

RFP No. 9031

Gravity Belt Thickener No. 3 Addition Project

Exhibit C – Design Contract Requirements



**Sacramento Regional County
Sanitation District
Design Contract Requirements**

Version 1.02

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Design Contract Requirements

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Chapter 1 -- Introduction

A. Purpose

The purpose of the **Design Contract Requirements** is to establish an understanding of design requirements between project Designers and the staff of the Sacramento Regional County Sanitation District (Regional San). This document defines and describes components that comprise a design project. Also presented is a level of expectation for each component that will ensure an effective and successful project.

B. Relationship with Other Design Standards

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

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

- **Design Contract Requirements** – Contract requirements for design projects
- **Design Guidelines** – Specific design discipline requirements
- **Guide Specifications** – A library of specifications available for project use
- **Contract Drawing Drafting Standards** – Standards to be used on computer aided drafting (CAD) drawings
- **Standard Drawings and Details** – CAD files of typically used drawings & details
- **Operations Manual and Training Development Guide** – Standards to follow in the preparation of Operations manuals and O&M training program

Regional San has developed a **Program Management Manual** for internal use. This two-volume manual addresses design project management procedures (Volume 1) and construction management procedures (Volume 2). This manual may also be used as a resource during the course of the project.

C. Organization of Design Contract Requirements

The **Design Contract Requirements** are organized as follows:

- Chapter 1 provides an introduction to this document.
- Chapter 2 addresses interaction activities between the project designers and Regional San staff.
- Chapter 3 presents general topics that occur on a design project.

- Chapters 4 through 7 present requirements for drawings, specifications, reports, and calculations, respectively.
- Chapter 8 lists the deliverables that are to be provided during the design phase of the project.

D. Deviations to 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 Regional San 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 Regional San staff. If warranted, project scope, budget and schedule will be revised. Upon completion of design and bid phases, the Designer and Regional San staff may wish to conduct a project debrief to identify areas that worked well and/or need improvement.

E. Design Project Schedule

The Designer shall prepare a design project schedule based on the various design phases and specific tasks identified in this document and other sources, such as the Request for Proposal. The project schedule shall provide appropriate Designer staff time for the preparation of all design elements. The schedule shall also provide appropriate Regional San staff time for input and review of the design. Key areas where time considerations are important include, but are not limited to:

- Field verification of existing and proposed facilities
- Preparation of Master Equipment List
- Construction sequencing within the existing operations
- Alternate equipment procurement methods
- Testing and startup services
- Permit processing time of outside agencies
- Documentation of electrical and instrumentation & control requirements – level of detail on drawings & specification schedules
- Preparation and maintenance of Project Design Manual
- Quality Control of contract documents – Allow 3 weeks minimum for 100% design submittal review

Additional discussion on the above items, as well as other design-related topics, are presented in the following chapters.

Chapter 2 -- Interaction with Regional San

A. Project Team Concept

For each design project, a Project Team is assembled. The leader of the Project Team is the Project Manager (PM) who is assigned from the SRWTP Engineering group. Members of the Project Team include staff who represent SRWTP Operations and Maintenance (O&M), Engineering, the Construction Management and Inspection office, the project Designers (in-house or consultant team), and others, as applicable. The Project Team is responsible for the successful completion of the project.

The PM is responsible to ensure that the Project Team is working effectively as a unit. The PM and Designer shall work to identify specific project needs. The entire Project Team shall work on the timely resolution of issues.

B. Project Meetings

Project meetings shall be held throughout the design phase of a project. Meetings will be held to kick-off the project, to resolve specific issues, and to provide periodic status of the project. The kick-off meeting is used to define project goals, priorities, roles, and responsibilities. During the design, the PM shall determine the need to resolve specific issues and shall determine the timing and participation of each meeting. Other meetings to discuss project status with the Project Team and/or management will occur.

The PM and Designers shall develop meeting agenda and meeting minute procedures. Each meeting shall have a written agenda. The agenda and any relevant information shall be distributed prior to the meetings. Arrangements shall be made for a person to be responsible for note taking during the meeting. Meeting minutes shall be distributed to all Project Team members and meeting attendees within 5 working days after the meeting.

C. Records of Conversation

Records of conversations shall be kept to document important information related to the project. Conversations may be face-to-face, telephone, electronic mail or other means of communication. The PM and Designer shall develop a procedure to document important conversations and to forward copies of these records of conversation to the PM.

D. Request for Information

The Designer and PM shall develop a request for information (RFI) procedure. The procedure shall address:

- An appropriate RFI form
- An understanding of an appropriate type of request and response
- The logistics of routing the RFI
- A log to track the submittal and completion of the RFI

E. Decision Log

A decision log is a formal way to document decisions that affect the direction of the project. The PM and Designer shall coordinate to ensure all appropriate decisions are documented. The Designer shall be responsible to maintain the decision log.

F. Field Verification

Field verification is essential in existing Regional San facilities. The Designer shall field verify design elements that (or has the possibility to) interface, interact, interfere, rely upon, or conflict with existing construction. The Designer shall determine that the new equipment piping, electrical, HVAC ductwork, etc., will physically fit in the existing facility and will function properly in the existing system. Field verification by the Designer shall occur early in the design and again at the 90% design phase.

Field verification by the Designer shall be coordinated through the PM. The PM will ensure that site visits comply with the Regional San's Access Request procedure and the Safety Office for work around the existing facility.

The Designer may request past drawings or documents; however, the design shall not be based solely on the information provided, unless field verified to be accurate.

Regional San will assist in field verifying any information that requires subsurface exposure or excavation. An RFI from the Designer shall be submitted in order to initiate this work. If new underground piping and facilities are anticipated to be in close proximity to existing infrastructure, potholing and/or surveying shall be included in the scope of work in order to create accurate, field-verified documents.

G. 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 Regional San 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 three 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.

H. Design Development

The phases of a typical design project include: Pre-design, 50% design, 90% design, 100% design, and bid phase. Flowcharts that depict major components of each phase are presented in Appendix A. These flowcharts were developed for inclusion in the **Program Management Manual, Volume 1**. The assigned PM shall access this manual if questions arise as to the intended requirements of each phase.

Regional San takes an active approach to participation in design projects. Participation is through the Project Team with input from other staff. The Designer shall meet with the Project Team and other staff, as appropriate, to produce a project in conformance with project goals/criteria and corresponding Design Standards.

To facilitate access to Regional San staff, the District will provide a workstation on-site for use by the Designer. The workstation may include desk space, telephone, and computer access. The workspace is intended for use by staff responsible for actual production of the design. Locating design staff on-site will allow informal meetings with Regional San staff so design concepts can be developed. The exact arrangements as to workspace, frequency of use, and personnel shall be developed in the scope of services.

The Designer shall allow Regional San staff to visit the Designer's office during the design process. The purpose of the visits will be to review the work and to respond to questions. Visits may be beneficial when coordination between design disciplines is necessary and/or prior to creating formal submittal documents.

I. Design Submittals

At various phases of project design, the Designer shall submit project documents to the other Project Team members for review and comment. For a listing of deliverables due at each submittal phase, see Chapter 8. The design submittal shall be presented in a meeting which highlights key progress, additions, changes, and areas of concern. The reviewers shall be briefed on types of constructive comments that will be helpful to the Designer.

Each Project Team member will review the design submittal and prepare comments that represent their respective areas of concern. The Project Team members will be responsible to solicit comments and resolve conflicts within their work area or other subject matter experts. The Project Team will review each submittal for conformance with the Design Standards, project criteria, operability, maintainability, reliability, constructability, bid ability, and ergonomics.

The PM is responsible to review each comment and collate the comments before forwarding them to the Designers. The comments will be reviewed to check for conflicts, duplication, clarity, and appropriateness. If conflicts exist amongst Project Team members, the PM will work to resolve the issue. After the PM has reviewed each comment and made any necessary changes, the comments will be collated and forwarded to the Designers for their response. The comments will be transmitted to the Designer in electronic format.

Within 5 working days of receiving collated comments, the Designers shall notify the PM of any comments that require additional clarification or discussion. The PM will facilitate discussions between the reviewer and Designer, if required. After the intent of each comment is understood, the Designer shall prepare preliminary responses to each comment. These preliminary responses, as well as a general sense of project direction, are incorporated into a submittal outcome report, which is circulated to the Project Team for their concurrence and approval. See Chapter 6 for additional information on the submittal outcome report.

Chapter 3 -- General Topics of Design

A. 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.

B. Regional San Safety Program

Safety is the number one priority in all Regional San work activities. This includes the day-to-day activities and consideration of future activities as part of design projects. Safety requirements shall be considered fundamental to the design, construction, and the operation of the project. As part of the design, the Designer shall make efforts to incorporate sound safety provisions. Regional San maintains a safety program, which may be used as a reference.

All individuals shall attend a safety training session prior to entering the process area of the SRWTP. The Designer shall coordinate with the Safety Office and the PM prior to performing field investigation and/or specific work activities.

C. Equipment Numbering System

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 numbering system, in general, and to work with the Project Team and other District staff to develop an appropriate project-specific numbering scheme. Regional San will provide equipment numbers to use throughout the project.

D. Master Equipment List

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

The Designer shall use a District provided excel 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 District representative shall assign

equipment numbers, and add them to the project-specific Master Equipment List as they are assigned.

The Designer shall work with the Project Team and other District staff to develop the project specific MEL at the 50% design stage. Specific instructions on using the Asset Metadata spreadsheet are included with this file. Asset Metadata Spreadsheet generates individual tabs for each asset classification which will contain all required columns and asset class information required for importing the 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 will auto-populates the MEL. Designer shall use “Miscellaneous” tab for unknown asset Classifications and the District will classify them.

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 District wide MEL is the responsibility of Regional San.

E. 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 Plant 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 Regional San 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 specification Section 01 14 00, “Work Restrictions”.

