



Design Contract Requirements for EchoWater Projects

Sacramento Regional County Sanitation District

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1.0 Introduction

1.1 Purpose

The purpose of the **Design Contract Requirements for EchoWater Projects** is to establish an understanding of content requirements for contract documents (plans and specifications) produced for Sacramento Regional County Sanitation District (District) projects under the EchoWater Project at the Sacramento Regional Wastewater Treatment Plant (SRWTP).

1.2 Relationship with Other District Design Standards

This document is one component in a suite of District Design Standards. The standards are created and maintained in order to provide consistency and efficiency among design projects within the District. The standards clearly document requirements, issues, decisions, products, procedures, etc. that have reached general consensus of District staff.

Each component of the standards is targeted for a specific purpose. The purpose of this document is as stated above. The additional major components of the District Design Standards include:

- **Design Guidelines** – Describes discipline-specific District design preferences above and beyond applicable codes and standards.
- **Guide Specifications** – A library of contract requirements and technical specifications available for project use.
- **CAD/BIM Standards** – Standards to be used on computer aided drafting (CAD) drawings and Building Information Model (BIM) requirements for data and file management.
- **Standard Drawings and Typical Details** – A library of CAD drawings common across all projects and typically used details available for use by the Designer.
- **Operations Manual Development Guide** – Presents the level of effort required, from the Design Consultant, to develop an Operations Manual for each project. In addition to providing details of the respective project, the Operations Manual must also include details of the interconnections to the existing SRWTP or other EchoWater projects. The Operations Manual will serve as a teaching and reference tool for Regional San.
- **Commissioning Plan Preparation Guide** – Describes the level of effort the District requires of the Design Engineer to develop plans for subsequent use and implementation by the Contractor during facility commissioning and startup.

Other guidance documents that aid in the execution of the work are available for reference, as appropriate. Additional requirements related to design execution, deliverables, and designer coordination with the EchoWater Project Program Management Office (PMO) and District staff will be contained in the Request for Proposal (RFP) for the specific design project.

1.3 Organization of District Design Contract Requirements

This District Design Contract Requirements document is organized as follows:

- Chapter 1 provides an introduction to this document.
- Chapter 2 discusses interaction with District and general design topics.
- Chapter 3 presents general requirements for drawings and modeling.
- Chapter 4 presents general requirements for specifications.
- Chapter 5 presents general requirements for calculations.

1.4 Deviations to District Design Contract Requirements

It is recognized that not all design contract requirements may be applicable or appropriate for each design project. When the Designer believes a project-specific deviation is warranted, the Designer shall identify the item to appropriate District staff during the negotiations of project scope and budget. The mutually agreed language, as incorporated into the final scope and budget, shall then supersede these Design Contract Requirements.

During the course of the design development, deviations to these Design Contract Requirements may be permitted or required if mutually agreed upon by the Designer and the PMO. If warranted, project scope, budget and schedule will be revised. Upon completion of design and bid phases, the Designer and District staff may wish to conduct a project debrief to identify areas that worked well and/or need improvement.

2.0 Interaction with the PMO and General Design Topics

2.1 Project Team Concept

For each District design project, a Project Team is assembled. The leader of the Project Team is a PMO project manager (PM) for EchoWater Projects.

Members of the Project Team include staff who represent District Engineering, Operations and Maintenance (O&M), Operations Support, District Resident Engineer's office, the project Designers (in-house or consultant team), EchoWater Project PMO staff, and others, as applicable. The Project Team is responsible for the successful completion of the project.

The PM serves as the principal point of contact for the Designer on all issues related to project execution, including coordination of activities between the Designer and the PMO. The PM and Designer shall work to identify specific project needs. The entire Project Team shall work on the timely resolution of issues.

2.2 Design Responsibility

The project Designer shall be responsible for the professional quality, technical accuracy, and coordination of all project documents. The engineering design and contract documents shall

comply with all applicable codes, standards, and industry practices. District review or acceptance of the project design shall not relieve the Designer of design responsibility.

2.3 Construction Sequence

The project shall be designed so that it can be constructed with minimum adverse impacts on existing operations. This includes all connections to existing plant processes, utilities, auxiliary systems, instrumentation and controls, electrical and computer systems, and structures. The construction sequence shall ensure that there is a means for the Contractor to do the work without undue difficulty. If the work has challenges, the sequence shall identify those challenges and constraints.

The designers shall prepare a Construction/Operations Sequencing Plan for use in discussions with District staff. The plan shall include:

- Specific work items and any associated Contractor constraints.
- A narrative description of at least one method for making each connection to existing infrastructure.
- Identification of process and equipment shutdown constraints.

Upon discussions with District staff who may be impacted by items in the Construction/Operations Sequencing Plan, the work items and work constraints shall be incorporated into the contract documents, including the District Guide Specification Section 01 14 00 “Work Restrictions.”

2.4 Commissioning Plan Preparation

The development of the testing and startup plan is a combined effort between the Designers, Project Team, and the District Test Team which is responsible to verify that the constructed system meets the design and operational requirements. Members of the Project Team, District Test Team, and Designers shall meet during the Design Submittal #2 (DS-2) phase to establish pass/fail criteria, contractor test requirements, and to verify the testability of the design.

