

Avenal State Prison Condensate Return System

Work Plan

Description of the Project:

This project includes replacing and enhancing the condensate piping system at the California Department of Corrections and Rehabilitation Avenal State Prison in Avenal, CA. The current underground steam system, which is used to heat domestic hot water as well as supplying hydronic heating of the housing units, has deteriorated to the point that the condensate is no longer returned to the Central Mechanical Plant (CMP) resulting in a large loss of water and heating energy.

The new condensate system will consist of stainless steel piping installed in aboveground locations wherever possible within the prison maintenance areas to minimize the impact of soil corrosion and for ease of access. Some portions of this piping will by necessity be located underground where roads and walkways cross the piping path. This aboveground installation will greatly enhance the reliability and efficiency of the system as will the enhancements to the underground insulation system.

Project Proponent/Partner:

Through a Joint Powers Agreement (JPA) between the City of Avenal (City) and the California Department of Corrections and Rehabilitation (CDCR), Avenal State Prison (ASP) receives its water from the City. The City's sole water supply source is Central Valley Project (CVP) water from the San Luis Canal through an allocation from the United States Bureau of Reclamation (BOR). All of Avenal's CVP water supply is used for Municipal & Irrigation purposes. Under the JPA, the City supplies ASP with 1,411 AF of water annually. The City also provides water service to the urbanized portions of Avenal and a limited number of connections in the northern portion of the community. CVP water is treated at the City's water treatment plant prior to distribution to local water users. Avenal does not pump groundwater as the poor quality of the groundwater and its high concentrations of sulfate, nitrates, and sodium preclude its use for domestic purposes¹.

In 2014, the drought had an immediate impact on the City upon receipt of notice from the BOR that their allocation had been reduced by 50% and water for the City and ASP would run out early². However in September, the City received an emergency allotment of 450 AF to last through March 1, 2015 when the BOR will announce the 2015-2106 allocations³. The status of

¹ Central Valley Project Interim Renewal Contracts for the Cities of Avenal, Coalinga, Huron and the California Department of Fish and Game 2013-2015, http://www.usbr.gov/mp/nepa/documentShow.cfm?Doc_ID=11352

² Letter from City of Avenal to ASP Warden Clifford, see ATT3_WE14_CDCR_WorkPlan_3of3

³ http://hanfordsentinel.com/news/local/avenal-gets-badly-needed-water-boost/article_7569635b-781b-5b97-ada-31d9362528f4.html

the drought and the unknown allocation in the upcoming year make this project a priority for the City and for CDCR.

This project has previously been advertised by CDCR and Aircon Energy, Inc. (Aircon), one of the CDCR pre-qualified Energy Service Companies (ESCOs), was selected as the contractor for the engineering design and construction of this project. Aircon is an ESCO specializing in energy savings design and infrastructure projects within the State of California. CDCR also has a pre-qualified pool of Architect and Engineering consultants and TMAD TAYLOR & GAINES Corp. (TTG) has been assigned to review Aircon's design to ensure the system will perform as expected. The notice to proceed (NTP) with construction is contingent upon receipt by CDCR of fully approved drawings and specifications. Once the NTP has been issued by CDCR, Aircon will mobilize and begin construction.

Work Plan Tasks

Task 1: Direct Project Administration and Reporting:

Progress reports will be issued by Aircon's Project Manager to the CDCR Project Manager on a weekly basis to keep the facility informed of current progress as well as upcoming work that may impinge on operational systems within the facility. Invoicing will be done on a monthly basis based upon the initial schedule of values and the percentage of completion of each section as detailed in the progress reports.

Task 2: Easement(s):

All work will be performed on the interior grounds of the Avenal State Prison (ASP) facility and will not require easements.

Task 3: Project Evaluation/Design/Engineering:

Aircon has received a notice to proceed for the engineering portion of this project. The engineering includes evaluating steam network loads and sizing equipment including pumping systems to optimize the energy usage for the domestic hot water and hydronic systems at the facility. This process includes 30%, 90% and 100% submittals consisting of drawings and specifications to be reviewed by the CDCR internal Architect & Engineering design group as well as by TTG.

