CAD/BIM STANDARDS MANUAL



Date Filed: **June 3, 2025**

Table of Contents

1.0 INTRODUCTION

2.0 DESIGN SYSTEMS AND DRAWINGS

3.0 FILE NAMING CONVENTION

4.0 LAYER CONVENTIONS

5.0 GRAPHIC/STYLE STANDARDS

6.0 DRAWING SET ORGANIZATION

7.0 DELIVERABLES AND DATA EXCHANGE

8.0 CAD STANDARDS IMPLEMENTATION TOOLS

9.0 PROCESS & INSTRUMENTATION DIAGRAMS

10.0 SINGLE/ONE LINE DIAGRAMS

11.0 INSTRUMENTATION LOOP DIAGRAMS

12.0 INSTRUCTIONS FOR DRAWING UPDATES FROM BID SET THROUGH RECORD DRAWINGS

13.0 DESIGN DOCUMENTATION STANDARDS FOR 3D

A.0 APPENDIX A – COMPOSITE SHEET DRAWINGS

B.0 APPENDIX B – STANDARD SYMBOLS

C.0 APPENDIX C – AUTOCAD PLANT 3D REFERENCE PROJECT

D.0 APPENDIX D – CAD STANDARDS COMPLIANCE CHECKLIST

E.0 APPENDIX E – BUILDING INFORMATION MODEL QUALITY CONTROL CHECKLIST

1.0 INTRODUCTION

Table of Contents

1.0 INTRODUCTION 1-1

1.1 HISTORY OF CHANGE 1-2
1.2 OBJECTIVE 1-3
1.3 SCOPE 1-3
1.4 RESPONSIBLE ORGANIZATION 1-3
1.5 SERVICE AREA 1-3

1.1 History of Change

Revision and Version	***Author***	***Date***	***Change***
A	MAB	04/24/01	Initial Release of Manual
B	DCR	03/02/11	Revised to show Enterprise Information Management as group responsible
G	BAW	08/08/16	Added Service Area Section
H	RDM	03/06/19	Grammar updates
I	RVT	09/13/21	OCSD references to OC San. Grammatical revisions.
K	EIM	04/16/25	Inclusion of BIM and Revit verbiage to OC San CAD Standard Manual

chap01-Introduction.docx

1.2 Objective

This manual describes the application of Computer Aided Design (CAD) and Building Information Modeling (BIM) standards and procedures at the Orange County Sanitation District (OC San). The manual is part of an enterprise-wide effort to develop data standards that address the entire life cycle of facilities within the OC San service area.

This manual is not intended to be a substitute for specific training in the use of CAD, Revit (BIM) or other related software packages.

1.3 Scope

The OC San CAD/BIM Manual is intended to provide OC San staff and consultants with information normally required to produce and process drawings in all project phases from Project Design phase through Project Record phase.

OC San staff and consultants shall follow the procedures and methods defined in this manual for all projects.

Deviations from the CAD/BIM standard requirements as specified and/or referenced in this Manual are not allowed. However, should OC San staff, consultants or contractors identify a project-specific CAD/BIM standard deviation that appears unavoidable, the deviation request must be submitted in writing to the Enterprise Information Management (EIM) group for approval.

1.4 Responsible Organization

The EIM group is responsible for updating and maintaining the OC San CAD/BIM Manual. This standard is intended to be neither static nor all-inclusive and thus will be updated and enhanced as appropriate. To propose changes to this manual, submit a request in memorandum form to the EIM. Requests for modifications shall document (1) why the current procedure and/or standard is inapplicable or ineffective; (2) what the proposed deviation or change should be and; (3) how would it improve the CAD/BIM standards or procedures and the overall productivity. The EIM group will review these requests for possible inclusion in the manual.

1.5 Service Area

OC San consists of a Service Area of approximately 479 square miles, serving 20 cities and 4 special districts. OC San maintains approximately 400 miles of trunk sewer and collection lines. OC San operates two reclamation plants and 15 outlying pump stations.

2.0 DESIGN SYSTEMS AND DRAWINGS

Table of Contents

2.0 DESIGN SYSTEMS AND DRAWINGS 2-1

2.1 HISTORY OF CHANGE 2-2
2.2 COMPUTER AIDED DESIGN SYSTEMS 2-3
2.2.1 CAD and BIM 2-3
2.2.2 Process and Instrumentation Diagrams (P&ID) 2-3
2.2.3 GIS 2-3
2.2.4 PDF 2-4
2.2.5 3D Coordination 2-4
2.2.6 3D (BIM) Data Environment 2-4
2.3 THE FACILITY MODEL 2-5
2.4 FILE TYPES 2-6
2.4.1 Base Maps 2-6
2.4.2 Baseline Model Files 2-6
2.4.3 Project Model Files 2-6
2.4.4 Composite Drawings 2-7
2.4.5 Project Border Files 2-7
2.5 REFERENCE FILES 2-9
2.5.1 Reference File Attachments (AutoCAD and Revit) 2-9
2.5.2 Reference File Paths (AutoCAD) 2-9
2.5.3 Reference File Paths (Revit) 2-9
2.5.4 Reference File Status (AutoCAD and Revit) 2-10
2.5.5 Baseline model updates from 3D BIM (Revit) 2-10
2.5.6 3D Coordination of Project 2-10
2.6 SEPARATION OF INFORMATION 2-11
2.7 MEASUREMENT UNITS AND COORDINATES 2-11
2.8 ROTATION 2-12
2.9 PAGE SETUP 2-13
2.10 FOLDER STRUCTURE 2-14

2.1 History of Change

Revision and Version	Author	Date	Change
A.1	MAB	04/24/01	Initial Release of Manual
A.2	MAB	9/21/01	Revised file type descriptions.
B	MAB	6/24/02	Incorporated PDS standards
C	MAB	10/15/04	Added emphasis
D	SJM	7/22/10	AutoCAD P&ID Update to replace PDS
D.1	DCR	11/1/10	Updates and revisions to content. Revised to show Enterprise Information Management as group responsible
G	BAW	08/08/16	Specified XREF settings, added CAD systems, added Bluebeam Revu for pdf files. Redesignated as chapter 2 (previously chapter 3)
G.1	RVT	10/04/17	Updates and revisions to content. Added content to Page Setup.
H	RDM	03/06/19	Updates and revisions to content.
I	RVT	09/13/21	OCSD references to OC San. Grammatical revisions.
J	EIM	03/30/23	Section 2.2.4 – Removed verbiage of ACAD Bluebeam plugin as preferred requirement. Section 2.4.4 – Added dimensions and annotations to paper space. Section 2.7 – Updated epoch adjustment from 2007 to 2017.50.
K	TAC	05/29/24	BIM Design Documentation. Coordination Models. Updates to Facility Model and use of GIS for BIM.

chap02-Design Systems and Drawings.docx

This chapter details the strategies for the organization of CAD files to support the various stages of a facility lifecycle or on any given project. The procedures described here are used extensively in the design industry to gain the greatest productivity from CAD.

2.2 Computer Aided Design Systems

In order to support a project's design and construction process, OC San uses several tools and software packages for working with CAD drawings, BIM Models, GIS data, and PDF documents.

CAD design drawings are converted to GIS based features for use in various GIS web applications to show the as-is conditions of the collections system and treatment plants. CAD baseline model files are created from OC San GIS data. See Section 2.4.

2.2.1 CAD and BIM

The CAD system at OC San is designed to provide the greatest capabilities for all OC San staff, consultants, and contractors. The unified approach to the CAD system and CAD procedures is intended to promote coordination between different departments, consultants, and contractors. This is to allow the creation of a uniform, high-quality design product and to minimize the time spent on CAD tasks.

The OC San CAD environment is based on the Autodesk, Inc. product line (Refer to the scope of work for the current version). OC San currently utilizes AutoCAD, AutoCAD Map 3D, AutoCAD Plant 3D, and Autodesk Revit. and all standards within this document are based on these products, unless otherwise noted.

Designs for Structural, Architectural, Building Mechanical (HVAC, Fire Protection, Plumbing), Process Mechanical, Electrical, and Telecommunication systems should utilize Autodesk™ Revit™ with the version specified in the project scope of work. The 3D Building Information Model (BIM) is preferred over CAD, as typical 2D views derived from the same 3D objects are consistent. Objects within a 3D BIM are designed to include functional characteristics important to OC San's operations.

2.2.2 Process and Instrumentation Diagrams (P&ID)

AutoCAD Plant 3D 2024 Design System has been implemented at OC San. The purpose of this system is to provide OC San with the capability to create and maintain Process and Instrumentation Diagrams (P&IDs) for the wastewater treatment plants and pump stations. P&IDs are to be produced using AutoCAD Plant 3D from Autodesk. **Refer to Chapter 9, Process & Instrumentation Diagrams and Appendix C for special requirements when using this system.**

2.2.3 GIS

The OC San GIS environment is based on the ESRI product line. Unless otherwise noted in the project scope of work, GIS deliverables are not required. All design work must be performed using the CAD applications as designated in section 2.2.1.

All 3D design models shall contain geospatial information that is referenced between a permanent, physical, USGS Survey Marker's geographic survey point available in the State Plane Coordinate system where the project is located, and the coordinate system in the model, thereby providing a precise, measurable

reference point for accurately locating building, site work, utilities, and infrastructure.

2.2.4 PDF

Bluebeam Revu Complete is the standard software used in the management of PDF files at OC San. A Bluebeam Plugin for AutoCAD and for Revit is available with Bluebeam Revu when providing PDFs created from AutoCAD or Revit. (Refer to Section 2.9 for Page Setup information).

Bluebeam Studio Sessions are utilized at OC San for all drawing reviews.

2.2.5 3D Coordination

All of the specified 3D modeling solutions, and to a lesser extent, 2D CAD designs, may be viewed together in a common 3D space for a variety of comparison and constructability checks.

Coordination of designs in this 3D environment consistently saves time, effort and cost in later procurement and assembly efforts, often in the form of reduced re-work.

OC San's 3D Coordination strategy is based on the use of the Model Coordination feature of the Autodesk Construction Cloud™ (ACC) in tandem with Autodesk™ Navisworks™. The consultant shall provide ACC access to OC SAN Engineers and staff for review purposes.

2.2.6 3D (BIM) Data Environment

3D designs are maintained by the consultants in a cloud environment. This allows for granular access by all team members, ability to view models and metadata, and easy reconciliation of design progress through file version tracking.

The BIM environment is the Autodesk Construction Cloud™. This provides the necessary workspace for Revit and AutoCAD Plant 3D workflows, as well as the ability to selectively load and display 3D content from ACC into OC San's GIS solutions.

2.3 The Facility Model

OC San treatment facilities were constructed over the past 60 years, under hundreds of projects, with thousands of engineering drawings. As each project is constructed, the resulting modifications or enhancements become part of the Facility Model. A Facility Model is all information created relating to a particular facility such as Plant 1 or Plant 2. OC San utilizes the Facility Model concept to assist in Design, Construction, Operations, and Maintenance activities.

Figure 2-1 describes a simplified view of the repeatable project to facility model cycle. Project 1 results in an addition to the facility. The project drawings are archived, and the facility model(s) are updated to reflect the new construction. Project 2 will then utilize the revised facility model(s) as the baseline to begin the new design and thus repeat the process. Therefore, it is critical that this information is accurate and organized in a way that facilitates easy retrieval and reuse.

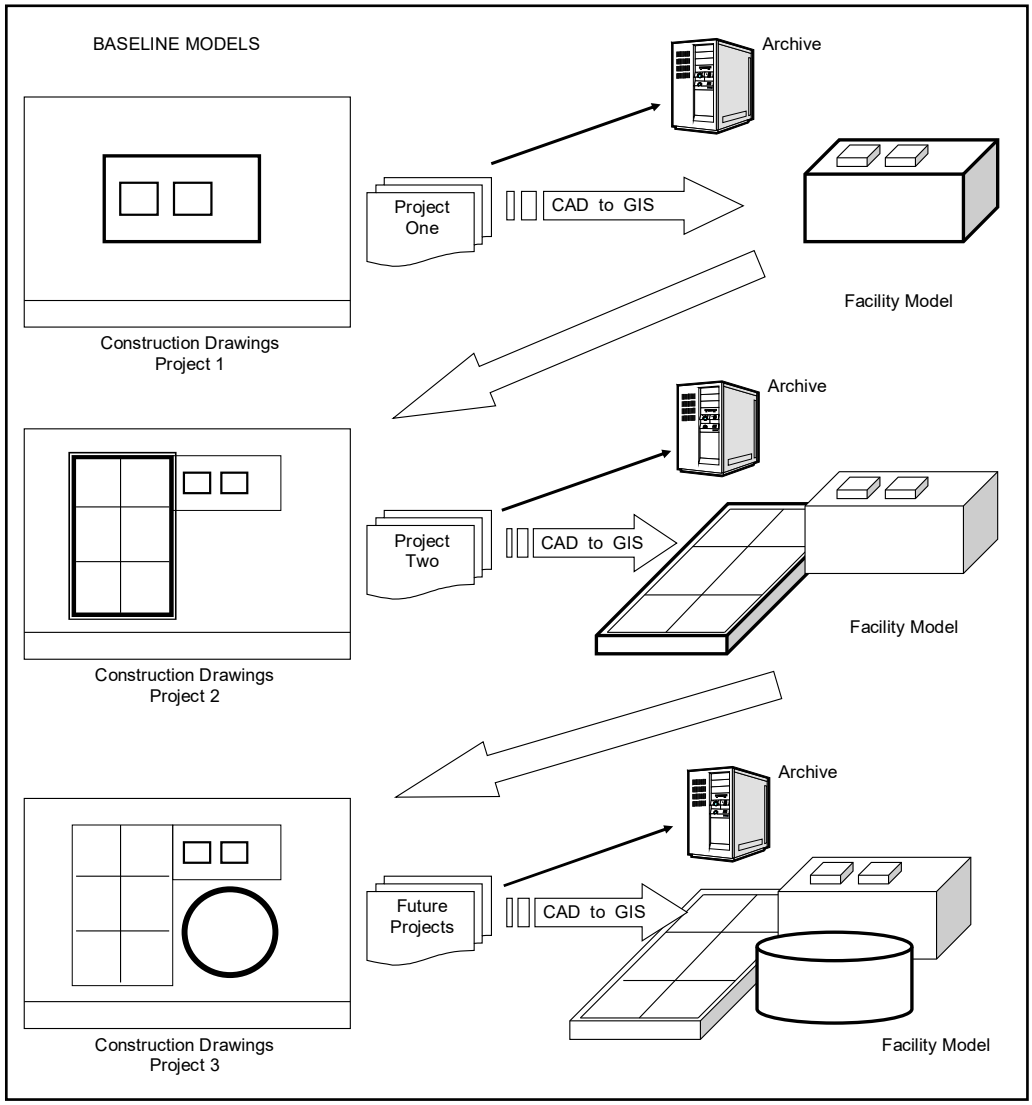


Figure 2-1

2.4 File Types

To support the Facility Model concept, information is organized into four file types, Base Maps, Baseline Model Files, Project Model Files and Composite Drawings. Figure 2-2 shows schematically the relationship between these file types.