The Designer shall develop a new commissioning plan and/or confirm existing test procedures for all equipment and systems. Overall system test procedures shall ensure that the design intent is satisfied. These procedures, along with the Master Equipment List, will be used by the Designer to develop the Commissioning Plan. The Designer shall prepare the Commissioning Plan and modify the technical specifications for the Contractor to describe how to implement the testing plans; in addition, the Commissioning Plan shall be made available to the Contractor as an appendix to the project specifications. Detailed requirements for the Design Consultant’s work are contained in the District’s Commissioning Plan Preparation Guide.

2.5 Standardized Equipment

The SRWTP has obtained District Board approval to standardize on certain equipment on previous projects. The rationale for accepting “sole source” items is based on several factors:

- The equipment is currently in use at the SRWTP.
- Standardized equipment results in efficient use of personnel and training.
- Consolidation of spare parts.
- Interchangeability throughout the SRWTP.
- Operational reliability.
- Significant consequences for not standardizing on equipment.

A list of current SRWTP standardized equipment is provided in Appendix A. When warranted, the District will evaluate and modify the list of standardized equipment. Technical specifications for the standardized equipment have been prepared and are available as part of the District Guide Specifications library.

2.6 Designer Proposed Alternates

When materials and installation techniques previously adopted by the District are not appropriate for the proposed project or when the Designer believes that an alternate material or technique would be more efficient, reliable or cost effective, the Designer shall provide to the PMO for approval the following material:

- Manufacturer’s catalog and application data for both or all alternatives,
- Manufacturer’s representatives name and telephone number,
- At least one location where the material or installation technique has been successfully employed for a minimum of 3 years, and
- An analysis comparing life cycle costs, both capital and O&M, for each alternative.

The Designer and PM should attempt to identify need or opportunities for designer proposed alternates before the completion of the pre-design phase.

3.0 Documents

During the course of a design, written documents shall be produced to document the project. The Designer shall coordinate with the PMO and obtain templates for each document type.

Upon request, the electronic file of any report, letter, memo, drawing, or other document shall be delivered to the District. In general, the Designer shall prepare draft and final copies of each document. The Project Team shall review each draft version and provide comments. The PMO PM will collate and resolve any conflicts in the comments before forwarding them to the Designer. The Designer shall address each comment and provide a written response in PMWeb.

3.1 Technical Memoranda

Technical memoranda (TM) shall be written to address project specific issues. The TMs shall include background information, discussion on available alternatives and options, tables listing pros and cons, life cycle cost analysis (if appropriate) and a recommendation.

TMs shall be prepared by the Designer and reviewed by the Project Team. A draft TM shall be initially released once the Designer has completed investigations, evaluations, and recommendations. The Project Team will review the draft TM for completeness, clarification or further investigation. Comments will be routed through the PMO PM who will collate the comments before returning them to the Designer. The Designer shall respond to all written comments in PMWeb. A final draft TM, with the review comments addressed, shall be delivered to the PMO PM. The PMO PM will be responsible to review the final draft and coordinate with other Project Team members as necessary. All final comments will be returned to the Designer.

All completed technical memoranda shall be distributed to the Project Team. For TMs produced during the preliminary design phase, the final TMs shall be included in the preliminary design report. Any TM completed after the preliminary design phase shall be distributed under separate cover, or incorporated in the Project Design Manual.

The technical memoranda shall be prepared and submitted to the PMO for review as they are completed and subsequently discussed in detail through a series of review meetings and workshops. The District's intention is for all significant equipment decisions to be made before the start of Final Design. At the end of Preliminary Design, major design elements should be fixed and major equipment, building footprints, major structural elements and process pipelines should be well defined and established. The extent of the design and the number and type of drawings should also be established.

3.2 Preliminary Design Report

The preliminary design report (PDR) is the tool to identify key design features of the project. The purpose of the PDR is to present the project while it is still in its conceptual form. These concepts shall be aligned with the project objectives with regard to intent, budget, and schedule. Once the concepts are approved, the project can proceed into final design.

The PDR shall consist of a series of TMs that document the conceptual design of the proposed facilities and a separate package that includes all drawings associated with the PDR.

Documents that must accompany the PDR include the following:

- Decision Log (using PMWeb with the following minimum number of headings: item number, date, item action description, decision, action by and related discipline),
- Meeting and workshop notes in PMWeb, and

- Project Support Documentation including calculations, information research and other required materials and construction costs and backup data related to Risk Management Plan.

The Project Team will review the preliminary design report to confirm that the direction of the project is accurately documented and meets the criteria/goals established for the project. The draft PDR will also be reviewed for completeness, clarification or further investigation. Comments on the draft PDR will be routed through the PMO PM who will collate the comments before returning them to the Designer to produce a final PDR. Project Team members will accept response to comments in PMWeb to indicate their approval. The final PDR shall be submitted via PMWeb.

3.3 Project Design Manual

A Project Design Manual (PDM) shall be prepared for each project and updated as the design progresses. The PDM shall be a reference document of key project information, and shall provide rationale for the design. The PDM shall contain all pertinent design criteria, schematic layout drawings, process schematic diagrams, narratives of the process elements, hydraulic profiles, utility system elements (narratives and schematics), and all provisions made to accommodate future expansions. Since much of this information is initially included in the PDR and associated TMs, the PDM may be initiated during Design Submittal #1 (DS-1) to document changes after finalization of the PDR.

