-sealing longitudinal laps and butt strips or with outward clinch expanding staples and vapor retarder mastic.

B. Rigid Mineral Fiberboard: ASTM C612; rigid, noncombustible.
1. k (ksi) factor: 0.24 at 75 degrees F (0.035 at 24 degrees C).
2. Maximum service temperature: 850 degrees F.
3. Density: 3.0 lb/cu ft.
4. Vapor Retarder Jacket: Kraft paper with glass fiber yarn and bonded to aluminized film, secured with self-sealing longitudinal laps and butt strips or with outward clinch expanding staples and vapor retarder mastic.
5. Facing: One inch galvanized steel hexagonal wire mesh stitched onto both faces of insulation.

C. Cellular Glass: ASTM C552; 'k' factor of 0.29 at 75 degrees F (ksi value of 0.047 at 24 degrees C); 8.0 lb/cu ft (128 kg/cu m) density.

D. Hydrous Calcium Silicate: ASTM C533; rigid molded, asbestos free, gold color.
1. k (ksi) factor: 0.44 at 300 degrees F (0.060 at 147 degrees C).
2. Maximum Service Temperature: 1200 degrees F (649 degrees C).
3. Tie Wire: Stainless steel with twisted ends on maximum 12 inch (300 mm) centers.

2.3 DUCTWORK INSULATION

A. Flexible Glass Fiber: ASTM C553; flexible, noncombustible blanket.
1. k (ksi) Value: 0.29 at 75 degrees F (0.042 at 24 degrees C).
2. Vapor Retarder Jacket: Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, secured with pressure sensitive tape.

B. Rigid Glass Fiber: ASTM C612; rigid, noncombustible blanket.
1. k (ksi) Value: 0.29 at 75 degrees F (0.042 at 24 degrees C).
2. Density: 3.0 lb/cu ft (48 kg/cu m).
3. Vapor Retarder Jacket: Kraft paper with glass fiber yarn and bonded to aluminized film, secured with pressure sensitive tape.

C. Canvas Jacket: UL listed fabric, 6 oz/sq yd (220 g/sq m), plain weave cotton treated with dilute fire retardant lagging adhesive.

D. Mineral Fiber (Outdoor) Jacket: Asphalt impregnated and coated sheet, 36 lb/square.

E. Aluminum Jacket: 0.025 inch thick sheet, smooth finish, with longitudinal slip joints and 2 inch (50 mm) laps.

F. Duct Liner: ASTM C1071; flexible, noncombustible blanket with acrylic polymer meeting ASTM G21 and ASTM G22 impregnated surface and edge coat.
1. k (ksi) Value: ASTM C1071.
2. Maximum Velocity on Coated Air Side: 5,000 ft/min (25.4 m/s).
3. Adhesive: Waterproof fire-retardant type.
4. Liner Fasteners: Galvanized steel, self-adhesive pad or welded with press-on head.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify piping, equipment and ductwork are tested and ready for installation.

3.2 INSTALLATION

A. Install duct liner in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

B. Continue insulation vapor barrier through penetrations.

C. Piping Insulation:
1. Locate insulation and cover seams in least visible locations.
2. Neatly finish insulation at supports, protrusions, and interruptions.
3. Insulate complete system of pipes conveying fluids below ambient temperature.
4. Install fiber glass insulated pipes conveying fluids below ambient temperature with vapor barrier jackets. Finish with glass cloth and vapor barrier adhesive.
5. For man made mineral fiber insulated pipes conveying fluids above ambient temperature, install standard jackets. Bevel and seal ends of insulation at equipment, flanges, and unions.
6. Install insert between support shield and piping on piping 2 inches (50 mm) diameter or larger. Fabricate of cork or other high density insulating material suitable for temperature, not less than 6 inches (150 mm) long.
7. For pipe exposed in mechanical equipment rooms or in finished spaces below 10 feet (3 meters) above finished floor, finish with PVC jacket and fitting covers.
8. For exterior applications, install vapor barrier jacket. Insulate pipe, fittings, joints, and valves and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

D. Equipment Insulation:
1. Apply insulation to equipment by grooving, scoring, and beveling insulation. Secure insulation to equipment with studs, pins, clips, adhesive, wires, or bands.
2. Fill joints, cracks, seams, and depressions with bedding compound to form uniform surface. On cold equipment, use vapor barrier cement.
3. Install fiber glass insulated equipment containing fluids below ambient temperature with vapor barrier jackets.
4. For fiber glass insulated equipment containing fluids above ambient temperature, install standard jackets, with or without vapor barrier.
5. Cover insulation with metal mesh and finish with coat of insulating cement.
6. For equipment in mechanical equipment rooms or in finished spaces, finish with PVC jacket and fitting covers.
7. Do not insulate over nameplate or ASME stamps. Bevel and seal insulation around nameplates or stamps.
8. When equipment with insulation requires periodic opening for maintenance, repair, or cleaning, install insulation in to allow removal and replacement without damage.

E. External Ductwork Insulation:
1. For insulated ductwork conveying air below ambient temperature install vapor barrier jacket. Finish with tape. Seal vapor barrier penetrations with vapor barrier adhesive.
2. For insulated ductwork conveying air above ambient temperature install with or without standard vapor barrier jacket. Where service access is required, bevel and seal ends of insulation.
3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.

4. Install without sag on underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging.
5. For ductwork exposed in mechanical equipment rooms or in finished spaces, finish with canvas jacket sized for finish painting.
6. For exterior applications, install insulation with vapor barrier jacket. Cover with outdoor jacket.

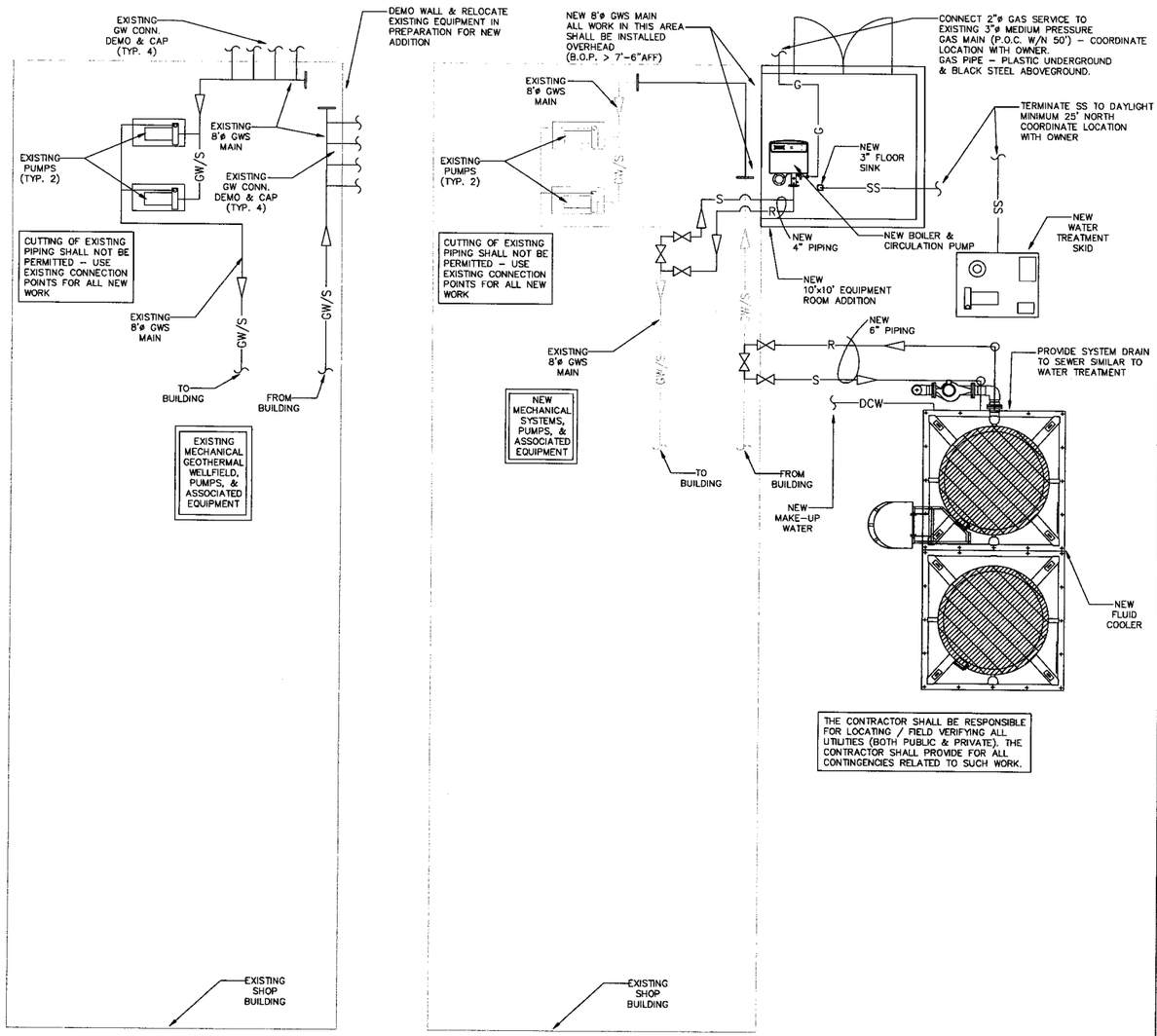
F. Duct Liner:
1. Adhere insulation with adhesive for 100 percent coverage.
2. Secure insulation with mechanical liner fasteners. Refer to SMACNA HVAC Duct Construction Standards - Metal and Flexible for spacing.
3. Seal liner surface penetrations with adhesive.
4. Duct dimensions indicated are net inside dimensions required for airflow. Increase duct size to allow for insulation thickness.

3.3 INSULATION SCHEDULE

1. The Contractor shall provide insulation thicknesses in accordance with the following:

Item:	Thickness:
Unlined Ducts	1-1/2"
Exterior Geothermal Piping	2"

Notes: In all cases the duct insulation shall provide a minimum insulation value of R-8 as applied to the duct and as specified by the insulation manufacturer. The thicknesses listed above are minimum values, provide thicker insulation where required by code or regulation.



01 M1 **"DEMOLITION" SCHEMATIC**
SCALE: N.T.S.

02 M1 **"NEW CONSTRUCTION" SCHEMATIC**
SCALE: N.T.S.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING / FIELD VERIFYING ALL UTILITIES (BOTH PUBLIC & PRIVATE). THE CONTRACTOR SHALL PROVIDE FOR ALL CONTINGENCIES RELATED TO SUCH WORK.

PIPING SYSTEM NOTES:

1. All fusion joints shall be checked to verify that no leaks have occurred due to fusion joining or shipping damage.

2. All piping shall be pressure tested before connection to mechanical equipment.

3. ALL NEW water piping system shall be flushed and purged in the forward and reverse directions with water at a minimum flowrate of 2 ft/sec through each piping section. Flow must be maintained for a minimum of 15 minutes in each direction to remove all debris and air. To verify that all air is removed from the system, the return water valve to the tank shall be closed. A change in the level of fluid in the purge pump tank during pressurization indicates air is still trapped in the system.

4. Flowrates and pressure drops shall be compared to calculated values to assure that there is no blockage or kinking of any pipe. If actual flowrate or pressure drop values differ from calculated values by more than 10 percent, the problem shall be identified and corrected.

5. At a minimum, the system shall be pressure tested with water at 100 psig for 1 hour with no observed drop in pressure (greater than 10 psig).

SCOPE OF WORK:

Demolition:
1. Demolish & remove geothermal supply and return piping (as shown) within pump room - supply & return piping connections to the buildings served shall remain untouched.
2. Demolish & remove geothermal well field manifold and associated piping (within pump room).
3. Geothermal well field connections at building floor shall be capped / sealed.
4. The existing geothermal well field shall be abandoned in place.
5. During demolition & construction, supply & return piping connections to building shall be covered / protected in order to prevent debris from entering piping system.
6. The contractor shall coordinate with the Owner regarding any equipment that shall be retained from demolition operations.
7. The contractor shall coordinate all work with the Owner no less than 3 "work" days prior to work being performed.

Construction:
1. Fluid Cooler
   a) New Fluid Cooler shall be Reymsa 250 ton closed circuit cooling tower, double cell, (2) fans, (1) pump, 146" long x 73" wide x 196" high. Unit shall be installed due east of the pump building. Unit shall be Reymsa or approved alternate - approval shall be gained prior to bid. Coordinate all electrical requirements & provision with noted electrical provider.
   b) Provide & install all new equipment needed to provide a complete and fully functional system - such shall include new water treatment skid. Install entire system in accordance with Reymsa Instructions. Coordinate all water treatment requirements & provisions with noted water treatment provider.
   c) Provide & install structural concrete pad / foundation for new fluid cooler - minimum size per Reymsa / structural recommendations.
   d) Provide & install all connecting utilities and services required. Minimum utilities shall include:
      i. Geothermal Supply & Return
      ii. Make-up Water
      iii. System Drain to Sewer
   e) Provide & install insulation and heat trace for all exterior fluid filled lines that per the specficiation.
2. Boiler
   a) New Boiler shall be Aerco condensing 2.0 MMBH boiler, Model Benchmark 2000. Unit shall be installed indoors within the new addition. Unit shall be provided with Original Equipment Manufacturer provided circulation pump, per enclosed detail. Unit shall be Aerco Benchmark or approved alternate - approval shall be gained prior to bid. Coordinate all electrical requirements & provisions with noted electrical provider.
   b) Provide & install concrete equipment pad for new boiler - minimum size 6" thickness.
   c) Provide & install all connecting utilities and services required. Minimum utilities shall include:
      i. Geothermal Supply & Return
      ii. Natural Gas
      iii. System Drain to Sewer
   d) Provide & install insulation on all associated piping.
3. Piping, Fittings, etc...
   a) Provide & install control valves as required for proper control
   b) Provide & install shut-off valves at all equipment
   c) Provide & install strainers prior to new fluid cooler and new boiler
   d) Provide & install vents & drains as required for proper operation
4. System Controls
   a) Provide & install new system controls to fully integrate the new fluid cooler & new boiler into the existing mechanical & controls systems. The facility is equipped with an existing Trane Trace Summit Controls System.