2.4.1 Base Maps

Base Maps are a representation, usually on a flat surface, of the whole or a part of an area. Base Maps are generally created by outside firms or agencies or can be produced from the Facility Models. Examples of a base map are aerial topographies, parcel boundary maps, and satellite images. Base Maps are used to locate OC San assets in their correct place in the coordinate system. When only a portion of the base map is needed, an x-clip or imageclip should be used. **Edits to the Base Maps are restricted to layer modifications only. It is imperative that no new data is added and that no existing elements are modified.**

2.4.2 Baseline Model Files

Baseline Model Files are produced from the Facility Models. These files consist of the existing condition of offices, structures, above and below ground process piping, tunnels, roadways, piping & instrumentation diagrams, instrument loop diagrams, and other process information. At project initiation, OC San will export the necessary Facility Models to Baseline Model Files to be used by the consultant. When only a portion of a baseline model file is needed, an x-clip should be used. **Edits to the Baseline Model Files are restricted to layer modifications only. It is imperative that no new data is added and that no existing elements are modified.**

Each project should use the most current baseline model files which can be obtained through the EIM group.

2.4.3 Project Model Files

Project Model Files contain proposed, project-specific geometry currently being designed such as structures, piping, connections, equipment, elevations, details, etc. A Project Model File contains the bulk of the actual design information for one or more Composite Drawings. Elements graphically representing the site should always be created at their actual size, in their appropriate units, and at the correct coordinates, per section 2.7. A Project Model File is rarely plotted and is always referenced to one or more Composite Drawings to create a finished drawing. Model files do not contain drawing-specific information such as north arrows, graphic scales and sheet titles.

2.4.4 Composite Drawings

A Composite Drawing is a visual communication tool, made up of graphic and textual information organized on a two-dimensional surface, for the purpose of documenting the existing world and indicating proposed changes to it. **Each Composite Drawing file contains a single layout**. Composite drawings are generally plotted at full size (1:1), and the origin of each sheet is typically located at the lower left corner of the sheet border. Composite Drawings contain drawing-specific information such as north arrows, graphic scales, dimensions, annotations and sheet titles in the layout (paper space in AutoCAD, 'Sheets' view in Revit). Composite drawings are never referenced to another composite drawing to produce a final drawing.

2.4.5 Project Border Files

For AutoCAD Applications:
For each Composite Drawing, a single Project Border is attached as a reference file in the paper space environment using a scale factor of 1:1. The design data is drawn full-size, and the plotting scale is established by scaling the viewport. Viewport scales must be locked. A project border file is established by copying the standard border template in accordance with the Project Border File Naming Convention (Section 3.6, Project Border Files)

For Autodesk Revit:
A consistent Project Border is achieved by a project-specific family file. Each sheet in the model will be setup using this border. If a change is required, the same project border family shall be loaded to each model to maintain consistency.

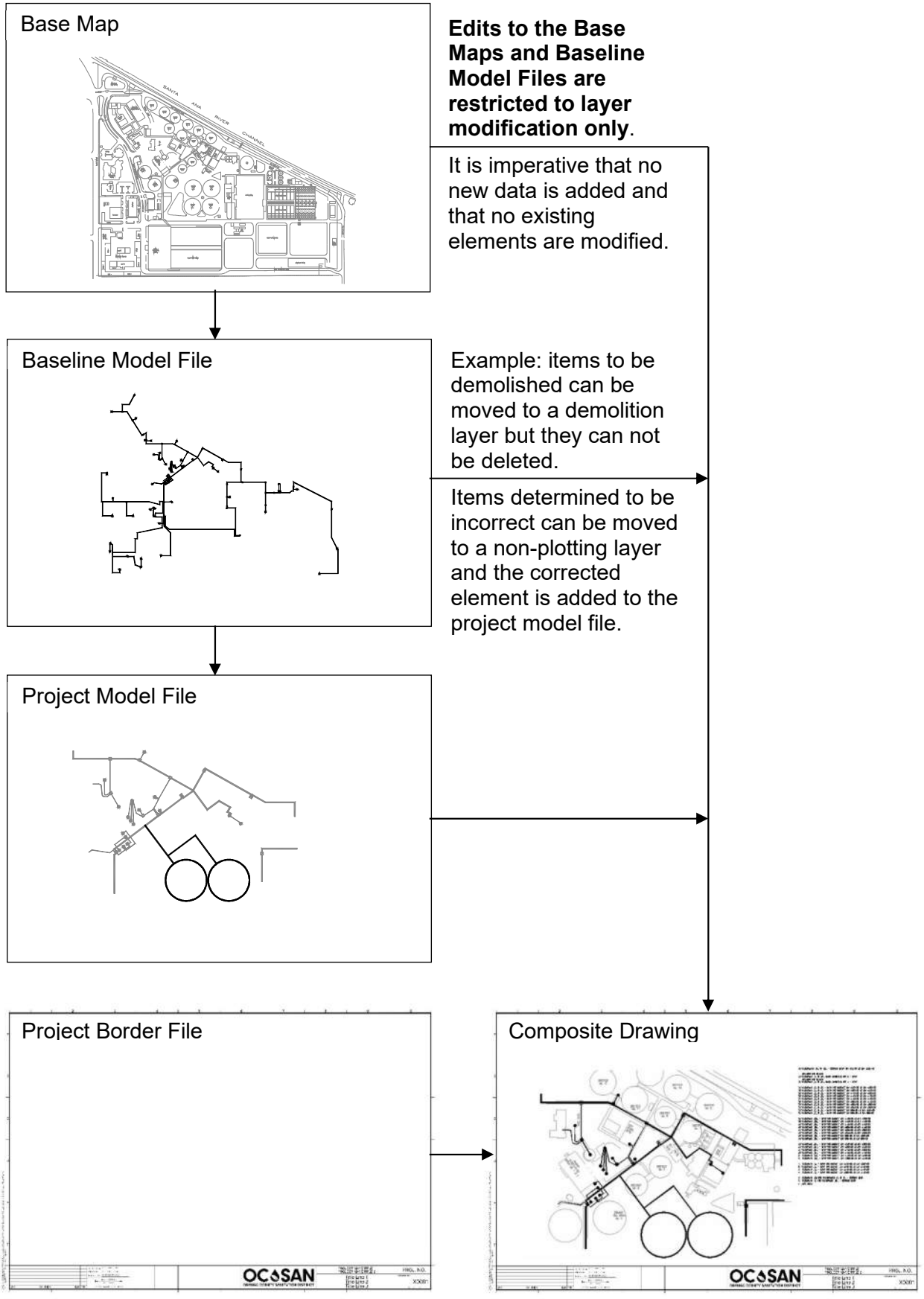

Base Map
Edits to the Base Maps and Baseline Model Files are restricted to layer modification only.
It is imperative that no new data is added and that no existing elements are modified.
Baseline Model File
Example: items to be demolished can be moved to a demolition layer but they can not be deleted.
Items determined to be incorrect can be moved to a non-plotting layer and the corrected element is added to the project model file.
Project Model File
Project Border File
Composite Drawing
OCSAN
OCSAN

Figure 2-2

2.5 Reference Files

Base Maps, Baseline Model Files, Project Model Files and Project Borders are reference files. It is important to understand what reference files are and how they are to be used.

The reference file function allows graphic information in one file to be referenced by another file. This allows information to be distributed to many drawings in a project, and as the base information changes, each of the associated drawings is automatically updated.

For example, a single project border sheet is created for the whole project and referenced to each drawing in the set. If the project title is changed, the change only needs to be made to the original and it will automatically show up on all drawings to which it has been referenced.

2.5.1 Reference File Attachments (AutoCAD and Revit)

AutoCAD has two unique reference file attachment options, attach and overlay.

Overlaying is the only correct setting for drawing files linked to other drawings. Do not use the “Attached” method.

If you link an external reference file (XREF) and that drawing itself contains an “attached” XREF, the “attached” XREF appears in the current drawing as a nested attachment to the first XREF. Like blocks, attached XREFs can be nested. Attached references can create undesired conditions for other files and uses. **All reference files are to be linked using the “Overlay” method in AutoCAD** and Revit (Overlay is the default setting for Revit). Also, overlaying an XREF reduces the possibility that you might create self-referencing drawings (circular XREFs).

2.5.2 Reference File Paths (AutoCAD)

By default, AutoCAD stores the file name and path of the drawing used to create the external reference. Each time you open the drawing or use the XREF Reload option to update the external reference, AutoCAD checks the file name and path to determine the name and location of the associated drawing file. If the name of the drawing associated with the XREF has changed or the drawing has been moved, AutoCAD cannot resolve or load the external reference. This poses significant problems when drawings are shared between OC San and consultants due to different drive mappings, server names or directory structure in use.

To minimize these issues, **a relative path must be specified for all XREF files**. **DO NOT** specify full path location for the XREF overlay. Refer to the AutoCAD Help files for more information on XREF pathing.

2.5.3 Reference File Paths (Revit)

The only Revit files that may be linked to other Revit files are those in the same project in ACC. Each linked reference file shall be established with its own workset.

All Revit models within the same project shall share the same project base point and reference alignment (between models is established by the common base point.

When AutoCAD references are loaded into Revit, they shall be loaded ONLY with the 'LINK CAD' option. **'Import CAD' is not allowed.**

Each linked AutoCAD file shall be placed on a unique workset. If many AutoCAD links are necessary, then collections of similar links may share a common workset (that serves no other purpose). Linked CAD files shall be pinned in position.

2.5.4 Reference File Status (AutoCAD and Revit)

All reference files should be loaded in submitted drawings. Unloaded reference files should be detached.

2.5.5 Baseline model updates from 3D BIM (Revit)

The 3D project model(s) will provide the assets necessary to update baseline models for the future. All new capital improvement projects should be documented in 3D; designed and dimensioned accurately. The intent with requiring 3D and BIM development in conjunction with all projects is to achieve baseline models that represent the extent of OC San facilities in 3D.

Concepts for a new or upgraded project may be developed months or years before that project may be bid and procured. When the extent of a future project is defined, the design team may 'reserve' the space based on the anticipated schedule. The project model file defining the extent of the anticipated project will be incorporated into the baseline model temporarily. In this way, the baseline model communicates to all stakeholders that a project is planned in a specific area.

2.5.6 3D Coordination of Project

3D Coordination is a series of discrete activities intended to respond to constructability issues before they occur.

The coordination model (sometimes called the 'Federated Model') is a collection of 3D designs and may include baseline models in addition to project models.

Project models should always be updated in response to 3D coordination, however, the coordination model itself is not incorporated into future baseline models.

See Figure 2-3 for more information

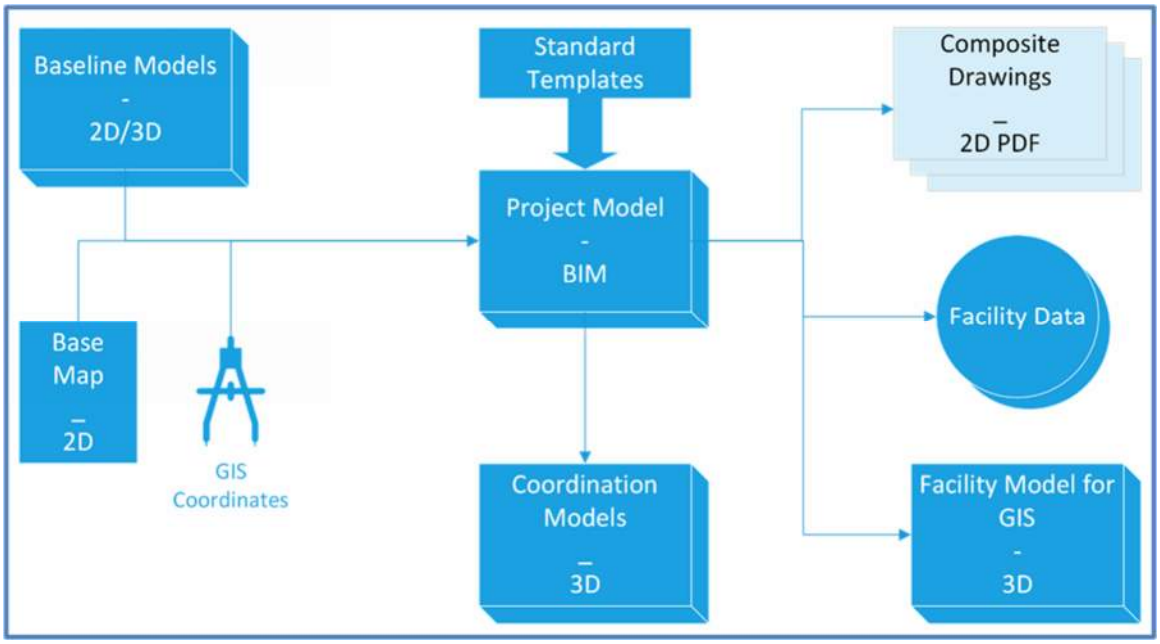


Figure 2-3

2.6 *Separation of Information*

Each Baseline Model File and Project Model File typically contains information associated with only one discipline, e.g., Civil, Mechanical, Electrical, etc. On a given project, it is common to find at least one Model file for each discipline contributing to the design effort. It is critical that this separation of information be maintained even when the same person is producing two different Model files. For example, if a mechanical drafter produces plans containing both mechanical and structural information, he/she would create a separate model file for each, placing each file in the appropriate location. Both model files are referenced as necessary to create Composite Drawings, but the information is never combined into one model file. Refer to Chapter 3, File Naming Convention, for more information on separating files.

2.7 *Measurement Units and Coordinates*

Model files are always drawn in imperial units at “Full Size,” that is one inch equals one inch and one foot equals one foot. Civil and Landscape plans are to use “decimal” units and other disciplines are to use “architectural” units. Project models are always drawn so that the information contained in the file is in its proper geographic position in the Design Plane. This position is defined by X and Y coordinate values based on the California State Plane Coordinate System NAD83, Zone VI, 2017.50 epoch adjustment and the vertical datum NAV88, OCS 1995 adjustment.

Piping & Instrumentation Diagrams shall be developed using Grid and Snap. Refer to Instrumentation Section 9.2.1 for unit requirements.