Where appropriate to avoid redundancy, the PDM may reference calculations, specifications, and drawings. The PDM shall also contain information, decisions, and rationale on specific design discipline features. The PDM shall be tabbed and bound in a three-ring binder(s) to allow for future updates.

The PDM shall be updated at each design submittal (DS-1, DS-2 and DS-3). The updates shall provide more detail as the project design progresses. The goal is to have an updated PDM that complements the completed project plans and specifications. The PDM is not a construction contract document.

3.4 Equipment Numbering and Location Identification System and Related Asset Management Databases

An equipment number and location identification auto-numbering system has been established for District facilities. All new equipment shall be numbered in accordance with that system. The system consists of a standardized list of equipment prefixes and a unique identifying number related to the location within the facility.

The Designer shall allocate time and resources to become familiar with the auto-numbering system, in general, and to work with the Project Team and other District staff to develop an appropriate project-specific numbering scheme. A block of equipment numbers have been reserved for specific process areas and are shown on common contract drawing GI601. Designer shall use the block of equipment numbers and develop a numbering scheme.

Regional San will review and approve the numbering scheme prior to its detailed use throughout the project.

Asset data from process and piping schematics and process and instrumentation diagrams (P&IDs) shall be extracted to a project database, as outlined in the CAD/BIM Standards. This shall be automated process using workflow and software selected by the Designer to maximize efficiency of data transfer and minimize discrepancies. .

3.4.1 Master Equipment List

The District maintains a Master Equipment List (MEL) for the SRWTP. This list is a compilation of equipment information from past projects, and is used for ongoing operation and maintenance needs.

The Designer shall use the project asset database to prepare a project-specific MEL which records specific information for each piece of mechanical, electrical, and instrumentation equipment (including all accessories), as well as, each manual valve, slide gate, process manhole, electrical manhole and handhole, control unit, and utility station. All existing equipment abandoned in place, demolished, replaced, relocated, renumbered, or modified by the project, as well as all future equipment, shall also be included. A designated person on the Designer staff shall assign equipment numbers and location ID's, and add them to the project-specific MEL as they are assigned. Prior to DS-1, designer shall define the numbering strategy with the District and use this to assign tag numbers.

The Designer shall work with the Project Team and other District staff to develop a project specific MEL that will record the appropriate information for future uses. Designers are provided an Asset Metadata Spreadsheet to generate the initial MEL for DS-1. Specific instructions on using the Asset Metadata spreadsheet are included with this file. Asset Metadata Spreadsheet generates individual tabs for each asset classification which contain all the required columns and asset class information required for importing data into the District Computerized Maintenance Management System (CMMS). The Asset Metadata spreadsheet can be populated by importing the Data directly from AutoCAD P&ID or REVIT database or manually. If MEL is developed manually, designer is to fill out Asset Classifications tabs first which auto-populates the MEL. Designer shall use "Miscellaneous" tab for unknown asset Classifications. District would classify these assets.

Designer shall review the data requirements associated with the Asset Metadata Spreadsheet to develop a scope for managing the data.

The incorporation of the project-specific MEL into the SRWTP-wide MEL is the responsibility of the District.

3.4.2 MEL Review and Maintenance-Managed Items

After the initial submittal of the MEL and during the DS-2 phase, Regional San will review MEL and verify the equipment numbering, classify unclassified equipment and identify Maintenance Managed Items. District will identify MMIs by including a “Y” the MMI column for each Asset Classification Tabs in the Asset Metadata Spreadsheet.

Designer shall re-submit MEL and Asset Metadata spreadsheet as part of the next design submittal (DS-2 and DS-3). Designer shall identify Assets that have been added or removed as the design progresses by highlighting/flagging the new and/or deleted asset using an exceptions list so the District can make the necessary revisions in their CMMS system.

3.4.3 Equipment Data Forms

Equipment data form templates have been developed for each asset classification as part of the guide specifications. The equipment data forms are used to obtain asset attribute data during construction from the Contractor. Designer shall incorporate all relevant data forms in the contract specifications.

3.5 Reliability Centered Design (RCD) Documentation

Designer will utilize the approach to RCD described in the Reliability Centered Design Implementation Guide, to document that the design process is based in RCD principles. The Designer will integrate O&M requirements into the design process; implement a systematic approach to maximize treatment process availability by increasing asset reliability, operability and maintainability; and establish criticality-based decision making on asset redundancy and spares inventory.

During the planning phase (Basis of Design Report), the Designer will participate with District staff in a facilitated workshop for an initial screening of process systems and primary system functions that will require RCD analysis. Since draft P&IDs are usually initiated during the subsequent PDR phase (see below), this initial screening will be general in nature, with more detailed identification of systems and functions later, when P&IDs are available.

During the PDR, Designer will prepare the RCD-based information described in the Reliability Centered Design Implementation Guide, including preliminary P&IDs; participate in a facilitated workshop for failure mode analysis of major systems; and prepare a TM documenting how RCD principles will be incorporated into the design.

