

APPENDIX 2F

Water, Wastewater, and Chemical Treatment and Handling Systems Design Criteria

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2F.1 Introduction

The engineering, design, procurement, and construction activities on the project will be completed in accordance with standard engineering practices and project-specific programs/practices. An orderly sequence of events for the implementation of the project is planned consisting of the following major activities:

- Conceptual design
- Licensing and permitting
- Detailed design
- Procurement
- Construction and construction management
- Startup, testing, and checkout
- Project completion

This appendix summarizes the general design criteria for the project. These criteria form the basis of the design for the water, wastes and chemical treatment and handling systems of the project. More specific design information will be developed during detailed design development phase to support equipment and erection specifications. It is not the intent of this appendix to present the detailed design information for each component and system, but rather to summarize the codes, standards, and general criteria that will be used.

Subsection 2F.2 summarizes the applicable codes and standards, and Subsection 2F.3 includes the general criteria for design water quality, chemical conditioning, chemical storage, and wastewater treatment.

2F.2 Design Codes and Standards

The design of all work will be in accordance with the laws and regulations of the federal government and the State of California and local codes and ordinances. As minimum, the following codes and standards, latest editions, are applicable to the water, wastewater and chemical treatment and handling aspects of the power facility:

- ANSI B31.1 Power Piping Code
- ASME Performance Test Code 31, Ion Exchange Equipment
- American Concrete Institute (ACI)
- American Society for Testing and Materials (ASTM)
- American National Standards Institute (ANSI)
- American Institute of Steel construction: AISC Manual

- California Building Standards Code (CBSC)
- California State Environmental Protection Agency
- Institute of Electricals and electronic Engineers (IEEE)
- National Electrical Manufacturers Association (NEMA)
- National Fire Protection Code (NFPA)
- Occupational Safety and Health Administration (OSHA)
- United States Environmental Protection Agency (USEPA)
- Steel Structures Painting Council Standards (SSPC)
- Underwriters Laboratories (UL)
- Uniform Building Code
- American Waterworks Association (AWWA)

Other recognized standards will be used as required to serve as design, fabrication, and construction guidelines when not in conflict with the above-listed standards.

The codes and industry standards used for design, fabrication, and construction will be the codes and industry standards, including all addenda, in effect as stated in equipment and construction purchase or contract documents.

2F.3 General Criteria

2F.3.1 Design Water Quality

2F.3.1.1 City of Carlsbad Reclaimed and Potable Water

The City of Carlsbad will supply reclaimed water and potable water to the Carlsbad Energy Center Project (CECP). These will be used, either treated or untreated, for industrial water needs in the CECP including evaporative air cooling makeup, service water, heat recovery steam generator (HRSG) feedwater makeup, and combustion turbine power augmentation.

Typical water analyses for the water supplies are presented in Subsection 5.15.

2F.3.1.2. Water Storage Tanks

The reclaimed water will be stored in a 360,000-gallon aboveground storage tank. This tank will be supplied by a reclaimed water line adjacent to the existing rail line to the plant site from a connection to the City's system at Cannon Road and Avenida Encinas.

The potable water will be stored in a 240,000-gallon aboveground tank. This tank will be supplied by a short water line tying into the existing potable water service at the existing Encina station.

2F.3.1.3 Demineralized Water System

High-purity demineralized water will be used for HRSG steam cycle makeup and combustion turbine washes.

Target demineralized water quality will be as follows:

- Silica (total): <0.005 mg/L
- Sulfate <0.005 mg/L
- Chloride <0.005 mg/L
- Phosphate <0.005 mg/L
- Sodium <0.005 mg/L
- Specific conductivity: <0.08 microsiemen per centimeter ($\mu\text{S}/\text{cm}$)
- Total Organic carbon (TOC) <100 $\mu\text{g}/\text{L}$

Demineralized water will be produced at site by processing raw reclaim water through mobile, leased RO/mixed bed demineralizing units. Four 33 percent capacity RO trains (one standby) will be provided to produce a total of 670 gpm of demineralized water required to meet the daily peak demand of the two combined cycle units.