2.8 Rotation

True North in a design file is always toward the top of the design plane. Viewports may be rotated to create a more desirable display without affecting the actual coordinates of the design data. Model files should never be rotated from their correct coordinates. Consistent use of this strategy guarantees alignment of design data between different disciplines and different projects. View rotation does not affect the way a design file appears when referenced to another file.

The preferred location for the North Arrow is the upper right of the plan view or the lower right of a detail. When possible, the view should not be rotated by more than 90 degrees.

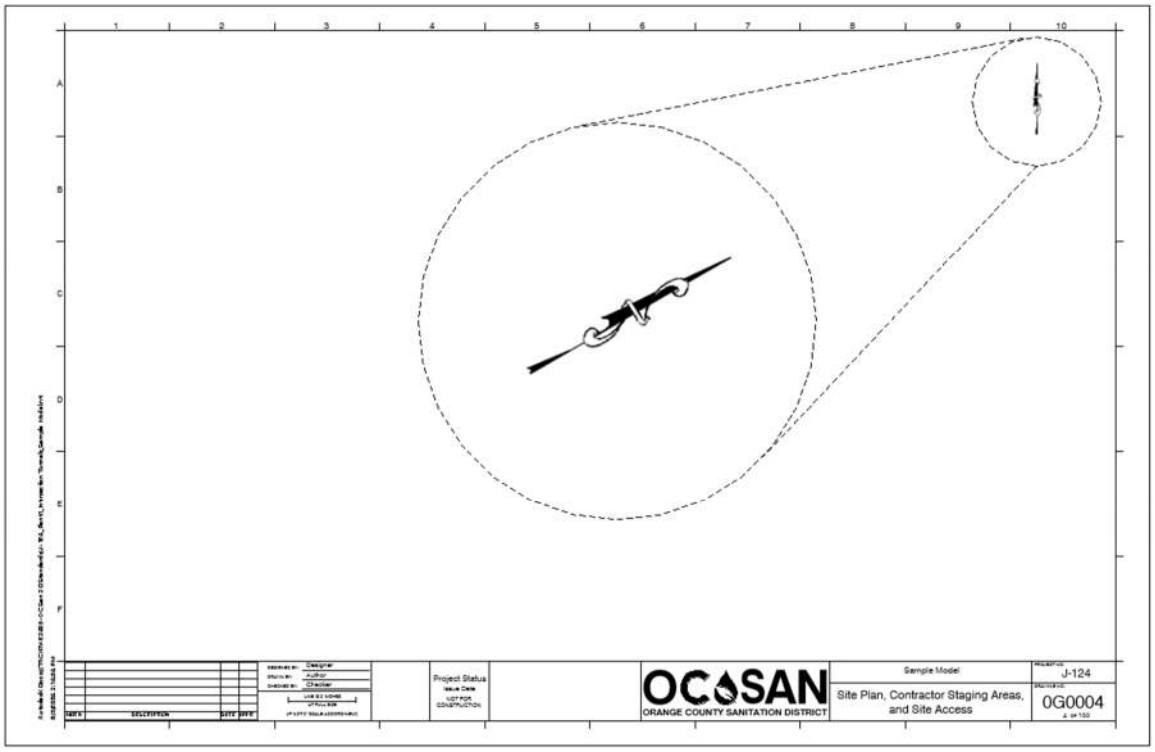


Figure 2-4

2.9 Page Setup

To ensure consistent plots from drawing files, a saved page setup should be used for all composite sheets that includes the settings shown below. For convenience, these settings are present in the composite sheet templates as named page setups. Additional custom page setups may also be present.

Page Setup Name	PDF 34x22	PDF 17x11 (Instrumentation Loop Diagrams)
Printer/plotter	AutoCAD PDF(Web & Mobile)	AutoCAD PDF(Web & Mobile)
Paper size	ANSI expand D (34” x 22”)	ANSI expand B (17” x 11”)
Plot area	Layout	Layout
Scale	1:1	1:2
Plot style table	OCSAN.stb	OCSAN.stb
Quality	Custom	Custom
DPI	300	300
Orientation	Landscape	Landscape
Scale lineweights	Not selected	Selected

To optimize PDF creation plot to scale, DO NOT use Fit to Page setting when plotting.

PDF Layers should also be turned off when Plotting. See below for turning off PDF layers using the plot function:

- Open the Plot dialog or Page Setup dialog, using the named page setup above select the PDF Options button under Printer/plotter.
- Uncheck the “Include Layer Information” located under the Data Section and press the “OK” button.
- Press “OK” again. You will be prompted to save changes in a temporary printer configuration file.

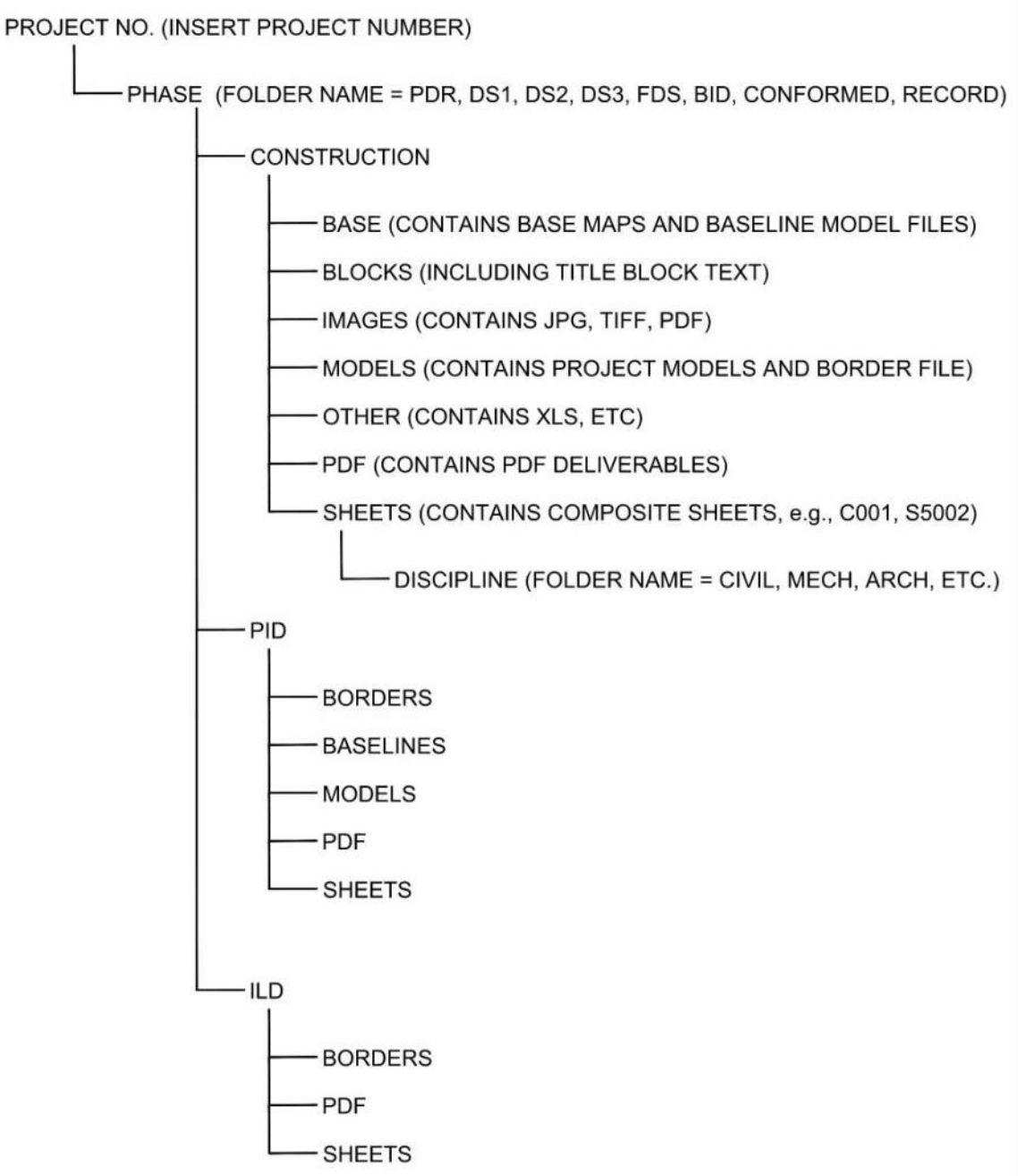
Verify that correct fonts appear in PDF output.

Within Autodesk Revit a saved ‘print set’ specifying the sheets that are part of the latest design package should be maintained.

2.10 Folder Structure

Files should be organized according to the following file structure. Folders that do not contain any files are not necessary. Reference files and other externally linked data should be assigned a relative path to the appropriate folder within this file structure.

Similar alternative file structures may be permitted with prior approval.



3.0 FILE NAMING CONVENTION

Table of Contents

3.0 FILE NAMING CONVENTION 3-1

3.1 HISTORY OF CHANGE 3-2
3.2 BASELINE MODEL FILES 3-3
3.3 PROJECT MODEL FILES 3-4
3.4 COMPOSITE DRAWINGS 3-5
3.5 INSTRUMENTATION DRAWINGS 3-6
3.6 PROJECT BORDER FILES 3-7
3.7 IMAGE FILES 3-8
3.8 MODEL TYPES 3-8

3.1 History of Change

Revision and Version	***Author***	***Date***	***Change***
A1	MAB	04/24/01	Initial Release of Manual
B1	MAB	6/21/01	Included Geotechnical discipline
C	MAB	8/14/02	Incorporated PDS standards
D	MAB	10/15/04	Revised Instrumentation
E	SJM	07/22/10	Updated for Instrument Loop Diagram file naming
E.1	DCR	03/02/11	Updates and revisions to content. Revised to show Enterprise Information Management as group responsible.
G	BAW	08/08/16	Specified additional sheet types. Redesignated as chapter 3 (previously chapter 4).
H	EIM	12/01/19	Updates and revisions to content.
I	RVT	09/13/21	OCSD references to OC San. Grammatical revisions.
J	EIM	03/30/23	Section 3.2 – Updated example descriptions of baseline model files. Section 3.3 – Updated example descriptions of project model files. Section 3.6 – Added Project Codes FE, FR, and FRC.

chap03-File Naming Convention.docx

This chapter details OC San's system for naming of electronic files. This system adheres to industry standards. Files that use this system include design files, scanned files, project files and other file types normally encountered in the use of CAD at OC San. Naming conventions for electronic files allow CAD users to determine the contents of a drawing without actually displaying the file. They also provide a convenient and clear structure for organizing files for particular projects. The system outlined here is intended to be used on all OC San projects. However, there may be situations that are not easily handled with this naming convention. These atypical situations will need to be studied and documented on a project-by-project basis before an alternative is used.

3.2 Baseline Model Files

File names for Baseline Model Files are derived from the plant number or service area number, discipline and type of information contained in the files as follows:

Plant No./Service Area No.:	**PLNT01**	Plant 1	**SA05**	Service Area 5
	PLNT02	Plant 2	**SA06**	Service Area 6
	SA01	Service Area 1	**SA07**	Service Area 7
	SA02	Service Area 2	**SA11**	Service Area 11
	SA03	Service Area 3	**SA14**	Service Area 14
Discipline Code:	**A**	Architectural	**L**	Landscape
	B	Geotechnical	**M**	Mechanical
	C	Civil	**S**	Structural
	D	Demolition	**T**	Telecom
	E	Electrical	**V**	Survey & Mapping
	G	General	**Z**	Contractor/Shop

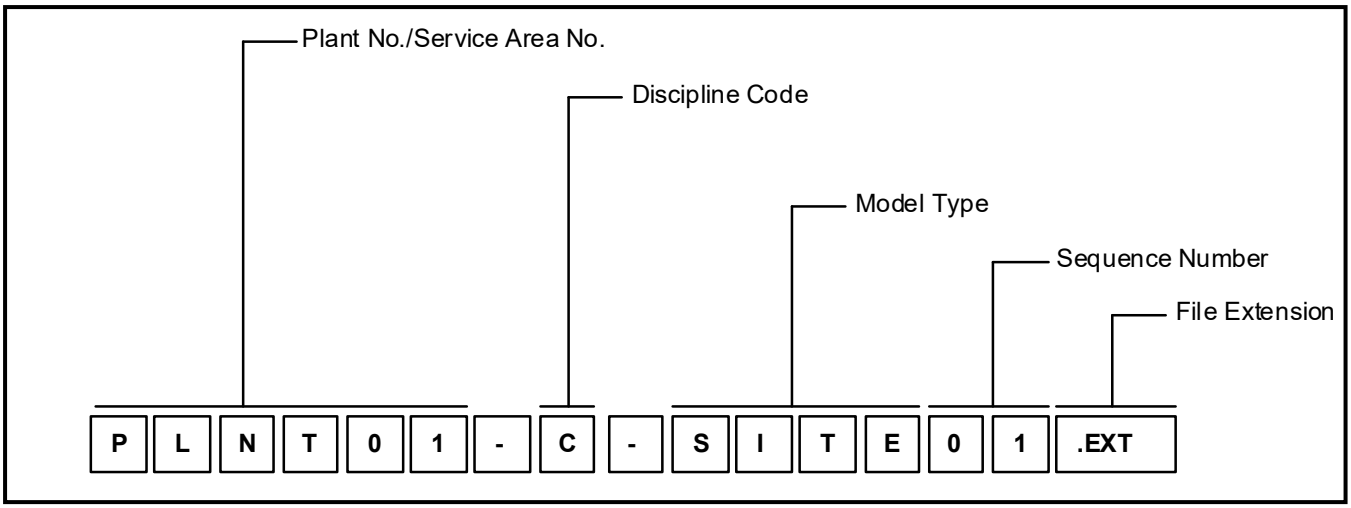
Model Type: Varies with Discipline. Refer to Section 3.8

Sequence Number: 01 – 99

File Extension: File extensions will adhere to the design software used to create the drawing.

Examples:

PLNT01-C-SITE01	Plant 1, civil baseline model file, existing site plan, file 1
PLNT02-C-UTIL01	Plant 2, civil baseline model file, existing utility plan, file 1
SA14-C-UTIL01	Service area 14, civil baseline model file, existing utility plan, file 1



3.3 Project Model Files

File names for Project Model Files are derived from the project number, discipline and the type of information contained in the files as follows:

Project Code: OC San Project Number with hyphens. Number may exceed the number of characters shown. See Section 3.6, Project Border Files, for additional information.