F. Future Work / Master Plan Coordination

The physical location and routing of new work shall be designed to minimize interference with future work. The design shall also provide connection points and interfaces for future work to minimize interruption of operation during future construction activities.

G. Independent Constructability Review

Regional San may procure an outside firm to conduct an independent bid ability/constructability review of the 90% design documents. The District will make a diligent effort to define that scope of work such that the independent review does not conflict or overlap with the reviews of the Project Team.

If initial project scope anticipates the need for an independent review, the Designer shall include a special services task to address and incorporate comments resulting from such independent review.

H. Construction Schedule

At the completion of pre-design, Designer shall submit a Work Item breakdown to the PM. The breakdown will be used to define the level of detail for the construction schedule.

Beginning with the 50% submittal, a construction schedule shall be submitted. The schedule shall be developed using the Critical Path Method (CPM), unless an alternate method is acceptable to the Project Team. The schedule shall be produced and maintained on a commercially available computer software program, such as Microsoft Project or Primavera Project Planner. The schedule shall be refined as the project becomes better defined.

A final construction schedule shall be provided based on the bid documents. The final schedule shall include:

- A detailed breakdown of construction activities
- Major submittal review activities
- Startup and testing activities

The final construction schedule will be made available to Contractors, upon request, during the bid period.

I. Opinion of Probable Construction Costs

At each design submittal, an opinion of probable construction costs (i.e. cost estimate) shall be submitted. For the Pre Design submittal, it may be necessary to identify costs for various alternatives to facilitate decision making on available options. The cost estimate shall be refined as the project becomes better defined. Designer shall submit a written explanation of changes from previous cost estimate each time the updated cost estimate is submitted. The cost estimate shall include:

- All costs related to the basic construction and installation
- Startup and testing costs
- Typical overhead and profit type costs

A final opinion of probable construction costs shall be provided at the time of bid opening. The final opinion shall be based on the bid documents and estimated costs either added or deleted through addenda.

J. 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 District standardized equipment is provided in Appendix B. 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 Guide Specifications library.

If the Project Team identifies the need for certain standardized equipment, the PM shall request District Board approval for specifying standardized equipment on the particular project. This request should be made between the 50% and 90% design phase.

K. Alternate Equipment Procurement Methods

Regional San, owner of the SRWTP, is a public entity subject to the provisions of the Public Contract Code. Procurement of equipment is subject to the competitive bid process.

On case by case basis, other equipment procurement methods have been justified for use at Regional San facilities. These methods, however, require significant coordination with the Project Team as well as other Sacramento County Departments -- County Counsel, Contract Services Section, Risk Management, etc. If an alternative equipment procurement method may be warranted, the need shall be identified when the engineering services contract is amended to include design and construction services.

L. Testing and Startup

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 90% design phase to establish pass/fail criteria, contractor test requirements, and to verify the testability of the design.

The Designer shall develop new 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 District Test Team to develop the District Test Plan, which is not a contract document. The Designer shall provide assistance in the preparation of the District Test Plan. The scope of the particular project will also further define these requirements.

M. Operation and Maintenance Manuals

The District maintains a set of Maintenance Manuals and a set of Operations Manuals for its facilities. The production of these manuals is initiated during the construction phase of the project. The construction contractor assembles the Maintenance Manuals using maintenance data from the equipment submittals. The Designers shall prepare the Operations Manuals which contain general operation instructions and information. The Designers shall review the Maintenance Manuals for any operational information that should be incorporated into the Operations Manuals.

The **Operations Manual and Training Development Guide** contains specific requirements as to the scope, content, and format for the Operations Manuals. The Guide also details the deliverables and interaction activities with District operations staff.

N. Operation and Maintenance Training

Operation and Maintenance (O&M) training of the constructed facilities is provided by the construction contractor/supplier, the District's O&M group, and the Designer. The construction contractor/supplier will provide O&M training for individual or component portions of the facility. Overall system training will be a shared effort between the O&M group, Engineering and the Designer. The District will provide "Pre-Operational" and "Hands-On" training.

As noted above, the Designer will assist the O&M group on the overall system training for Operations and Maintenance staff. This training shall consist of an explanation of the design intent of all systems, and a field walkthrough of the facility. Training sessions shall be provided for each of the three shifts (23:00 to 07:00; 07:00 to 15:00; and 15:00 to 23:00). Training sessions shall be limited to 2 hours, with multiple sessions scheduled if needed to comply with this time limit.

The Designer shall prepare large (24"x 36" or larger), color coded, poster board diagrams or create class room presentations to help facilitate O&M training. For the overall system training, the Designer shall prepare diagrams of all systems with notations on Instrumentation and Control, as well as, a Normal Valving Schematic. For the Regional San provided "Pre-Operational" and "Hands-On" training, the Designer shall prepare other training posters as needed.

The **Operations Manual and Training Development Guide** contains additional requirements as to the scope, content, and format for the training program. The Guide also details the

deliverables and interaction activities with Regional San operations staff. The scope of the particular project will also further define these requirements.

O. Permits

The Designer shall identify and assist Regional San in obtaining the necessary permits for the project. This includes assistance with the application, review, and compliance processes. The Designer shall incorporate all requirements and conditions of all permits into the bid documents. Communication protocol with outside entities shall be discussed with the PM and any designated Plant liaisons. Applicable permits may include, but are not limited to:

- Building permit/standards
- Environmental impact
- Air quality
- Waste Discharge Requirements / NPDES Permit
- Risk Management Prevention Plan (RMPP)

P. Bid Services

Once the Regional San Board gives approval to advertise the project for bid, the Designers shall provide the following services:

- Designer shall gather data and information in response to questions during the bidding phase
- Designer shall prepare and issue addenda in electronic form only, including revised contract documents, to all plan holders.
- Key member(s) of the design team shall attend the pre-bid conference, and assist in providing information and answers to questions from contractors
- Designer shall prepare and deliver a final opinion of construction costs, which shall include changes made by addenda.
- Designer shall assist Regional San in evaluating the bids if there are significant differences between engineer's estimate and bid amounts, or other challenges.
- Designer shall incorporate addenda into bid documents.

Q. Special Services Tasks

All tasks essential to the design, construction, and commissioning of a project shall be included in the Basic Services portion of the project scope of work and budget. There may exist, however, some tasks that benefit the project, but for certain reasons, can not be adequately scoped and/or budgeted when the scope and budget amount are negotiated. These tasks may be identified as special services tasks. A brief description and an allowance shall be included in the contract.

The Designer shall immediately notify the PM, in writing, upon the potential initiation of special services tasks. The Designer shall not proceed with the work until authorized to do so. Prior to the authorization, the Designer and PM shall negotiate and agree on the scope, budget, schedule

impacts, and deliverables. Authorization, if granted, will be issued via letter from the District to the Designer.

R. Contingency Expenditures

The initial project budget should have a contingency fund of approximately 10% for the design phase. This fund is reserved for additional services subsequently identified during the performance of the basic services and deemed to be reasonable and necessary.

The Designer shall immediately notify the PM, in writing, upon the identification of potential “Out-of-Scope” work items. The Designer shall not proceed with out-of-scope work until authorized to do so. Prior to the authorization, the Designer and PM shall negotiate and agree on the scope, budget, schedule impacts, and deliverables. Authorization, if granted, will be issued via letter from Regional San to the Designer.

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Chapter 4 -- Drawings

A. CAD Standards

The **Contract Drawing Drafting Standards** present computer-aided drafting (CAD) standards to be used in the production of project drawings. Regional San will furnish a compact disk (CD) which contains the borders, symbols, scripts, and other files referenced in the standards. These standards shall be followed, unless specific approval for variances is granted by the PM. Once issued to the project, the Designer need not be responsible for any later updates or revisions made by Regional San.

B. General

Drawings shall be submitted with each design submittal. Drawings shall be provided electronically and be sized to print at half size (11"x17").

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, out-dated standards, new preferences, etc. The Designer shall verify, with the PM, the level of detail to be provided on the drawings.

The remainder of this chapter defines various types of drawings typically included in design discipline drawings. For each drawing type, a general description of the drawing content is provided. Not all drawing types are applicable for a particular project. Similarly, a particular project may include drawing types not listed.

C. Common Drawings

Regional San 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.

D. Standard Details

Regional San maintains a library of standard details. The standard details represent typical 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 standard 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 standard details for applicability to the specific project.

E. Example Diagrams

Regional San maintains a set of approximately 35 example diagrams that are to be included in the contract documents. These example diagrams 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 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.

F. Demolition Drawings

In general, demolition work shall not be shown on drawings depicting new work. Demolition work shall be shown on separate plans, details, and sections. Demolition work shall be shown with cross-hatching and shall be of the same quality as drawings showing new work. All demolition work shall include a description of the work to be performed, shutdown requirements, sequence constraints, and all other applicable items of attention in specification Section 01 14 00 – Work Restrictions.

G. General\Civil Drawings

Design Data

Project design data shall be presented on a drawing. Information shall be provided for major process equipment/facilities. The type of information to be provided includes, but not limited to, number, size, capacities, ratings, etc. For modification or upgrade projects, design data on the existing equipment/facilities shall be provided. If applicable, provisions for future expansion shall also be shown in tabulation of design data.

Hydraulic Profile

A hydraulic profile drawing shall be developed or updated (if existing) to reflect the project design. Water surface elevations shall indicate the hydraulic capacity, peak wet weather flow, and average dry weather flow for each process stage. A vertical datum with reference to the mean sea level shall be provided. All physical structures and equipment are to be referenced.

Coordinate Layout

Coordinates (i.e. Northings and Eastings) of major elements of the project shall be provided in a plan view of the project site. Examples of major elements include: buildings, structures, pipelines, and roadways

Site Work Key Plan

An overview plan of the project site and its relationship to the existing Plant shall be provided. This drawing shall provide a key for more detailed outside piping and grading and paving plans.