Throughout construction, TTG will continue to provide design and submittal review and will develop the commissioning plan. CDCR will also utilize their internal Inspection Services Section to perform routine inspections of construction techniques and performance.

CDCR also has a partnership with the California Investor Owned Utilities (IOUs) and PG&E will provide a rebate/incentive for the project, which is subtracted from the cost of the

project. PG&E provides Energy Incentive Program Measurement and Verification (M&V) with an independent third party engineering firm upon completion of the project.

Costing and scheduling are estimated based on the current 30% design level although the final construction cost estimate will follow delivery of the engineering portion of this project which is scheduled for completion in January 2015.

Task 4: Environmental Documentation:

All construction involves replacement of existing equipment/piping within the Avenal State Prison and any environmental documentation required will be processed by CDCR. A negative declaration, a mitigated declaration, or an Environmental Impact Report (EIR) will be prepared as applicable. Pursuant to the California Environmental Quality Act (CEQA), CDCR will distribute and make available its CEQA documents for public review.

Task 5: Permitting:

Project permitting will be achieved as applicable.

Task 6: Proposal Monitoring Plan:

Once construction has been completed, condensate return will be quantifiable due to the new equipment installed and the system will easily be monitored to determine energy/water savings. Refer to Attachment 6 Proposal Monitoring for additional details regarding Aircon's M&V methodology.

Task 7: Project Construction/Implementation:

This project includes replacing approximately 7,600 linear feet of condensate piping with stainless steel piping mainly installed aboveground to allow for ease of access as well as extending the life of the piping. All supports, expansion joints, trenching, etc. as necessary for a complete system will be included as shown on the approved drawings and specifications. Throughout construction, inspections will be performed by CDCR's internal Inspection Services Section.

Condensate Return Piping System Scope of Work:

1. Furnish labor, equipment and materials and perform operations in connection with trench excavation and backfilling required to install the steam supply and condensate return pipes.
2. Aircon Project Manager and facility operator to coordinate a project schedule, prior to beginning any work.

3. All work shall be installed in accordance with 2013 Edition of the California Plumbing Code and California Mechanical Code.
4. Below grade pipe insulation shall be Gilsulate 500XR pour-in-place insulation.
 - Insulation shall satisfy U.S. Military Standards (UFGS 33.61.13).
 - Product provides improved thermal protection, corrosion protection, with high resistance to water penetration.
 - Insulation for the condensate return (200°F) shall be a minimum of 2.5" thickness.
5. Above grade pipe insulation shall be fiberglass with the minimum thicknesses as required by the 2013 Title 24 requirements as published by the California Energy Commission on July 01, 2014.
 - First layer of insulation shall be without service jacket.
 - Second layer of insulation shall be with service jacket.
 - Joints in first and second layer shall not be aligned.
 - Exterior jacket shall be epoxy coated 0.016" aluminum with an integral moisture barrier banded in place approved for use outdoors and joint shall be at the bottom of the jacket.
 - All joints shall be fully sealed and installation shall be executed in a manner consistent with the manufacturer's recommendations.
 - Insulation shall be provided by a company with a minimum of five years' experience and shall be a company similar to Owens Corning, Johns Manville, Knauf, or Frost King.

FLUID TEMPERATURE RANGE (°F)	CONDUCTIVITY RANGE (in Btu-inch per hour per square)	INSULATION MEAN RATING TEMPERATURE (°F)	NOMINAL PIPE DIAMETER (in inches)				
			1 and less	1 to <1.5	1.5 to < 4	4 to < 8	8 and larger
			INSULATION THICKNESS REQUIRED (in inches)				
Above 350	0.32-0.34	250	4	5.0	5.0	5.0	5.0
251-350	0.29-0.31	200	3	4.0	4.5	4.5	4.5
201-250	0.27-0.30	150	2	2.5	2.5	3.0	3.0
141-200	0.25-0.29	125	1	1.5	2.0	2.0	2.0
105-140	0.22-0.28	100	1	1.0	1.5	1.5	1.5

6. Piping supports.

- Aboveground pipe rack will be designed for three pipes to transfer condensate back to the CMP. Pipe supports will be located at 8'-0" centers.
- Supports to be galvanized steel for corrosion resistance.
- Details for the support design are as shown on piping drawings.