NEW BUILDING ADDITION:

1. Contractor shall provide / construct a new 10' x 10' addition to the northeast corner of the existing pump / maintenonce building.
2. Minimum Building Provisions shall be:
   - o All construction shall be compliant with at least the 2012 version of all applicable ICC Building Codes
   - o Building addition shall be constructed as a mechanical equipment room to house the operation of a natural gas boiler
   - o Fully equipped with code required / compliant interior & exterior general purpose & emergency lighting
   - o Fully equipped with code required / compliant power receptacles
   - o Fully equipped with code required / compliant insulation, heat, & ventilation. Minimum internal temperature shall be 60 F. Maximum internal temperature shall not exceed ratings of enclosed equipment or 90 F, whichever is less.
   - o All utility connections (piping, electrical, etc?) shall be made through the floor
   - o Extend electrical power to new building addition
   - o Extend make-up domestic water to new building addition
   - o Install new floor sinks at new building addition. Terminate connected sanitary sewer at existing SS service or at location approved by Owner.
3. Contractor shall paint the building addition - exterior paint & finish shall be as approved by the Owner
4. Provide double doors (3'-0" each) for access into new building addition from the exterior. Provide minimum 10' x 10' x 6" concrete pad as an exterior threshold to the double doors.
5. Provide code compliant rain gutter & downspouts. Terminate downspout flow at location approved by Owner. Provide oversized concrete splash blocks at each downspout.
6. Contractor shall utilizie minimum 26 gauge class 4 rating sheeting, minimum 4"x4"x11 gauge posts, & 4"x2"x14 gauge trusses.

IMPORTANT NOTE:
THE CONTRACTOR SHALL VISIT THE SITE & PERFORM A COMPLETE WALK THROUGH OF THE PROJECT AS PART OF BID PREPARATION AND SUBMITTAL. THE CONTRACTOR SHALL VERIFY ALL CRITICAL UTILITY LOCATIONS, CONNECTIONS, CAPACITIES, & AVAILABILITY AT THE TIME OF THE INITIAL SITE VISIT. THE CONTRACTOR SHALL COORDINATE ANY OUTSTANDING ISSUES WITH THE MECHANICAL ENGINEER.

LEGEND:

DCW	DOMESTIC COLD WATER
G	GAS
SS	SANITARY SEWER
GW/S	GEOTHERMAL SUPPLY
S	SUPPLY TO EQUIPMENT
R	RETURN FROM EQUIPMENT

APPLICABLE DESIGN, INSTALLATION, & CONSTRUCTION CRITERIA:

ALL MECHANICAL SYSTEMS SHALL BE DESIGNED, INSTALLED, AND CONSTRUCTED IN ACCORDANCE WITH THE FOLLOWING CRITERIA -
A. INTERNATIONAL BUILDING CODE, 2012
B. INTERNATIONAL MECHANICAL CODE, 2012
C. INTERNATIONAL FIRE CODE, 2012
D. INTERNATIONAL PLUMBING CODE, 2012
E. IECC 2012 & ASHRAE 90.1

LICENSED PROFESSIONAL ENGINEER
02/05/2015
Lance D. LaRue
20691
OKLAHOMA

REVISIONS

DATE	DESCRIPTION
02/12/2015	BID DOCUMENTS

PARADIGM BUILDING SCIENCE & ENGINEERING, PLLC
MECHANICAL, PLUMBING, & FIRE PROTECTION ENGINEERING
Post Office Box 204
Chickasha, OK 73020
405.224.4800
www.PBSEngineering.com

CERTIFICATE OF AUTHORITY
NUMBER 4532
EXPIRES: JUNE 30TH, 2017

CANADIAN COUNTY JUVENILE DETENTION DENTER
EL RENO, OK

PROJECT NO. 00000 DATE: 02/12/15 REVISED:

SHEET NO. M1
SHEET TITLE MECHANICAL SCHEMATICS

SECTION 235216 – 2 MBTU CONDENSING BOILERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes packaged, factory-fabricated and -assembled, gas-fired, fire-tube condensing boilers, circulating pump, trim, and accessories for generating hot water.

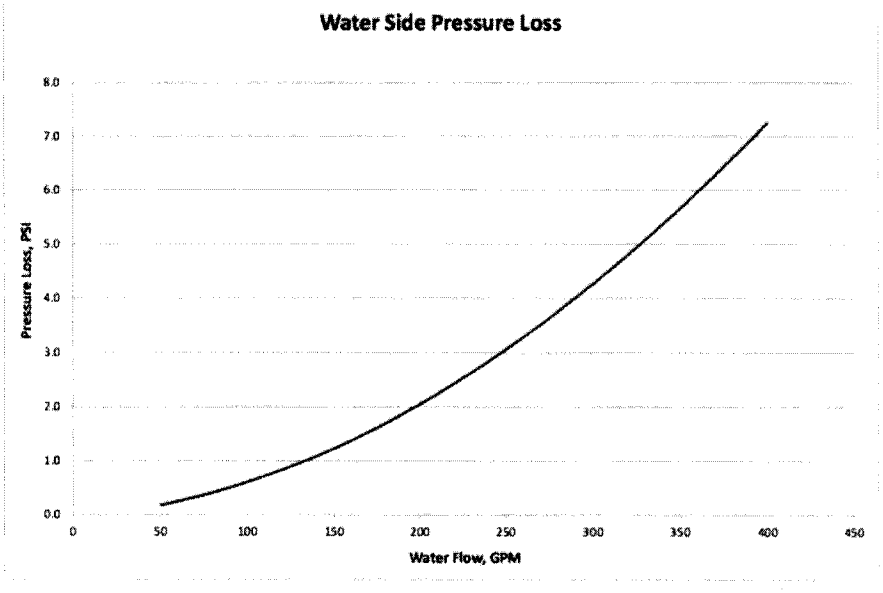
1.3 SUBMITTALS

A. Product Data: Include performance data, operating characteristics, furnished specialties and accessories.

1. Prior to flue vent installation, engineered calculations and drawings must be submitted to Engineer to thoroughly demonstrate that size and configuration conform to recommended size, length and footprint for each submitted boiler.

B. Efficiency Curves: At a minimum, submit efficiency curves for 100%, 50% and 7% input firing rates at incoming water temperatures ranging from 80°F to 160°F. Test protocols shall conform to **Efficiency Testing Standard AE-1** (see attached).

C. Pressure Drop Curve. Submit pressure drop curve for flows ranging from 0 GPM to 375 GPM. Pressure drops shall not exceed those below.



D. Shop Drawings: For boilers, boiler trim and accessories include:

1. Plans, elevations, sections, details and attachments to other work
2. Wiring Diagrams for power, signal and control wiring

E. Source Quality Control Test Reports: Reports shall be included in submittals.

F. Field Quality Control Test Reports: Reports shall be included in submittals.

G. Operation and Maintenance Data: Data to be included in boiler emergency, operation and maintenance manuals.

H. Warranty: Standard warranty specified in this Section

I. Other Informational Submittals:

1. ASME Stamp Certification and Report: Submit "A," "S," or "PP" stamp certificate of authorization, as required by authorities having jurisdiction, and document hydrostatic testing of piping external to boiler.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices and Accessories: Boilers must be 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. I=B=R Performance Compliance: Condensing boilers must be rated in accordance with applicable federal testing methods and verified by AHRI as capable of achieving the energy efficiency and performance ratings as tested within prescribed tolerances.

C. ASME Compliance: Condensing boilers must be constructed in accordance with ASME Boiler and Pressure Vessel Code, Section IV "Heating Boilers".

D. ASHRAE/IESNA 90.1 Compliance: Boilers shall have minimum efficiency according to "Gas and Oil Fired Boilers - Minimum Efficiency Requirements."

E. DOE Compliance: Minimum efficiency shall comply with 10 CFR 430, Subpart B, Appendix N, "Uniform Test Method for Measuring the Energy Consumption of Furnaces and Boilers."

F. UL Compliance: Boilers must be tested for compliance with UL 795, "Commercial-Industrial Gas Heating Equipment." Boilers shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.

G. NOx Emission Standards: When installed and operated in accordance with manufacturer's instructions, condensing boilers shall comply with NOx emissions of less than 20ppm, corrected to 3% oxygen at all firing rates. Certificate or report of compliance is to be supplied upon request.

H. As of the date of the bid, the contractor shall have been in the business of installing boilers & other related mechanical equipment for no less than 12 years. As of the date of the bid, the contractor shall have performed at least one successful boiler installation of the same manufacturer as that which is approved & provided – the contractor shall provide written verification of such installation. If required by the Owner or Engineer the contractor shall arrange a site visit to witness the referenced successful boiler installation.

1.5 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases.

1.6 WARRANTY

A. Standard Warranty: Boilers shall include manufacturer's standard form in which manufacturer agrees to repair or replace components of boilers that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Fire-Tube Condensing Boilers

   a. The pressure vessel/heat exchanger shall carry a (10) year from shipment, non-prorated, limited warranty against any failure due to condensate corrosion, thermal stress, mechanical defects or workmanship.

   b. Manufacturer labeled control panels are conditionally warranted against failure for (2) two years from shipment.

   c. All other components, with the exception of the igniter and flame detector, are conditionally guaranteed against any failure for 18 months from shipment

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Manufacture must have a minimum of 5 years of field experience with the specific model being offered. Subject to complete compliance with all requirements herein, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. AERCO, International – Benchmark Model
   2. OR APPROVED ALTERNATE (NOTE - APPROVAL MUST BE OBTAINED FROM THE ENGINEER PRIOR TO BID (NO EXCEPTIONS))

2.2 CONSTRUCTION

A. Description: Boiler shall be natural gas fired, fully condensing, fire tube design. **NOTE: Water-Tube and Cast Iron Heat Exchangers are not acceptable.** Power burner shall have full modulation (the minimum firing rate shall not exceed 200,000 BTU/HR input. Boilers that have an input greater than 200,000 BTU/Hr at minimum fire will not be considered) and discharge into a positive pressure vent. Boiler efficiency shall increase with decreasing load (output), while maintaining setpoint. Boiler shall be factory-fabricated, factory-assembled and factory-tested, fire-tube condensing boiler with heat exchanger sealed pressure-tight, built on a steel base, including insulated jacket, flue-gas vent, combustion-air intake connections, water supply, return and condensate drain connections, and controls.

B. Heat Exchanger: The heat exchanger shall be constructed of 439 stainless steel fire tubes and tubesheets, with a one-pass combustion gas flow design. **Cast iron, copper, and other grades of stainless steel shall not be acceptable.** The fire tubes shall be 5/8" OD, with no less than 0.049" wall thickness. The upper and lower stainless steel tubesheet shall be no less than 0.25" thick. The pressure vessel/heat exchanger shall be welded construction. The heat exchanger shall be ASME stamped for a **working pressure not less than 160 psig**. Access to the tubesheets and heat exchanger shall be available by burner and exhaust manifold removal. Minimum access opening shall be no less than 14-inch diameter.

C. Pressure Vessel: The pressure vessel shall have a maximum water volume of 55 gallons. The boiler water pressure drop shall not exceed 3 psig at 258 gpm. The boiler water connections shall be 4 inch flanged connection. The pressure vessel shall be constructed of SA53 carbon steel, with a 0.25 inch thick wall and 0.50-inch thick upper head. Inspection openings in the pressure vessel shall be in accordance with ASME Section IV pressure vessel code. The boiler shall be designed so that the thermal efficiency increases as the boiler firing rate decreases.

D. Modulating Air/Fuel Valve and Burner: The boiler burner shall be capable of a **15 to 1 turndown ratio of the firing rate without loss of combustion efficiency or staging of gas valves. Multiple gas valves or multiple burners shall not be acceptable.** The burner shall produce less than 14 Ng/J or 20 ppm of NOx corrected to 3% excess oxygen. The burner shall be metal fiber mesh covering a stainless steel body with pilot ignition system and flame rectification. All burner material exposed to the combustion zone shall be of stainless steel construction. There shall be no moving parts within the burner itself. A modulating air/fuel valve shall meter the air and fuel input. The modulating motor must be linked to both the gas valve body and air valve body

with a single linkage. **The linkage shall not require any field adjustment.** A variable frequency drive (VFD), controlled cast aluminum pre-mix blower shall be used to ensure the optimum mixing of air and fuel between the air/fuel valve and the burner.

E. Minimum boiler efficiencies shall be as follows at a **20 degree delta-T:**

EWT	100% Fire	50% Fire	5% Fire
160 °F	87%	87%	87%
140 °F	88%	88%	88%
120 °F	89%	90%	90.5%
100 °F	93.7%	95%	95%
80 °F	96%	98%	98.6%

F. Exhaust Manifold: The exhaust manifold shall be of corrosion resistant cast aluminum or 316 stainless steel with an 8 inch diameter flue connection. The exhaust manifold shall have a collecting reservoir and a gravity drain for the elimination of condensation. Larger flue connections

G. Blower: The boiler shall include a VFD controlled fan to operate during the burner firing sequence and pre-purge the combustion chamber.

1. Motors: Blower motors shall comply with requirements specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
    a. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require a motor to operate in the service factor range above 1.0.

H. Ignition: Ignition shall be via spark ignition with 100 percent main-valve shutoff and electronic flame supervision.

I. The boiler's manufacturer recommended annual replacement parts shall cost no more than $250 to the end customer.

J. The boiler shall be designed such that the combustion air is drawn from the inside of the boiler enclosure, decoupling it from the combustion air supply and preheating the air to increase efficiency.

K. Enclosure: The sheet metal enclosure shall be fully removable, allowing for easy access during servicing.

L. **Size: Boiler shall not exceed 28"W x 56"L x 78"H and shall fit through a standard 2'6" door without disassembly.**

2.3 CONTROLS

A. Fully coordinate all requirements with Trane Company – Oklahoma City Office

B. The boiler control system shall be segregated into three components: Control Panel, Power Box and Input/Output Connection Box. The entire system shall be Underwriters Laboratories recognized.