During DS-2 preparation, Designer will validate prior RCD conclusions and implementation steps; participate in a facilitated workshop; perform reliability centered maintenance (RCM) analysis; develop documents for implementation of RCM, as described in the District’s Reliability Centered Design Implementation Guide, and document RCD and RCM principles of design in a TM.

4.0 Drawings

The District has developed CAD/BIM Standards that set the minimum requirements for CAD drawings and BIM data that are to be used in District construction contracts. In addition, the CAD/BIM Standards describe requirements for the organization and content of the contract drawing set. The purpose of these standards is to provide designers and construction contractors with the information required to ensure that the District will receive CAD documents and BIM data that will comply with the minimum acceptable standards in use at the District's facilities.

These standards shall be followed by all designers. Exceptions to the standards must be submitted in writing prior to implementation for specific approval by the PMO PM. Once issued to the project, the impact of any later updates or revisions to the design scope, budget and schedule will be discussed between the Designer and PMO, before proceeding with the changes.

4.1 General

Drawings shall be submitted with each design submittal as outlined in the District CAD/BIM Standards. In addition to the drawing submittals, designer is to submit both native and federated models for review at each submittal. Refer to the District CAD/BIM Standards for specific submittal requirements for federated models and associated review procedures.

The Designer may request the viewing of drawings from previous design projects in order to obtain, in general, the quality and level of detail expected. The Designer is cautioned that some details may be inappropriate for the current project due to technological advances, outdated standards, new preferences, etc. The Designer shall verify, with the PMO PM, the level of detail to be provided on the drawings at each submittal stage, and shall develop and maintain a Design Drawing Submittal Content Inventory matrix similar to the example contained in Appendix B.

In general, the level of design development for the model files and associated drawings at each submittal stage shall meet the following minimum guidelines:

- PDR Drawing Set – Schematic design, including process flow diagrams, hydraulic profiles, process and piping schematics, P&IDs, and single line diagrams shall be developed to a level of detail to allow a thorough understanding of the design intent, operational flexibility, and provisions for future modifications. Physical layout drawings, including plans and sections for all disciplines, shall be developed to a level that allows for a determination of space requirements, clearances, access, provisions for future facilities, and sufficient detail for a construction cost estimate at the PDR level of accuracy.
- DS-1 – Schematic design shall be completed, including annotations and tagging, allowing reliable use of the schematic drawings for development of physical layout drawings (plans, sections and details) and design data development, such as equipment

and instrument lists. Final dimensions, including slab and wall thicknesses, shall be indicated on all plan and section views, and information such as re-bar placement, allowing for a detailed quantity take-off shall be included.

- DS-2 – The entire drawing set shall be at approximately a 90 percent level of completion, with 100 percent of the planned contract drawing set included in the submittal; i.e., no missing drawings, and the majority of line work and call-outs completed. Remaining work on drawings after DS-2 shall generally be annotations that are not needed for a thorough understanding of the concepts, layouts, construction cost, and construction schedule.
- DS-3 – The entire drawing set shall be 100 percent complete, ready for final review and coordination checking.

4.2 District Common Contract Drawings

The District maintains a set of drawings that are commonly included in the contract documents. These drawings present information that remains constant from project to project, or represent project-specific information relative to existing facilities. These drawings are available to the Designer with the intent that only minor work (such as updating the border information, showing the project site, adding project specific information, etc.) is required.

4.3 District Typical Details

The District maintains a library of typical details. The typical details represent construction details grouped by design discipline. These details are available in AutoCAD format and may be used on project drawings. The Designer may request a hardcopy catalog and/or electronic copy of the current details. Once the typical details have been issued to the Designer, it is the intent that the details are not to be modified by either the Designer or the Project Team unless there is compelling reason to do so. However, the Designer is responsible for reviewing all typical details for applicability to the specific project.

4.4 District Example Diagrams

The District maintains a set of example diagrams that are intended to show the construction contractor the level of detail to provide on certain contractor-furnished electrical, instrumentation and control drawings. The Designer shall incorporate these example diagrams without modification. The Designer may supplement these diagrams for particular project needs, such as sample PLC or workstation screen configurations.

Although intended as a reference for construction contractors, the Designer should review the District Example Diagrams when preparing project-specific drawings that depict details similar to the example diagrams. Possible project-specific drawings may include, but are not limited to, typical discrete and analog loops, interconnection wiring diagrams, and control panel drawings.

5.0 Specifications

The District maintains a library of guide specifications, which follows the Construction Specifications Institute (CSI) Masterformat 50 Division Specification numbering.

The Designers shall prepare and assemble specifications relevant to the project. The Guide Specifications Library shall be the primary source for specifications. If a particular specification section does not exist, the Designer shall develop new specifications to match District standards. The specifications shall be coordinated with the Project Team, as described in the sections below.

For the bid set and conformed set, a limited number of copies of the specifications shall be printed and spiral bound for internal use by SRWTP and PMO staff. Bid sets will be provided (sold) to prospective bidders in CD/DVD format only, no hard copies will be produced.

Specifications shall be prepared using the latest version of Microsoft Word in use by the District. When editing District Guide Specifications, the “track changes” feature for highlighting additions and deletions shall be turned on. Changes shall be highlighted in each design submittal. The “track changes” feature shall be turned off for the check set print between DS-3 and the bid set, and all “track changes” shall be accepted as modified for the bid set.