Grading and Paving Plans

The grading and paving plans shall highlight the finish grade and extent of paving for the project. Information from a topographic survey for the project area shall be shown.

Outside Piping Plan

The outside pipe plans shall highlight underground and above-ground piping located outside of structures. For continuation of piping within structures, see mechanical drawings.

Piping Profiles

Unless otherwise mutually agreed to by the Designer and PM, all piping shown in outside piping plans shall be detailed in full length piping profiles. The profiles shall identify pipe system, invert elevations, pipe slopes, and stationing of key locations. Additional construction notes may also be provided. Existing underground piping/facilities shall be identified to the greatest possible accuracy. The profiles shall use appropriate horizontal and vertical scales.

H. Architectural Drawings

Building Code Analysis

A summary building code analysis based on the classification of the building shall be provided on the drawings. If a separate drawing is not warranted, this information may be included on another drawing, such as the floor plan drawing.

Room Finish, Door, and Window Schedules

Schedules for room finish, door, and window shall be provided on the drawings. Typical details for jamb, head, and sill of openings shall also be provided.

Floor and Roof Plans

Floor and roof plans shall be provided for each human occupied structure. Floor plans show overall layout of structure. All rooms, doors, windows, louvers shall be identified and labeled. Architectural features shall be identified. Main mechanical and electrical components shall be outlined. Roof plans shall show roof drainage, roof access, and roof mounted equipment.

Building Sections

Full height sections shall be taken through the building and shall highlight architectural features.

Exterior Elevations

Each exterior face of buildings shall have an exterior elevation provided. The elevation shall highlight exterior finishes and architectural detailing.

Interior Elevations

Rooms with significant architectural treatment shall have interior elevations provided. Examples of applicable rooms include restrooms, locker rooms, dining areas, and entry foyers. Ceiling plans shall be provided where finished ceilings are provided, such as in normally occupied spaces.

Sections and Details

Sections and details shall be provided, as needed, to clearly present all architectural features.

I. Structural Drawings

General Structural Notes

Structural notes shall be provided as a separate drawing. The notes shall address general structural items and materials of construction.

Standard Structural Details

Structural details typically applied throughout the project shall be presented. The details may come from the applicable Standard Details library, or shall be created, as necessary, for the specific project.

Foundation, Floor, and Roof Plans

Plan views of foundation, each floor level, and roof or top level of each structure shall be provided. Structural features, foundation, and framing details shall be highlighted.

Elevations, Sections and Details

Elevations, sections and details shall be provided to convey all structural features.

J. Process Drawings

Process and Piping Schematics

Process and piping schematics depict simplified schematic layout of process flows, showing equipment, piping, pipe sizes, valves, flowmeters, flow designations, etc. The emphasis is on piping and the relative location of valves in the system. Schematics shall be prepared for all new systems, and for all existing systems which are to be modified or expanded. Modifications or expansions may require the complete system to be depicted, depending on the impact to the existing system. These schematics are to be used in conjunction with the Process and Instrumentation Diagrams.

K. Mechanical Drawings

Standard Mechanical Details

Mechanical details typically applied throughout the project shall be presented. The details may come from the applicable Standard Details library, or shall be created, as necessary, for the specific project.

Mechanical Plans

Plan views of each floor of each structure shall be provided showing the location of each piece of mechanical equipment.

Mechanical Sections and Details

Sections and details shall be provided to clearly depict all mechanical features.

Fire Sprinkler Riser Plan

Plan view showing the fire sprinkler riser locations, available pressures and point of connection. The Contractor shall provide the design of the fire sprinkler system per National Fire Protection Association requirements.

L. Heating, Ventilation and Air Conditioning Drawings

Standard Designations, Symbols and Schedule

Drawings shall provide HVAC general notes, symbols, designations, and schedules. Schedules shall be provided for diffusers, registers, and grills.

Standard HVAC Details

HVAC details typically applied throughout the project shall be presented. The details may come from the applicable Standard Details library, or shall be created, as necessary, for the specific project.

Airflow Schematics

Airflow schematics shall show air balance for all structures.

Temperature Control Diagrams

Air handler schematics showing the following information:

- Fans, coils, control valves, dampers, filters, cfm, etc.
- Controller, valve actuators, damper actuators, transducers, instrumentation, etc.
- Calibration information such as set point, throttling range, action, input and output signals, spring ranges, air pressures, normally open and normally closed and common ports, etc.

- Performance charts showing input and output signals, valve damper status, pump status, etc. as a function of temperature.

HVAC Plans

Plan views of each floor and roof levels of each structure shall be provided showing all HVAC equipment, piping, ductwork etc.

HVAC Sections and Details

Sections and details shall be provided to clearly depict all HVAC features.

M. Electrical Drawings

Symbols and Abbreviations

These drawing shall depict all symbols and abbreviations used on the drawings. Use the District's standard drafting symbols. If additional symbols are required, submit a proposed symbol for District review and approval.

Standard Electrical Details

Electrical details typically applied throughout the project shall be presented. The details may come from the applicable Standard Details library, or shall be created, as necessary, for the specific project.

Elementary Diagrams

If warranted, Regional San's set of elementary diagrams may be supplemented with project specific elementary diagrams. These drawings show the manufacturer's typical internal wiring diagrams for each power circuit breaker and MCC unit starter. The drawings shall show the internal control logic and external connection terminal blocks.

Single-Line Diagram – 12 kV and 4160V Plant Distribution

As applicable, Regional San's set of 12 kV and 4160 V single line diagrams shall be modified for project specific demolition and/or new construction. These drawings depict the major electrical equipment, arrangement, protective relays, transfer control devices, mechanical interlocking, circuit disconnects, interrupting devices, surge protection devices and equipment ratings. The medium voltage distribution drawings show building areas with a drawing reference to the unit substation single line.

480V Switchgear Elevations

Equipment elevations shall be shown for all switchgear. Elevations shall be scaled and shall show the physical arrangement of all front panel mounted devices in their proposed physical location. Include a nameplate schedule for all sections and devices.

Electrical Site Location Plan

An overview plan of the project site and its relationship to the existing Plant shall be provided. This drawing shall provide a key for more detailed electrical site and structure plans.

Site Plans – Power and Instrumentation

Electrical site plans shall depict the routing of underground conduits and duct banks, locations of handholes, manholes, major electrical equipment, site lighting, area ground mats and structure grounding systems.

Manhole and Handhole Schedule

A drawing shall list a schedule of all electrical manholes and handholes.

Duct Bank Profiles

All medium voltage duct banks shall be detailed in full length profiles. The profiles shall identify manholes, elevations, slopes, and new and existing underground piping/facilities.

Duct Bank Sections

Ductbank section drawings shall depict cross sections of all unique ductbank sections.

Structure Plans – Power, Control, and Grounding

For complex projects where multiple electrical systems are intermixed, separate structure plans for power, control, and grounding systems shall be provided. Plan views of each floor of each structure shall be provided showing the location of each piece of equipment and control device. Drawings shall show the routing of conduits and elevations at conduit racks and major junction boxes required for a complete electrical installation. The Ufer grounding system shall also be shown.

Structure Plans – Instrumentation and Communications

For complex projects where multiple electrical systems are intermixed, separate structure plans for instrumentation and communication systems shall be provided. Plan views of each floor of each structure shall be provided showing the location of each instrument, communications device and connecting conduit. Drawings shall show the routing and elevations of cable trays and conduits.

Structure Plans – Lighting and Receptacles

For complex projects where multiple electrical systems are intermixed, separate structure plans for lighting and receptacles systems shall be provided. Plan views of each floor of each structure shall depict the location of each lighting fixture, switch, receptacle, exit sign, and emergency light. Fixtures shall be identified by type, panelboard circuit, and switch. Mounting heights shall be indicated.

N. Instrumentation and Control Drawings

Symbols and Abbreviations

These drawings depict the more commonly used symbols and abbreviations that appear on the drawings. Standard process and piping related symbols and the mechanical equipment numbering system drawings are included in the I&C drawing set for convenience.

Block Diagram – Plant Control System

Regional San maintains a block diagram which shows a simplified version of the Plant's Computer Control System which shows the PCC, ACCs and their associated area or building being controlled. New and/or modification work shall be identified.

ACC Functional Diagrams -- Existing ACC's

These Regional San template drawings depict the ACC's relationship between field devices, PLCs, MCCs and the PCC in a functional manner. These diagrams show typical analog and discrete control functions. Diagrams show typical signal paths and the relationship of signal conditioners, indicators, controllers and annunciators. The ACC cabinets are identified as housing their specific functions of analog, discrete, PLC, input/output and computer hardware.

PLC System Block Diagram

The PLC system block diagram shall show the network topology and major components of the PLC system.

PLC Module Block Diagram

The PLC module block diagrams shall show the internal PLC rack modules and I/O link connection wiring for each PLC.

Typical Instrumentation Installation Details

Instrumentation installation details typically applied throughout the project shall be presented. The details may come from the applicable Standard Details library, or shall be created, as necessary, for the specific project.

Typical Wiring and Loop Diagrams

The Designer shall prepare sample diagrams that depict typical loops applicable to the particular contract being designed. The diagrams shall follow the same level of detail as shown in the Regional San example diagrams.

Typical Power Distribution Diagrams

The Designer shall prepare sample diagrams that depict typical power distribution requirements applicable to the particular contract being designed. The diagrams shall follow the same level of detail as shown in the Regional San example diagrams.

Control and Logic Diagrams

Control and logic diagrams are composed of three components: Field elementary, PLC logic diagram, and sequence of operation for each type of equipment.

The field elementary diagrams shall show the interconnection of all 120 V control devices external to the MCC starter, control panels and ACC terminals. Diagrams shall have line numbers and relay coils shall list the line numbers where the control contact appears. Diagrams shall show the MCC starter terminal numbers.