C. The control panel shall consist of a minimum of six independently replaceable circuit boards using state-of-the-art surface-mount technology in a single enclosure. These circuit boards shall include:

1. A display board incorporating LED display to indicate temperature and a vacuum fluorescent display module for all message enunciation
2. A CPU board housing all control functions
3. An electric low-water cutoff board with test and manual reset functions

4. A power supply board
5. An ignition /stepper board incorporating flame safeguard control
6. A connector board

Each board shall be individually field replaceable.

D. The combustion safeguard/flame monitoring system shall use spark ignition and a rectification-type flame sensor.

E. The control panel hardware shall support both RS-232 and RS-485 remote communications.

F. The controls shall annunciate boiler and sensor status and include extensive self-diagnostic capabilities that incorporate a minimum of eight separate status messages and 34 separate fault messages.

G. The control panel shall incorporate three self-governing features designed to enhance operation in modes where it receives an external control signal by eliminating nuisance faults due to over-temperature, improper external signal or loss of external signal. These features include:

1. Setpoint High Limit: Setpoint high limit allows for a selectable maximum boiler outlet temperature and acts as temperature limiting governor. Setpoint limit is based on a PID function that automatically limits firing rate to maintain outlet temperature within a 0 to 10 degree selectable band from the desired maximum boiler outlet temperature.
2. Set point Low Limit: Allow for a selectable minimum operating temperature.
3. Fail safe Mode: Fail safe mode allows the boiler to switch its mode to operate from an internal set point if its external control signal is lost, rather than shut off. This is a selectable mode, enabling the control can to shut off the unit upon loss of external signal, if so desired.

H. The boiler control system shall incorporate the following additional features for enhanced external system interface:

1. System start temperature feature
2. Pump delay timer
3. Auxiliary start delay timer
4. Auxiliary temperature sensor
5. Analog output feature to enable simple monitoring of temperature setpoint, outlet temperature or fire rate
6. Remote interlock circuit
7. Delayed interlock circuit
8. Fault relay for remote fault alarm

I. Each boiler shall include an electric, single-seated combination safety shutoff valve/regulator with proof of closure switch in its gas train. Each boiler shall incorporate dual over-temperature protection with manual reset, in accordance with ASME Section IV and CSD1.

J. Each boiler shall have an oxygen monitoring system that will measure the oxygen content of the exhaust gasses in real-time. Output of O2 information shall be displayed on the control panel. Boiler shall be capable of automatic self-contained O2 trim without modification of hardware.

K. Each boiler shall have integrated Boiler Sequencing Technology (BST), capable of multi-unit sequencing with lead-lag functionality and parallel operation. The system will incorporate the following capabilities:
1. Efficiently sequence 2-to-8 units on the same system to meet load requirement.
2. Integrated control and wiring for seamless installation of optional isolation valve. When valves are utilized, the system shall operate one motorized valve per unit as an element of load sequencing. Valves shall close with decreased load as units turn off, minimum of one must always stay open for recirculation.
3. Automatically rotate lead/lag amongst the units on the chain and monitor run hours per unit and balance load in an effort to equalize unit run hours.

4. Designated master control, used to display and adjust key system parameters.
5. Automatic bump-less transfer of master function to next unit on the chain in case of designated master unit failure; master/slave status should be shown on the individual unit displays.
6. Designated master control, used to display and adjust key system parameters.

2.4 REMOTE MONITORING:

A. The boiler manufacturer shall provide continuous monitoring of the boiler systems 24 hours per day, 7 days per week, 365 days per year. This monitoring service shall be included period of 24 months from the date of substantial completion. The owner will provide an Ethernet connection in the boiler room and the necessary modifications to their communication equipment to allow for this service. The owner and his agent shall be notified immediately upon any fault of the boiler system. A monthly report shall be provided to the owner with all information as documented in the appendix of this specification.

2.5 ELECTRICAL POWER

A. Controllers, Electrical Devices and Wiring: Electrical devices and connections are specified in Division 26 sections.

B. Single-Point Field Power Connection: Factory-installed and factory-wired switches, motor controllers, transformers and other electrical devices shall provide a single-point field power connection to the boiler.

C. Electrical Characteristics: Verify with Electrical Provider

2.6 VENTING

A. The exhaust vent must be UL Listed for use with Category II, III and IV appliances and compatible with operating temperatures up to 230°F, condensing flue gas service. **UL listed vents Al 29-4C stainless steel or polypropylene must be used with boilers.**

B. The minimum exhaust vent duct size for each boiler is eight-inch diameter.

C. Combustion-Air Intake: Boilers shall be capable of drawing combustion air from the outdoors via a metal or PVC duct connected between the boiler and the outdoors.

D. The minimum ducted combustion air duct size for each boiler is eight-inch diameter.

E. Common vent and common combustion air must be an available option for boiler installation.

F. Follow guidelines specified in manufacturer's venting guide.

2.7 SOURCE QUALITY CONTROL

A. Burner and Hydrostatic Test: Factory adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions and carbon monoxide in flue gas, and to achieve combustion efficiency. Perform hydrostatic testing.

B. Test and inspect factory-assembled boilers, before shipping, according to ASME Boiler and Pressure Vessel Code.

1. If boilers are not factory assembled and fire-tested, the local vendor is responsible for all field assembly and testing.

C. Allow Owner access to source quality-control testing of boilers. Notify Engineer fourteen days in advance of testing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before boiler installation examine roughing-in for concrete equipment bases, anchor-bolt sizes and locations and piping and electrical connections to verify actual locations, sizes and other conditions affecting boiler performance, maintenance and operations.

1. Final boiler locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.

B. Examine mechanical spaces for suitable conditions where boilers will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 BOILER INSTALLATION

A. Install boilers level on minimum 6" concrete bases.

B. Install gas-fired boilers according to NFPA 54.

C. Assemble and install boiler trim.

D. Install electrical devices furnished with boiler but not specified to be factory mounted.

E. Install control wiring to field-mounted electrical devices.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 sections. Drawings indicate general arrangement of piping, fittings and specialties.

B. Install piping adjacent to boiler to permit service and maintenance.

C. Install piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection. Provide an isolation valve if required.

D. Connect gas piping to boiler gas-train inlet with unions. Piping shall be at least full size of gas train connection. Provide a reducer if required.

E. Connect hot-water piping to supply and return boiler tappings with shutoff valve and union or flange at each connection.

F. Install piping from safety relief valves to nearest floor drain.

G. Boiler Venting

1. Install flue venting kit and combustion-air intake.
2. Connect venting full size to boiler connections. [Comply with requirements in Division 23 Section "Breechings, Chimneys and Stacks."]

H. Ground equipment according to Electrical Provider

I. Connect wiring according to Electrical Provider

3.4 FIELD QUALITY CONTROL

A. The boiler manufacturers representative shall maintain a minimum of two fully factory trained service technicians on his payroll at all times. At least one of these technicians shall have completed all levels of factory service certifications including but not limited to a minimum of five (5) years of experience servicing, maintaining, and repairing the specific boilers being proposed. These technicians shall reside within 20 miles of downtown Oklahoma City.

B. Perform tests and inspections and prepare test reports.

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. Perform installation and startup checks according to manufacturer's written instructions.
2. Perform hydrostatic test. Repair leaks and retest until no leaks exist.
3. Start units to confirm proper motor rotation and unit operation. Adjust air-fuel ratio and combustion.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
   a. Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level and water temperature.
   b. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

D. Remove and replace malfunctioning units and retest as specified above.

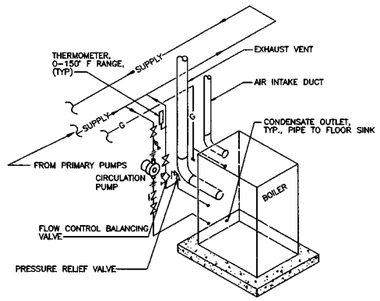
E. Occupancy Adjustments: When requested within 2 months of date of Substantial Completion, provide on-site assistance adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other than normal occupancy hours for this purpose.

F. Performance Tests:

The boiler manufacturer is expected to provide partial load thermal efficiency curves. These thermal efficiency curves must include at least three separate curves at various BTU input levels. If these curves are not available, it is the responsibility of the boiler manufacturer to complete the following performance tests:

1. Engage a factory-authorized service representative to inspect component assemblies and equipment installations, including connections, and to conduct performance testing.
2. Boilers shall comply with performance requirements indicated, as determined by field performance tests. Adjust, modify, or replace equipment to comply.
3. Perform field performance tests to determine capacity and efficiency of boilers.
   a. Test for full capacity.
   b. Test for boiler efficiency at [low fire 20, 40, 60, 80, 100, 80, 60, 40 and 20] percent of full capacity. Determine efficiency at each test point.
4. Repeat tests until results comply with requirements indicated.
5. Provide analysis equipment required to determine performance.
6. Provide temporary equipment and system modifications necessary to dissipate the heat produced during tests if building systems are not adequate.
7. Notify Engineer in advance of test dates.
8. Document test results in a report and submit to Engineer.

END OF SECTION 235216

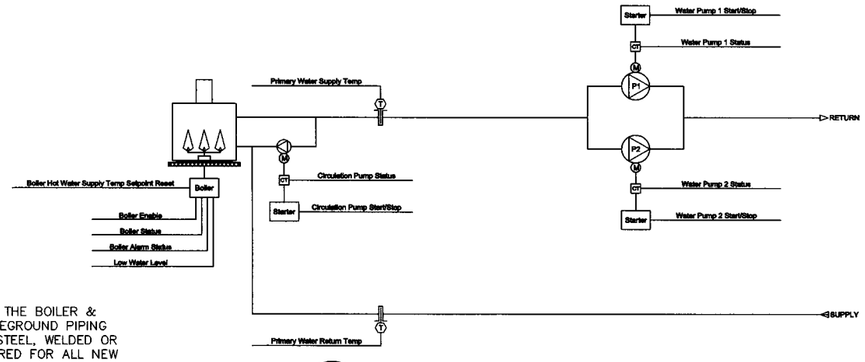


01 M2 **"TYPICAL" BOILER DETAIL**
SCALE: N.T.S.

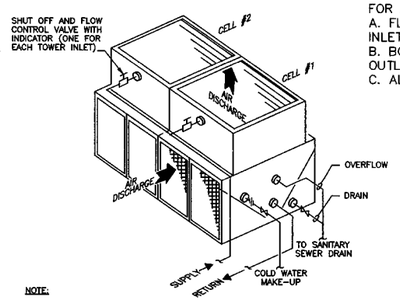
INSTALLATION NOTES:

1. HDPE PIPING MAY BE USED EXCEPT AT THE BOILER & CONNECTING PIPING. OTHERWISE ALL ABOVEGROUND PIPING SHALL BE MINIMUM SCHEDULE 40 BLACK STEEL, WELDED OR FLANGED. CATHODIC PROTECTION IS REQUIRED FOR ALL NEW BURIED FERROUS PIPING.

2. PROVIDE & INSTALL PRESSURE AND TEMPERATURE GAUGES FOR ALL MECHANICAL EQUIPMENT AS FOLLOWS:
A. FLUID COOLER: PRESSURE & TEMPERATURE GAUGE AT EACH INLET & OUTLET.
B. BOILER: PRESSURE & TEMPERATURE GAUGE AT EACH INLET & OUTLET.
C. ALL GAUGES SHALL BE EQUIPPED WITH PET COCKS.



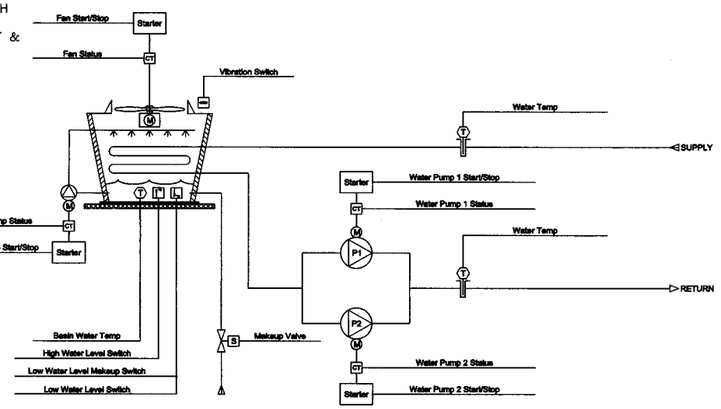
02 M2 **"TYPICAL" BOILER CONTROLS**
SCALE: N.T.S.



NOTE:

1. WHEN PLANS INDICATE MORE THAN ONE CELL, THE BASINS OF THE CELLS ARE TO BE INTERCONNECTED BY FLUMES. EACH CELL SHALL BE PROVIDED WITH ITS OWN SUMP AND ANTI-CAVITATION PLATE. THE MULTI-CELL TOWER SHALL HAVE ONE MAKE-UP VALVE, ONE OVERFLOW, AND ONE DRAIN. 1" PIPE FOR INSPECTION & TEST SHALL BE PROVIDED ONLY AT EACH CELL.
2. PROVIDE THERMOSTATICALLY CONTROLLED ELECTRIC SELF-LIMITING HEAT TRACING TAPE UNDERNEATH THE INSULATION OF ALL NEW PIPINGLOCATED OUTDOORS. COORDINATE THE LOCATION OF THE THERMOSTAT WITH THE ENGINEER & OWNER. SET THE THERMOSTAT TO ENERGIZE THE HEAT TAPE BELOW 45 F.
3. PROVIDE & INSTALL PIPE SUPPORTS / STANDS FOR ALL PIPING.
4. INSTALL ALL PIPING TO PERMIT COMPLETE MAINTENANCE ACCESS TO ALL PARTS OF FLUID COOLER.