Discipline Code:

A	Architectural	**L**	Landscape
B	Geotechnical	**M**	Mechanical
C	Civil	**S**	Structural
D	Demolition	**T**	Telecom
E	Electrical	**V**	Survey & Mapping
G	General	**Z**	Contractor/Shop Dwgs

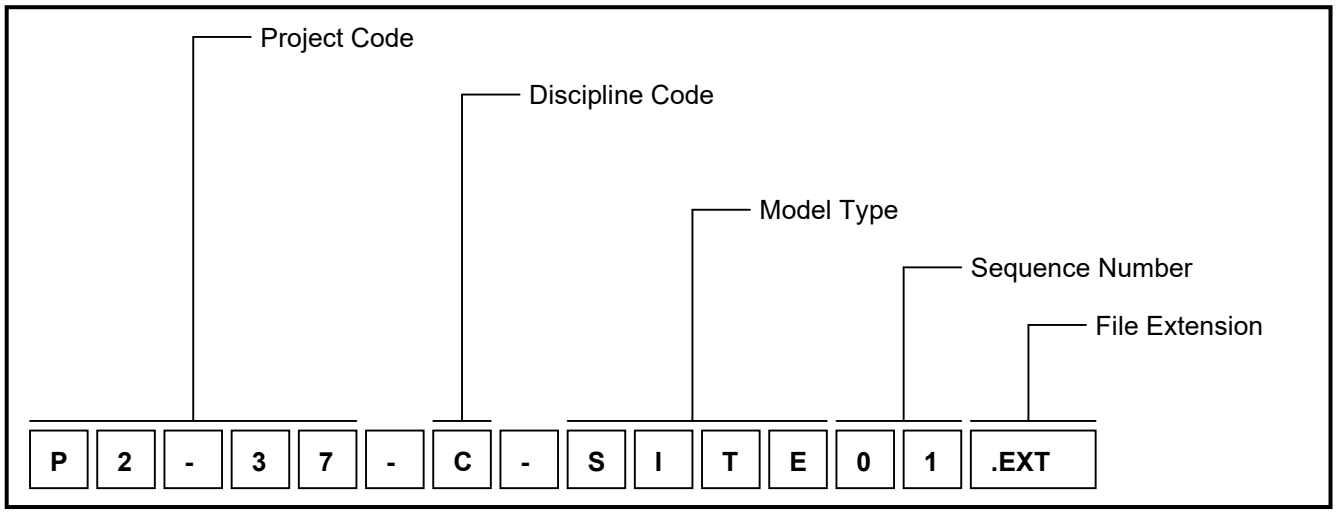
Model Type: Varies with Discipline. Refer to Section 3.8

Sequence Number: 01 – 99

File Extension: File extensions will adhere to the design software used to create the drawing.

Examples:

J-48-1-M-CHEM01	Project J-48-1, mechanical model file, chemical systems, file 1
P2-37-C-SITE01	Project P2-37, civil model file, site improvements, file 1
1-98-C-SSWR01	Project 1-98, civil model file, sanitary sewers, file 1



3.4 Composite Drawings

File names for Composite Drawings are derived from the project number, discipline and the type of information contained in the files as follows:

Project Code: OC San Project Number with hyphens. Number may exceed the number of characters shown. See Section 3.6, Project Border Files, for additional information.

Discipline Code:

A	Architectural	**L**	Landscape
B	Geotechnical	**M**	Mechanical
C	Civil	**S**	Structural
D	Demolition	**T**	Telecom
E	Electrical	**V**	Survey & Mapping
G	General	**Z**	Contractor/Shop Dwgs

Sheet Type:

0	General (Symbols, legend, notes, etc.)
1	Plans (Horizontal views)
2	Elevations (Vertical views)
3	Sections (Sectional views)
4	Large Scale (Plans, elev, or sections that are not details)
5	Details
6	Schedules and diagrams
7	Photos – other images not from model
8	3D views (isometrics, perspectives)
9	User defined (reference drawings)

Sequence Number: 001 – 999 : Proposed

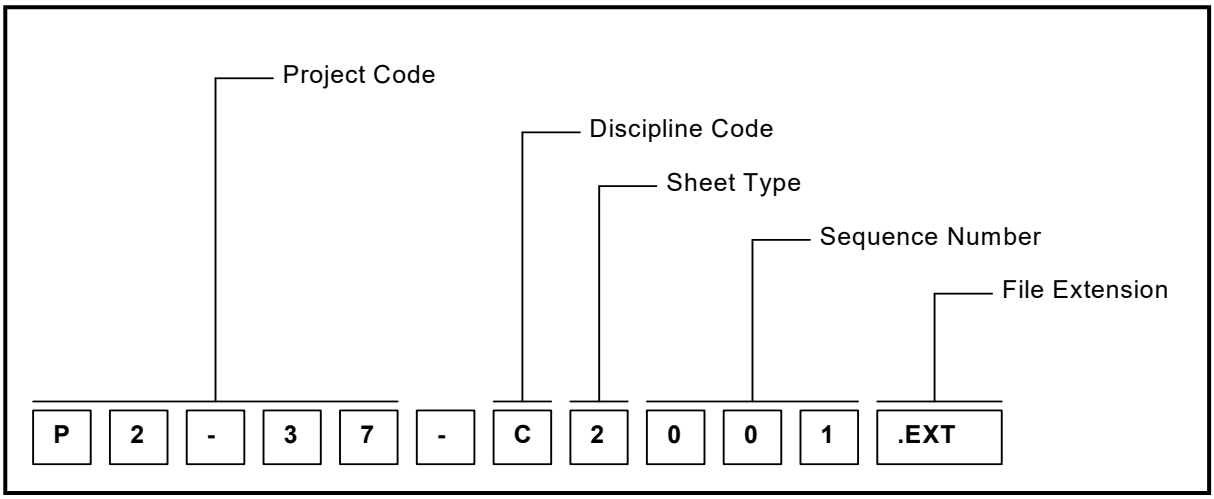
File Extension: File extensions will adhere to the design software.

Examples:

P2-37-C2001	Project P2-37, civil profile, sheet 1
P2-37-M5004	Project P2-37, mech details, sheet 4

Group numbers may be used with prior approval from the OC San Project Manager.

Note: Refer to Section 3.5 for specific requirements regarding Instrumentation drawings.



3.5 Instrumentation Drawings

The file names are derived from the OC San area code, location code, discipline, and type of information contained in the files as shown.

File names for Baseline P&ID are assigned by OC San.

File names for Loop drawings are derived from the instrument tag number and are named and numbered as shown. (See examples).

Area Code/Location Code: Derived from OC San Tagging Procedures.

Discipline Code:

N	Instrumentation

Sheet Type:

C	Block, Control Logic Diagram	**I**	I/O List
D	Demolition	**L**	Loop*
E	Control Panel Elevation	**P**	Piping & Instrumentation
F	Fiber	**S**	Special System Diagram
G	General	**T**	Schedule

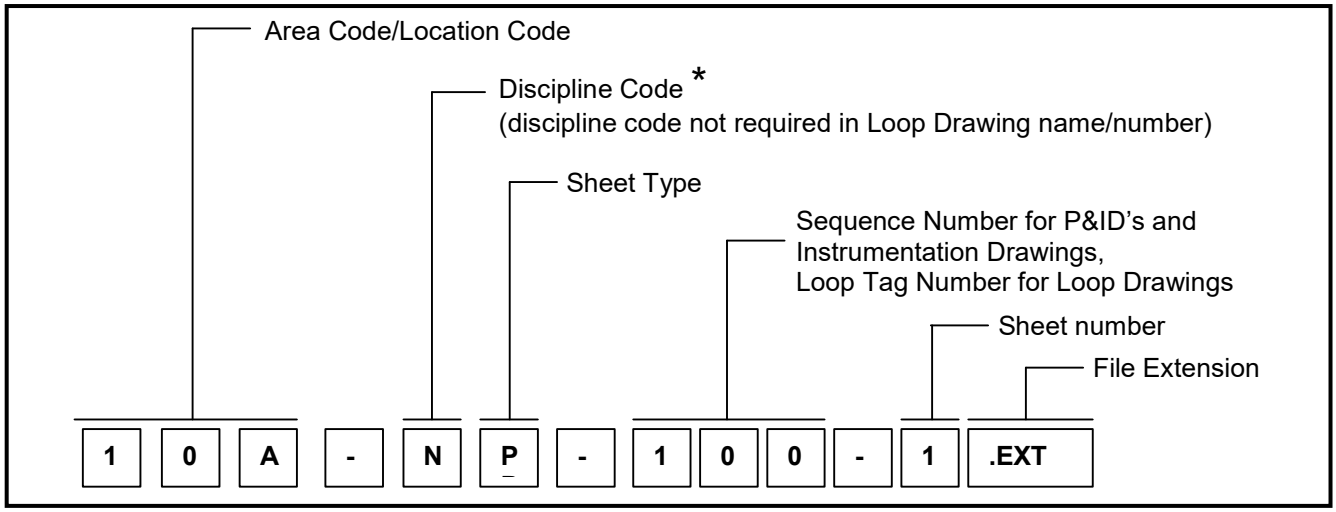
Sequence Number: 100 – 990, in increments of 10. (1-9 can be used to insert additional drawings to avoid renumbering as required).

Sheet Number: Optional, used if multiple sheets are required.

File Extension: File extensions will adhere to the design software.

Examples:

10A-NP-100	Area 10, location A, instrumentation, piping & instrumentation, number 100
10A-NG-100	Area 10, location A, instrumentation, general, number 100
11D-L-670-1 *	Area 11, location D, loop, tag sequence number 670, sheet 1
11D-L-670-2 *	Area 11, location D, loop, tag sequence number 670, sheet 2



3.6 Project Border Files

File names for the Project Border are derived from the project number and drawing size.

Project Code: OC San Project Number with hyphens. Number may exceed the number of characters shown.
P1 = Projects within Plant 1
P2 = Projects within Plant 2
FE = Facility Engineering
FR = Facility Repair
FRC = Facility Repair Collection
J = Joint projects that consist of both Plant 1 and Plant 2
No Letter Designation in front of project code indicates a Collections Project.

Discipline Code: **G** General

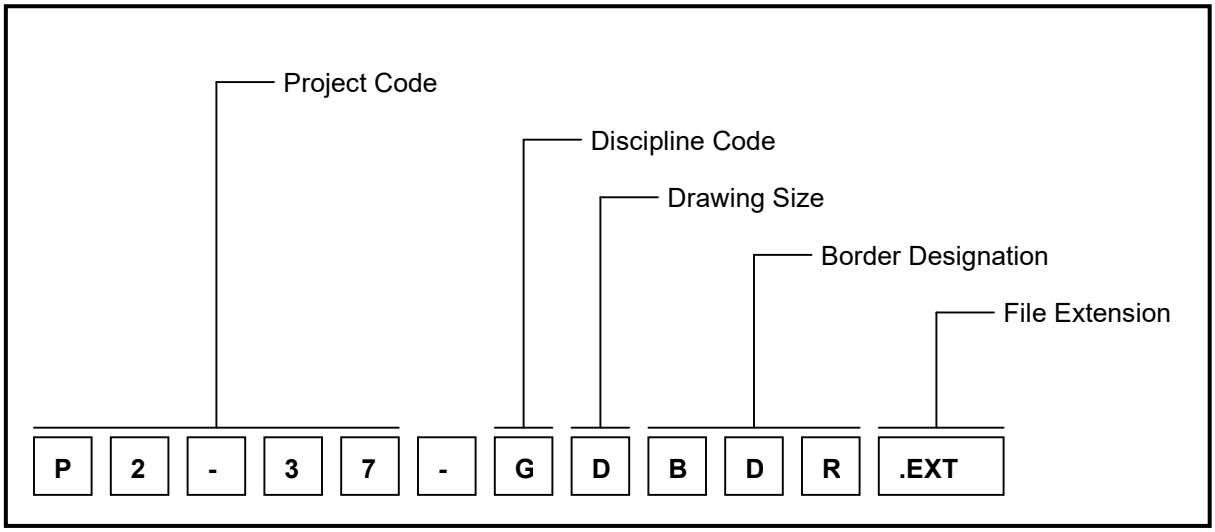
Drawing Size:
A 8.5” x 11”
B 11” x 17”
C 17” x 22”
D 22” x 34”
E 34” x 44”

Border Designation: BDR

File Extension: File extensions will adhere to the design software.

Examples:		
	J-48-1-GABDR	Project J-48-1, A size border sheet
	P2-37-GBBDR	Project P2-37, B size border sheet
	1-98-GDBDR	Project 1-98, D size border sheet

Note: Refer to Chapter 11.0, Instrumentation Loop Diagrams, for specific requirements regarding borders and Instrumentation Loop Diagrams.



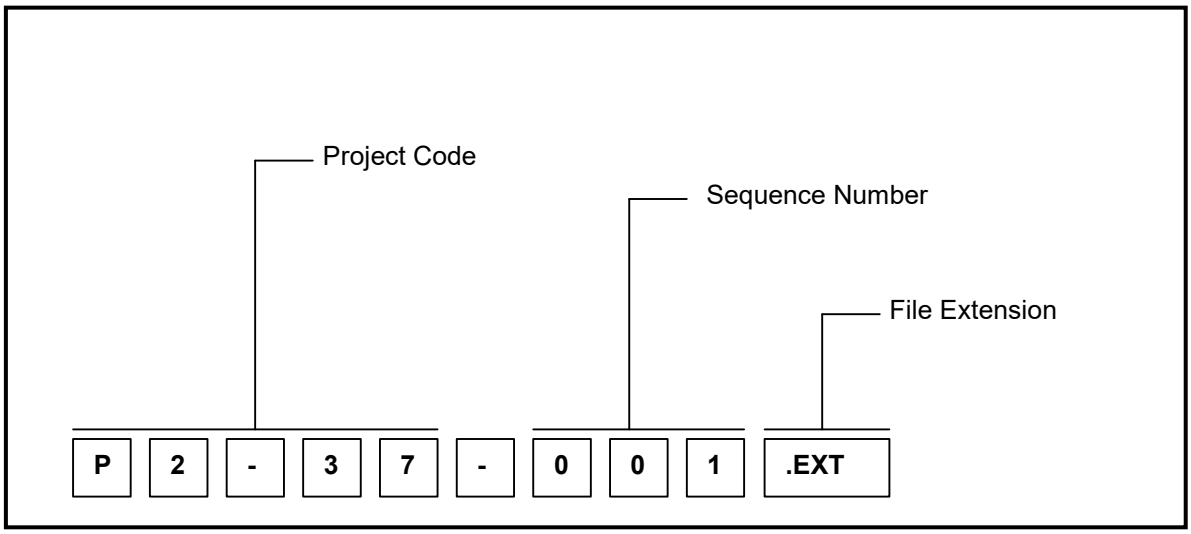
3.7 Image Files

File names for all image files (e.g., .jpg, .pdf, .tif) are derived from the project number and sequence number.