The PLC logic diagrams shall show the interconnection of all external control devices and internal wiring and logic schematics. Diagrams shall have line numbers and relay coil or PLC points that list the line numbers where the control contact appears.

Control and logic diagrams shall also include a narrative sequence of operations, nameplate schedules for field devices, limit switch development, and all other necessary items for a complete control design.

As part of the development of control and logic diagrams, the Designer shall prepare control block diagrams that show the MCC, ACC, Control Panels and all control devices in block format. Diagrams shall list the equipment, cable and raceway numbers and shall also show the type, number and gauge of all interconnecting control conductors. Control block diagrams are not part of the contract documents. These diagrams shall be submitted as part of the electrical calculations to aid the review of the cable and raceway schedules.

Process and Instrumentation Diagrams

Process and Instrumentation Diagrams shall symbolically represent the junctions of piping flow, instrumentation, display, control, logic, PLC and computer interfaces. These diagrams shall depict process lines, valves, actuators, mechanical devices, primary elements, instruments, annunciators, interlocks, programmable controllers, signal paths, field instrument power sources, computer interfaces and all other items required for a complete system representation. Complete P&ID's shall be drawn for all new and modified process and HVAC systems.

Cabinets and Panels

Cabinet and panel drawings shall be furnished for ACC cabinets, PLC panels, control panels, and terminal boards.

ACC cabinet drawings shall include a plan view, front view, discrete, analog and computer cabinet layouts, annunciator and signal module arrangements. Also include typical construction details, equipment mounting, ground busses, cable entries, operator station arrangement, engraving and all other items necessary for a complete design.

PLC panel drawings shall include a dimensioned front view, internal arrangement with sections, material list, nameplate schedule, typical mounting details, typical control station details and

engravings, references to the applicable control diagrams and all other items necessary for a complete design.

Control panel and terminal board drawings shall include a dimensioned front view, internal arrangement with sections, material list, lamp schedule, nameplate schedule, engraving schedule, references to the electrical plans and control diagrams, and all other items necessary for a complete design.

Control Room Layouts

Plan drawing of the control room with outline of control workstations, panels, equipment, and related equipment.

Miscellaneous Hardware Details

Various components of the design may require custom hardware to be constructed to match existing components or to interface with existing systems, such as computer I/O cards or discrete control station assemblies (DCSAs). Drawings included in this section shall include detailed descriptions of the required dimensions and functionality of the desired hardware. The Contractor is generally required to do detailed design including detailed submittals to demonstrate that the required custom hardware meets the contract requirements.

Miscellaneous Systems

Riser or other drawings necessary to fully describe the required interface to existing systems shall be provided. Examples include:

- Public Address Riser – Schematic diagram depicting the extension of the existing public address system, as well as the components of the new system
- Fire Alarm Riser -- Schematic diagram depicting the extension of the existing fire alarm system, as well as the components of the new system
- Telephone System -- Schematic diagram depicting the extension of the existing telephone system, as well as the components of the new system

Example Diagrams

The C1000 series drawings are maintained by Regional San. See description in paragraph “E” above. The Designer may supplement these drawings for particular project needs.

Demolition and Interface Drawings

Demolition and Interface drawings show demolition of, and new wiring to, existing control equipment. Each demolition and interface drawing shall refer back to corresponding P&ID, control and logic diagrams, and interconnection diagrams.

Interconnection Diagrams

The Designer shall prepare sample diagrams that depict typical interconnection details applicable to the particular contract being designed. The diagrams shall follow the same level of detail as shown in the Regional San example diagrams.

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Chapter 5 -- Specifications

A. Requirements

Regional San maintains a library of guide specifications, which follows the Construction Specifications Institute (CSI) Master Format 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 and other Regional San staff as necessary.

Specifications shall be prepared using the latest version of Microsoft Word in use by Regional San. When editing Guide Specifications, the “track changes” feature for highlighting additions and deletions shall be turned on. Changes shall be highlighted in the 50%, 90%, and 100% design submittals. The “track changes” feature shall be turned off for the check set print between the 100% design submittal and the bid set.

B. General Conditions

The General Conditions 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, appropriate Regional San staff shall be consulted.

C. Technical Specifications

The Technical Guide Specifications address technical construction aspects of the specifications. The guide specifications are intended to serve as a starting point for project specifications; however, the content shall not be significantly altered without the consent of Regional San. 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 PM a list of all reference material, codes and/or standards which are referenced in new specification sections.

D. Manufacturer’s Catalog Information

The Designers shall obtain manufacturer catalog information for all proposed products and equipment not previously identified in the 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 PM.

E. 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.

Raceway Schedule

Section 02 41 19.21 contains a schedule of existing raceways to be removed, abandoned in place, or reused. Section 26 06 20.21 contains a schedule of new raceway to be provided and existing raceway 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

Cable Schedule

Section 02 41 19.25 contains a schedule of existing cable to be removed, abandoned in place, or reused. Section 26 06 20.25 contains 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

Panelboard Schedule

Section 26 06 20.16 lists panelboards that are to be provided or modified. For each panelboard, the following information is depicted in tabular form:

- Panelboard name plate 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

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

Motor Control Center Schedule

The Motor Control Centers (MCCs) schedule is to be provided on drawings. For each MCC, the following information is depicted in tabular form:

- 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
- 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 in the specification section. The drawing shall show MCC dimensions and cubicle layout with designations.

F. Process Control Specification Schedules

Certain process control specification sections will include schedules generated specifically for each project. Samples of these specification sections are part of the Guide Specifications library.

Presented below is a brief description of each schedule.

Schedules of Instrumentation for Process Systems

Section 40 06 70 lists 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.

Schedules for Process control and Process Facility Enterprise Management System

Section 40 06 60 lists face mounted instruments on Area Control Center (ACC) Control Panels. Face mounted instruments include alarm annunciators, analog controllers, indicators, analog signal hand switches, discrete control station assemblies (DCSAs) and miscellaneous other instruments. For each instrument, the following information is depicted:

- Revision
- ACC number, cabinet, row and column location
- Tag number
- Engraving as it will physically appear
- Switch type
- Nameplate color
- Instrument type
- Notes

Plant Computer Control System Input/Output

Section 40 61 93.10 lists each computer input and output (I/O) circuit which must be wired to the ACC computer I/O sub systems and tested. This schedule also defines the specific terminal board and terminal numbers to be wired for each computer I/O channel. The following information is sorted by ACC number and alphanumeric tag number:

- Point identification
- Description

- Type
- ACC designation with cabinet and row
- Terminal board and starting terminal point
- P&ID and C&LD reference
- Notes
- Revision

Programmable Controller Input/Output

Section 40 61 93.20 lists the input and output (I/O) points for the programmable logic controller (PLC) systems.

Plant Computer Control System Control Strategies

Section 40 61 96.10 contains written descriptions of analog and discrete control functions executed by the Plant computer system, 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.

Selective Area Control Center Panel Demolition Schedule

Section 02 41 10.28 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 Section 40 06 60.

Fiber Optic Patch Cord Schedule

Regional San has spec section which was not updated by the Echo Water Project. Spec section 17909 lists fiber optic patch cords used to connect project fiber optic cable to the existing Plant fiber optic system. Regional San has a design standard for documenting fiber optic patch cords. A Microsoft Excel spreadsheet shall be obtained from SRWTP Engineering Design. The filename is "Section 17909 – Fiber Optic Patch Cord Schedule.xls". See the file for more specific instructions.

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Chapter 6 -- Reports

A. Requirements

During the course of a design, written documents shall be produced to document the project.

In general, Designer shall prepare draft and final copies of each report. The Project Team shall review each draft version and provide comments. The PM will collate and resolve any conflicts in the comments before forwarding them to the Designer. The Designer shall address each comment in the final report.

Upon request, the electronic file of any report, letter, memo, drawing, or other document shall be delivered to the District.

B. Technical Memoranda

Technical memoranda (TM) shall be written to address project specific issues. The TMs shall include background information, discussion on available options, life cycle cost analysis (if appropriate) and a recommendation. Technical memoranda include, but are not limited to:

- Design criteria
- Conceptual layout
- Process alternatives
- Conceptual description of redundancy and automation
- Permit requirements
- Other project specific issues

Technical memoranda 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 PM who will collate the comments before returning them to the Designer. A final draft TM, with the review comments addressed, shall be delivered to the PM. The PM will be responsible to review the final draft and coordinate with other Project Team members as necessary. All final comments are returned to the Designer.

All completed technical memoranda shall be distributed to the Project Team. For TM's produced during the predesign phase, the final TM's shall be included in the pre-design report. Any TM completed after the predesign phase shall be distributed under separate cover.

C. Pre-Design Report

The pre-design report is the tool to identify key design features of the project. The purpose of the pre-design report 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 design.

The pre-design report typically includes, but is not limited to, the following:

- Project schedule
- Construction cost estimate
- Final technical memoranda
- Outcome of any studies
- Soils investigation and report
- Hydraulic profile
- Recommended alternatives with their associated life cycle costs
- Preliminary drawings or sketches to support the recommended alternatives
- List of project specifications
- Additional needs as defined by the contracted scope of work

The Project Team will review the pre-design report to confirm that the direction of the project is accurately documented and meets the criteria/goals established for the project. The pre-design report will also be reviewed for completeness, clarification or further investigation. Comments will be routed through the PM who will collate the comments before returning them to the Designer.

D. Pre-Design Confirmation Report

Due to the critical nature of pre-design stage, the Designer shall prepare a separate pre-design confirmation report after incorporating the pre-design report comments. The confirmation report shall briefly document the project criteria/goals, direction, and decisions. Project Team members will sign the confirmation report to indicate their approval. Copies of the pre-design confirmation report shall be distributed to the Project Team and Plant management.