03 M2 **"TYPICAL" FLUID COOLER DETAIL**
SCALE: N.T.S.



04 M2 **"TYPICAL" COOLING TOWER CONTROLS**
SCALE: N.T.S.

GENERAL MECHANICAL NOTES:
(Applies to all Sheets)

1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH IMC 2012, IPC 2012, AND IBC 2012. ALL LOCAL CODE ADOPTIONS/VARIANCES SHALL APPLY.
2. ANY PERMITS AND INSPECTION FEES SHALL BE SECURED AND PAID FOR BY THE MECHANICAL CONTRACTOR (M.C.).
3. ALL WORK SHALL BE PERFORMED BY THE EXPERIENCE AND SKILLED CRAFTSMEN. THE M.C. SHALL COORDINATE ALL OF HIS WORK WITH ALL OTHER CONTRACTORS.
4. THE MECHANICAL PLANS AND SPECIFICATIONS SHALL BE THOROUGHLY REVIEWED PRIOR TO PURCHASING MATERIALS AND INSTALLATION. ALL DISCREPANCIES OR INTERFERENCES SHALL BE BROUGHT TO THE ENGINEER'S ATTENTION.
5. THESE PLANS ARE DIAGRAMMATIC AND MAY NOT SHOW MINOR DETAILS AND LOCATIONS. THE CONTRACTOR SHALL PROVIDE FOR REASONABLE VARIATIONS & ACCOMODATIONS.
6. THE M.C. SHALL BE RESPONSIBLE FOR ALL ELECTRICAL STARTERS, INTERLOCKS, CONTROL WIRING. THE ELECTRICAL CONTRACTOR SHALL PROVIDE POWER WIRING, CONDUIT FROM THE DISCONNECTS TO M.C. EQUIPMENT.
7. ALL TEMPERATURE SENSORS AND ASSOCIATED WIRING ARE TO BE FURNISHED BY THE M.C. MOUNT THERMOSTATS AS COORDINATED WITH THE FACILITY OWNER/OPERATOR.
8. THE M.C. SHALL INSURE THAT ALL MECHANICAL EQUIPMENT INSTALLED UNDER THIS CONTRACT SHALL OPERATE FREE OF OBJECTIONABLE NOISE AND VIBRATION.
9. THE M.C SHALL KEEP THE PREMISES CLEAR OF DEBRIS FROM HIS WORK DURING CONSTRUCTION AND LEAVE THE AREA AND BUILDING CLEAN AT THE COMPLETION OF HIS WORK. HE SHALL ALSO LEAVE CLEAN ALL EXPOSED EQUIPMENT IN HIS CONTRACT.
10. THE MECHANICAL CONTRACTOR SHALL PROVIDE FOR AND PERFORM COMPLETE START-UP, TESTING, ADJUSTING, & BALANCING SERVICES FOR ALL MECHANICAL EQUIPMENT IN ACCORDANCE WITH NEBB. COMPLETE DOCUMENTATION OF SUCH SERVICES SHALL BE SUBMITTED TO THE OWNER, ENGINEER, CONTROLS PROVIDER, AND GENERAL CONTRACTOR.

NOTE – WATER TREATMENT PROVIDER

THE CONTRACTOR SHALL ACQUIRE THE SERVICES OF MR. KALIN KLINE OF WATER QUALITY CONTROL. THE WATER TREATEMENT EQUIPMENT AS SPECIFIED BY MR. KLINE SHALL BE INCLUDED WITH THE CONTRACTOR'S PROPOSAL – MINIMUM EQUIPMENT SHALL INCLUDE GRISWOLD WATER SYSTEMS INTEGRACLEAN WITH WAVE UNIT, BASIN SWEEP, CENTRIFUGAL SEPARATOR, PUMP, & SKID MOUNTED ASSEMBLY. THE CONTRACTOR SHALL COORDINATE THEIR WORK ON ALL WATER RELATED SYSTEMS WITH MR. KALIN KLINE. MR. KALIN KLINE SHALL SIGN OFF ON ALL WATER RELATED SYSTEMS PRIOR TO FINAL ACCEPTANCE TESTING. THE CONTRACTOR SHALL PROVIDE WRITTEN VERIFICATION TO THE OWNER THAT ALL ASSOCIATED ITEMS HAVE BEEN COORDINATED WITH THE WATER TREATMENT PROVIDER. THE CONTRACTOR SHALL PROVIDE FOR THE WATER TREATMENT PROVIDER TO BE PRESENT AT & ACTIVELY PARTICIPATING IN ALL PRE-FINAL & FINAL SYSTEM TESTS.

MR. KALIN KLINE CAN BE CONTACTED AT 405-642-0950.

NOTE – ELECTRICAL PROVIDER

ALL ELECTRICAL PROVISIONS OF THIS PROJECT SHALL BE PROVIDED BY DAN DILL ELECTRIC – CONTACT DANIEL DILL @ 405-262-6925. SUCH ELECTRICAL WORK SHALL BE ACCOMPLISHED UNDER A SEPARATE CONTRACT.

THE CONTRACTOR SHALL PROVIDE FOR ALL ELECTRICAL MATERIAL (LIGHTS, CONDUIT, SWITCHES, WIRING, ETC...) THAT ARE NOT SPECIFICALLY PROVIDED FOR AND DOCUMENTED BY THE ELECTRICAL PROVIDER.

THE CONTRACTOR SHALL COORDINATE ALL ASPECTS OF THE PROJECT WITH THE ELECTRICAL PROVIDER PRIOR TO BID. SUCH COORDINATION SHALL INCLUDE BUT NOT BE LIMITED TO ELECTRICAL SERVICE FOR MECHANICAL EQUIPMENT, ELECTRICAL SERVICE FOR BUILDING ADDITION, ELECTRICAL SERVICE FOR MECHANICAL CONTROLS, ETC... FINAL COORDINATION OF ALL ELECTRICAL SERVICE ITEMS SHALL BE COORDINATED WITH THE OWNER PRIOR TO PROCUREMENT & INSTALLATION. THE CONTRACTOR SHALL PROVIDE WRITTEN VERIFICATION TO THE OWNER THAT ALL ASSOCIATED ITEMS HAVE BEEN COORDINATED WITH THE ELECTRICAL PROVIDER. THE CONTRACTOR SHALL COORDINATE WITH THE ELECTRICAL PROVIDER SUCH THAT THEY ARE PRESENT AT & ACTIVELY PARTICIPATING IN ALL PRE-FINAL & FINAL SYSTEM TESTS.

NOTE – CONTROLS PROVIDER

THE CONTRACTOR SHALL ACQUIRE THE SERVICES OF TRANE COMPANY – OKLAHOMA CITY OFFICE. THE ADDITIONAL CONTROLS EQUIPMENT REQUIRED AS SPECIFIED BY MR. KYLE TROTTER OF TRANE – OKC OFFICE SHALL BE INCLUDED WITH THE CONTRACTOR'S BID. THE CONTRACTOR SHALL COORDINATE & PROVIDE FOR ALL ITEMS PRIOR TO BID.

MINIMUM CONTROL PROVISIONS SHALL INCLUDE BUT NOT BE LIMITED TO THE FOLLOWING:
– COMPLETE INTEROPERABILITY WITH OEM CONTROLS OF THE BOILER & FLUID COOLER
– COMPLETED INTERFACE WITH EXISTING TRANE TRACER SUMMIT SYSTEM
– COMPLETE VISIBILITY & OPERABILITY OF ALL NEW EQUIPMENT THROUGH THE EXISTING TRANE SYSTEM – ONSITE & REMOTE WORKSTATION(S)

THE CONTRACTOR SHALL COORDINATE MECHANICAL EQUIPMENT INSTALLATION WITH THE CONTROLS PROVIDER. THE CONTRACTOR SHALL PROVIDE WRITTEN VERIFICATION TO THE OWNER THAT ALL ASSOCIATED ITEMS HAVE BEEN COORDINATED WITH THE CONTROLS PROVIDER. THE CONTRACTOR SHALL PROVIDE FOR THE CONTROLS PROVIDER TO BE PRESENT AT & ACTIVELY PARTICIPATING IN ALL PRE-FINAL & FINAL SYSTEM TESTS.

NOTE – SUBMITTALS REQUIRED

PRIOR TO PROCUREMENT OF ANY EQUIPMENT OR MATERIAL, THE CONTRACTOR SHALL PROVIDE ELECTRONIC SUBMITTALS FOR THE BUILDING ADDITION AND THE MECHANICAL EQUIPMENT & CONTROLS. THE CONTRACTOR SHALL SEND SUCH ELECTRONIC SUBMITTALS TO THE OWNER & ENGINEER FOR REVIEW & APPROVAL – CONTRACTOR SHALL ALLOW NO LESS THAN (15) DAYS FOR REVIEW & COMMENT OF EACH SUBMITTAL.

MINIMUM MATERIAL SUBMITTALS REQUIRED – ALL MATERIALS RELATED TO THE BUILDING ADDITION, BOILER, FLUID COOLER, MECHANICAL INSULATION, PIPING, VALVES, CONTROLS, ETC...

MINIMUM SHOP DRAWINGS REQUIRED – BUILDING ADDITION STRUCTURAL, CONTROLS (WIRING SCHEMATICS, SEQUENCE OF OPERATIONS, POINTS LIST), OEM BOILER INSTALLATION SCHEMATIC, OEM FLUID COOLER INSTALLATION SCHEMATIC

LICENSED PROFESSIONAL ENGINEER
02/05/2016
Lance D. LaRue
20691
OKLAHOMA

REVISIONS

DATE	DESCRIPTION
02/12/2015	BID DOCUMENTS

PARADIGM
BUILDING SCIENCE
& ENGINEERING, PLLC

MECHANICAL, PLUMBING, & FIRE PROTECTION ENGINEERING

Post Office Box 204
Choctaw, OK 73020
405-306-1400
www.PBSEngineering.com

CERTIFICATE OF AUTHORITY NUMBER: 7855
EXPIRES: JUNE 30TH, 2017

CANADIAN COUNTY JUVENILE DETENTION DENTER
EL RENO, OK

PROJECT NO. 00000 DATE: 02/12/15 REVISED:

SHEET NO. M2
SHEET TITLE MECHANICAL SCHEMATICS

SECTION 23 64 26

COMMON PIPING FOR HVAC

PART 1 GENERAL

1.1 NOT USED

1.2 GENERAL REQUIREMENTS

Submit Material, Equipment, and Fixture Lists for pipes, valves and specialties including manufacturer's style or catalog numbers, specification and drawing reference numbers, warranty information, and fabrication site information. Provide a complete list of construction equipment to be used.

Submit Connection Diagrams for pipes, valves and specialties indicating the relations and connections of devices and apparatus by showing the general physical layout of all controls, the interconnection of one system (or portion of system) with another, and internal tubing, wiring, and other devices.

1.3 SUBMITTALS

Submit the following in accordance with Section SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Submit the following for pipes, valves and specialties showing conformance with the referenced standards contained within this section.

Record Drawings
Connection Diagrams

SD-03 Product Data

Submit equipment and performance data for the following items consisting of corrosion resistance, life expectancy, gage tolerances, and grade line analysis.

Submit Manufacturer's catalog data for the following items:

Pipe and Fittings
Piping Specialties
Valves
Miscellaneous Materials
Supporting Elements

Equipment Foundation Data shall be in accordance with paragraph entitled, "General Requirements," of this section.

SD-06 Test Reports

Submit test reports on the following tests in accordance with paragraph entitled, "Piping Installation," of this section.

Hydrostatic Tests
Air Tests
Valve-Operating Tests
Drainage Tests
Pneumatic Tests
System Operation Tests

SD-07 Certificates

Submit Listing of Product Installations for piping systems verifying proper qualifications.

Submit Records of Existing Conditions by the Contractor prior to start.

Submit Certificates for the following in accordance with paragraph entitled, "Pipe Installation," of this section.

Surface Resistance
Shear and Tensile Strengths
Temperature Ratings
Bending Tests
Flattening Tests
Transverse Guided Weld Bend Tests

SD-10 Operation and Maintenance Data

Submit Operation and Maintenance Manuals in accordance with paragraph entitled, "Operation and Maintenance," of this section.

1.4 QUALITY ASSURANCE

1.4.1 Material and Equipment Qualifications

Provide materials and equipment that are standard products of manufacturers regularly engaged in the manufacture of such products, which are of a similar material, design and workmanship. Standard products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year use shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2 year period.

1.4.2 Alternative Qualifications

Products having less than a two-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturer's factory or laboratory tests, can be shown.

1.4.3 Service Support

The equipment items shall be supported by service organizations. Submit a certified list of qualified permanent service organizations for support of the equipment which includes their addresses and qualifications. These service organizations shall be reasonably convenient to the equipment installation and able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

1.4.4 Manufacturer's Nameplate

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.4.5 Modification of References

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction", or words of similar meaning, to mean the Contracting Officer.

1.4.5.1 Definitions

For the International Code Council (ICC) Codes referenced in the contract documents, advisory provisions shall be considered mandatory, the word "should" shall be interpreted as "shall." Reference to the "code official" shall be interpreted to mean the "Contracting Officer." For Navy owned property, references to the "owner" shall be interpreted to mean the "Contracting Officer." For leased facilities, references to the "owner" shall be interpreted to mean the "lessor." References to the "permit holder" shall be interpreted to mean the "Contractor."

1.4.5.2 Administrative Interpretations

For ICC Codes referenced in the contract documents, the provisions of Chapter 1, "Administrator," do not apply. These administrative requirements are covered by the applicable Federal Acquisition Regulations (FAR) included in this contract and by the authority granted to the Officer in Charge of Construction to administer the construction of this project. References in the ICC Codes to sections of Chapter 1, shall be applied appropriately by the Contracting Officer as authorized by his administrative cognizance and the FAR.

1.5 DELIVERY, STORAGE, AND HANDLING

Handle, store, and protect equipment and materials to prevent damage before and during installation in accordance with the manufacturer's recommendations, and as approved by the Contracting Officer. Replace damaged or defective items.

1.8 SECTION NOT USED

1.9 ACCESSIBILITY

Install all work so that parts requiring periodic inspection, operation, maintenance, and repair are readily accessible. Install concealed valves, expansion joints, controls, dampers, and equipment requiring access, in locations freely accessible through access doors.

PART 2 PRODUCTS

2.1 ELECTRICAL HEAT TRACING

Heat trace systems for pipes, valves, and fittings shall be in accordance with IEEE 515 and be UL listed. System shall include all necessary components, including heaters and controls to prevent freezing.