5.1 General Conditions

The contract general conditions (GCs) address bidding and contract administration functions. Given the nature of topics covered, the Project Team shall not modify the GCs unless specifically identified to do so. Examples of project-specific information that will be furnished by the Project Team include bid schedule, work constraints, and time of completion. If changes to the GCs are necessary, the PMO shall be consulted.

5.2 Technical Specifications

The District Guide Specifications address technical construction aspects of the specifications. The guide specifications are intended to serve as a starting point for the Designer and to assist in the development of the project specifications; however, the content shall not be significantly altered without the consent of the PMO. The District does recognize the need to tailor or create specifications for specific projects, and will assist the Project Team in preparing technical specifications for the project. The Designer shall forward to the PMO PM a list of all reference material, codes and/or standards which are referenced in new specification sections.

5.3 Manufacturer’s Catalog Information

The Designers shall obtain manufacturer catalog information for all proposed products and equipment not previously identified in the District Guide Specifications. The information shall be of sufficient detail to allow the Project Team to decide whether or not to allow the item in the project specifications. If the decision is to allow the item into the project specifications, the

Designer shall forward an original copy of the manufacturer's catalog information to the PMO PM.

5.4 Electrical Specification Schedules

Certain electrical specification sections will include schedules generated specifically for each project. Some sections contain lead-in information, such as an explanation or applicable definitions used in the schedule. Samples of these specification sections are part of the Guide Specifications library.

Presented below is a description of each schedule.

5.4.1 Raceway Schedule

The District Guide Specifications contain a schedule of existing raceways to be removed, abandoned in place, or reused. They also contain a schedule of new raceways to be provided and existing raceways to be reused. The raceway and cable (as discussed below) information shall be maintained in a single database format. Each raceway schedule shall depict the following information:

- Revision
- Raceway designation
- From/To – Equipment destinations including junction boxes, pull boxes, wireways, cable tray, duct banks, hand holes, manholes, etc.
- Size of raceway
- Contains -- Cable numbers
- Reference drawings
- Notes

5.4.2 Cable Schedule

The District Guide Specifications contain a schedule of existing cable to be removed, abandoned in place, or reused. They also contain a schedule of new cable to be provided and existing cable to be reused. The raceway (as discussed above) and cable information shall be maintained in a single database format. Each cable schedule shall depict the following information:

- Revision
- Cable designation
- From/To – Equipment destinations including junction boxes, pull boxes, wireways, cable tray, duct banks, hand holes, manholes, etc.

- Routing – All intermediate raceways, boxes, etc.
- Cable type
- Number of conductors
- Size of conductors
- Size of ground conductor
- Insulation voltage rating
- Notes

5.4.3 Panelboard Schedule

The District Guide Specifications list panelboards that are to be provided or modified. For each panelboard, the following information is depicted in tabular form:

- Panelboard nameplate designation
- Location – Physical location
- Voltage, frequency, and number of phases, withstand rating
- Phase and ground bus ampacity
- Main interruption device ampacity, and AIC rating
- Branch interrupting device ratings; ampacity and number of poles
- Load on each branch circuit
- Description of branch circuit load
- Total load per phase
- Total load
- Current per phase
- Notes – Drawing references

The District has a design standard for documenting panelboard schedules. A Microsoft Excel spreadsheet shall be obtained from the PMO. The filename is “SRWTP Panelboard Schedule Template.xls.” See the file for more specific instructions.

5.4.4 Motor Control Center Schedule

The District Guide Specifications list motor control centers (MCCs) to be provided or modified. For each MCC, the following information is depicted in tabular form on the drawings:

- MCC designation nameplate

- Nominal operating voltage, number of phases, and wires
- Horizontal and vertical bus ampacities
- Bus fault bracing
- Cubicle location or designation
- Equipment number
- Location I.D.
- Equipment title nameplate
- Hp or kVA rating
- Interrupter type, number of poles, and trip rating
- Starter type and size
- Control or wiring diagram (manufacturer's drawings)
- Notes
- Connected load calculation
- NEC load calculation

In addition, a front elevation drawing of the MCC shall be provided on the drawings. The drawing shall show MCC dimensions and cubicle layout with designations.

5.5 Process Control Specification Schedules

Presented below are certain process control specification sections that include schedules generated specifically for each project. Samples of these specification sections are part of the Guide Specifications library.

5.5.1 Instrument Schedule

The District Guide Specifications list instruments required by the control system. The list is ordered by instrument loop number. For each instrument loop, a functional title is provided. Within a given loop, each instrument is listed by tag number. For each instrument, the following information is depicted:

- Revision
- Tag number
- Description
- Location
- Electrical drawing reference
- Mechanical drawing reference

- Instrument specification reference – including paragraph number
- Process and Instrumentation Diagram reference
- Control and Logic Diagram reference
- Notes – set points, ranges, units, etc.