E. Project Design Manual

A Project Design Manual (PDM) shall be prepared for each project. 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. As much of this information is included in the Pre-design and Pre-Design confirmation reports, these documents may initially be included in the Project Design Manual. 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 project CAD standards shall also be included. The PDM shall be tabbed and bound in a three-ring binder to allow for future updates.

The Project Design Manual shall be updated at each design submittal. 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.

F. Submittal Outcome Reports

Submittal outcome reports shall be prepared after 50%, 90%, and 100% submittal review comments are returned to the Designer. The submittal outcome report shall document the project status, direction, decisions, and proposed resolution of submittal comments. A draft report is forwarded to all Project Team reviewers to make them aware of exactly how their comments will be resolved. Any continuing disagreements over comment resolution shall be resolved before work progress to the next design stage. After all Project Team members are satisfied, the submittal outcome report is signed to acknowledge that the report meets their approval. The signed submittal outcome reports shall be incorporated into the Project Design Manual and distributed to management.

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Chapter 7 -- Calculations

A. Requirements

Design calculations shall be prepared, as necessary, for the development of the project. Calculations shall be submitted with the 90% submittal 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 name and design phase. 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. An electronic copy of the complete binder shall be provided.

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.

B. 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

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Chapter 8 -- Deliverables

A. General

Each design project shall have periodic submittals to confirm the direction of the project design. Submittals shall be due at the pre-design (10%), 50%, 90%, and 100% completion points in design; unless otherwise agreed to when the scope of work is established. Definitions of completion points and list of deliverables are given in the sections below.

Unless otherwise specified for an individual item or by mutual agreement between the Designer and PM, the number of copies of each deliverable item shall be equal to the number of Project Team reviewers plus four (i.e. two for SRWTP plan rooms and two for files). The exact number of submittal drawings, specifications and reports for SRWTP use shall be determined on a project-specific basis (typically 12 – 15).

Bid documents and conformed documents (i.e. bid documents with addenda incorporated) shall also be delivered. The quantity of bid and conformed documents to be furnished shall be determined on a project-specific basis.

B. Pre-Design Submittal

The pre-design submittal shall be delivered when key design features of the project have been defined.

The deliverable for the pre-design submittal is:

- Pre-design report as described in Chapter 6

After review comments to the pre-design report have been returned to the Designer, the following additional deliverables are due:

- Pre-design confirmation report
- Project Design Manual (5 copies, typical when listed)

C. 50% Design Submittal

The 50% design submittal shall be delivered when preliminary plans and specifications are available to select and layout major equipment to support the project.

The deliverables for the 50% design submittal are:

- Preliminary drawings, including but not limited to:
 - General/Civil – Design data; hydraulic profile; site work plan; grading and paving plans; outside piping plans.
 - Architectural – Building code analysis; floor & roof plans; exterior elevations
 - Structural – Foundation, floor and roof plans; elevations, sections and details
 - Mechanical – Process piping schematics, mechanical floor plans

- HVAC – Airflow Schematics
- Electrical – Single-line diagrams; Electrical site plan
- Instrumentation & Control --process portion of all P&IDs, PLC block diagram
- Preliminary specifications without electrical and instrumentation schedules
- Master Equipment List (5 copies, typical when listed)
- Construction/Operations Sequencing Plan (5 copies, typical when listed)
- Construction schedule (3 copies, typical when listed)
- Opinion of probable construction costs (3 copies, typical when listed)
- Updates to Project Design Manual
- Manufacturer’s equipment catalog information (1 original, typical when listed)
- A compact disc (CD) with electronic files of drawings, including a plan for managing a drawing log, drawing numbers, and X-references. Also, the MEL.

After review comments to the submittal have been returned to the Designer, the 50% submittal outcome report is due.

D. 90% Design Submittal

The 90% design submittal shall be delivered when all details of the project have been completed.

The deliverables for the 90% design submittal are:

- Contract drawings
- Contract specifications, including schedules
- Master Equipment List
- Test Plan (5 copies, typical when listed)
- Design calculations (2 copies, typical when listed)
- Updated opinion of probable construction costs
- Updated construction schedule
- Updates to Project Design Manual
- Manufacturer’s catalog for new equipment and/or products
- A compact disc (CD) with electronic files of drawings, specifications, MEL, and construction schedule

After review comments to the submittal have been returned to the Designer, the 90% submittal outcome report is due.

E. 100% Design Submittal

The 100% design submittal shall be delivered when the plans and specifications are ready for a quality control review. This includes cross-checking all references within the various contract documents.

The deliverables for the 100% design submittal are:

- Contract drawings
- Contract specifications, including schedules
- Master Equipment List
- Test Plan
- Updated opinion of probable construction costs
- Updated construction schedule
- Updates to Project Design Manual
- A compact disc (CD) with electronic files of drawings, specifications, MEL, and construction schedule

After review comments to the submittal have been returned to the Designer, the 100% submittal outcome report is due.

F. Bid Documents

Once all revisions have been made to the 100% Plans and specifications, one complete set of plans and specifications shall be submitted to the PM for a final review. The set shall be in the exact form as intended to be sent to the printers for production of the bid sets. The PM will notify the Designers within 5 working days of any discrepancies.

Five working days prior to the day that bids are advertised to the public, the following documents shall be delivered:

- Stamped and signed bid sets of plans and specifications (number as specified in the scope of work)
- One set of full-size drawings
- Final construction schedule
- Master Equipment List
- A compact disc (CD) with electronic files of drawings, specifications, MEL, and construction schedule. Coordinate with SRWTP staff regarding format and layout of CD, prior to submittal.

During the bid period, the Designer shall prepare, copy, and deliver addenda.

On the bid opening date, the final opinion of probable construction costs shall be delivered to the PM. If the engineer's estimate differs from the low bid by more than 20%, either higher or lower, the Designer shall provide a written explanation for the difference, with justification.

G. Conformed Documents

The bid set of plans and specifications shall be updated by incorporating and identifying all addenda items issued during the bid period. No other changes to the plans and specifications shall be made. Within 5 working days of bid opening date, all addenda shall be incorporated, and one complete set of plans and specifications shall be submitted to the PM for a final review.

The set shall be in the exact form as intended to be sent to the printers for reproduction of the conformed sets. The PM will notify the Designers within 5 working days of any discrepancies.

Within four weeks of bid opening date, unless otherwise specified in the scope of work, the Designer shall deliver:

- Stamped and signed conformed sets of plans and specifications (number as specified in the scope of work. In addition, 10 sets in 3 ring “locking” binders)
- One set of full-size drawings
- Stamped and signed design calculations
- Master Equipment List
- A compact disc (CD) with the electronic files of the conformed drawings and specifications, and MEL. Coordinate with Regional San staff regarding format and layout of CD, prior to submittal.

Glossary

The following abbreviations, terms, and definitions are used within this document.

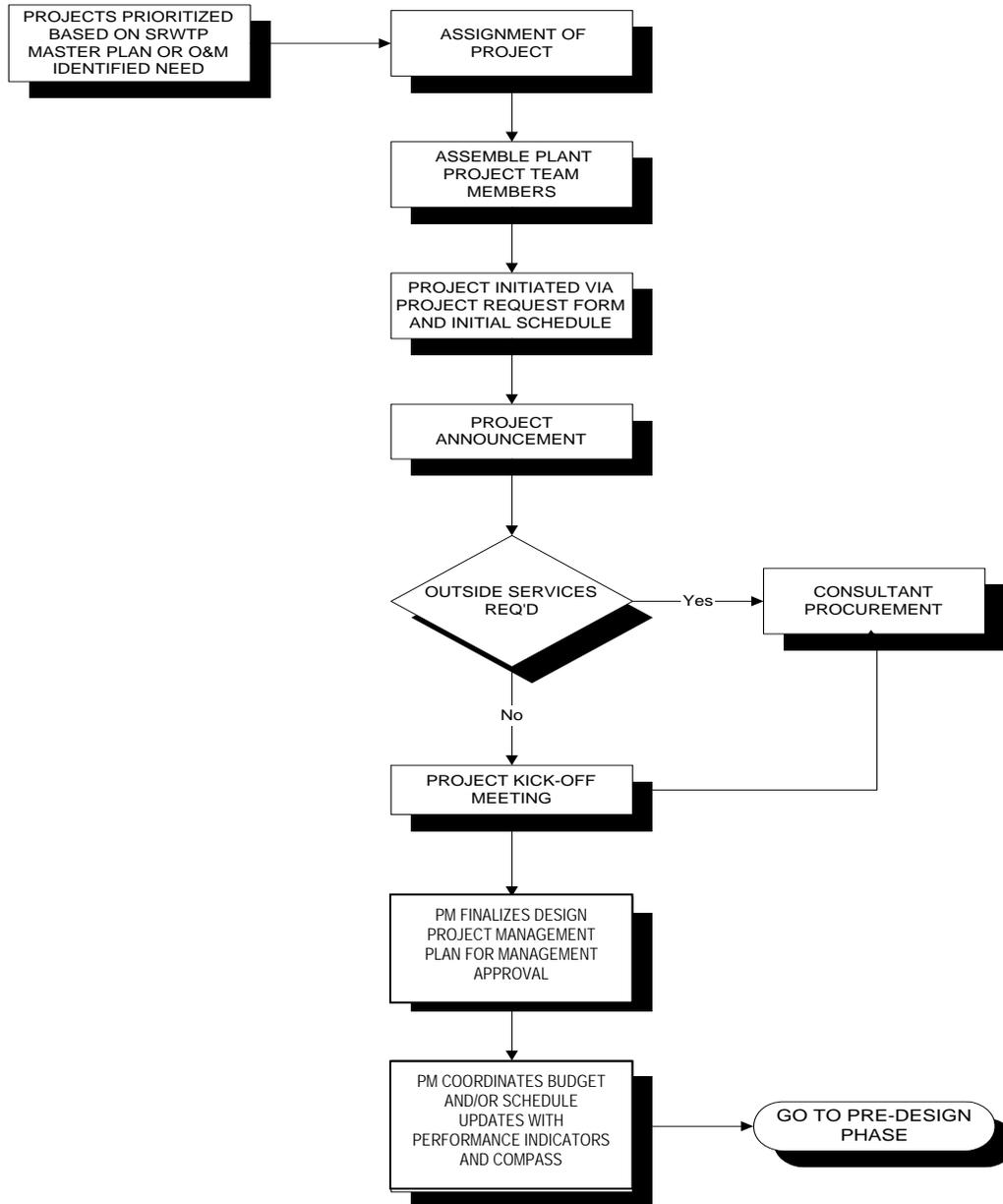
Abbreviation/Term	Definition
Addenda	Supplemental written specifications or drawings issued after Notice to Contractors and prior to execution of the contract which modify or interpret the contract documents by addition, deletion, clarification, or correction.
Bid Documents	The plans and specifications for a particular project for construction or installation at the Sacramento Regional Wastewater Treatment Plant that are made available for bidding purposes
Board	Board of Directors of the SRCSD and CSD-1 comprised of the five County of Sacramento Supervisors plus the mayors or their designees from the cities of Sacramento, Folsom, Citrus Heights, and Elk Grove.
CIP	Capital Improvement Program
PM	Project Manager, assigned from the SRWTP Engineering group
Conformed Documents	Bid documents with all addenda items incorporated
Contract Documents	The plans, specifications, addenda, and change orders for construction or installation at the Sacramento Regional Wastewater Treatment Plant.
Designer	Consultant or In-house design team
District	Regional San or SASD as applicable
Regional San	Sacramento Regional County Sanitation District formed by the County of Sacramento, the City of Sacramento, the City of Folsom, the City of Citrus Heights, and the City of Elk Grove.
SASD	Sacramento Area Sewer District
SRWTP	Sacramento Regional Wastewater Treatment Plant