7. Land Survey

- To be accomplished by Aircon to determine routing, grades and location of interferences.
- Review "as-built" drawings and interview CDCR maintenance personnel to locate underground interferences.
- Aircon shall utilize an electronic pipe locator and a magnetic locator to aid in locating existing pipe lines or other obstructions.

8. Perform all trench excavation and backfilling activities in accordance with the Occupational Safety and Health Act of 1970 (PL 91-596), as amended. Particular attention paid to the Safety and Health Regulations Part 1926, Subpart P "Excavation, Trenching & Shoring" as described in OSHA publication 2226.

9. Pipe Trenching

- Trenches shall be maintained dry until final field closure is complete.
- All excavations shall be dewatered properly before laying pipe.
- The sides of all trenches and excavation for water pipes and structures shall be securely held by stay bracing, or by skeleton or solid sheeting and bracing, if necessary as required by the soil conditions encountered.

10. Pipe Backfill

- All trenches shall be backfilled immediately after pipes are laid, joints have been inspected and insulation has been compacted and completed.
- Piping to be temporarily supported as Gilsulate 500XR insulating granules will be placed and tamped in the preformed sheetrock form within the trench to provide uniform bedding for the piping structure.
- Temporary supports will then be removed as the remainder of the insulation will be added to maintain a minimum required of 4 ½" layer around all piping while maintaining a level surface over the top of the piping.

- Once the system is in place, the trenches shall be carefully backfilled with the remainder of the backfill which shall be void of large rocks and foreign material.
- In street and road right-of-ways, yards and other traveled areas, accessible to vehicles or pedestrian travel, the ditch shall be backfilled and each layer shall be tamped to a density equivalent to at least 95% of the Standard Proctor maximum dry density in accordance with ASTM D 698, as amended to date.
- Areas requiring pavement replacement shall require mechanical tamping of all backfilling of excavated portions. After backfilling and tamping is completed, the top ten inches (10") of the ditch shall be backfilled with Compacted Crushed Stone, ASTM C 33, as amended to date. Further compaction shall be accomplished by leaving the backfilled trench open to traffic while maintaining the surface area with stone. Settlement in trenches shall be refilled with stone and such maintenance shall continue until replacement of pavement with the use of a slurry patch.
- Other areas (not accessible to vehicles) shall be backfilled by placing fill in ditch and "walking-in" with wheel loaded equipment. Backfill material shall be windrowed and maintained in a suitable manner so as to concentrate and pond rainfall runoff over the trench.
- After sufficient settlement has been obtained, Aircon shall complete surface dressing, remove surplus material and clean up.
- Wherever trenches have not been properly filled, or if settlement occurs, they shall be refilled, smoothed and finally made to conform to the surface of the ground.
- Backfilling shall be carefully performed and the original surface restored.
- After sufficient settlement has been obtained Aircon shall complete surface dressing, dispose of surplus material (spoils) carefully per code.
- No scattered excavated material shall be allowed to remain on site.

11. Connection of the new piping to the existing piping to occur inside the individual buildings.

- Make safe for reconnection.
- Care shall be given to prevent damage to the existing system.

12. Crane and heavy equipment time shall be included in this project.

13. Aircon shall be responsible for providing all rigging, hoisting and lifting as required for the piping installation.

14. Direct-buried Condensate Return and Steam Piping

14.1. Piping System

- Condensate return pipe fittings below grade shall be SCH 80 stainless steel butt welded
- Depth of the burial system shall be as deemed necessary by Aircon to avoid other underground utilities in certain spots and to a minimum depth of 24" below grade to the top of the piping prior to adding pavement (if required).
- Condensate return piping also referred to as service pipe, and/or piping system.
- The original design conditions for the Condensate system are 35 psig and 275°F.
- The system shall be furnished with sufficient flexibility to avoid large stresses from thermal growth in accordance with ASME B31.1 latest addition.
- Provide isolation valves (gate valves) on all branch connections to the main piping runs.
- Provide pressure gages at the outlet side of all condensate valves.
- The service piping shall be hydrostatically tested to 1 ½ times the operating pressure, for a minimum of 24 hours.
- Bollards to be located in high traffic areas as shown on piping drawings. Bollard construction and anchoring as shown in construction details.