Provide self-regulating heaters consisting of two 16 AWG tinned-copper bus wires embedded in parallel in a self-regulating polymer core that varies its power output to respond to temperature along its length. Heater shall be able to be crossed over itself without overheating and be approved before used directly on plastic pipe. Heater shall be covered by a radiation cross-linked modified polyolefin dielectric jacket in accordance with ASTM D 2308.

Provide heater with self-regulating factor of at least 90 percent, in order to provide energy conservation and to prevent overheating.

Heater shall operate on line voltages of 120 volts without the use of transformers.

Size Heater according to the following table:

Pipe Size (Inch, Diameter)	Minus 10 degrees F	Minus 20 degrees F
3 inches or less	5 watts per foot (wpf)	5 wpf
4 inch	5 wpf	8 wpf
6 inch	8 wpf	8 wpf
8 inch	2 strips/5 wpf	2 strips/8 wpf
12 inch to 14 inch	2 strips/8 wpf	2 strips/8 wpf

System shall be controlled by an ambient sensing thermostat set at 40 degrees F either directly or through an appropriate contactor.

2.2 PIPE AND FITTINGS

2.2.1 Type BCS, Black Carbon Steel

Pipe 1/8 through 12 inches shall be Schedule 40 black carbon steel, conforming to ASTM A 53/A 53M.

Pipe 1/8 through 10 inches shall be Schedule 40 seamless or electric-resistance welded black carbon steel, conforming to ASTM A 53/A 53M, Type E, Grade B (electric-resistance welded). Grade A should be used for permissible field bending, in both cases.

Pipe 12 through 24 inches shall be 0.375-inch wall seamless black carbon steel, conforming to ASTM A 53/A 53M, Type E, Grade B (electric-resistance

welded).

Fittings 2 inches and under shall be 150-pounds per square inch, gage (psig) working steam pressure (wsp) banded black malleable iron screwed, conforming to ASTM A 197/A 197M and ASME B16.3.

Unions 2 inches and under shall be 250 pounds per square inch, wsp female, screwed, black malleable iron with brass-to-iron seat, and ground joint, conforming to ASME B16.39.

Fittings 2-1/2 inches and over shall be Steel butt weld, conforming to ASTM A 234/A 234M and ASME B16.9 to match pipe wall thickness.

Flanges 2-1/2 inches and over shall be 150-pound forged-steel conforming to ASME B16.5, welding neck to match pipe wall thickness.

2.2.2 NOT USED

2.2.3 SECTION NOT USED

2.2.4 NOT USED
2.2.5 NOT USED

2.2.6 NOT USED

2.2.7 Grooved Pipe Couplings and Fittings

Provide housing for all couplings, fabricated in two or more parts, of black, ungalvanized malleable iron castings. Coupling gasket shall be molded synthetic rubber, conforming to ASTM D 2000. Coupling bolts shall be oval-neck, track-head type, with hexagonal heavy nuts conforming to ASTM A 183.

Fabricate all pipe fittings used with couplings of black, ungalvanized malleable iron castings. Where a manufacturer's standard-size malleable iron fitting pattern is not available, approved fabricated fittings may be used.

Fabricate fittings from Schedule 40 or 0.75-inch wall ASTM A 53/A 53M, Grade B seamless steel pipe; long radius seamless welding fittings with wall thickness to match pipe, conforming to ASTM A 234/A 234M and ASME B16.9.

2.3 PIPING SPECIALTIES

2.3.1 Air Separator

Air separated from converter discharge water shall be ejected by a reduced-velocity device vented to the compression tank.

Commercially constructed separator shall be designed and certified to separate not less than 80 percent of entrained air on the first passage of water and not less than 80 percent of residual on each successive pass. Provide shop drawings detailing all piping connections proposed for this work.

2.3.2 Air Vents

Manual air vents shall be 3/8-inch globe valves.

2.3.3 NOT USED

2.3.4 Dielectric Connections

Dissimilar pipe metals shall be electrically insulated from each other by couplings, unions, or flanges commercially manufactured for that purpose and rated for the service pressure and temperature.

2.3.5 Expansion Vibration Isolation Joints

Single or multiple arch-flanged expansion vibration isolation joints shall be constructed of steel-ring reinforced chloroprene-impregnated cloth materials. Design joint to absorb the movement of the pipe sections in which installed with no detrimental effect on the pipe or connected equipment. Back flanges with ferrous-metal backing rings. Provide control rod assemblies to restrict joint movement. All nonmetallic exterior surfaces of the joint shall be coated with chlorosulphinated polyethylene. Provide grommets in limit bolt hole to absorb noise transmitted through the bolts.

Joints shall be suitable for continuous-duty working temperature of at least 250 degrees F.

Fill arches with soft chloroprene.

Joint, single-arch, movement limitations and size-related, pressure characteristics shall conform to FSA-0017.

2.3.6 Flexible Pipe

Flexible pipe vibration and pipe-noise eliminators shall be constructed of wire-reinforced, rubber-impregnated cloth and cord materials and shall be flanged. Flanges shall be backed with ferrous-metal backing rings. Service pressure-rating shall be minimum 1.5 times actual service. Surge pressure shall be at 180 degrees F.

Flexible pipe vibration and pipe noise eliminators shall be constructed of wire-reinforced chloroprene-impregnated cloth and cord materials and they shall be flanged. Provide all flanges backed with ferrous-metal backing rings. Nonmetallic exterior surfaces of the flexible pipe shall be coated with an acid- and oxidation-resistant chlorosulphinated polyethylene. Flexible pipe shall be rated for continuous duty at 130 psi and 250 degrees F.

Unit pipe lengths, face-to-face, shall be not less than the following:

INSIDE DIAMETER	UNIT PIPE LENGTH
To 2-1/2 inches, inclusive	12 inches
3 to 4 inches, inclusive	18 inches
5 to 12 inches, inclusive	24 inches

INSIDE DIAMETER	UNIT PIPE LENGTH
To 3 inches, inclusive	18 inches
4 to 10 inches, inclusive	24 inches
12 inches and larger	36 inches

2.3.7 NOT USED

2.3.8 NOT USED

2.3.9 Metallic Expansion Joints

Expansion joints shall be metallic-bellows-type, conforming to MIL-DTL-17813.

Design and construct joints to absorb all of the movements of the pipe sections in which installed, with no detrimental effect on pipe or supporting structure.

Rate, design, and construct joints for pressures to 125 psig and temperatures to 500 degrees F.

Joints shall have a designed bursting strength in excess of four times their rated pressure.

Joints shall be capable of withstanding a hydrostatic test of 1.5 times their rated pressure while held at their uncompressed length without leakage or distortion that may adversely affect their life cycle.

Life expectancy shall be not less than 10,000 cycles.

Movement capability of each joint shall exceed calculated movement of piping by 100 percent.

Bellows and internal sleeve material shall be AISI Type 304, 304L, or 321 corrosion-resistant steel.

End connections shall require no field preparation other than cleaning.

Butt weld end preparation of expansion joints shall conform to the same codes and standards requirements as applicable to the piping system materials at the indicated joint location.

Flanges of flanged-end expansion joints shall conform to the same codes and standard requirements as are applicable to companion flanges specified for the given piping system at the indicated joint location.

Joints, 2-1/2 inches and smaller, shall have internal guides and limit stops.

Joints, 3 inches and larger, shall be provided with removable external covers, internal sleeves, and purging connection. Sleeves shall be sized to accommodate lateral clearance required, with minimum reduction of flow area, and with oversized bellows where necessary. When a sleeve requires a gasket as part of a locking arrangement, the gasket shall be provided by the manufacturer. Joints without purging connection may be provided;

however, remove these from the line prior to, or not installed until, cleaning operations are complete.

Cylindrical end portion of the reinforced bellows element shall be provided with a thrust sleeve of sufficient thickness to bring that portion within applicable code-allowable stress. Sleeve shall provide 360 degrees support for the element and end-reinforcing ring.

Expansion joints shall have four, equidistant, permanent tram points clearly marked on each joint end. Locate points to prevent obliteration during installation. Distance between tram points indicating installed lengths shall be included in shop drawings. Overall dimension after joint installation shall be subject to approval.

Each expansion joint shall have adjustable clamps or yokes provided at quarter points, straddling the bellows. Overall joint length shall be set by the manufacturer to maintain joints in manufacturer's recommended position during installation.

Permanently and legibly mark each joint with the manufacturer's name or trademark and serial number; the size, series, or catalog number; bellows material; and directional-flow arrow.

2.3.10 Hose Faucets

Construct hose faucets with 1/2 inch male inlet threads, hexagon shoulder, and 3/4 inch hose connection, conforming to ASME A112.18.1/CSA B125.1. Hose-coupling screw threads shall conform to ASME B1.20.7.

Vandalproof, atmospheric-type vacuum breaker shall be provided on the discharge of all potable water lines.

2.3.11 Pressure Gages

Pressure gages shall conform to ASME B40.100 and to requirements specified herein. Pressure-gage size shall be 3-1/2 inches nominal diameter. Case shall be corrosion-resistant steel, conforming to any of the AISI 300 series of ASTM A 6/A 6M, with an ASM No. 4 standard commercial polish or better. Equip gages with adjustable red marking pointer and damper-screw adjustment in inlet connection. Service-pressure reading shall be at midpoint of gage range. All gages shall be Grade B or better and be equipped with gage isolators.

2.3.12 Sight-Flow Indicators

Sight-flow indicators for pressure service on 3-inch ips and smaller shall be constructed of bronze with specially treated single- or double-glass sight windows and have a bronze, nylon, or tetrafluoroethylene rotating flow indicator mounted on an AISI Type 304 corrosion-resistant steel shaft. Body may have screwed or flanged end. Assembly shall be pressure- and temperature-rated for the applied service. Flapper flow-type indicators are not acceptable.

2.3.13 Sleeve Couplings

Sleeve couplings for plain-end pipe shall consist of one steel middle ring,

two steel followers, two chloroprene or Buna-N elastomer gaskets, and the necessary steel bolts and nuts.

2.3.14 Thermometers

Thermometers shall conform to ASTM E 1, except for being filled with a red organic liquid. Thermometers shall be an industrial pattern armored glass model, (well-threaded and seal-welded). Thermometers installed 6 feet or higher above the floor shall have an adjustable angle body. Scale shall be not less than 7 inches long. Case face shall be manufactured from manufacturer's standard polished aluminum or AISI 300 series polished corrosion-resistant steel. Thermometer range shall be 150% of operating range.. Provide thermometers with nonferrous separable wells. Provide lagging extension to accommodate insulation thickness.

2.3.15 NOT USED

2.3.16 Line Strainers, Water Service

Strainers shall be Y-type with removable basket. Strainers in sizes 2-inch ips and smaller shall have screwed ends. In sizes 2-1/2-inch ips and larger, strainers shall have flanged ends. Body working-pressure rating shall exceed maximum service pressure of system in which installed by at least 50 percent. Body shall have cast-in arrows to indicate direction of flow. All strainer bodies fitted with screwed screen retainers shall have straight threads and gasketed with nonferrous metal. Strainer bodies 2-1/2-inches and larger, fitted with bolted-on screen retainers, shall have offset blowdown holes. All strainers larger than2-1/2-inches shall be fitted with manufacturer's standard ball-type blowdown valve. Body material shall be cast bronze conforming to ASTM B 62. Where system material is nonferrous, metal strainer body material shall be nonferrous metal.

Minimum free-hole area of strainer element shall be equal to not less than 3.4 times the internal area of connecting piping. Strainer screens shall have perforations not to exceed 0.045-inch. Strainer screens shall have finished ends fitted to machined screen chamber surfaces to preclude bypass flow. Strainer element material shall be AISI Type 304 corrosion-resistant steel.

2.3.17 Line Strainers, Steam Service

Strainers shall be Y-type with removable strainer element.

Body end connections shall be flanged for all valves larger than 2 inches, unless butt weld ends are specified. Socket weld shall be used for sizes 2 inches and under to suit specified piping system end connection and maintenance requirements or be welded.

Strainers located in tunnels, trenches, manholes, and valve pits shall have welded end connections.

Body working steam pressure rating shall be the same as the primary valve rating for system in which strainer is installed, except where welded end materials requirements result in higher pressure ratings. Body shall have integral cast or forged arrows to indicate direction of flow. Provide strainer bodies with blowdown valves that have discharge end plugged with a

solid metal plug. Make closure assembly with tetrafluoroethylene tape. Bodies fitted with bolted-on screen retainers shall have offset blowdown holes.

Body materials shall be cast steel conforming to ASTM A 216/A 216M, Grade WCB.

Minimum free-hole area of strainer element shall be equal to not less than 3.4 times the internal area of connecting piping. Strainer screens shall have perforations not to exceed 0.020 inch or equivalent wire mesh. Strainer screens shall have finished ends fitted to machined screen chamber surfaces to preclude bypass flow. Strainer element material shall be AISI Type 304 corrosion-resistant steel and fitted with backup screens where necessary to prevent collapse.

2.4 VALVES

2.4.1 Ball and Butterfly Valves

Ball valves shall conform to MSS SP-72 for Figure 1A, 1 piece body 1B, vertically split body 1C, top entry 1D, three piece body and shall be rated for service at not less than 175 psig at 200 degrees F. Valve bodies in sizes 2 inches and smaller shall be screwed-end connection-type constructed of Class A copper alloy. Valve bodies in sizes 2-1/2 inches and larger shall be flanged-end connection type, constructed of Class D material. Balls and stems of valves 2 inches and smaller shall be manufacturer's standard with hard chrome plating finish. Balls and stems of valves 2-1/2 inches and larger shall be manufacturer's standard Class C corrosion-resistant steel alloy with hard chrome plating. Balls of valves 6 inches and larger may be Class D with 900 Brinell hard chrome plating. Valves shall be suitable for flow from either direction and shall seal equally tight in either direction. Valves with ball seals held in place by spring washers are not acceptable. All valves shall have adjustable packing glands. Seats and seals shall be tetrafluoroethylene.