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Appendix A Flowcharts of Design Project Phases

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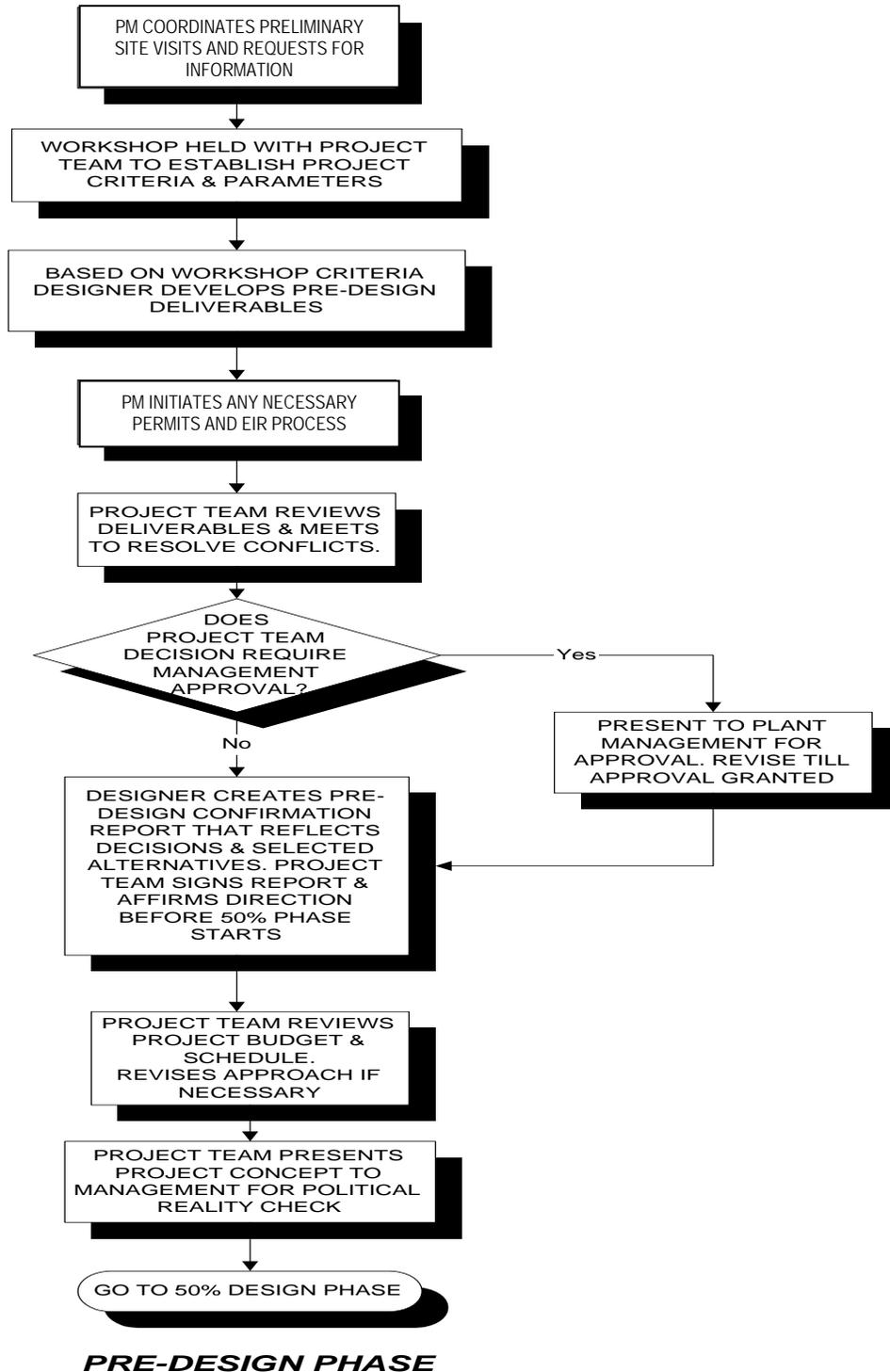
Project Initiation Flowchart



PROJECT INITIATION

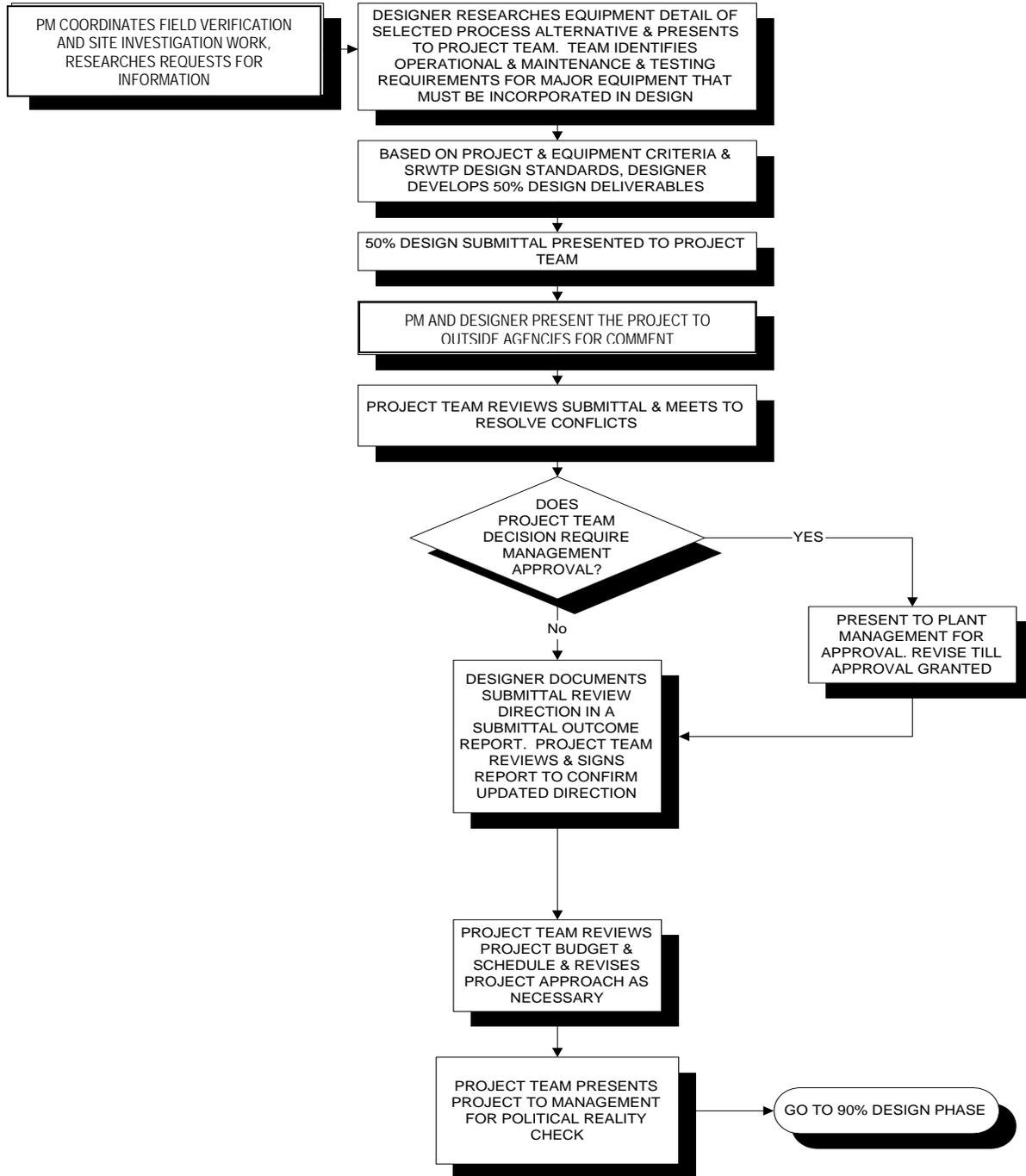
(Reprint from Project Management Manual – Vol. 1)