Project Code:	OC San Project Number with hyphens. Number may exceed three characters.	
Sequence Number:	001 - 999	
File Extension:	File extensions will adhere to the design software.	
Examples:	J-48-1-001	Project J-48-1, image 001
	P2-37-001	Project P2-37, image 001
	1-98-001	Project 1-98, image 001

Note:
Each image file must be named with a unique sequence number, even if it has a different file extension.

If using an unaltered copy of an image file from a different project, leave the filename as-is. If modifications need to occur, rename the copy to follow current project file naming convention.



3.8 Model Types

The lists in the following table outline the alpha codes used to identify CAD files. These codes are used in conjunction with the file naming conventions shown in Sections 3.2 and 3.3.

Discipline	Type	Description
Architectural,	BSMT	Basement
Electrical,	CLNG	Ceiling plan
Mechanical,	DETL	Details/section
Structural	ELEV	Elevation
Demolition	FLOR	Floor plan
	FNDN	Foundation plan
	ROOF	Roof plan
	SITE	Site plan
Civil	DETL	Details/section
	GRAD	Grading
	HALN	Horizontal alignment
	SITE	Site Improvements
	UTIL	Utility plan
	VALN	Vertical alignment/profile
Electrical	DIAG	Wiring Diagram
	ELEM	Elementary / Ladder Diagram
	SLDS	Single Line Diagram
	SCHE	Panel Schedule
General	KEYP	Keyplan
Geotechnical	PLAN	Geotechnical plan
Landscape	DETL	Details/section
	IRRG	Irrigation
	PLNT	Planting plan
	SITE	Site Improvements
Mechanical	CHEM	Chemicals systems
	CMPA	Compressed air or oxygen systems
	GASS	Gas Systems
	MISC	Miscellaneous, unknown, sampling
	OILS	Oil Systems
	SLUD	Sludge, scum, grit
	STEM	Steam
Instrumentation		Not Applicable
Survey & Mapping	SURV	Survey and mapping plan
	TOPO	Aerial topography
	SITE	Site Information

4.0 LAYER CONVENTIONS

Table of Contents

4.0 LAYER CONVENTIONS 4-1

4.1 HISTORY OF CHANGE 4-3
4.1.1 Model Categories vs. Layers 4-3
4.2 AIA LAYER GUIDELINES 4-4
4.2.1 Discipline Code 4-4
4.2.2 Major Group 4-4
4.2.3 Primary Minor Group 4-4
4.2.4 Secondary Minor Group 4-4
4.2.5 Status Field 4-4
4.3 COMMON LAYERS 4-5
4.3.1 Annotation Layers 4-5
4.3.2 Common Modifiers 4-5
4.3.3 Status Field Modifiers 4-5
4.4 ARCHITECTURAL 4-6
4.4.1 Drawing Type: Ceiling plan 4-6
4.4.2 Drawing Type: Details/section 4-6
4.4.3 Drawing Type: Elevation 4-6
4.4.4 Drawing Type: Floor plan 4-6
4.4.5 Drawing Type: Roof plan 4-7
4.5 GEOTECHNICAL 4-8
4.5.1 Drawing Type: Plan 4-8
4.6 CIVIL 4-8
4.6.1 Drawing Type: Details/section 4-8
4.6.2 Drawing Type: Grading 4-8
4.6.3 Drawing Type: Horizontal alignment 4-8
4.6.4 Drawing Type: Site improvements 4-8
4.6.5 Drawing Type: Utility plans 4-10
4.6.6 Drawing Type: Vertical alignment/profile 4-11
4.7 ELECTRICAL 4-12
4.7.1 Drawing Type: Details/Section 4-12
4.7.2 Drawing Type: Site improvements 4-12
4.7.3 Single Line Diagrams (SLD) 4-13
4.8 GENERAL 4-14
4.8.1 Drawing Type: Key plan 4-14
4.9 INSTRUMENTATION 4-15
4.9.1 Process & Instrumentation Diagrams 4-15
4.9.2 Instrument Loop Diagrams (ILD) AutoCAD 4-16
4.10 LANDSCAPE 4-17
4.10.1 Drawing Type: Details/section 4-17
4.10.2 Drawing Type: Irrigation 4-17
4.10.3 Drawing Type: Site Improvements 4-17
4.11 MECHANICAL 4-18
4.11.1 Drawing Type: Water and Wastewater 4-18
4.11.2 Drawing Type: Chemical systems 4-20
4.11.3 Drawing Type: Compressed air or oxygen system 4-21
4.11.4 Drawing Type: Details/section 4-21
4.11.5 Drawing Type: Gas systems 4-22
4.11.6 Drawing Type: Oil systems 4-22
4.11.7 Drawing Type: Sludge, scum, grit 4-23

4.11.8 Drawing Type: Steam 4-23
4.11.9 Drawing Type: Miscellaneous 4-24
4.12 STRUCTURAL 4-25
4.12.1 Drawing Type: Details/section 4-25
4.12.2 Drawing Type: Elevation 4-25
4.12.3 Drawing Type: Structural Plans 4-25
4.13 SURVEY & MAPPING 4-26
4.13.1 Drawing Type: Survey and mapping plan 4-26

4.1 History of Change

Revision and Version	*Author*	*Date*	*Change*
A.1	MAB	04/24/01	Initial Release of Manual
A.2	MAB	6/21/01	Modified layer names for Civil, Mechanical, General and added Geotechnical Layers.
B	MAB	6/26/02	Incorporated PDS standards
C	MAB	2/22/06	Incorporated ILD standards
F	SJM	7/22/10	Incorporated AutoCAD P&ID and removed PDS
F.1	DCR	02/02/11	Updates and revisions to content. Revised to show Enterprise Information Management as group responsible.
G	BAW	08/08/16	Revised layer properties per new plot style standards and defined additional layers
H	EIM	05/01/19	Updates and revisions to content
I	RVT	09/13/21	OCSD references to OC San. Grammatical revisions.
K	TAC	05/29/24	Update Reference Source from AIA to NCS. Provide commentary regarding Model Categories.

chap04-Layer Conventions.docx

This chapter defines the layer conventions currently in use at OC San. The layers for all OC San CAD work shall follow these conventions, whether work is produced in-house or by an outside contractor or consultant. All layer names are to be UPPER CASE.

The layer names follow The US National CAD Standards (NCS) CAD Layer Guidelines, (latest edition) and are organized by discipline. Additional layer names may be created as needed if they are consistent with the NCS CAD Layer Guidelines. A brief description is provided.

4.1.1 Model Categories vs. Layers

Many 3D platforms do allow for layers natively. Where layers are part of the authoring tool, designs shall adhere to the layer names and properties as defined in this chapter.

For design tools that do not use layers (e.g. Autodesk™ Revit™) an “Export to CAD” scheme will assign CAD layers with discipline codes and major groups based on model categories. It is the responsibility of the consultant to ensure that model elements are created with correct categories.

4.2 NCS Layer Guidelines

The layer naming convention incorporates the following components – a discipline code, a major element category designator, two optional minor element category designators and a status field.

4.2.1 Discipline Code

The discipline code is one-character field. The defined discipline codes are the same for both layers and files names. Refer to Chapter 3, File Naming Convention for a list of discipline codes.

4.2.2 Major Group

The major group designation identifies the building system. Although major groups are logically grouped with specific discipline codes, it is possible to combine major group codes with any of the discipline codes.

4.2.3 Primary Minor Group

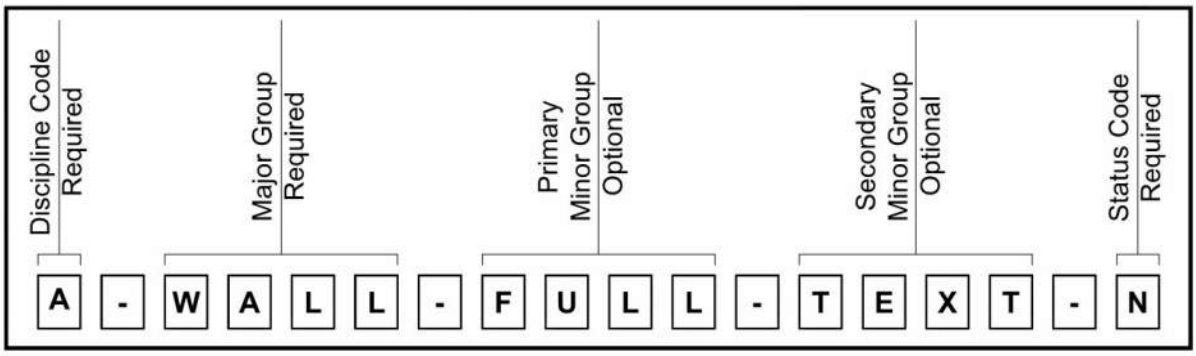
This is an optional, four-character field for further differentiation of major groups. The minor group field can be defined by the user, which allows additional layers to be added to accommodate special project requirements. This should only be done if a defined layer does not apply to a project.

4.2.4 Secondary Minor Group

This is an additional optional, four-character field for further differentiation. Minor codes are paired with commonly used major group codes. Any reasonable combination of the prescribed major and minor groups is permitted. Any user-defined combinations must be documented and included with the submittal.

4.2.5 Status Field

The status field is a one-character designator that differentiates new construction from existing. The acceptable values for this field are found in section 4.3.3. Refer to the NCS Layer Guidelines for more information.



4.3 Common Layers

4.3.1 Annotation Layers

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
*-ANNO-TEXT	2	Continuous	0.35	Solid	Text, Notes, Key notes, etc.
*-ANNO-REDL	1	Continuous	0.35	Solid	Redline
*-ANNO-SYMB	3	Continuous	0.35	Solid	Symbols
*-ANNO-LEGN	2	Continuous	0.35	Solid	Legends and schedules
*-ANNO-DIMS	1	Continuous	0.25	Solid	Dimensions
*-ANNO-TTLB	2	Continuous	0.35	Solid	Border and Title Block
*-ANNO-NPLT	8	Continuous	0.35	Solid	Const. lines, non-plotting info
*-ANNO-REVS	1	Continuous	0.35	Solid	Revisions
*-ANNO-XREF	7	Continuous	0.35	Solid	Referenced model files

* Asterisk represents discipline code

4.3.2 Common Modifiers

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
*-****-PATT	-	-	-	-	Cross-hatching, poche
*-****-IDEN	-	-	-	-	Identification tags
*-****-ELEV	-	-	-	-	Elevation (vertical surfaces)
*-****-CORR	-	-	-	-	Corrected
*-****-NCOR	-	-	-	-	Incorrect
*-****-FINE	-	-	0.18	-	line work using a Fine line
*-****-THIN	-	-	0.25	-	line work using a Thin line
*-****-MEDM	-	-	0.35	-	line work using a Medium line
*-****-WIDE	-	-	0.50	-	line work using a Wide line
*-****-NPLT	-	-	-	-	Read-me layer, not to be plotted

4.3.3 Status Field Modifiers

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
*-****-N	-	-	-	Solid	New / Proposed
*-****-E	-	-	-	Screened	Existing
*-****-D	-	-	-	Screened	To be Demolished
*-****-A	-	-	-	Screened	To be Abandoned
*-****-F	-	Dashed	-	Solid	Future work
*-****-T	-	-	-	-	Temporary work
*-****-X	-	-	-	-	Not in contract
*-****-1-9	-	-	-	-	Phase numbers (1-9)

Note: The status field may also occur as the third or fourth field, following a major or minor group.

4.4 Architectural

4.4.1 Drawing Type: Ceiling plan

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
A-CLNG	101	Continuous	0.35	Per Status	Ceiling information
A-CLNG-GRID	103	Continuous	0.35	Per Status	Ceiling grid

4.4.2 Drawing Type: Details/section

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
A-DETL	4	Continuous	0.35	Per Status	Details
A-SECT	4	Continuous	0.35	Per Status	Sections
A-SECT-PATT	11	Continuous	0.25	Per Status	Textures and hatch patterns

4.4.3 Drawing Type: Elevation

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
A-ELEV	5	Continuous	0.35	Per Status	Interior & exterior elevations

4.4.4 Drawing Type: Floor plan

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
A-AREA	132	Continuous	0.35	Per Status	Area calculation boundary lines
A-AREA-IDEN	132	Continuous	0.35	Per Status	Area calculations, room nums
A-AREA-PATT	132	Continuous	0.25	Per Status	Area cross-hatching
A-COLS	180	Continuous	0.35	Per Status	Columns
A-DOOR	3	Continuous	0.35	Per Status	Doors
A-DOOR-JAMB	20	Continuous	0.35	Per Status	Door jamb
A-DOOR-OTLN	3	Continuous	0.35	Per Status	Door outlines
A-EQPM	4	Continuous	0.35	Per Status	Equipment
A-EQPM-IDEN	4	Continuous	0.35	Per Status	Equipment identification number
A-FLOR	60	Continuous	0.35	Per Status	Floor plan information
A-FLOR-IDEN	60	Continuous	0.35	Per Status	Room numbers, names, etc.
A-FLOR-OTLN	6	Continuous	0.35	Per Status	Floor or building outline
A-FURN	42	Continuous	0.35	Per Status	Furniture
A-GLAZ	40	Continuous	0.35	Per Status	Windows, glazed partitions
A-GRID	163	Center	0.35	Per Status	Planning grid or column grid
A-HVAC	130	Continuous	0.35	Per Status	Heating, ventilation and A/C
A-LITE	212	Continuous	0.35	Per Status	Light fixtures
A-PMFN	2	Continuous	0.35	Per Status	Materials and finish plan

A-POCC	3	Continuous	0.35	Per Status	Occupancy plan
A-STRS	112	Continuous	0.35	Per Status	Stairs
A-WALL	1	Continuous	0.35	Per Status	Exterior/Interior walls
A-WALL-CNTR	13	Center	0.35	Per Status	Wall centerlines

4.4.5 Drawing Type: Roof plan

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
A-ROOF	52	Continuous	0.35	Per Status	Roof information
A-ROOF-OTLN	52	Continuous	0.35	Per Status	Roof outline

4.5 Geotechnical

4.5.1 Drawing Type: Plan

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
B-FALT	42	Continuous	0.35	Per Status	Seismic fault lines
B-SBOR	42	Continuous	0.35	Per Status	Solid borings
B-SECT	42	Continuous	0.35	Per Status	Section View
B-SECT-PATT	11	Continuous	0.25	Per Status	Textures and hatch patterns