Butterfly valves shall conform to MSS SP-67. Valves shall be wafer type for mounting between specified flanges and shall be rated for 150-psig shutoff and nonshock working pressure. Bodies shall be cast ferrous metal conforming to ASTM A 126, Class B, and to ASME B16.1 for body wall thickness. Seats and seals shall be of the resilient elastomer type designed for field removal and replacement.

2.4.2 Drain, Vent, and Gage Cocks

Drain, vent, and gage cocks shall be lever handle, ground key type, with washer and screw, constructed of polished ASTM B 62 bronze, and rated 125-psi wsp. End connections shall be rated for specified service pressure.

Pump vent cocks, and where spray control is required, shall be UL umbrella-hood type, constructed of manufacturer's standard polished brass. Cocks shall be 1/2-inch ips male, end threaded, and rated at not less than 125 psi at 225 degrees F.

2.4.3 Gate Valves (GAV)

Gate valves 2 inches and smaller shall conform to MSS SP-72. Valves located in tunnels, equipment rooms, factory-assembled equipment, and where

indicated shall be union-ring bonnet, screwed-end type. Make packing of non-asbestos type materials. Valves shall be rising stem type.

Gate valves 2-1/2 inches and larger, shall be Type I, (solid wedge disc, tapered seats, steam rated); Class 125 (125-psig steam-working pressure at 353 degrees F saturation); and 200-psig, wog (nonshock), conforming to MSS SP-70 and to requirements specified herein. Valves shall be flanged, with bronze trim and outside screw and yoke (OS&Y) construction. Make packing of non-asbestos type materials.

2.4.4 Globe and Angle Valves (GLV-ANV)

Globe and angle valves 2 inches and smaller, shall be 125-pound, 125-psi conforming to MSS SP-85 and to requirements specified herein. Valves located in tunnels, equipment rooms, factory-assembled equipment, and where indicated shall be union-ring bonnet, screwed-end type. Disc shall be free to swivel on the stem in all valve sizes. Composition seating-surface disc construction may be substituted for all metal-disc construction. Make packing of non-asbestos type materials. Disk and packing shall be suitable for pipe service installed.

Globe and angle valves 2-1/2 inches and larger, shall be cast iron with bronze trim. Valve bodies shall be cast iron conforming to ASTM A 126, Class A, as specified for Class 1 valves under MSS SP-70. Valve ends shall be flanged in conformance with ASME B16.1. Valve construction shall be outside screw and yoke (OS&Y) type. Make packing of non-asbestos type materials.

2.4.5 Standard Check Valves (SCV)

Standard check valves in sizes 2 inches and smaller shall be 125-psi swing check conforming to MSS SP-71, except as otherwise specified. Provide lift checks where indicated. Swing-check pins shall be nonferrous and suitably hard for the service. Discs shall be composition type. Swing-check angle of closure shall be manufacturer's standard unless a specific angle is needed.

Check valves in sizes 2-1/2 inches and larger shall be cast iron, bronze trim, swing type. Valve bodies shall be cast iron, conforming to ASTM A 126, Class A. Valve ends shall be flanged in conformance with ASME B16.1. Swing-check pin shall be AISI Type or approved equal corrosion-resistant steel. Angle of closure shall be manufacturer's standard unless a specific angle is needed. Valves shall have bolted and gasketed covers.

Provide check valves with external spring-loaded, positive-closure devices and valve ends shall be mechanical joint.

2.4.6 NOT USED

2.5 MISCELLANEOUS MATERIALS

2.5.1 NOT USED

2.5.2 Bolting

Flange and general purpose bolting shall be hex-head and must conform to ASTM A 307, Grade B (bolts, for flanged joints in piping systems where one

or both flanges are cast iron). Heavy hex-nuts shall conform to ASTM A 563. Square-head bolts and nuts are not acceptable. Threads shall be coarse-thread series.

2.5.3 Elastomer Calk

Polysulfide- or polyurethane-base elastomer calking material shall be two-component type, conforming to ASTM C 920.

2.5.4 Escutcheons

Escutcheons shall be manufactured from nonferrous metals and chrome-plated except when AISI 300 series corrosion-resistant steel is provided. Metals and finish shall conform to ASME A112.19.2.

Escutcheons shall be one-piece type where mounted on chrome-plated pipe or tubing, and one-piece of split-pattern type elsewhere. All escutcheons shall have provisions consisting of internal spring-tension devices for maintaining a fixed position against a surface.

2.5.5 Flashing

Sheet lead shall conform to ASTM B 749, UNS Alloy Number L50049 (intended for use in laboratories and shops in general application).

Sheet copper shall conform to ASTM B 370 and be of not less than 16 ounces per square foot weight.

2.5.6 Flange Gaskets

Compressed non-asbestos sheet, conforming to ASTM F 104, coated on both sides with graphite or similar lubricant, with nitrile composition, binder rated to750 degrees F.

2.5.7 Grout

Shrink-resistant grout shall be a premixed and packaged metallic-aggregate, mortar-grouting compound conforming to ASTM C 404 and ASTM C 476.

Shrink-resistant grout shall be a combination of premeasured and packaged epoxy polyamide or amine resins and selected aggregate mortar grouting compound conforming to the following requirements:

Tensile strength		1,900 psi, minimum
Compressive strength	ASTM C 109/C 109M	14,000 psi, minimum
Shrinkage, linear		0.00012 inch per inch, maximum
Water absorption	ASTM C 67	0.1 percent, maximum
Bond strength to		1,000 psi, minimum steel in shear minimum

2.5.8 Pipe Thread Compounds

Use tetrafluoroethylene tape not less than 2 to 3 mils thick in potable and process water and in chemical systems for pipe sizes to and including 1-inch ips. Tetrafluoroethylene dispersions and other suitable compounds shall be used for all other applications upon approval by the Contracting Officer; however, no lead-containing compounds shall be used in potable water systems.

2.6 SUPPORTING ELEMENTS

Provide all necessary piping systems and equipment supporting elements, including but not limited to: building structure attachments; supplementary steel; hanger rods, stanchions, and fixtures; vertical pipe attachments; horizontal pipe attachments; anchors; guides; and spring-cushion, variable, or constant supports. All supporting elements shall be suitable for stresses imposed by systems pressures and temperatures and natural and other external forces normal to this facility without damage to supporting element system or to work being supported.

Supporting elements shall conform to requirements of ASME B31.3, MSS SP-58, and MSS SP-69 except as noted.

Attachments welded to pipe shall be made of materials identical to that of pipe or materials accepted as permissible raw materials by referenced code or standard specification.

Supporting elements exposed to weather shall be hot-dip galvanized or stainless steel. Materials shall be of such a nature that their apparent and latent-strength characteristics are not reduced due to galvanizing process. Supporting elements in contact with copper tubing shall be electroplated with copper.

Type designations specified herein are based on MSS SP-58 and MSS SP-69. Masonry anchor group-, type-, and style-combination designations shall be in accordance with CID A-A-1922, CID A-A-1923, FS A-A-1924, FS A-A-1925 , CID A-A-55614, and CID A-A-55615. Support elements, except for supplementary steel, shall be cataloged, load rated, commercially manufactured products.

2.6.1 Building Structure Attachments

2.6.1.1 Anchor Devices, Concrete and Masonry

Anchor devices shall conform to CID A-A-1922, CID A-A-1923, FS A-A-1924, FS A-A-1925 , CID A-A-55614, and CID A-A-55615

Cast-in, floor mounted, equipment anchor devices shall provide adjustable positions.

Powder-actuated anchoring devices shall not be used to support any mechanical systems components.

2.6.1.2 Beam Clamps

Beam clamps shall be center-loading MSS SP-58 Type 20.

When it is not possible to use center-loading beam clamps, eccentric-loading beam clamps, MSS SP-58 Type 19 may be used for piping

sizes 2 inches and less and for piping sizes 2 through 10 inches provided two counterbalancing clamps are used per point of pipe support. Where more than one rod is used per point of pipe support, rod diameter shall be determined in accordance with referenced standards.

2.6.1.3 C-Clamps

Do not use C-clamps.

2.6.1.4 Inserts, Concrete

Concrete inserts shall be MSS SP-58 Type 18. When applied to piping in sizes 2 inches ips and larger and where otherwise required by imposed loads, insert and wire a 1-foot length of 1/2-inch reinforcing rod through wing slots. Submit proprietary-type continuous inserts for approval.

2.6.2 Horizontal Pipe Attachments

2.6.2.1 Single Pipes

Support piping in sizes to and including 2-inch ips by MSS SP-58 Type 6 solid malleable iron pipe rings, except that split-band-type rings shall be used in sizes up to 1-inch ips.

Support piping in sizes through 8-inch ips inclusive by MSS SP-58 Type 1 attachments.

MSS SP-58 Type 1 and Type 6 assemblies shall be used on vapor-sealed insulated piping and shall have an inside diameter larger than pipe being supported to provide adequate clearance during pipe movement.

Where thermal movement of a point in a piping system 4 inches and larger would cause a hanger rod to deflect more than 4 degrees from the vertical or where a horizontal point movement exceeds 1/2 inch, MSS SP-58 Type 41 pipe rolls shall be used.

Support piping in sizes larger than 8-inch ips with MSS SP-58 Type 41 pipe rolls.

MSS SP-58 Type 40 shields shall be used on all insulated piping. Area of the supporting surface shall be such that compression deformation of insulated surfaces does not occur. Longitudinal and transverse shield edges shall be rolled away from the insulation.

Provide insulated piping without vapor barrier on roll supports with MSS SP-58 Type 39 saddles.

Spring supports shall be as indicated.

2.6.2.2 Parallel Pipes

Trapeze hangers fabricated from structural steel shapes, with U-bolts, shall be used in congested areas and where multiple pipe runs occur. Structural steel shapes shall .

2.6.3 Vertical Pipe Attachments

Vertical pipe attachments shall be MSS SP-58 Type 8.

Shop drawing data shall include complete fabrication and attachment details of any spring supports.

2.6.4 Hanger Rods and Fixtures

Only circular cross section rod hangers shall be used to connect building structure attachments to pipe support devices. Pipe, straps, or bars of equivalent strength shall be used for hangers only where approved by the Contracting Officer.

Turnbuckles, swing eyes, and clevises shall be provided as required by support system to accommodate temperature change, pipe accessibility, and adjustment for load and pitch. Rod couplings are not acceptable.

2.6.5 Supplementary Steel

Where it is necessary to frame structural members between existing members or where structural members are used in lieu of commercially rated supports, design and fabricate such supplementary steel in accordance with AISC 325.

PART 3 EXECUTION

3.1 PIPE INSTALLATION

Submit certificates for pipes, valves and specialties showing conformance with test requirements as contained in the reference standards contained in this section. Certificates shall verify Surface Resistance, Shear and Tensile Strengths, Temperature Ratings, Bending Tests, Flattening Tests and Transverse Guided Weld Bend Tests.

Test reports for Hydrostatic Tests, Air Tests, Valve-Operating Tests, Drainage Tests, Pneumatic Tests, Non-Destructive Electric Tests and System Operation Tests shall be provided by the Contractor, in compliance with referenced standards contained within this section.

Fabricate and install piping systems in accordance with ASME B31.3, MSS SP-69, and AWS WHB-2.9.

Submit Installation Drawings for pipes, valves and specialties. Drawings shall include the manufacturer's design and construction calculations, forces required to obtain rated axial, lateral, or angular movements, installation criteria, anchor and guide requirements for equipment, and equipment room layout and design. Drawings shall specifically advise on procedures to be followed and provisions required to protect expansion joints during specified hydrostatic testing operations.

Connections between steel piping and copper piping shall be electrically isolated from each other with dielectric couplings (or unions) rated for the service.

Make final connections to equipment with unions OR flanges provided every 100 feet of straight run. Provide unions in the line downstream of screwed- and welded-end valves.

Ream all pipe ends before joint connections are made.

Screwed joints shall be made up with specified joint compound and not more than three threads shall show after joint is made up.

Apply joint compounds to the male thread only and exercise care to prevent compound from reaching the unthreaded interior of the pipe.

Provide screwed unions, welded unions, or bolted flanges wherever required to permit convenient removal of equipment, valves, and piping accessories from the piping system for maintenance.

Securely support piping systems with due allowance for thrust forces, thermal expansion and contraction, and shall not be subjected to mechanical, chemical, vibrational or other damage as specified in ASME B31.3.

Field welded joints shall conform to the requirements of the AWS WHB-2.9, ASME B31.3, and ASME BPVC SEC IX.

Make piping systems butt weld joints with backing rings. Backing ring materials shall be compatible with materials being joined. Joint configuration shall conform to ASME B16.25.

3.2 VALVES

Provide valves in piping mains and all branches and at equipment where indicated and as specified.

Provide valves to permit isolation of branch piping and each equipment item from the balance of the system.

Riser and downcomer drains above piping shutoff valves in piping 2-1/2 inches and larger shall be provided. Tap and fit shutoff valve body with a 1/2-inch plugged globe valve.

Valves unavoidably located in furred or other normally inaccessible places shall be provided with access panels adequately sized for the location and located so that concealed items may be serviced, maintained, or replaced.

3.3 SUPPORTING ELEMENTS INSTALLATION

Provide supporting elements in accordance with the referenced codes and standards.

Support piping from building structure. No piping shall be supported from roof deck or from other pipe.

Piping shall run parallel with the lines of the building. Space and install piping and components so that a threaded pipe fitting may be removed between adjacent pipes and so that there shall be no less than 1/2 inch of clear space between the finished surface and other work and between the finished surface of parallel adjacent piping. Hangers on different adjacent service lines running parallel with each other shall be arranged to be in line with each other and parallel to the lines of the building.

Install piping support elements at intervals specified hereinafter, at

locations not more than3 feet from the ends of each runout, and not over 1 foot from each change in direction of piping.