Pre-Design Phase Flowchart



(Reprint from Project Management Manual – Vol. 1)

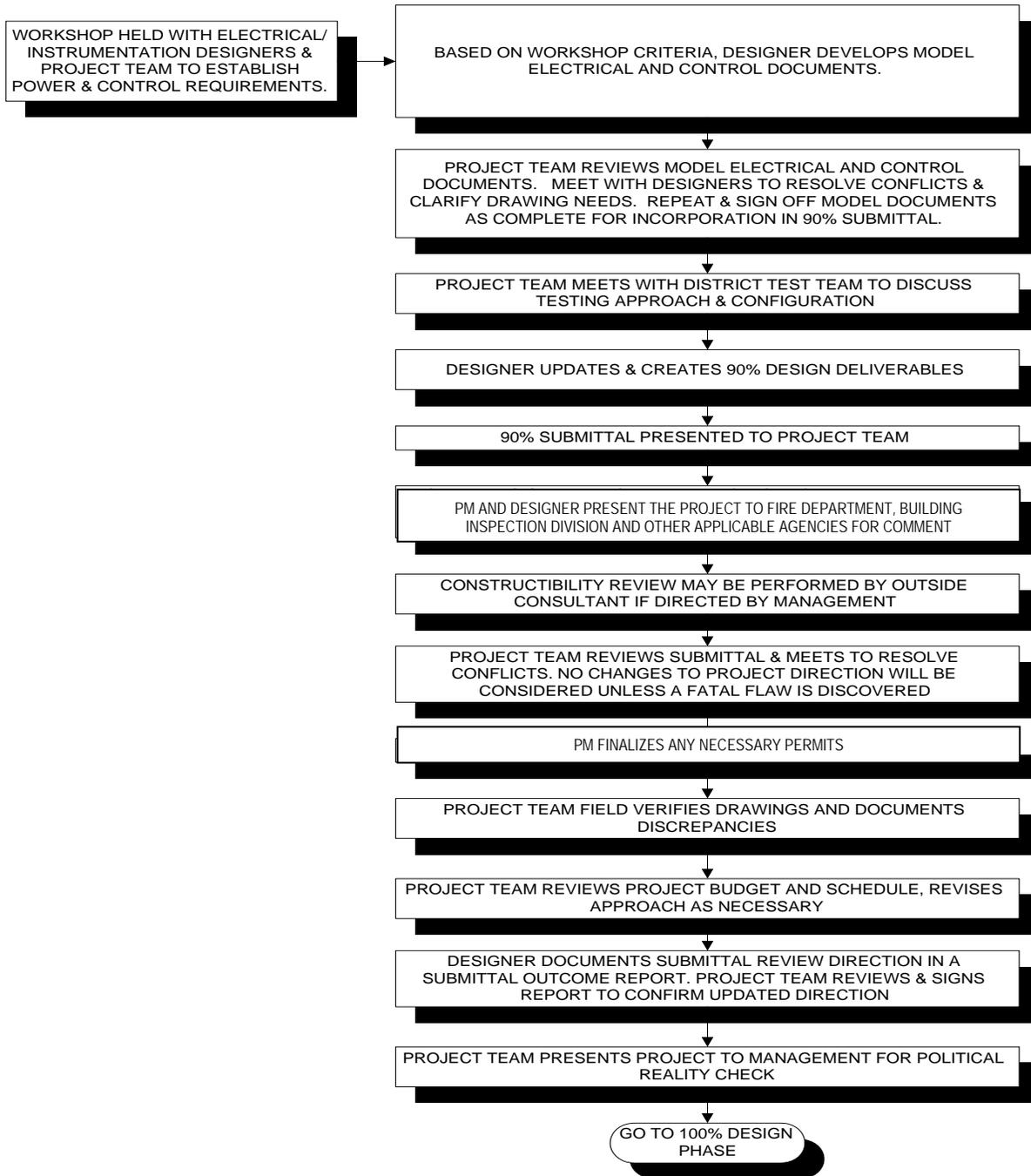
50% Design Phase Flowchart



50% DESIGN PHASE

(Reprint from Project Management Manual – Vol. 1)

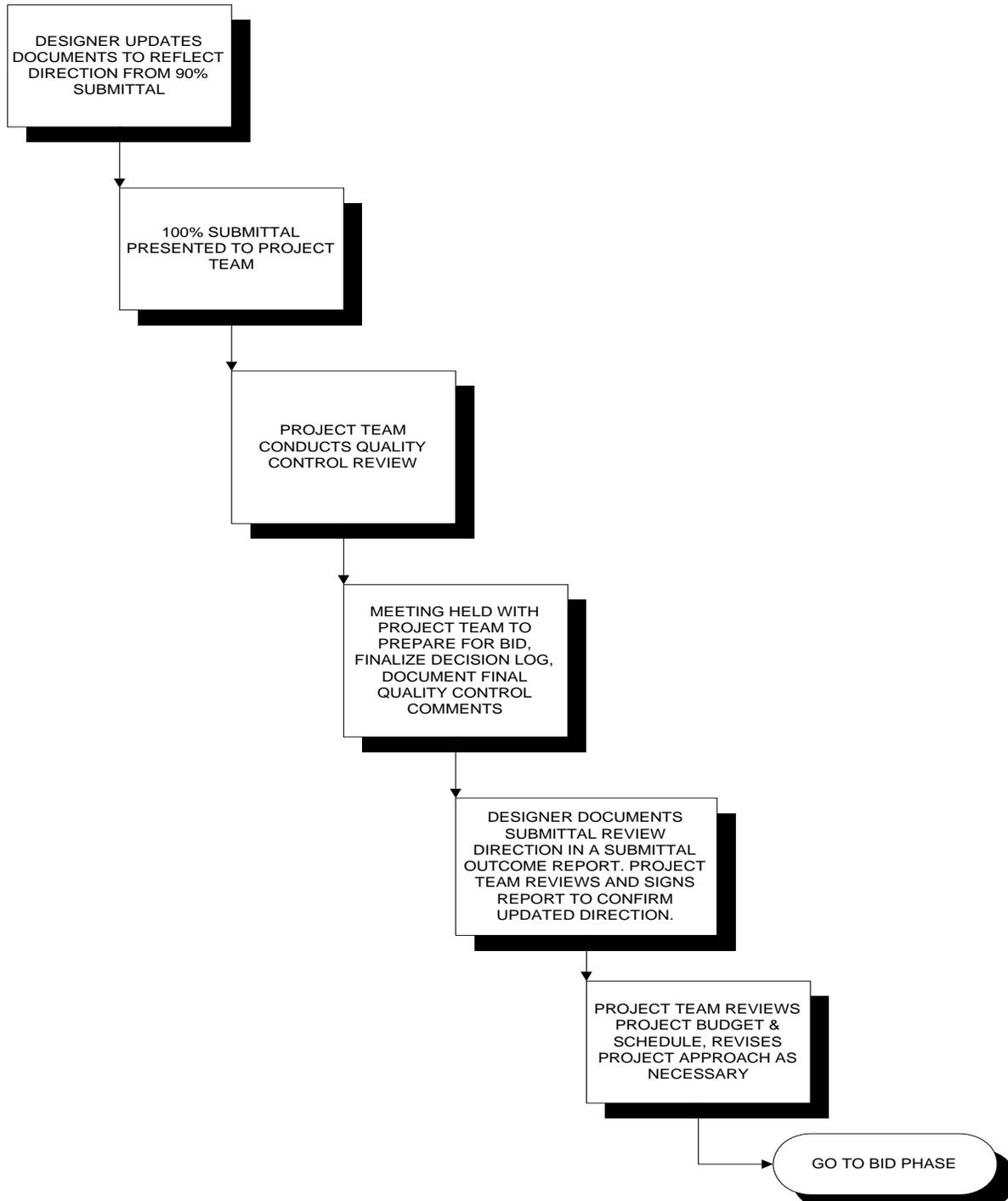
90% Design Phase Flowchart



90% DESIGN PHASE

(Reprint from Project Management Manual – Vol. 1)