4.6 Civil

4.6.1 Drawing Type: Details/section

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
C-DETL	4	Continuous	0.35	Per Status	Details
C-SECT	4	Continuous	0.35	Per Status	Sections
C-SECT-PATT	1	Continuous	0.25	Per Status	Textures and hatch patterns

4.6.2 Drawing Type: Grading

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
C-TOPO-MAJR	40	Continuous	0.35	Per Status	Proposed major contour lines
C-TOPO-MNOR	41	Continuous	0.25	Per Status	Proposed minor contour lines
C-TOPO-TEXT	2	Continuous	0.35	Per Status	Contour elevations
C-SPOT	2	Continuous	0.35	Per Status	Proposed spot elevations
C-SURV	2	Continuous	0.35	Per Status	Benchmarks, survey control lines
C-BORW	40	Continuous	0.35	Per Status	Borrow/spoil area

4.6.3 Drawing Type: Horizontal alignment

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
C-ALGN-HORZ	1	Center	0.35	Per Status	Horizontal alignment

4.6.4 Drawing Type: Site improvements

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
C-AREA	1	Continuous	0.35	Per Status	Area code bndry (process areas)
C-BLDG	5	Continuous	0.35	Per Status	Bldg., primary structures

C-DEMO	1	Continuous	0.35	Per Status	Demolition
C-EROS	1	Continuous	0.35	Per Status	Riprap, breakwaters, dikes, jetty
C-PAVE	113	Continuous	0.35	Per Status	Edge of pavement
C-PKNG-DRAN	2	Continuous	0.35	Per Status	Parking lot slope indicators
C-PKNG-STRP	5	Continuous	0.35	Per Status	Lot striping, handicapped
C-PROP	7	Phantom	0.50	Per Status	Property line, survey benchmark
C-PROP-BRNG	2	Continuous	0.35	Per Status	Bearing and distance labels
C-PROP-ESMT	6	Continuous	0.35	Per Status	Easements, R.O.W., setbacks
C-PTIC	6	Continuous	0.35	Per Status	Plant coordinate grid tics
C-RAIL	1	Continuous	0.35	Per Status	Railroad outlines
C-RAIL-CNTR	1	Center	0.25	Per Status	Railroad centerlines
C-ROAD-CNTR	1	Center	0.25	Per Status	Road centerlines
C-ROAD-CURB	2	Continuous	0.35	Per Status	Curbs
C-ROAD-GTTR	60	Continuous	0.25	Per Status	Gutter
C-ROW	7	Phantom	0.50	Per Status	Right-of-way
C-SITE	1	Continuous	0.35	Per Status	Fences, handrails, ramps, signs
C-STAG	5	Continuous	0.35	Per Status	Construction staging
C-STIC	8	Continuous	0.35	Per Status	State plane grid tics
C-STRM	4	Continuous	0.35	Per Status	Storm drain, catch basins, inlets
C-STRU	144	Continuous	0.35	Per Status	Structures
C-TUNL	4	Continuous	0.35	Per Status	Tunnel outlines
C-TUNL-CNTR	1	Center	0.35	Per Status	Tunnel centerlines
C-TUNL-LADD	4	Continuous	0.35	Per Status	Tunnel access points
C-UTIL	4	Continuous	0.35	Per Status	Power lines, telephone poles
C-VEGE	3	Continuous	0.35	Per Status	Vegetation
C-WRKA	7	Phantom / Divide	0.35	Per Status	Work area, project boundary

4.6.5 Drawing Type: Utility plans

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
C-AIR	41	Continuous	0.35	Per Status	Air system
C-AIR-CNTR	41	Center	0.25	Per Status	Air system centerlines
C-CHEM	232	Continuous	0.35	Per Status	Chemical system
C-CHEM-CNTR	232	Center	0.25	Per Status	Chemical system centerlines
C-DRAN	20	Continuous	0.35	Per Status	Drains
C-DRAN-CNTR	20	Center	0.25	Per Status	Drains centerlines
C-GUYW	1	Continuous	0.35	Per Status	Down guy wires
C-GUYW-CNTR	1	Center	0.25	Per Status	Down guy wires centerlines
C-HOTW-RETN	22	Continuous	0.35	Per Status	Hot water return
C-HOTW-RETN-CNTR	22	Center	0.25	Per Status	Hot water return centerlines
C-HOTW-SUPP	22	Continuous	0.35	Per Status	Hot water supply
C-HOTW-SUPP-CNTR	22	Center	0.25	Per Status	Hot water supply centerlines
C-HOTW-UNKN	22	Continuous	0.35	Per Status	Unknown water
C-HOTW-UNKN-CNTR	22	Center	0.25	Per Status	Unknown water centerlines
C-GAS	30	Continuous	0.35	Per Status	Gas system
C-GAS-CNTR	30	Center	0.25	Per Status	Gas system centerlines
C-INTR	3	Continuous	0.35	Per Status	Interplant sewer
C-INTR-CNTR	3	Center	0.25	Per Status	Interplant sewer centerlines
C-IWTR	122	Continuous	0.35	Per Status	Industrial water
C-IWTR-CNTR	122	Center	0.25	Per Status	Industrial water centerlines
C-OIL	182	Continuous	0.35	Per Status	Oil lines
C-OIL-CNTR	182	Center	0.25	Per Status	Oil lines centerlines
C-OUTF	72	Continuous	0.35	Per Status	Ocean outfall
C-OUTF-CNTR	72	Center	0.25	Per Status	Ocean outfall centerlines
C-PEFF	72	Continuous	0.35	Per Status	Primary effluent
C-PEFF-CNTR	72	Center	0.25	Per Status	Primary effluent centerlines
C-PIFF	72	Continuous	0.35	Per Status	Primary influent
C-PIFF-CNTR	72	Center	0.25	Per Status	Primary influent centerlines
C-POLE	1	Continuous	0.35	Per Status	Power poles, telephone poles
C-POLE-CNTR	1	Center	0.25	Per Status	Power poles, telephone poles centerliness
C-POTW	150	Continuous	0.35	Per Status	Potable water
C-POTW-CNTR	150	Center	0.25	Per Status	Potable water centerlines
C-PWTR	120	Continuous	0.35	Per Status	Plant water
C-PWTR-CNTR	120	Center	0.25	Per Status	Plant water centerlines
C-RAWS	72	Continuous	0.35	Per Status	Raw sewage
C-RAWS-CNTR	72	Center	0.25	Per Status	Raw sewage centerlines
C-RCYC	200	Continuous	0.35	Per Status	Recycle, recirculation, venting lines

C-RCYC-CNTR	200	Center	0.25	Per Status	Recycle, recirculation, venting lines centerlines
C-SEFF	72	Continuous	0.35	Per Status	Secondary effluent
C-SEFF-CNTR	72	Center	0.25	Per Status	Secondary effluent centerlines
C-SLDG	42	Continuous	0.35	Per Status	Sludge lines
C-SLDG-CNTR	42	Center	0.25	Per Status	Sludge lines centerlines
C-SSTR	15	Continuous	0.35	Per Status	Substructure, pipeline structure
C-SSTR-CNTR	15	Center	0.25	Per Status	Substructure, pipeline structure centerlines
C-SSWR	72	Continuous	0.35	Per Status	Sanitary sewer lines
C-SSWR-CNTR	72	Center	0.25	Per Status	Sanitary sewer lines centerlines
C-STEM	141	Continuous	0.35	Per Status	Steam lines
C-STEM-CNTR	141	Center	0.25	Per Status	Steam lines centerlines
C-STRM	20	Continuous	0.35	Per Status	Storm drain lines
C-STRM-CNTR	20	Center	0.25	Per Status	Storm drain lines centerlines
C-UTIL-A	252	Continuous	0.35	Screened	Abandoned utilities
C-UTIL-CNTR -A	252	Center	0.25	Screened	Abandoned utilities centerlines
C-UTIL-BUFF	9	Continuous	0.35	Per Status	Pipe footprints
C-UTIL-BUFF-CNTR	9	Center	0.25	Per Status	Pipe footprints centerlines
C-UTIL-D	1	Continuous	0.35	Screened	Demolished utilities - unverified
C-UTIL-CNTR -D	1	Center	0.25	Screened	Demolished utilities - unverified centerlines
C-WATR	150	Continuous	0.35	Per Status	Water utility lines
C-WATR-CNTR	150	Center	0.25	Per Status	Water utility lines centerlines
C-WATR-FIRE	162	Continuous	0.35	Per Status	Fire protection
C-WATR-FIRE-CNTR	162	Center	0.25	Per Status	Fire protection centerlines
C-WATR-RECL	200	Continuous	0.35	Per Status	Reclaimed water
C-WATR-RECL-CNTR	200	Center	0.25	Per Status	Reclaimed water centerlines
C-WATR-UNKN	142	Continuous	0.35	Per Status	Unknown water
C-WATR-UNKN-CNTR	142	Center	0.25	Per Status	Unknown water centerlines
C-WSST	62	Continuous	0.35	Per Status	Waste sidestream
C-WSST-CNTR	62	Center	0.25	Per Status	Waste sidestream centerlines
C-WWTR	1	Continuous	0.35	Per Status	Wastewater utility lines
C-WWTR-CNTR	1	Center	0.25	Per Status	Wastewater utility lines centerlines

4.6.6 Drawing Type: Vertical alignment/profile

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
C-ALGN	1	Continuous	0.35	Per Status	Vertical alignment
C-FRAM	8	Continuous	0.35	Per Status	Grid lines, profiles, x-sections

4.7 Electrical

4.7.1 Drawing Type: Details/Section

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
E-DETL	4	Continuous	0.35	Per Status	Details
E-SECT	4	Continuous	0.35	Per Status	Sections
E-SECT-PATT	11	Continuous	0.35	Per Status	Textures and hatch patterns

4.7.2 Drawing Type: Site improvements

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
E-ALRM	12	Continuous	0.35	Per Status	Alarm systems
E-AUXL	31	Continuous	0.35	Per Status	Auxiliary systems
E-CCTV	93	Continuous	0.35	Per Status	Closed circuit TV
E-COMM	153	Continuous	0.35	Per Status	Fiber optic cable, telecom
E-COMM-VALT	153	Continuous	0.35	Per Status	Fiber optic vaults, telecom
E-DATA	160	Continuous	0.35	Per Status	Data outlets
E-DUCT	222	Continuous	0.35	Per Status	Electrical conduit, duct bank
E-ELCT	190	Continuous	0.35	Per Status	Electrical cable tray
E-ELCT-VALT	32	Continuous	0.35	Per Status	Electrical vaults
E-GRND	72	Continuous	0.35	Per Status	Ground system
E-LITE	62	Continuous	0.35	Per Status	Lighting
E-LITE-EQPM	62	Continuous	0.35	Per Status	Major lighting equipment
E-LITE-PNLS	62	Continuous	0.35	Per Status	Lighting panels
E-NFPA-DIV1	205	Continuous	0.35	Per Status	NFPA division 1 hazardous area
E-NFPA-DIV2	205	Continuous	0.35	Per Status	NFPA division 2 hazardous area
E-POWR	3	Continuous	0.35	Per Status	Power
E-POWR-EQPM	82	Continuous	0.35	Per Status	Major power equipment
E-POWR-EXTL	84	Continuous	0.35	Per Status	External power system
E-SERT	154	Continuous	0.35	Per Status	Security
E-SOUN	124	Continuous	0.35	Per Status	Sound/PA systems
E-LNWK-FINE	50	Continuous	0.18	Per Status	Schematic line work using the Fine line thickness
E-LNWK-THIN	40	Continuous	0.25	Per Status	Schematic line work using the Thin line thickness
E-LNWK-MEDM	30	Continuous	0.35	Per Status	Schematic line work using the Medium line thickness
E-LNWK-WIDE	20	Continuous	0.50	Per Status	Schematic line work using the Wide line thickness

4.7.3 Single Line Diagrams (SLD)

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
E-CNTL-WIRE	1	Continuous	0.35	Per Status	Control Lead/Wiring
E-ENCL-DTRB-MAIN	5	Phantom	0.70	Per Status	Electrical distribution enclosures
E-ENCL-SECD	3	Phantom	0.50	Per Status	Electrical enclosure (Secondary)
E-EQPM-DEVC	3	Continuous	0.35	Per Status	Electrical Equipment/Devices
E-EQPM-IDEN-TAGG	3	Continuous	0.35	Per Status	Equipment identification
E-EQPM-LOAD	3	Continuous	0.35	Per Status	Equipment load
E-EQPM-SECD	3	Continuous	0.35	Per Status	Electrical Equipment/Device (Secondary)
E-FDRS	4	Continuous	0.50	Per Status	Feeders
E-POWR-MBUS	15	Continuous	0.70	Per Status	Main bus
E-SGNL	1	Hidden	0.35	Per Status	Signal / Data
E-LNWK-CONT	6	Continuous	0.70	Per Status	Continuation/Cut line
E-LNWK-FINE	50	Continuous	0.18	Per Status	Schematic line work using the Fine line thickness
E-LNWK-THIN	40	Continuous	0.25	Per Status	Schematic line work using the Thin line thickness
E-LNWK-MEDM	30	Continuous	0.35	Per Status	Schematic line work using the Medium line thickness
E-LNWK-WIDE	20	Continuous	0.50	Per Status	Schematic line work using the Wide line thickness

4.8 General

4.8.1 Drawing Type: Key plan

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
G-PLAN	4	Continuous	0.35	Per Status	General plan
G-SITE	3	Continuous	0.35	Per Status	General site plan
G-GRID	7	Center	0.35	Per Status	Column grid and tags
G-SPLN	3	Continuous	0.35	Per Status	Strategic plan scenarios
G-STAG	2	Continuous	0.35	Per Status	Staging area
G-WRKA	1	Continuous	0.35	Per Status	Work area
G-AQMD	5	Continuous	0.35	Per Status	AQMD permit sites
G-NFPA-DIV1	244	Continuous	0.35	Per Status	NFPA division 1 hazardous area
G-NFPA-DIV2	242	Continuous	0.35	Per Status	NFPA division 2 hazardous area

4.9 Instrumentation

4.9.1 Process & Instrumentation Diagrams

Layering shown is a sample only and may vary. The OCSan AutoCAD Plant 3D Reference Project specifies layering for AutoCAD P&ID's and must not be changed.