5.5.2 Computer Input/Output Schedule

The District Guide Specifications list each computer input and output (I/O) circuit which must be wired to the ACC computer I/O subsystems and tested. This schedule also defines the specific I/O module, module personality type, and terminal numbers. The following information is sorted by ACC number and alphanumeric tag number:

- Point identification
- Description
- Type
- ACC designation with cabinet and row
- Terminal point
- P&ID and C&LD reference
- Notes
- Revision

5.5.3 Programmable Controller Input/Output Schedule

The District Guide Specifications list the input and output (I/O) points for the programmable logic controller (PLC) systems.

5.5.4 PCCS Control Strategies

The District Guide Specifications contain written descriptions of analog and discrete control functions executed by the plant computer control system (PCCS), as well as functions implemented in the ACC control panels and field instruments. These control strategies are intended as an aide to understand the overall objective of each subsystem of the control system. Control strategies shall include pertinent sequence of operation descriptions.

5.5.5 PLC Control Narratives

The District Guide Specification contains written descriptions of analog and discrete control functions executed by the PLCs contained in vendor control panels.

5.5.6 ACC Control Panel Demolition Schedule

The ACC Control Panel Demolition Schedule section of the project technical specifications lists instruments located in existing ACC control panels that are to be removed, relocated, or abandoned in-place. The schedule shall be similar to that in the District Guide Specifications.

6.0 Calculations

Design calculations shall be prepared, as necessary, for the development of the project. Calculations shall be submitted with DS-2 and with conformed documents. Two complete sets of calculations shall be submitted. The calculations shall be bound in 3-ring binders and clearly identified as to the project and design phase, and description of what is being calculated. Calculations shall be supplemented with copies of reference material pertinent to the design, such as manufacturer's data, design references, etc. If necessary, the District may request calculations to verify certain design conditions.

The calculations shall be organized by design discipline. Within each discipline, the calculations shall be broken down and identified by task. Each task shall be separated by index tabs.

The calculations submitted with conformed documents shall be stamped and signed by a California professional engineer in responsible charge for the applicable design discipline.

6.1 Computer Output

Computer output, if used, shall be included with the calculations. Information that shall be provided to adequately interpret the input and output parameters include:

- Information on computer program name, version, and producer.
- Separate calculations deriving the input variables.
- Drawings showing computer model geometry.
- Drawings/explanations to assist in interpreting the results.
- Separate calculations showing how the results are incorporated into the design.

APPENDIX A
STANDARDIZED EQUIPMENT

APPENDIX A
LIST OF STANDARDIZED EQUIPMENT ITEMS

Equipment Description	Manufacturer	Type/Model/Series	Comments
Programmable Logic Controllers (PLC)	Allen Bradley	ControlLogix Series	PLC/5 was initially installed through pre-qualification and subsequently used as basis for ACC design guide. ControlLogix Series is the manufacturer's replacement for the PLC/5 and subsequent Logix 5000 Series.
	Allen Bradley	SLC-500 Series	Alternate to PLC/5 Series for medium applications.
	Allen Bradley	Graphical User Interface (GUI)	This is recommended GUI to use with AB PLC due to unique programming and interfacing.
	Allen Bradley	RSLogix5, RSLogix 500, RSLogix 5000, Studio 5000	This is the recommended software to use with Allen Bradley PLC/5 systems for programming. The RSLogix 5000 Series is the recommended software for the new Logix 5000 Series.
PLC Interface Card	ProSoft Technology	Profibus DP V1 Master MV156-PDPMV1 Series	This is recommended communication interface card to use with Allen Bradley PLC due to the District's past use of ProSoft Technology interface cards with other network communication protocols in existing PLC-5s and the fact that District staff has been trained on the ProSoft common software.
Vibration Protection	Bently Nevada	Series 3500	Meets stringent API standards. At time of initial installation, Plant knew of no equal product. Installed BN after problems with previous vibration monitoring equipment. System is very reliable and is essential to predictive maintenance program.
	Bently Nevada	Prox Probes 3300 Series	Specialized probes for use with BN monitoring equipment.
	Bently Nevada	Velometer Probes for Acceleration	Specialized probes for use with BN monitoring equipment.
Mass Gas Flowmeters	FCI	Series GF-90	Initially selected by competitive procurement process.
Tank/Hopper Level Indicators	Siemens	MultiRanger HydroRanger	Initially selected by competitive procurement process. Electronics supports up to 6 tanks, thus reducing number of units.
Pressure Transmitters	Rosemount	Series 3051 Alpline Smart with HART Protocol	Series 3051 replaces the Series 1151 which was initially selected through competitive procurement process.
Temperature Transmitters	Rosemount	Series 3144P Smart with HART Protocol	Series 3144P replaces the Series 3044 which was initially selected through competitive procurement process. Series 3044 is no longer manufactured.
Transmit Time Flowmeters	Siemens	SITRANS FUS1010	Initially selected through competitive procurement process as part of the Grit Systems Modification Project. SITRANS FUS1010 replaces System 1010.
Uninterruptible Power Supply	Liebert	N Power (large) Nfinity (medium) GXT 2U(small)	Initially selected through competitive procurement process.
480 Volt Power Switchgear	Cutler-Hammer Westinghouse	DS II	Initially selected through competitive procurement process as part of the original SRWTP construction.
	General Electric	AKD-8	Initially selected through competitive procurement process. Accepted as an approved "or equal".
Motor Control Centers	Cutler-Hammer Westinghouse	Freedom 2100	Initially selected through competitive procurement process as part of the original SRWTP construction.