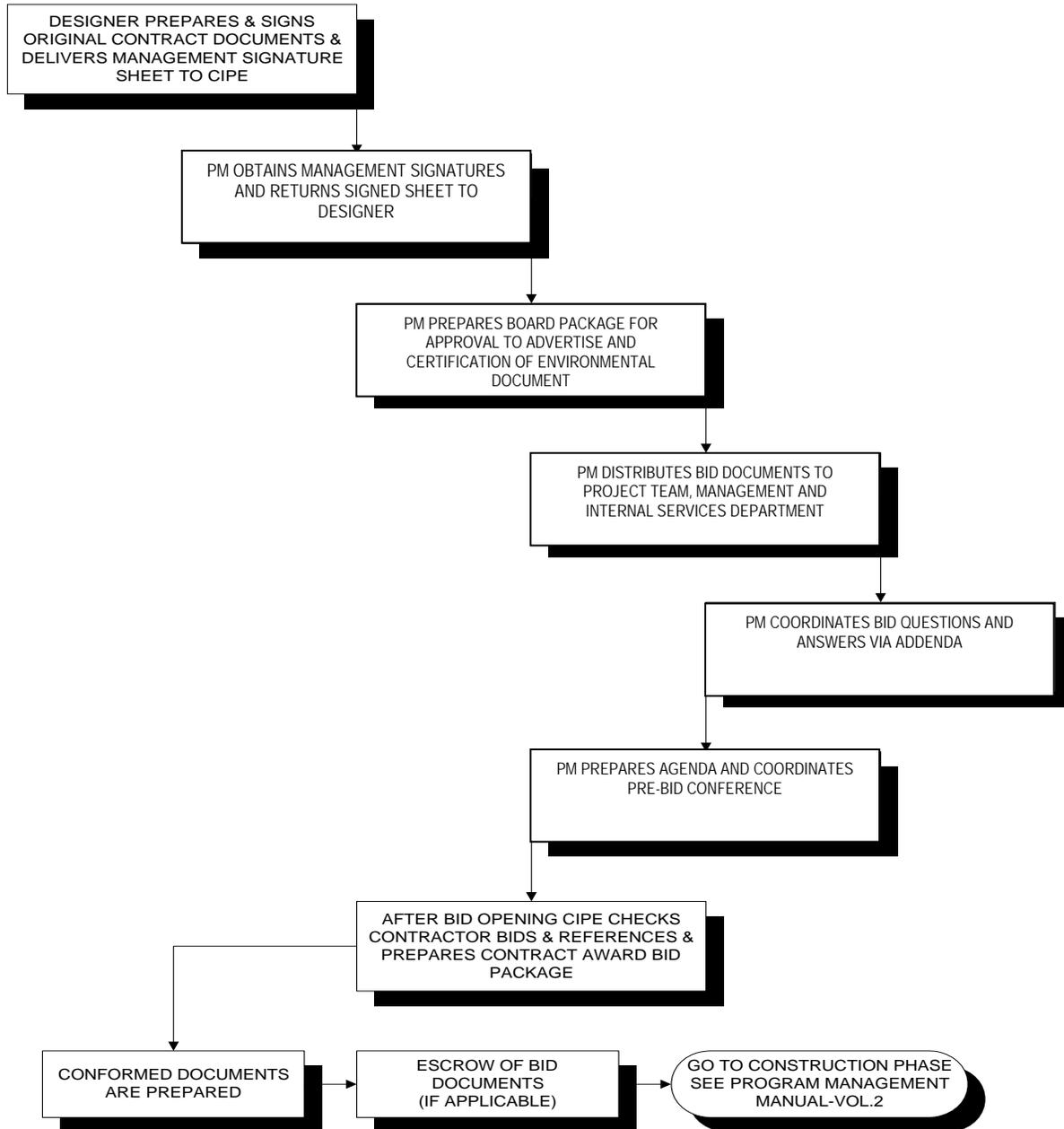
100% Design Phase Flowchart



100% DESIGN PHASE

(Reprint from Project Management Manual – Vol. 1)

Bid Phase Flowchart



BID PHASE

(Reprint from Project Management Manual – Vol. 1)

Appendix B Standardized Equipment

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REGIONAL SAN STANDARDIZED EQUIPMENT

Equipment Description	Manufacturer	Type/Model/Series	Comments
INSTRUMENTATION AND CONTROL			
Profibus Network Componets*	Phoenix Contact	Profibus gateway, headstation, power module, DP surge protection device, DP repeater, DP power supply, DP active terminator, DP ProfiHub, DP media converters, PA coupler, and PA device coupler (also known as segment protector or field barrier).	Initially selected through a competitive procurement process on the EchoWater Flow Equalization construction contract. Procentec added as manufacturer of OEM Phoenix Contact Profibus devices.
	Procentec		
FDT-Certified Frame Software*	Endress+Hauser	FieldCare SFE500	Initially selected through competitive procurement process. Software to expand existing FieldCare Profibus network equipment monitoring.
Programmable Logic Controller (PLC)	Rockwell Automation	ControlLogix Series/CompactLogix	PLC/5 was initially installed through a pre-qualification process and subsequently used as basis for the ACC design guide. The Logix5000 Series contains ControlLogix and CompactLogix, where ControlLogix Series is the manufacturer's replacement for the PLC/5. The Allen-Bradley (AB) product line is now manufactured by Rockwell Automation.
	Rockwell Automation	SLC-500 Series	Alternate to AB PLC/5 Series for medium applications.
	Rockwell Automation	RSLogix5, RSLogix 500, RSLogix 5000, Studio 5000	This is the recommended software to use for programming on the AB PLC/5 systems and the Logix 5000 Series.
	Rockwell Automation	Graphical User Interface (GUI)	The recommended GUI due to unique programming and interfacing.
PLC Interface Card*	ProSoft Technology	Profibus DP V1 Master MVI56-PDPMV1 Series	This is a recommended communication interface card to use with AB 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.
		Modbus TCP/IP Client/Server Enhanced Network Interface Module	Initially selected through 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.

REGIONAL SAN STANDARDIZED EQUIPMENT

Equipment Description	Manufacturer	Type/Model/Series	Comments
Fire Alarm System	Edwards Systems Technology	EST3 application system with Fireworks Software and associated detection and alarm components.	Initially selected through competitive procurement process.
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.
Turbidimeter*	Hach Company	Hach TU5300 sc	Selected based on a pilot study performed by staff where various types of turbidity meters were tested.
	Swan Analytical Instruments	Monitor AMI Turbiwell 7027; Auto-Drain	
Chlorine/Sulfite Dioxide Analyzers	Analytical Technology Inc.	Model Q46S/66 Model Q46H/79S	Plant staff tested various types of direct read SO ₂ and Cl ₂ analyzers to improve monitoring plant effluent for permit compliance and process control. The study recommended ATI's SO ₂ A15/66 and CL ₂ A15/79 direct read analyzers. ATI's latest analyzer models with the same sensor and technology are analyzers Q46S/66 and Q46H/79S, respectively.
Chlorine Residual Analyzers	Evoqua - Wallace and Tiernan	Micro/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.
Sulfonators/Evaporator	Evoqua - Wallace and Tiernan	Series V2000 Chlorinators/Sulfonator Series 50-200 Evaporator	The plant has Fischer-Porter (FP) and W & T units, competitively procured in 1982 and 1991, respectively.
Tank/Hopper Level Indicators	Siemens	MultiRanger HydroRanger	Initially selected by competitive procurement process. Electronics supports up to 6 tanks, thus reducing number of units.
Mass Gas Flowmeters	FCI	ST-100 Series STP-100 Series	ST100 Series replaces the GF-90 Series which was initially selected by competitive procurement process. ST provide mass gas flow and STP provides mass gas flow and pressure measurements.
Transit/Doppler Time Flowmeters	Siemens	SITRANS FUS1010	Initially selected through competitive procurement process as part of the Grit Systems Modification Project. SITRANS FUS1010 replaces System 1010.
Vibration Protection	GE Bently Nevada	Series 3500	Meets stringent API standards. At time of initial installation, Plant knew of no equal product. Plant has several BN vibration monitoring systems installed, a stock of BN parts, and is trained in all aspects of programming, operating, and maintaining the BN

REGIONAL SAN STANDARDIZED EQUIPMENT

Equipment Description	Manufacturer	Type/Model/Series	Comments
			equipment. System is very reliable and is essential to the Plant's predictive maintenance program.
	GE Bently Nevada	Prox Probes 3300 Series	Specialized probes for use with BN monitoring equipment.
	GE Bently Nevada	Velometer Probes for Acceleration	Specialized probes for use with BN monitoring equipment.
ELECTRICAL			
Uninterruptible Power Supply	Liebert	N Power (large) Nfinity (medium) GXT 2U(small)	Initially selected through competitive procurement process.
Contactors/Starters for medium voltage MCC	Eaton/Cutler-Hammer	Type SJ400	Initially selected by competitive procurement process. The manufacturer name has changed from Cutler-Hammer/Westinghouse to Eaton/Cutler-Hammer.
Breakers for Switchgear Medium-Voltage Power Circuit	Eaton/Cutler-Hammer	Type VCP-W	Initially selected by competitive procurement process. The manufacturer name has changed from Cutler-Hammer/Westinghouse to Eaton/Cutler-Hammer.
Medium Voltage Variable Frequency Drives*	Rockwell Automation	Powerflex 7000	Initially selected through a competitive procurement process.
	Siemens/Robicon	Sinamics Perfect Harmony	
Motor Control Centers	Eaton/Cutler-Hammer	Freedom 2100	Initially selected through competitive procurement process as part of the original SRWTP construction. The manufacturer name has changed from Cutler-Hammer/Westinghouse to Eaton/Cutler-Hammer.
	General Electric	GE 9000	Model GE 9000 replaces GE 8000 which was initially selected through competitive procurement process.
Low Voltage Switchgear	Eaton/Cutler-Hammer	Magnum DS	Initially selected through competitive procurement process as part of the original SRWTP construction. The manufacturer name has changed from Cutler-Hammer/Westinghouse to Eaton/Cutler-Hammer.
	General Electric	AKD-20	Model AKD-20 replaces AKD-8 which was initially selected through competitive procurement process.
MECHANICAL			
AWWA Butterfly Valves* (for valves greater than 24")	Mosser	Series 830	Initially selected through competitive procurement process.
	Rodney Hunt	Streamseal	Initially selected through competitive procurement process.
	Valmatic	American-BFV	Initially selected through competitive procurement process.

REGIONAL SAN STANDARDIZED EQUIPMENT

Equipment Description	Manufacturer	Type/Model/Series	Comments
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.
Forklift Boom Attachment*	Lift Master Boom	Telescoping Economy Boom – LM-EBT-4-24	Manufacturer of this attachment has been approved for use with existing Regional San forklifts.
HVAC			
HVAC Direct Digital Controller	Johnson Controls	FX-PCG2621	Initially selected Johnson Controls model DX-9100 through competitive procurement process. Model DX-9100 has been phased out and replaced with model FX-PCG2621
GENERAL/PERSONNAL SAFETY			
Door Hardware	Best Access Systems	Cormax XD Series	A standardized door locking system to match existing and meet the District's security policy.
Irrigation Controller	Rain Master	Evolution DX2	Initially selected by competitive procurement process.
Advanced Davit Arm System*	DBI-SALA	3M DBI-SALA Advanced One Piece Adjustable Offset Davit	Staff are trained in the use of DBI-SALA safety equipment and the accessories that are compatible with the product.

*New or revised standardized equipment item