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
ANNOTATION	7	Continuous			
BORDER	7	Continuous			
DEFPOINTS	7	Continuous			
DEMO	31	Continuous			
EQUIPMENT	1	Continuous			
EQUIPMENT EXISTING	240	Continuous			
EQUIPMENT FUTURE	10	Hidden			
G-ANNO-TEXT	1	Continuous			
G-ANNO-TTLB	3	Continuous			
INSTRUMENT	3	Continuous			
INSTRUMENT EXISTING	90	Continuous			
INSTRUMENT FUTURE	100	Hidden			
MECHANICAL	31	Continuous			
MECHANICAL EXISTING	21	Continuous			
MECHANICAL FUTURE	43	Hidden			
NO PLOT	7	Continuous			
OCSD_OPC	140	Continuous			
PANEL	5	Phantom			
PROCESS PRIMARY	41	Continuous			
PROCESS PRIMARY EXISTING	40	Continuous			
PROCESS PRIMARY FUTURE	30	Hidden			
PROCESS SECONDARY	183	Continuous			
PROCESS SECONDARY EXISTING	173	Continuous			

PROCESS SECONDARY FUTURE	193	Hidden			
REVISION	6	Continuous			
SETPOINT	140	Continuous			
SIGNAL LINES	3	Continuous			
SIGNAL LINES EXISTING	90	Continuous			
SIGNAL LINES FUTURE	100	Hidden			
TEXT	7	Continuous			
VIEWPORT	211	Continuous			

4.9.2 Instrument Loop Diagrams (ILD) AutoCAD

Refer to Chapter 11 for additional details on Instrument Loop Diagrams.

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
N-LNWK-FINE	1	Continuous	0.18	Per Status	Schematic line work using the Fine line thickness
N-LNWK-THIN	2	Continuous	0.25	Per Status	Schematic line work using the Thin line thickness
N-LNWK-MEDM	3	Continuous	0.35	Per Status	Schematic line work using the Medium line thickness
N-LNWK-WIDE	4	Continuous	0.50	Per Status	Schematic line work using the Wide line thickness
N-RACK	2	Continuous	0.25	Per Status	Rack number (PLC)
N-REG_	2	Continuous	0.25	Per Status	Register number (PLC)
N-WIRE-FELD	2	HIDDEN2	0.25	Per Status	Field wiring
N-WIRE-PANL	2	Continuous	0.25	Per Status	Panel wiring
N-ZONE	1	Continuous	0.18	Per Status	Drawing zone
N-ANNO-TEXT	2	Continuous	0.25	Per Status	General Text

4.10 Landscape

4.10.1 Drawing Type: Details/section

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
L-DETL	94	Continuous	0.35	Per Status	Details
L-SECT	94	Continuous	0.35	Per Status	Sections
L-SECT-PATT	11	Continuous	0.35	Per Status	Textures and hatch patterns

4.10.2 Drawing Type: Irrigation

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
L-IRRG	120	Continuous	0.35	Per Status	Irrigation piping

4.10.3 Drawing Type: Site Improvements

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
L-PLNT	124	Continuous	0.35	Per Status	Plant and landscape materials
L-SITE	154	Continuous	0.35	Per Status	Site improvements
L-WALK	164	Continuous	0.35	Per Status	Walks and steps
L-HYDR	64	Continuous	0.35	Per Status	Hydroseeding, seed, sod
L-TURF	64	Continuous	0.35	Per Status	Mulching outline
L-SEED	64	Continuous	0.35	Per Status	Seed, sod

4.11 Mechanical

4.11.1 Drawing Type: Water and Wastewater

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
M-DRAN	20	Continuous	0.35	Per Status	Drains
M-DRAN-CNTR	20	Center	0.25	Per Status	Drains centerlines
M-HOTW-RETN	22	Continuous	0.35	Per Status	Hot water return
M-HOTW-RETN-CNTR	22	Center	0.25	Per Status	Hot water return centerlines
M-HOTW-SUPP	22	Continuous	0.35	Per Status	Hot water supply
M-HOTW-SUPP-CNTR	22	Center	0.25	Per Status	Hot water supply centerlines
M-HOTW-UNKN	22	Continuous	0.35	Per Status	Unknown water
M-HOTW-UNKN-CNTR	22	Center	0.25	Per Status	Unknown water centerlines
M-INTR	72	Continuous	0.35	Per Status	Interplant sewers
M-INTR-CNTR	72	Center	0.25	Per Status	Interplant sewers centerlines
M-IWTR	122	Continuous	0.35	Per Status	Industrial water
M-IWTR-CNTR	122	Center	0.25	Per Status	Industrial water centerlines
M-OUTF	72	Continuous	0.35	Per Status	Ocean outfall
M-OUTF-CNTR	72	Center	0.25	Per Status	Ocean outfall centerlines
M-PEFF	72	Continuous	0.35	Per Status	Primary effluent
M-PEFF-CNTR	72	Center	0.25	Per Status	Primary effluent centerlines
M-PIFF	72	Continuous	0.35	Per Status	Primary influent
M-PIFF-CNTR	72	Center	0.25	Per Status	Primary influent centerlines
M-POTW	150	Continuous	0.35	Per Status	Potable water
M-POTW-CNTR	150	Center	0.25	Per Status	Potable water centerlines
M-PWTR	120	Continuous	0.35	Per Status	Plant water
M-PWTR-CNTR	120	Center	0.25	Per Status	Plant water centerlines
M-RAWS	72	Continuous	0.35	Per Status	Raw sewage
M-RAWS-CNTR	72	Center	0.25	Per Status	Raw sewage centerlines
M-RCYC	200	Continuous	0.35	Per Status	Recycle, recirc, venting lines
M-RCYC-CNTR	200	Center	0.25	Per Status	Recycle, recirc, venting lines centerlines
M-SEFF	72	Continuous	0.35	Per Status	Secondary effluent
M-SEFF-CNTR	72	Center	0.25	Per Status	Secondary effluent centerlines
M-SSTR	15	Continuous	0.35	Per Status	Substructure, pipeline structure
M-SSTR-CNTR	15	Center	0.25	Per Status	Substructure, pipeline structure centerlines
M-SSWR	72	Continuous	0.35	Per Status	Sanitary sewer lines
M-SSWR-CNTR	72	Center	0.25	Per Status	Sanitary sewer lines centerlines

M-STRM	20	Continuous	0.35	Per Status	Storm drain lines
M-STRM-CNTR	20	Center	0.25	Per Status	Storm drain lines centerlines
M-TFEF	72	Continuous	0.35	Per Status	Trickling Filter effluent
M-TFEF-CNTR	72	Center	0.25	Per Status	Trickling Filter effluent centerlines
M-UTIL-A	252	Continuous	0.35	Screened	Abandoned utilities
M-UTIL-CNTR-A	252	Center	0.25	Screened	Abandoned utilities centerlines
M-UTIL-BUFF	9	Continuous	0.35	Per Status	Pipe footprints
M-UTIL-D	1	Continuous	0.35	Screened	Demolished utilities - unverified
M-UTIL-CNTR-D	1	Center	0.25	Screened	Demolished utilities - unverified centerlines
M-WATR	150	Continuous	0.35	Per Status	Water utility lines
M-WATR-CNTR	150	Center	0.25	Per Status	Water utility lines centerlines
M-WATR-FIRE	162	Continuous	0.35	Per Status	Fire protection
M-WATR-FIRE-CNTR	162	Center	0.25	Per Status	Fire protection centerlines
M-WATR-RECL	200	Continuous	0.35	Per Status	Reclaimed water
M-WATR-RECL-CNTR	200	Center	0.25	Per Status	Reclaimed water centerlines
M-WATR-UNKN	142	Continuous	0.35	Per Status	Unknown water
M-WATR-UNKN-CNTR	142	Center	0.25	Per Status	Unknown water centerlines
MM-WSST	62	Continuous	0.35	Per Status	Waste sidestream
MM-WSST-CNTR	62	Center	0.25	Per Status	Waste sidestream centerlines
M-WWTR	1	Continuous	0.35	Per Status	Wastewater utility lines
M-WWTR-CNTR	1	Center	0.25	Per Status	Wastewater utility lines centerlines

4.11.2 Drawing Type: Chemical systems

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
M-CHEM-UNKN	232	Continuous	0.35	Per Status	Unknown chemical
M-CHEM-UNKN-CNTR	232	Center	0.25	Per Status	Unknown chemical centerlines
M-CHLR	232	Continuous	0.35	Per Status	Chlorine solution
M-CHLR-CNTR	232	Center	0.25	Per Status	Chlorine solution centerlines
M-CSTC	232	Continuous	0.35	Per Status	Caustic solution
M-CSTC-CNTR	232	Center	0.25	Per Status	Caustic solution centerlines
M-FCL2	232	Continuous	0.35	Per Status	Ferrous chloride
M-FCL2-CNTR	232	Center	0.25	Per Status	Ferrous chloride centerlines
M-FCL3	232	Continuous	0.35	Per Status	Ferric chloride
M-FCL3-CNTR	232	Center	0.25	Per Status	Ferric chloride centerlines
M-H2O2	232	Continuous	0.35	Per Status	Hydrogen peroxide
M-H2O2-CNTR	232	Center	0.25	Per Status	Hydrogen peroxide centerlines
M-HCLA	232	Continuous	0.35	Per Status	Hydrochloric acid
M-HCLA-CNTR	232	Center	0.25	Per Status	Hydrochloric acid centerlines
M-NAOC	232	Continuous	0.35	Per Status	Sodium hypochlorite
M-NAOC-CNTR	232	Center	0.25	Per Status	Sodium hypochlorite centerlines
M-NAOH	232	Continuous	0.35	Per Status	Sodium hydroxide
M-NAOH-CNTR	232	Center	0.25	Per Status	Sodium hydroxide centerlines
M-POLY-CATI	232	Continuous	0.35	Per Status	Polymer - Cationic
M-POLY-CATI-CNTR	232	Center	0.25	Per Status	Polymer – Cationic centerlines
M-SULF	232	Continuous	0.35	Per Status	Sulfuric acid
M-SULF-CNTR	232	Center	0.25	Per Status	Sulfuric acid centerlines
M-SAMP	232	Continuous	0.35	Per Status	Sampling line
M-SAMP-CNTR	232	Center	0.25	Per Status	Sampling line centerlines
M-POLY-ANIO	232	Continuous	0.35	Per Status	Polymer - Anionic
M-POLY-ANIO-CNTR	232	Center	0.25	Per Status	Polymer – Anionic centerlines

4.11.3 Drawing Type: Compressed air or oxygen system

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
M-AIR_-UNKN	41	Continuous	0.35	Per Status	Unknown air system
M-AIR_-UNKN-CNTR	41	Center	0.25	Per Status	Unknown air system centerlines
M-CMPH	41	Continuous	0.35	Per Status	High pressure compressed air
M-CMPH-CNTR	41	Center	0.25	Per Status	High pressure compressed air centerlines
M-CMPL	41	Continuous	0.35	Per Status	Low pressure compressed air
M-CMPL-CNTR	41	Center	0.25	Per Status	Low pressure compressed air centerlines
M-FOUL	41	Continuous	0.35	Per Status	Foul air
M-FOUL-CNTR	41	Center	0.25	Per Status	Foul air centerlines
M-INST	41	Continuous	0.35	Per Status	Instrument air
M-INST-CNTR	41	Center	0.25	Per Status	Instrument air centerlines
M-OXGN	41	Continuous	0.35	Per Status	Gaseous oxygen
M-OXGN-CNTR	41	Center	0.25	Per Status	Gaseous oxygen centerlines

4.11.4 Drawing Type: Details/section

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
M-DETL	4	Continuous	0.35	Per Status	Details
M-SECT	4	Continuous	0.35	Per Status	Sections
M-SECT-PATT	11	Continuous	0.25	Per Status	Textures and hatch patterns

4.11.5 Drawing Type: Gas systems

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
M-ACET	30	Continuous	0.35	Per Status	Acetylene
M-ACET-CNTR	30	Center	0.25	Per Status	Acetylene centerlines
M-GAS_-UNKN	30	Continuous	0.35	Per Status	Unknown gas
M-GAS_-UNKN-CNTR	30	Center	0.25	Per Status	Unknown gas centerlines
M-HPDG	30	Continuous	0.35	Per Status	High pressure digester gas
M-HPDG-CNTR	30	Center	0.25	Per Status	High pressure digester gas centerlines
M-LPDG	30	Continuous	0.35	Per Status	Low pressure digester gas
M-LPDG-CNTR	30	Center	0.25	Per Status	Low pressure digester gas centerlines
M-NGAS	30	Continuous	0.35	Per Status	Natural gas
M-NGAS-CNTR	30	Center	0.25	Per Status	Natural gas centerlines
M-PGAS	30	Continuous	0.35	Per Status	Propane gas
M-PGAS-CNTR	30	Center	0.25	Per Status	Propane gas centerlines

4.11.6 Drawing Type: Oil systems

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
M-FUEL	182	Continuous	0.35	Per Status	Fuel oil
M-FUEL-CNTR	182	Center	0.25	Per Status	Fuel oil centerlines
M-OIL_-UNKN	182	Continuous	0.35	Per Status	Unknown oil
M-OIL_-UNKN-CNTR	182	Center	0.25	Per Status	Unknown oil centerlines

4.11.7 Drawing Type: Sludge, scum, grit

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
M-DGSL	42	Continuous	0.35	Per Status	Digester sludge
M-DGSL-CNTR	42	Center	0.25	Per Status	Digester sludge centerlines
M-DGSN	42	Continuous	0.35	Per Status	Digester supernatant
M-DGSN-CNTR	42	Center	0.25	Per Status	Digester supernatant centerlines
M-GRIT	42	Continuous	0.35	Per Status	Grit
M-GRIT-CNTR	42	Center	0.25	Per Status	Grit centerlines
M-PRSL	42	Continuous	0.35	Per Status	Primary sludge
M-PRSL-CNTR	42	Center	0.25	Per Status	Primary sludge centerlines
M-RASL	42	Continuous	0.35	Per Status	Return activated sludge
M-RASL-CNTR	42	Center	0.25	Per Status	Return activated sludge centerlines
M-SCUM	42	Continuous	0.35	Per Status	Scum
M-SCUM-CNTR	42	Center	0.25	Per Status	Scum centerlines
M-SLDG-CAKE	42	Continuous	0.35	Per Status	Sludge cake
M-SLDG-CAKE-CNTR	42	Center	0.25	Per Status	Sludge cake centerlines
M-SLDG-UNKN	42	Continuous	0.35	Per Status	Unknown sludge, scum or grit
M-SLDG-UNKN-CNTR	42	Center	0.25	Per Status	Unknown sludge, scum or grit centerlines
M-SRFW	42	Continuous	0.35	Per Status	Surface wasting
M-SRFW-CNTR	42	Center	0.25	Per Status	Surface wasting centerlines
M-WASL	42	Continuous	0.35	Per Status	Waste activated sludge
M-WASL-CNTR	42	Center	0.25	Per Status	Waste activated sludge centerlines