APPENDIX A
LIST OF STANDARDIZED EQUIPMENT ITEMS

Equipment Description	Manufacturer	Type/Model/Series	Comments
	General Electric	GE 8000	Initially selected through competitive procurement process.
Breakers for Switchgear Medium-Voltage Power Circuit	Cutler-Hammer/Westinghouse	Type VCP-W	Initially selected by competitive procurement process.
Contactors/Starters for medium voltage MCC	Cutler-Hammer/Westinghouse	Type SJ400	Initially selected by competitive procurement process.
Backup Controllers	Micromod Automation	Series MC5000	Initially selected through competitive procurement process as part of the original SRWTP construction. Micromod Automation replaces Fisher Porter.
Bargraph Indicators	Micromod Automation	Series 53IT5100	Initially selected through competitive procurement process as part of the original SRWTP construction. Micromod Automation replaces Fisher Porter.
Chlorine Residual Analyzers	Wallace and Tiernan	Series 2000	Plant had numerous chlorine residual discharge violations with initial analyzers. Plant field tested other available equipment and WT was selected. Instrumentation Testing Association (ITA) study confirmed reliability and accuracy.
Chlorine/Sulfite Dioxide Analyzers	Analytical Technology Inc.	Model A15/79 Model A15/66	Plant staff tested various types of direct SO2 and Cl2 analyzers to improve monitoring plant effluent for permit compliance and process control. The study recommended ATI SO2 and ATI CL2 direct read analyzers.
Sulfonators/Evaporator	Wallace and Tiernan	Series V2000 Chorinators/Sulfonator Series 50-200 Evaporator	The plant has Fischer-Porter (FP) and W&T units, competitively procured in 1982 and 1991, respectively.
Dissolved Oxygen Indicators	Royce	Series 9220	Initially selected through competitive procurement process.
AWWA Butterfly Valves	Mosser	Series 830	Initially selected through competitive procurement process.
Mechanically Cleaned Bar Screens	Headworks Inc.	MAHR Screen	Initially selected through competitive procurement process on the Bar Screen Replacement Project.
Recessed Impeller Pumps	Wemco	Model C	Initially selected through competitive procurement process.
	Twin Pumps	Model C	Twin Pumps Model C parts are interchangeable with Wemco Model C parts.
Rotary Lobe Blowers	Kaeser	Omega Blowers	Initially selected through competitive procurement process.
Air compressor	Kaeser	Lubricated Rotary Screw Compressor Series	Initially obtained through competitive procurement process.
Positive Displacement Rotary Lobe Pump	Swaby	Lobeline	Initially selected through competitive procurement process.
Electric Valve Actuators (Large)	Limitorque	Series MX	Series MX replaces the Series T, which was initially selected through competitive procurement process.
	EIM	Series TEC2000	Series TEC2000 replaces the Series 2000, which was initially selected through competitive procurement process.
	Rotork	Series IQ	Initially selected through competitive procurement process.
Fire Alarm System	Edwards	EST-3 with Fireworks Software	Initially selected through competitive procurement process.

*APPENDIX A
LIST OF STANDARDIZED EQUIPMENT ITEMS*

Equipment Description	Manufacturer	Type/Model/Series	Comments
HVAC Direct Digital Controller	Johnson Controls	FX-PCG2621	Initially selected Johnson Controls model DX-9100 by a competitive procurement process. Model DX-9100 is being phased out and replaced with model FX-PCG2621
Irrigation Controller	Rain Master	Evolution DX2	Initially selected by competitive procurement process.
Door Hardware	Best Access Systems	Cormax XD Series	A standardized door locking system to match existing and meet the District's security policy.

APPENDIX B

**EXAMPLE OF DESIGN DRAWING SUBMITTAL
CONTENT INVENTORY**

APPENDIX B
EXAMPLE OF DESIGN DRAWING SUBMITTAL
CONTENT INVENTORY

Sheet Content	PDR Content		Submittal#1 Content		Submittal #2 Content		Submittal #3 Content	
	PDF	3D Model ⁽¹⁾	PDF	3D Model ⁽¹⁾	PDF	3D Model ⁽¹⁾	PDF	3D Model ⁽¹⁾
General								
Cover	■		■		■		■	
Index of Contract Documents and Signature Sheet	■		■		■		■	
Index of Drawings	■		■		■		■	
Location and Vicinity Maps	■		■		■		■	
Existing Site and Contractor Access Road	■		■		■		■	
Standard Abbreviations	■		■		■		■	
Standard Symbols	■		■		■		■	
Standard Designations, Document Annotation Symbols, and Schedules (ie: piping systems, piping and valve numbering, plan, section, and detail referencing, etc)	■		■		■		■	
Mechanical Equipment Numbering Systems and Schedules	■		■		■		■	
Design Data	■		■		■		■	
Hydraulic Profile	■		■		■		■	
Coordinate Layout	■		■		■		■	
Site Work Key Plan	■		■		■		■	
Plant Flow Schematics	■		■		■		■	
Cathodic Protection Plans				■		■		■
Cathodic Protection Sections				■		■		■
Cathodic Protection Details and Schedules					■		■	
Civil								
Standard Designations, Symbols, and Schedules	■		■		■		■	
Standard Civil Details	■		■		■		■	
Site Plan	■	■	■	■	■	■	■	■