14.2. Quality Assurance

- Welding Qualifications: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code IX.
- ASME Compliance: Comply with ASME B31.1, "Power Piping," for materials, products, and installation.
- ASME Compliance: Safety valves and pressure vessels shall bear appropriate ASME labels.

14.3. Delivery, Storage and Handling

- The piping system shall be supplied with end caps covering each pipe end to prevent the ingress of dirt, moisture, rodents and other contaminants.
- All materials are to be stored in a predetermined fenced in area outside the fence of the Institution near the main sally port area.
- All deliveries will be received at the predetermined construction yard area and will be transported into the facility daily or as needed.

14.4. Materials

14.4.1. Above Grade Pipe & Fittings

- All pipe and fittings shall be fabricated in accordance with ASTM A53, Grade B, Type E (electric-resistance welded) or ASTM A106, Grade B, Type S (seamless).
- Condensate piping shall be Schedule 40 stainless steel.
 - Diameter based on design drawings, square cut for socket welding.
 - The service pipe fittings shall be ASTM [A234 WPB butt weld in accordance with ASME/ANSI B16.9

14.4.2. Below Grade Pipe & Fittings

- All pipe and fittings shall be fabricated in accordance with ASTM A53, Grade B, Type E (electric-resistance welded) or ASTM A106, Grade B, Type S (seamless).
- Condensate piping shall be Schedule 80 stainless steel.
 - Diameter based on design drawings, square cut for socket welding.
 - The service pipe fittings shall be ASTM [A234 WPB butt weld in accordance with ASME/ANSI B16.9

14.5. Aircon shall provide sleeves, openings, cutting, and patching needed for the installation of the work. All cutting and patching shall be performed with quality workmanship.

- Pipes and conduits passing through wall, floor and partitions shall be provided with sleeves, except as prohibited by code. Sleeves passing through waterproofing shall be watertight. Penetrations through fire rated construction shall be fire proofed with materials approved for the rating of the structure.

14.6. Cleaning and flushing of condensate systems

- Thoroughly clean condensate systems before placing into operation to rid systems of rust, dirt, piping compound, mill scale, oil, grease, any and all other material foreign to water being circulated.
- Exercise extreme care during construction to prevent dirt and other foreign matter from entering pipe or other parts of systems. Pipe stored on the project shall have open ends capped and equipment shall have openings fully protected. Before installation, each piece of pipe, fitting, or valve shall be visually examined and dirt removed.

- Chemicals, feeding devices and water technician services shall be furnished by CDCR who will be responsible for the complete cleaning and flushing of the systems. Provide only chemical products that are acceptable under State and local pollution control regulations.
- Final connection shall not be made to the institution/building loop system until the Chemical Contractor (provided by Aircon) has filed a report stating that the systems are clean with the Owner's representatives.

14.7. All work to be performed during normal working hours. Some down time will be required to make tie-in connections to existing equipment, coordination will occur between Aircon Project Manager and CDCR Project Manager and a site representative.

14.8. Tags and Marking: Identify piping near each valve with approved marking tape that shows direction of flow and description. Tape shall be applied per manufacturer's recommended procedures to pipe, or insulation jacket.

Task 8: Quality Assurance/Project Completion:

Quality Assurance has been built into this project on every level. During the design, CDCR's internal A&E group will provide review and TTG has been contracted to confirm the engineering components. During construction, CDCR's internal Inspection Services Section will provide regular inspections, and TTG will provide submittal review and the commissioning plan. At the completion of construction, PG&E will provide a third party engineering firm to perform Energy Incentive Program Measurement and Verification (M&V). Aircon will also implement their monitoring program as described in Attachment 6. Once the project is accepted, a notice of completion will be issued by CDCR.