2F.3.1.4 Construction Water

Water for use during construction will be supplied by the City of Carlsbad reclaimed and potable water systems.

Reclaimed water will be used for the following:

- Dust suppression
- Truck and tanker wash
- Concrete mixing

Potable water will be used for the following:

- Emergency eye wash and shower
- Drinking

Estimated water consumption is approximately 200,000 to 1,400,000 gallons per day, depending on plant operations.

2F.3.1.5 Fire Protection Water

The source of water for fire protection will be potable water from the City of Carlsbad. A 240,000 gallon tank will be provided to store the fire water. This tank will also be used for providing drinking water, emergency eye wash and shower.

2F.3.1.6 Irrigation Water

Reclaimed water will be used for irrigating shrubs and grass areas at the plant site. Irrigation water will be derived from the 360,000 gallon Reclaimed Water Storage Tank

2F.3.2 Chemical Conditioning

2F.3.2.1 HRSG Make-Up Water Chemical Conditioning

To control corrosion and deposit formation in the HRSG/steam turbine cycle, ammonia solution and an oxygen scavenger will be added to the HRSG makeup water. The chemicals

will be added to the HRSG make-up water by means of automatic chemical injection systems. Each system will consist of a feed tank and two positive displacement feed pumps (one a standby). The systems will be skid mounted and will have spill/leakage containments to hold the content of a full day tank plus reserve.

2F.3.2.2 Condensate Polishing System

The condensed steam from steam turbines will be polished in mixed bed demineralizers to remove any impurities. The mixed bed demineralizers will be taken off-site by a service contractor for regeneration and replacement. The polished condensates will be recycled into the circulating boiler feed water and the operation of the mixed bed demineralizers will not generate any liquid or solid wastes on-site.

2F.3.2.3 RO/Mixed Bed Treatment

The RO/Mixed Bed treatment system, to be used to produce make-up water for HRSGs from reclaimed water, will tentatively use the following chemicals:

- A coagulant for pre-filters
- Sodium bisulfite for dechlorinating raw reclaimed water
- An anti-scalant for RO membranes
- Sodium hydroxide for pH adjustment of permeates
- Citric Acid for RO membrane cleaning

No chemicals will be required to operate the condensate polishing system

3.3 Chemical Storage and Handling

2F.3.3.1 Storage Capacity

In general, bulk chemical storage tanks will be sized to store a maximum of 2,000 gallons. One 15,000-gallon tank will be provided for each unit for the storage of aqueous ammonia for the selective catalytic reduction systems.

The chemicals for the HRSG chemical conditioning and RO system will be contained in spill proof 55-gallon drums or carbuoys and stored indoor.

2F.3.3.2 Containment

Chemical storage tanks containing corrosive fluids will be surrounded by curbing. Curbing and drain-piping design will allow a full-tank capacity spill without overflowing the curbing. For multiple tanks within the same curbed area, the largest single tank will be used to size the curbing and drain piping. For outdoor chemical containment areas, additional containment volume will be included for stormwater.

2F.3.3.3 Closed Drains

Waste piping for volatile liquids and wastes with offensive odors will use closed drains to control noxious fumes and vapors.

2F.3.3.4 Coatings

Tanks, piping, and curbing for chemical storage applications will be provided with a protective coating system. The specific requirements for selection of an appropriate coating will be identified prior to equipment and construction contract procurements.

2F.3.4 Wastewater Treatment

Periodically, metal cleaning wastes from pre-operational and operational chemical cleaning of the HRSGs and miscellaneous equipment will be collected, treated, and disposed of offsite by the chemical cleaning contractor. RO water treatment reject discharge and sanitary wastewater will be collected and discharged into the City of Carlsbad sewer system.

Miscellaneous plant wastes and evaporative cooler and HRSG blowdowns will be recycled and reused for process.