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	PDF	3D Model ⁽¹⁾	PDF	3D Model ⁽¹⁾	PDF	3D Model ⁽¹⁾	PDF	3D Model ⁽¹⁾
Grading and Paving Plans	■	■	■	■	■	■	■	■
Grading and Paving Sections and Details					■		■	
Outside Piping Plan			■	■	■	■	■	■
Piping Profiles			∩	■	∩	■	∩	■
Earthwork Sections			∩	■	∩	■	∩	■
Earthwork Details		□	■	□	■	□	■	□
Civil Sections, Details, Tables, and Schedules		∩		∩	■	∩	■	∩
Architectural								
General Notes	■	∩	■	∩	■	∩	■	∩
Standard Designations, Symbols and Schedules	■	∩	■	∩	■	∩	■	∩
Standard Details	■	∩	■	∩	■	∩	■	∩
Plans	■	■	■	■	■	■	■	■
Elevations	□	■	□	■	□	■	□	■
Interiors	∩		∩	■	∩	■	∩	■
Sections	∩		∩	■	∩	■	∩	■
Details		∩		∩	■	∩	■	∩
Schedules		□		□	■	□	■	□
Title 24 Compliance		∩	■	∩	■	∩	■	∩
Structural								
General Notes	■	∩	■	∩	■	∩	■	∩
Standard Designations, Symbols and Schedules	■	□	■	□	■	□	■	□
Standard Details	■	∩	■	∩	■	∩	■	∩
Plans	∩	∩	■	■	■	■	■	■

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	PDF	3D Model ⁽¹⁾	PDF	3D Model ⁽¹⁾	PDF	3D Model ⁽¹⁾	PDF	3D Model ⁽¹⁾
Sections	☐	☐	☐	■	☐	■	☐	■
Details	└	└	└	└	■	└	■	☐
Schedules	└	└	└	└	■	└	■	☐
Process								
Standard Designations, Symbols and Schedules	■		■		■		■	
Process and Piping Schematics	■		■		■		■	
Mechanical								
General Notes	■		■		■		■	
Standard Designations, Symbols and Schedules	■		■		■		■	
Standard Details	■		■		■		■	
Plans	■	■	■	■	■	■	■	■
Sections	└	■	└	■	└	■	☐	■
Details			■		■		■	
Schedules					■		■	
Plumbing Plans	■	■	■	■	■	■	■	■
Plumbing Sections	└	└	└	└	└	■	☐	■
Plumbing Details	└	└	└	└	■	└	■	☐
Fire Sprinkler Riser Plan	☐		■		■		■	
Fire Sprinkler Riser Sections and Details	└		└		■		■	
Heating, Ventilation and Air Conditioning								
Standard Designations, Symbols and Schedules	■		■		■		■	
HVAC Details	└		└		■		■	
Airflow Schematics	■		■		■		■	
Temperature Control Diagrams	└		└		■		■	

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HVAC Plans	☐	☐	■	■	■	■	■	■
HVAC Sections	└	└	└	■	└	■	└	■
HVAC Details	└		■		■		■	
Electrical								
Standard Designations, Symbols and Schedules	■		■		■		■	
Electrical Details	■		■		■		■	
Elementary Diagrams	└		■		■		■	
Single-Line Diagram – 12kV and 4160V Plant Distribution	■		■		■		■	
480V Switchgear Elevations	┌		┌		■		■	
Electrical Site Location Plan	└		■		■		■	
Site Plans – Power and Instrumentation	┌	┌	┌	┌	■	■	■	■
Manhole and Handhole Schedule	┌		┌		■		■	
Ductbank Profiles	☐	☐	☐	■	☐	■	☐	■
Ductbank Sections	└	└		└	■	└	■	└
Plans – Power, Control, and Grounding	┌	┌	■	■	■	■	■	■
Plans – Instrumentation and Communications	┌	┌	■	■	■	■	■	■
Plans – Lighting and Receptacles	☐	☐	■	■	■	■	■	■
Large Scale Views	└	└	└	■	└	■	└	■
Schedules and Diagrams	┌				■		■	
Instrumentation and Control								
Standard Designations, Symbols and Schedules	■		■		■		■	
Block Diagram – SRWTP Control System	■		■		■		■	
ACC Functional Diagrams – Existing ACCs	■		■		■		■	

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PLC System Block Diagram	☐		■		■		■	
PLC Module Block Diagram	┌		■		■		■	
Instrumentation Installation Details	┌		└		■		■	
Typical Wiring and Loop Diagrams	┌		└		■		■	
Typical Power Distribution Diagrams	☐		☐		■		■	
Control and Logic Diagrams	┌		└		■		■	
Process and Instrumentation Diagrams	■		■		■		■	
Cabinets and Panels	┌		└		■		■	
Control Room Layouts	☐	☐	☐	☐	■	☐	■	☐
Miscellaneous Hardware Details	┌		└		■		■	
Miscellaneous Systems	┌		└		■		■	

Note 1: 3D Models include native files (.RVT), Navisworks files (.MWD) and DWF(.dwf) files.