Load rating for all pipe-hanger supports shall be based on insulated weight of lines filled with water and forces imposed. Deflection per span shall not exceed slope gradient of pipe. Supports shall be in accordance with the following minimum rod size and maximum allowable hanger spacing for specified pipe. For concentrated loads such as valves, the allowable span must be reduced proportionately:

PIPE SIZE INCHES	ROD SIZE INCHES	STEEL PIPE FEET	COPPER PIPE FEET
1 and smaller	3/8	8	6
1-1/4 to 1-1/2	3/8	10	8
2	3/8	10	8
2-1/2 to 3-1/2	1/2	12	12
4 to 5	5/8	16	14
6	3/4	16	16
8 to 12	7/8	20	20
14 to 18	1	20	20
20 and over	1-1/4	20	20

Provide vibration isolation supports where needed. Refer to Section 23 05 48 VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT where A/C equipment and piping is installed.

Vertical risers shall be supported independently of connected horizontal piping, whenever practicable, with fixed or spring supports at the base and at intervals to accommodate system range of thermal conditions. Risers shall be guided for lateral stability. For risers subject to expansion, provide only one rigid support at a point approximately one-third down from the top. Place clamps under fittings unless otherwise specified. Support carbon-steel pipe at each floor and at not more than 15-footintervals for pipe 2 inches and smaller and at not more than 20-footintervals for pipe 2-1/2 inches and larger.

3.4 PENETRATIONS

Effective sound stopping and adequate operating clearance shall be provided to prevent structure contact where piping penetrates walls, floors, or ceilings into occupied spaces adjacent to equipment rooms; where similar penetrations occur between occupied spaces; and where penetrations occur from pipe chases into occupied spaces. Occupied spaces shall include space above ceilings where no special acoustic treatment of ceiling is provided. Penetrations shall be finished to be compatible with surface being penetrated.

Sound stopping and vapor-barrier sealing of pipe shafts and large floor and wall openings shall be accomplished by packing to high density with properly supported fibrous-glass insulation or, where ambient or surface temperatures do not exceed 120 degrees F, by foaming-in-place with self-extinguishing, 2-pound density polyurethane foam to a depth not less than 6 inches. Foam shall be finished with a rasp. Vapor barrier shall be not less than 1/8-inch thick vinyl coating applied to visible and accessible surfaces. Where high temperatures and fire stopping are a consideration, only mineral wool shall be used and openings must also be covered with 16-gage sheet metal.

3.5 SLEEVES

Provide sleeves where piping passes through roofs, masonry, concrete walls and floors.

Sleeves passing through steel decks shall be continuously welded to the deck.

Sleeves that extend through floors, roofs, load bearing walls, and fire barriers shall be continuous and fabricated from Schedule 40 steel pipe, with welded anchor lugs. All other sleeves shall be formed by molded linear polyethylene liners or similar materials that are removable. Diameter of sleeves shall be large enough to accommodate pipe, insulation, and jacketing without touching the sleeve and shall provide a minimum 3/8-inch clearance. Sleeve size must accommodate mechanical and thermal motion of pipe to preclude transmission of vibration to walls and the generation of noise.

Space between a pipe, bare or insulated, and the inside of a pipe sleeve or a construction surface penetration shall be packed solid with a mineral fiber conforming to ASTM C 553 Type V (flexible blanket), (to 1,000 degrees F). Provide this packing wherever the piping passes through firewalls, equipment room walls, floors, and ceilings connected to occupied spaces, and other locations where sleeves or construction-surface penetrations occur between occupied spaces. Where sleeves or construction surface penetrations occur between conditioned and unconditioned spaces, the space between a pipe, bare or insulated, and the inside of a pipe sleeve or construction surface penetration shall be filled with an elastomer calk to a depth of 1/2 inch. All surfaces to be calked shall be oil- and grease-free.

Through-Penetration fire stop materials and methods shall be in accordance with ASTM E 814 and UL 1479.

Exterior wall sleeves shall be calked watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed metal components.

Sleeve height above roof surface shall be a minimum of 12 and a maximum of 18 inches.

3.6 ESCUTCHEONS

Provide escutcheons at all penetrations of piping into finished areas. Where finished areas are separated by partitions through which piping passes, provide escutcheons on both sides of the partition. Where suspended ceilings are installed, provide plates at the underside only of

such ceilings. For insulated pipes, the plates shall be large enough to fit around the insulation. Escutcheons shall be chrome-plated in all occupied spaces and of size sufficient to effectively conceal openings in building construction. Firmly attach escutcheons with setscrews.

3.7 FLASHINGS

Provide flashings at penetrations of building boundaries by mechanical systems and related work.

3.8 UNDERGROUND PIPING INSTALLATION

Prior to being lowered into a trench, all piping shall be cleaned, visually inspected for apparent defects, and tapped with a hammer to audibly detect hidden defects.

Suspect cast-ferrous piping shall be further inspected by painting with kerosene on external surfaces to reveal cracks.

Distinctly mark defective materials found using a road-traffic quality yellow paint; promptly remove defective material from the site.

After conduit has been inspected, and not less than 48 hours prior to being lowered into a trench, all external surfaces of cast ferrous conduit shall be coated with a compatible bituminous coating for protection against brackish ground water. Application shall be single coat, in accordance with the manufacturer's instructions, to result in a dry-film thickness of not less than 12 mils.

Excavations shall be dry and clear of extraneous materials when pipe is being laid.

Cutting of piping shall be by wheel cutters or other machines designed specifically for that purpose. Electric-arc and oxyacetylene cutting will not be permitted.

Laying of pipe shall begin at the low point of a system. When in final acceptance position, it shall be true to the grades and alignment indicated, with unbroken continuity of invert. Blocking and wedging will not be permitted.

Bell or grooved ends of piping shall point upstream.

Make changes in direction with long sweep fittings.

Necessary socket clamping, piers, bases, anchors, and thrust blocking shall be provided. Protect rods, clamps, and bolting with a coating of bitumen.

Underground piping below supported or suspended slabs shall be supported from the slab with a minimum of two supports per length of pipe. Protect supports with a coating of bitumen.

On excavations that occur near and below building footings, the backfilling material shall consist of2,000-psi cured compressive-strength concrete poured or pressure-grouted up to the level of the footing.

Vertical downspouts; soil, waste, and vent stacks; water risers; and

similar work shall be properly supported on approved piers at the base and provided with approved structural supports attached to building construction.

Provide cleanout, flushing, and observation risers.

3.9 HEAT TRACE CABLE INSTALLATION

Heater tape shall be field applied and cut to fit as necessary, linearly along the length of pipe after piping has been pressure tested and approved by the Contracting Officer. Secure the heater to piping with cable ties. Thermal insulation shall be labeled on the outside, "Electrical Heat Trace."

Power connection, end seals, splice kits and tee kit components shall be installed in accordance with IEEE 515 to provide a complete workable system. Connection to the thermostat and ends of the heat tape shall be terminated in a junction box. Cable and conduit connections shall be raintight.

3.10 DISINFECTION

Flush piping with potable water until visible grease, dirt and other contaminants are removed (visual inspection).

3.11 NOT USED

3.12 OPERATION AND MAINTENANCE

Operation and Maintenance Manuals shall be consistent with manufacturer's standard brochures, schematics, printed instructions, general operating procedures and safety precautions. Test data shall be clear and readily legible.

3.13 PAINTING OF NEW EQUIPMENT

New equipment painting shall be factory applied or shop applied, and shall be as specified herein, and provided under each individual section.

3.13.1 Factory Painting Systems

Manufacturer's standard factory painting systems may be provided subject to certification that the factory painting system applied will withstand 125 hours in a salt-spray fog test, except that equipment located outdoors shall withstand 500 hours in a salt-spray fog test. Salt-spray fog test shall be in accordance with ASTM B 117, and for that test the acceptance criteria shall be as follows: immediately after completion of the test, the paint shall show no signs of blistering, wrinkling, or cracking, and no loss of adhesion; and the specimen shall show no signs of rust creepage beyond 0.125 inch on either side of the scratch mark.

The film thickness of the factory painting system applied on the equipment shall not be less than the film thickness used on the test specimen. If manufacturer's standard factory painting system is being proposed for use on surfaces subject to temperatures above 120 degrees F, design the factory painting system for the temperature service.

3.13.2 Shop Painting Systems for Metal Surfaces

Clean, pretreat, prime and paint metal surfaces; except aluminum surfaces need not be painted. Apply coatings to clean dry surfaces. Clean the surfaces to remove dust, dirt, rust, oil and grease by wire brushing and solvent degreasing prior to application of paint, except metal surfaces subject to temperatures in excess of 120 degrees F shall be cleaned to bare metal.

Where more than one coat of paint is specified, apply the second coat after the preceding coat is thoroughly dry. Lightly sand damaged painting and retouch before applying the succeeding coat. Color of finish coat shall be aluminum or light gray.

a. Temperatures Less Than 120 Degrees F: Immediately after cleaning, the metal surfaces subject to temperatures less than 120 degrees F shall receive one coat of pretreatment primer applied to a minimum dry film thickness of 0.3 mil, one coat of primer applied to a minimum dry film thickness of one mil; and two coats of enamel applied to a minimum dry film thickness of one mil per coat.

b. Temperatures Between 120 and 400 Degrees F: Metal surfaces subject to temperatures between120 and 400 degrees F shall receive two coats of 400 degrees F heat-resisting enamel applied to a total minimum thickness of 2 mils.

c. Temperatures Greater Than 400 Degrees F: Metal surfaces subject to temperatures greater than 400 degrees F shall receive two coats

of 600 degrees F heat-resisting paint applied to a total minimum dry film thickness of 2 mils.

-- End of Section --

DOUBLE FAN CLOSED CIRCUIT FLUID COOLER

SECTION 23 65 00

1.0 CLOSED CIRCUIT FLUID COOLER

1.1 GENERAL

Furnish and install an induced draft, counter-flow, factory-assembled closed circuit fluid cooler, manufactured by REYMSA Cooling Tower, Inc. OR APPROVED ALTERNATE (NOTE - APPROVAL MUST BE OBTAINED FROM THE ENGINEER PRIOR TO BID (NO EXCEPTIONS)), and equal in all respects to REYMSA HFC-612275 cooling tower model. The closed circuit fluid cooler shall consist of one (01) basin section with coil, one (01) body section, one (01) re-circulating pump system, and two (02) fan ducts.

Reference mechanical drawings for submittal requirements.

As of the date of the bid, the contractor shall have been in the business of installing cooling towers / fluid coolers & other related mechanical equipment for no less than 12 years. As of the date of the bid, the contractor shall have performed at least one successful cooling tower / fluid cooler installation of the same manufacturer as that which is approved & provided – the contractor shall provide written verification of such installation. If required by the Owner or Engineer the contractor shall arrange a site visit to witness the referenced successful cooling tower / fluid cooler installation.

1.2 WARRANTY

The fluid cooler shall be provided with a minimum 15 year warranty for the cooling tower body and a minimum 5 year warranty for motors.

1.3 THERMAL PERFORMANCE

The closed circuit fluid cooler shall have the capacity to 250 tons (re: manf for flowrate) of water from 95°F to 85°F, at a design entering air wet-bulb temperature of 78°F.

Thermal performance shall be certified by the Cooling Technology Institute (CTI) in accordance with CTI Certification Standard STD-201. In addition, the manufacturer guarantees that the closed circuit fluid cooler shall meet the specified performance conditions when installed according to plans and per the guidelines established in the closed circuit fluid cooler manufacturer's Installation, Operation & Maintenance (IOM) Manual.

2.0 CONSTRUCTION

The closed circuit fluid cooler shall be designed and constructed to withstand wind pressure of no less than 30 pounds-forces per square foot (psf) on external surfaces. The top of the closed circuit fluid cooler's body shall be designed and constructed to withstand a live load of no less than 40 psf in addition to the concentrated loads of the fan or other equipment mounted thereon.

2.1 BODY SECTION

Body section shall be one (01) seamless, water-tight and leak-proof piece, constructed of high-performance corrosion-resistant Fiberglass Reinforced Polyester (FRP) with Ultraviolet (UV) resistant resins. The fiberglass reinforced polyester material shall have a thickness no less than ¼" inch; the closed circuit fluid cooler's structural members, body's structure, and top cover , shall be specially reinforced to ensure structural strength. Only a high grade isophalic polyester resin with UV inhibitor shall be used in the manufacturing process.

2.2 BASIN SECTION

Basin section shall be one (01) seamless, water-tight and leak-proof piece, constructed of high-performance corrosion-resistant fiberglass reinforced polyester (FRP) with Ultraviolet (UV) resistant resins. The fiberglass reinforced polyester material shall have a thickness no less than ¼" inch, the basin's walls and bottom shall be specially reinforced to ensure structural strength. Only a high grade isophalic polyester resin with UV inhibitor shall be used in the manufacturing process. No side fasteners will be allowed at the sidewalls of the basin. There shall not be any metal support or structure in direct contact with water.

Following water connections shall be furnished as standard:

a. Hot water inlet
b. Cold water outlet
c. Drain
d. Overflow
e. Make-up water
f. Purge

2.3 FAN DUCT

The closed circuit fluid cooler should have two (02) fan ducts constructed of high-performance corrosion-resistant FRP with Ultraviolet (UV) resistant resins. The fiberglass reinforced polyester material shall have a thickness no less than ¼" inch; the fan duct shall be specially reinforced to ensure its structural strength. The fan Duct shall contain a direct-drive fan, a motor mounted on an FRP structure, and a corrosion-resistant safety screen mesh (also known as "fan guard"). The fan duct is to be mounted on top of the body section, held in place with stainless steel fasteners provided by the manufacturer, and no gasket shall be required.

2.4 STANDARD FAN

The closed circuit fluid cooler shall contain two (02) standard fans. Fan shall be direct-drive, with axial, propeller type fan blades. Airfoil design fan blades shall be manufactured of spark and corrosion resistant Fiberglass Reinforced Polyamide (PAG) and shall be suitable for operation on a temperature range of -40° F (-40° C) to 230° F (110° C). Fan hubs shall be manufactured of a pressure die cast aluminum alloy.

2.5 STANDARD FAN MOTORS

The closed circuit fluid cooler shall contain two (02) fan motors, rated at (re: manf) HP at 850 RPM. The fan motor shall be single speed, Totally Enclosed Fan Cooled (TEFC), and shall be suitable for (re: Electrical Provider). The fan motor shall be rated for continuous operation, 1.15 service factor on sine wave, NEMA premium efficiency, severe duty – IP54, marine duty, and inverter rated. Fan motor's construction shall be 100% cast iron and shall have Class F Insulation System. The fan motor shall meet NEMA MG1 – 1.26.6, shall be Underwriters Laboratories (UL) Recognized, and CSA Certified.

3.0 FILL MEDIA MODULES

Fill media modules shall be fabricated from rigid, corrugated UV protected Polyvinyl Chloride (PVC) sheets that are conducive to cooling water. Polyvinyl chloride corrugated sheets shall form a cross-corrugated pattern with an angle of 60 degrees from the horizontal between adjacent sheets,

to provide a continuous and horizontal redistribution of air and water. Fill media modules shall provide no less than 69 ft^2/ft^3 of surface area and a void-to-volume ratio of 95%. The manufacturing material, polyvinyl chloride, shall be resistant to rot, fungi, bacteria and organic/inorganic acids, and alkalis as commonly found in closed circuit fluid coolers; and shall meet CTI STD-136. Fill media modules' flame spread rating shall be less than 20 according to ASTM E84; and regarding flammability, fill media modules shall be self-extinguishing in less than 5 seconds according to ASTM D635.

4.0 DRIFT ELIMINATORS

Drift eliminators shall be fabricated from rigid, corrugated UV protected polyvinyl chloride sheets and shall be furnished in lightweight, easily removable sections with 2 changes in air direction to remove entrained water particles from the leaving airstream. Drift losses shall not exceed 0.005% of the design circulating flow. The manufacturing material, PVC, shall be resistant to rot, fungi, bacteria and organic/inorganic acids, and alkalis as commonly found in closed circuit fluid coolers, and shall meet CTI STD-136. Drift eliminators' flame spread rating shall be less than 25 according to ASTM E84, and regarding flammability, drift eliminators shall be self-extinguishing.

5.0 AIR INLET LOUVERS

Air inlet louvers shall be cellular type and shall be designed to minimize splash-out of falling water, reduce light transmission into the fluid cooler, and reduce sound transmission out of the closed circuit fluid cooler at minimal airside pressure loss. Air inlet louvers shall be fabricated from rigid, corrugated UV protected PVC sheets and shall be easily removable to provide access for cleaning. The manufacturing material, polyvinyl chloride (PVC), shall be resistant to rot, fungi, bacteria and organic/inorganic acids, and alkalis as commonly found in closed circuit fluid coolers, and shall meet CTI STD-136. Air Inlet Louvers' flame spread rating shall be less than 20 according to ASTM E84, and regarding flammability, air inlet louvers shall be self-extinguishing in less than 5 seconds according to ASTM D635.

6.0 HOT WATER DISTRIBUTION SYSTEM

Hot water shall enter into the closed circuit fluid cooler through a single inlet. All interior distribution piping shall be polyvinyl chloride (PVC) schedule 40 pipe minimum. Water shall be evenly distributed over the fill media by removable 2 ½ inch spray nozzles made of Acrylonitrile Butadiene Styrene copolymer (ABS). Spray nozzles shall contain internal, interchangeable flow devices to provide an optimal spray pattern within the 2 to 10 psig operating pressure range.

7.0 WATER DISTRIBUTION PAN

Cooled water is distributed externally over the copper coil heat exchanger using gravity spray nozzles placed in a fiberglass pan, so water is evenly spread across the copper coil for better heat transfer.

8.0 COOL WATER RECIRCULATION PUMP

Water is recirculated to the water distribution system by a centrifugal, vertical inline recirculation pump designed for optimum performance, easy installation, and simplified maintenance. The close-coupled design results in improved alignment and increased seal life.

9.0 COPPER COIL

The copper coil tubes are constructed of 5/8" OD Type L copper with excellent thermal conductivity, corrosion resistance, and durability. It is encased in a stainless steel frame, leak tested at 300 psi, and uses 3" or 4" Victaulic connection depending on the model.

10.0 ACCESSORIES (ALL ARE REQUIRED TO BE PROVIDED)

10.1 BASIN HEATERS

The closed circuit fluid cooler shall be provided with one (01) basin heater system. The basin heater system shall consist of (per manf. recommendation) electric immersion basin heater(s) of (per manf. recommendation) kW each with (1) control panel and a combination level sensor/thermostat well, all installed by others. Immersion basin heaters shall have 334 stainless steel sheaths. The combination level sensor/thermostat well shall consist of a stainless steel low water probe with a brass and copper thermostat well mounted on a 2 inch stainless steel MPT plug. Basin heaters enclosure shall be furnished with NEMA 4X Glass Reinforced Polyester, stainless steel captive screws, a hinged silicone gasket cover, and shall meet flammability rating 4L94V-O. Basin heater system's contactor shall be a resistive silver-cadmium oxide contactor rated for 40 amperes.

10.2 ELECTRIC WATER LEVEL CONTROL

The closed circuit fluid cooler shall be provided with one (01) electric water level control system, and shall be installed by others. The electric water level control system shall consist of one (01) 5-probe water level controller and one (01) stilling chamber. Water level controller's enclosure shall be furnished with NEMA 4X Glass-Filled Polycarbonate, shall have a full gasket cover, and shall meet flammability rating U194V-1. Water level controller's electrodes shall be ¼ inch stainless steel probes and shall sense high water alarm, low water alarm, high water level, and low water level using a common ground. Stilling chamber shall consist of a 2 inch Polyvinyl Chloride (PVC) schedule 80 Body, ½ inch Male Pipe Thread (MPT) Polyvinyl Chloride schedule 80 mounting nipples, and ½ inch MPT drain plug.

10.3 VIBRATION SWITCH

The closed circuit fluid cooler shall be provided with two (02) vibration cut-out switches for shutdown of fan motor. The vibration switch shall be installed by others. Vibration switch case shall be equal to NEMA 3R. Vibration switch contacts shall be Single Pole Double Throw (SPDT)-double make leaf contacts for 5 amperes @ 480 VAC.

10.4 LADDER WITH STANDARD SUPPORTS

Aluminum ladder to grade shall be welded construction, with standard supports, ready to be installed to the closed circuit fluid cooler by others; stainless steel fasteners shall be provided by manufacturer. Supports' standard material shall be stainless steel, but galvanized steel may be requested instead as option.

10.5 LADDER WITH OSHA SAFETY CAGE

Aluminum ladder to grade shall be welded construction, and the OSHA safety cage shall be welded construction and assembled to ladder. Ladder with OSHA safety cage shall be ready to be installed to the closed circuit fluid cooler by others; stainless steel fasteners shall be provided by manufacturer. Cage shall meet OSHA 1910.23 standard. Cage's standard material shall be stainless steel, but galvanized steel can be requested instead as option.

10.6 PERIMETER HANDRAIL

Perimeter handrail shall be welded construction in several sections, ready to be assembled by others; stainless steel fasteners shall be provided by manufacturer. Handrail shall meet OSHA 1910.23 standard. Perimeter handrail's standard material shall be stainless steel, but galvanized steel can be requested instead as option.

10.7 CATWALK

Catwalk shall be a one-section non-skid welded construction plate, ready to be installed by others; stainless steel fasteners shall be provided by manufacturer. Catwalk shall meet OSHA 1910.23 standard. Catwalk's standard material shall be stainless steel, but galvanized steel can be requested instead as option.

10.8 CATWALK WITH HANDRAIL

Catwalk shall be a one-section non-skid welded construction plate, and catwalk's handrail shall be welded construction in several sections. Catwalk and catwalk's handrail shall be ready to be installed by others; stainless steel fasteners shall be provided by manufacturer. Catwalk and catwalk's handrail shall meet OSHA 1910.23 standard. Catwalk and catwalk's handrail standard material shall be stainless steel, but galvanized steel can be requested instead as option.

REFERENCE STANDARDS AND CODES

Cooling Technology Institute (CTI)	CTI STD-201	Standard for the Certification of Water-Closed Circuit Fluid Cooler Thermal Performance.
	CTI STD-136	Polyvinyl Chloride materials used for film fill, splash fill, louvers, and drift eliminators.
American Society for Testing and Materials (ASTM)	ASTM E84	Standard test method for Surface burning characteristics of building materials
	ASTM D635	Standard test method for rate of burning of plastics in a horizontal position.
National Electrical Manufacturers Association (NEMA)	MG1	Motors and generators.
	MG1 – 1.26.6	Waterproof Specification.
Occupational Safety & Health Administration (OSHA)	1910.23	Guarding floor and wall openings and holes.

Canadian County
Purchasing

Affidavit / Proof of Mailing

Date Issued: March 28, 2016
Bid Number: **2016-#13**
Closing Date: April 25, 2016 at 9:30am
PO Box 458, 201 N. Choctaw Ave., El Reno, OK 73036
Opening Date: April 25, 2016 at 9:30am
Commissioner's Meeting Room, 201 N. Choctaw Ave., El Reno, OK 73036

~ AFFIDAVIT~

Chiller/Boiler System / Children's Justice Center

State of Oklahoma)
County of Canadian) §

I, Sherry Murray, Purchasing Agent, in and for said County and State, do hereby certify that "Invitations to Bid" were sent to the following:

Adams Heat and Air
1101 NW 99th
Oklahoma City, OK 73114

Air Flow Technologies
PO Box 851844
Yukon, OK 73085

All Hours Plumbing Services
PO Box 12726
Oklahoma City, OK 73157

Bailey Brothers PMG, HTG & A/C Inc
800 Industrial Drive
Yukon, OK 73099-2833

Barry Sell Mechanical Tech.
3221 SW 18th Street
Oklahoma City, OK 73108

Bid Clerk
govbids@bidclerk.com

Bid News
project@bidnews.com

Brewers Heat and Air
5956 NW 34th
Oklahoma City, OK 73122

Capital Service
12900 Tracy Drive
Oklahoma City, OK 73165

Cheka Group LLC
1042 SE 25th Street
Oklahoma City, OK 73129

Central Mechanical Services Inc
1887 State Highway 92
Chickasha, OK 73018-7001

Central Mechanical Services Inc
2605 S Purdue
Oklahoma City, OK 73128

Central Oklahoma Winnelson
PO Box 2052
Oklahoma City, OK 73101

Central State Thermo King Inc
1401 Enterprise Avenue
PO Box 270543
Oklahoma City, OK 73127

Comfort Air
4917 SW 7th
Oklahoma City, OK 73128

Crick Air & Heat
PO Box 107
Hinton, OK 73047

Diversified Labor & Construction
3523 N Star Road
Stillwater, OK 74075

EDP Contract Services
Attn: Mike Modarelli
12128 Briarlake Ct
Oklahoma City, OK 73170

ePlan
4115 South Providence, Suite 105
Columbia, MO 65203

Ezell's Refrigeration
418 W Wade Street
El Reno, OK 73036

Francis Tuttle Vo-Tech Center
Attn: Bid Assistant – Judy Robbins
12777 N Rockwell
Oklahoma City, OK 73142

Gatz Mechanical Inc
PO Box 936
El Reno, OK 73036

Gentry Service & Repair Inc
12004 Southfork Road
Mustang, OK 73064

Gibbens Heating & Air
1107 Sunset Drive
El Reno, OK 73036

Harrison-Orr Air Conditioning Inc
4100 North Walnut
Oklahoma City, OK 73105-3798

Higgins Plumbing
404 Cherryvale Road
Edmond, OK 73103

Innovative Mechanical LLC
PO Box 721178
Oklahoma City, OK 73172

Integrity Restoration Specialists LLC
11532 NW 5th Street
Yukon, OK 73099

Johnson Controls Inc
4730 SW 20th Street
Oklahoma City, OK 73128

Lieber Mechanical LLC
1105 First Place Blvd
Yukon, OK 73099

Natkin
4730 SW 20th Street
Oklahoma City, OK 73128

Online Data Services
3295 River Exchange Drive, Suite 213
Norcross, GA 30092

Patrick's George Plumbing
401 SE 59th
Oklahoma City, OK 73129

Precision Plumbing Service
PO Box 734
Piedmont, OK 73078

Rainbow Heat & Air Inc
501 Cedar
Yukon, OK 73099

Reed Construction Data
30 Technology Pkwy South, Suite 100
Norcross, GA 30092

Ross Services LLC
11609 Footman's Court
Yukon, OK 73099

Smith Plumbing
12333 SW 6th Street
Yukon, OK 73099

Streets Inc
100 E Commerce
Oklahoma City, OK 73129

TA Miller Plumbing
2111 North Linn
Oklahoma City, OK 73107

Team Air
4001 North Walnut
Oklahoma City, OK 73105

Tipton's Plumbing & Sewer
708 NW 5th
Moore, OK 73160

Trane
PO Box 845053
Dallas, TX 75284-5053

Trane
305 Hudiburg Circle
Oklahoma City, OK 73108

Tuffcoat Inc
2896 Broce Drive
Norman, OK 73072

Waggoners Mechanical Services LLC
1351 E Indian Hills
Norman, OK 73071

Witness my hand and seal this 28th day of March, 2016.

Sherry Murray, Purchasing Agent

(SEAL)

CANADIAN COUNTY CLERK
OFFICIAL SEAL
EL RENO, OKLAHOMA

Canadian County
Purchasing

BID CHECKLIST

Date Issued: March 28, 2016
Bid Number: **2016-#13**
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PO Box 458, 201 N. Choctaw Ave., El Reno, OK 73036
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TO HELP PREVENT BIDS FROM BEING REJECTED FOR LACK OF COMPLETION
PLEASE CHECK FOR THE FOLLOWING:

Is the Invitation to Bid Signed and Notarized?_____

Are all applicable spaces filled in?_____

Are all necessary papers enclosed?_____

Is the Bid # and Opening Date on outside of return envelope?_____

Bids will be received beginning 9:30am Tuesday April 19 until 9:30am Monday April 25, 2016?_____
(Do not turn bid in before Tuesday April 19 @ 9:30am – bid will not be opened and considered)

Thank You,

Sherry Murray, Purchasing Agent