4.11.8 Drawing Type: Steam

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
M-STEM	141	Continuous	0.35	Per Status	Steam systems
M-STEM-CNTR	141	Center	0.25	Per Status	Steam systems centerlines
M-STEM-UNKN	141	Continuous	0.35	Per Status	Unknown steam
M-STEM-UNKN-CNTR	141	Center	0.25	Per Status	Unknown steam centerlines

4.11.9 Drawing Type: Miscellaneous

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
M-EQPM	160	Continuous	0.35	Per Status	Equipment
M-EXHS	160	Continuous	0.35	Per Status	Exhaust system
M-MISC	160	Continuous	0.35	Per Status	Unknown system
M-SAMP	160	Continuous	0.35	Per Status	Sample

4.12 Structural

4.12.1 Drawing Type: Details/section

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
S-DETL	4	Continuous	0.35	Per Status	Details
S-SECT	4	Continuous	0.35	Per Status	Sections
S-SECT-PATT	11	Continuous	0.35	Per Status	Textures and hatch patterns

4.12.2 Drawing Type: Elevation

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
S-ELEV	5	Continuous	0.35	Per Status	Interior & exterior elevations

4.12.3 Drawing Type: Structural Plans

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
S-BEAM	3	Continuous	0.35	Per Status	Beams
S-COLS	100	Continuous	0.35	Per Status	Primary & secondary columns
S-FNDN	1	Hidden	0.35	Per Status	Footings, grade beams, piles
S-GRAD	6	Continuous	0.35	Per Status	Elevated grading, floor grading
S-GRAT	11	Continuous	0.35	Per Status	Elevated grating, catwalks
S-GRID	8	Center	0.25	Per Status	Grid lines, column tags
S-HNDR	21	Continuous	0.35	Per Status	Handrails
S-JOIN	30	Continuous	0.35	Per Status	Const. joints, expansion joints
S-METL	140	Continuous	0.35	Per Status	Miscellaneous metal
S-OPNG	10	Continuous	0.35	Per Status	Opening
S-RBAR	144	Continuous	0.50	Per Status	Rebar
S-SLAB	60	Continuous	0.35	Per Status	Slab outline, control joints
S-SPPT	10	Continuous	0.35	Per Status	Misc. fasteners, anchor bolts
S-STRS	10	Continuous	0.35	Per Status	Stair control joints, ladders
S-WALL	4	Continuous	0.35	Per Status	Concrete walls, CMU walls

4.13 Survey & Mapping

4.13.1 Drawing Type: Survey and mapping plan

Layer Name	Color	Linetype	Weight (mm)	Plot Style	Description
V-AREA	22	Continuous	0.35	Per Status	Area code boundary (process areas)
V-BLDG	5	Continuous	0.35	Per Status	Building structures outline
V-BORW	40	Continuous	0.35	Per Status	Borrow/spoil area
V-DRAN	20	Continuous	0.35	Per Status	Drains
V-EROS	20	Continuous	0.35	Per Status	Riprap, breakwaters, dikes, jetty
V-PAVE	113	Continuous	0.35	Per Status	Edge of pavement
V-PKNG	3	Continuous	0.35	Per Status	Parking lots
V-PKNG-DRAN	2	Continuous	0.35	Per Status	Parking lot slope indicators
V-PKNG-ISLD	3	Continuous	0.35	Per Status	Parking islands
V-PKNG-STRP	120	Continuous	0.35	Per Status	Lot striping, handicapped
V-PROP	6	Phantom	0.35	Per Status	Prop. lines, survey benchmark
V-PROP-BRNG	6	Continuous	0.35	Per Status	Bearing and distance labels
V-PROP-ESMT	140	Phantom	0.35	Per Status	Easements, R.O.W., setbacks
V-PTIC-E	35	Continuous	0.35	Screened	Plant grid coordinate tics
V-RAIL	242	Continuous	0.35	Per Status	Railroad outlines, centerlines
V-RAIL-CNTR	245	Center	0.25	Per Status	Railroad centerlines
V-ROAD-CNTR	1	Center	0.35	Per Status	Road centerlines
V-ROAD-CURB	3	Continuous	0.35	Per Status	Curbs
V-ROAD-GTTR	3	Continuous	0.35	Per Status	Gutter
V-SITE	30	Continuous	0.35	Per Status	Fences, handrails, ramps, signs
V-SPOT	2	Continuous	0.35	Per Status	Proposed spot elevations
V-STAG	20	Continuous	0.35	Per Status	Construction staging
V-STIC-E	65	Continuous	0.35	Screened	State plane coordinate grid tics
V-STRM	20	Continuous	0.35	Per Status	Storm drain, catch basins, inlets
V-SURV	2	Continuous	0.35	Per Status	Survey data
V-TOPO-MAJR	40	Continuous	0.35	Per Status	Proposed major contour lines
V-TOPO-MNOR	41	Continuous	0.35	Per Status	Proposed minor contour lines
V-TOPO-TEXT	2	Continuous	0.35	Per Status	Contour elevations
V-TUNL-WALL	150	Continuous	0.35	Per Status	Tunnel outlines
V-TUNL-CNTR	140	Center	0.35	Per Status	Tunnel centerlines
V-UTIL	22	Continuous	0.35	Per Status	Power lines, telephone poles, hydrants
V-VEGE	102	Continuous	0.35	Per Status	Vegetation
V-WRKA	7	Continuous	0.35	Per Status	Work area, project boundary

5.0 GRAPHIC/STYLE STANDARDS

Table of Contents

5.0 GRAPHIC/STYLE STANDARDS 5-1

5.1 HISTORY OF CHANGE 5-2
5.2 LINEWEIGHTS 5-3
5.3 LINETYPES/STYLES 5-4
5.4 AUTOCAD PLOT STYLES 5-5
5.4.1 AutoCAD Plant 3D P&ID Plotting Parameters 5-5
5.5 DRAWING SCALES 5-6
5.6 TEXT STYLES/FONTS 5-7
5.7 DIMENSION STYLES 5-9
5.8 MULTI-LEADER STYLES 5-9
5.9 BORDER SHEETS 5-10
5.9.1 Sheet Sizes 5-10
5.9.2 Title Block 5-11

5.1 History of Change

Revision and Version	***Author***	***Date***	***Change***
A1	MAB	04/24/01	Initial Release of Manual
A2	MAB	06/18/01	Modified plot style section 7.7
B	MAB	08/15/02	Incorporated PDS standards.
C	MAB	01/27/04	Added document reference requirement
D	MAB	10/15/04	Correct plotting parameters
E	SJM	07/22/10	Revised for AutoCAD P&ID replacing PDS2D
E.1	DCR	03/02/11	Updates and revisions to content. Revised to show Enterprise Information Management as group responsible.
G	BAW	08/08/16	Re-designated as chapter 5 (previously chapter 7).
G.1	RVT	10/04/17	Updates and revisions to content. Replaced existing True type Dotum font with Swis font.
H	EIM	12/01/19	Updates and revision to content and Figure 5-1 and Figure 5-9.
I	RVT	09/13/21	OCSD references to OC San. Grammatical revisions.
J	EIM	03/30/23	Sections 5.6, 5.7, and 5.8 – Updated Annotative from Yes (checked) to No (unchecked)
K	TAC	05/29/24	Clarification: All fonts used shall be true type fonts as specified in Table 5-5

chap05-Graphic-Style Standards.docx

This chapter contains the graphic/style standards and examples of design elements which the drafter/designer can reference to create the Border sheet and other project drawings.

5.2 Lineweights

The five primary and two optional line weights defined in Table 5-1 are considered sufficient and should not be expanded unless an appreciable improvement in drawing clarity or contrast can be realized. With the use of named plot styles, lineweight is independent of color, allowing for any color to be any width. Lineweight is controlled using the lineweight property for each layer (the same method used to control linetype).

Table 5-1

Lineweight	mm	In.	Lineweight Sample
Fine	0.18	0.007	
Thin	0.25	0.010	
Medium	0.35	0.014	
Wide	0.50	0.020	
Extra Wide	0.70	0.028	
Option 1	1.00	0.040	
Option 2	1.40	0.055	

Lineweights should be specified by layer.

The following are typical usage for the line widths shown:

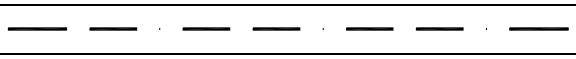
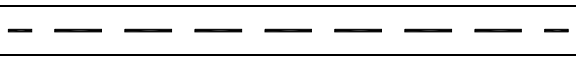
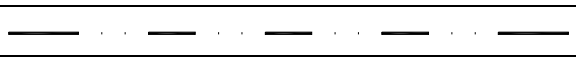
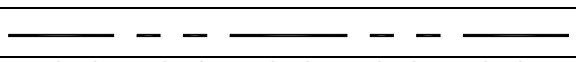
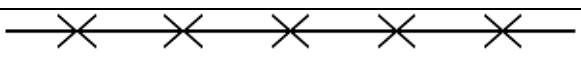
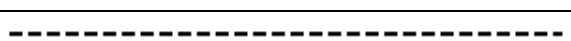
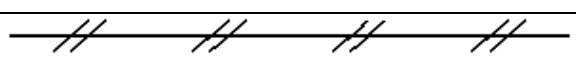
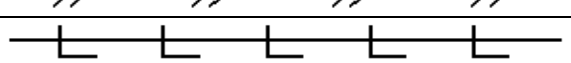
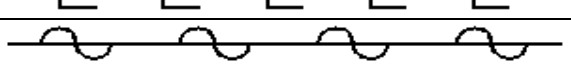
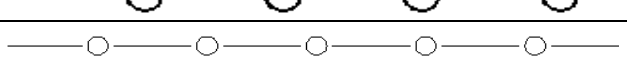
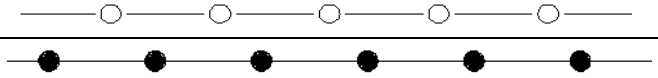
- Fine (0.18mm) Fine lines should be used sparingly, mostly for hatch/patterning (this line thickness typically does not reproduce well).
- Thin (0.25mm) Thin lines should be used for depicting dimension lines, dimension leader/witness lines, note leader lines, line terminators, phantom lines, hidden lines, center lines, long break lines, schedule grid lines, and other object lines seen at a distance.
- Medium (0.35mm) Medium lines should be used for depicting minor object lines, and schedule text.
- Wide (0.50mm) Wide lines should be used for major object lines, cut lines, section cutting plane lines, and titles.
- Extra Wide (0.70mm) Extra wide lines should be used for minor title underlining, schedule outlines, large titles, and object lines requiring special emphasis. Extra wide widths are also appropriate for use as an elevation grade line, building footprint, or top of grade lines on section/foundation details.
- Option 1 (1.00mm) This line width should be used for major title underlining and separating portions of the drawing.
- Option 2 (1.40mm) This line width should be used for border sheet outlines and cover sheet line work, and as an option for the designer as required.

Note: *The use of AutoCAD Polylines with a defined width is discouraged. However, if they are used, the polyline widths must be uniform throughout the extent of the line. Variable line width polylines do not translate into other CAD packages.*

5.3 Linetypes/Styles

The line styles defined in Table 5-2 are considered sufficient and should not be expanded unless an appreciable improvement in drawing clarity or contrast can be realized. The global linetype scale factor (LTSCALE) for all drawings should be set to .5. The paper space linetype scaling (PSLTSCALE) should be assigned a value of 1.

Table 5-2

Linetype	Note	Example
Border		
Center		
Continuous		
Dashdot		
Dashed		
Divide		
Hidden		
Phantom		
Capillary Tube	(AutoCAD P&ID)	
Electrical	(AutoCAD P&ID)	
Pneumatic	(AutoCAD P&ID)	
Hydraulic	(AutoCAD P&ID)	
Guided Sonic	(AutoCAD P&ID)	
Software Link	(AutoCAD P&ID)	
Mechanical Link	(AutoCAD P&ID)	

Linetypes should be specified by layer.

The following are typical usage for the line widths shown:

- Border linetype should be used to delineate city or county boundaries.
- Center linetype should be used to depict the centerline of a street or piece of equipment.
- Continuous linetype is the most common and is used for all object lines, dimension lines, extensions lines, leader lines, and other visible lines.
- Dashdot linetype should be used sparingly. (Linetypes with dots typically do not reproduce well).
- Dashed linetype should be used for existing features such as utilities, edge of pavement, and curbs.
- Divide linetype should be used to depict flow lines, rivers, and other water features.
- Hidden linetype should be used to show hidden features of an object or feature.
- Phantom linetype should be used for right of way lines, property boundaries and match lines.

5.4 AutoCAD Plot Styles

AutoCAD drawings are plotted using a specific Named Plot Style. With a Named Plot Style, the linetypes, lineweights, colors, and plot styles are specified for each layer within the layer properties manager.

The plot style to be used is **OCSAN.stb**.

Plot styles shall be specified by layer.

Refer to section 4.3.3 for typical plot style application to layers.

The available plot styles are shown in Table 5-3 below.

Table 5-3

Plot Style	Description	Typical Use
Solid	Black	Proposed features
Screened	Gray	Existing features
Color	Match layer's color property	Photos
Normal	Default style	Do not use

5.4.1 AutoCAD Plant 3D P&ID Plotting Parameters

Refer to the AutoCAD Plant 3D P&ID Functionality Documentation, provided with the AutoCAD Plant 3D P&ID Reference Project documentation, for current OC San P&ID plotting parameters. (Example Plot Style name – "OCSAN_PID.ctb")

5.5 Drawing Scales

Typical drawing scales for imperial measurements are shown in Table 5-4.

Table 5-4

Drawing Type	Preferred Drawing Scale	
Site plans	1” = 10’ 1” = 20’ 1” = 40’ 1” = 100’ 1” = 1000’ 1” = 1mile	
Floor plans	1/4” = 1’ – 0” 1/8” = 1’ – 0”	
Plan and Profiles	Horizontal 1” = 40’	Vertical 1” = 4’
Sections	1/4” = 1’ – 0” 3/8” = 1’ – 0” 1/2” = 1’ – 0” 3/4” = 1’ – 0”	
Details	1/4” = 1’ – 0” 3/8” = 1’ – 0” 1/2” = 1’ – 0” 3/4” = 1’ – 0” 1” = 1’ – 0”	
Schematics	NTS	

While models are drawn at full size, the scale is assigned to the viewport. Once a viewport scale is set, it should be locked.

5.6 Text Styles/Fonts

Contrasting text styles or fonts are used within a drawing to delineate types of information. OC San adheres to the six text styles with their accompanying fonts shown in Table 5-5 for AutoCAD. If consultants desire to use fonts in addition to those listed, they must first submit a request to OC San in writing and receive written authorization* to do so. Consideration shall be given to adding new non-proprietary fonts to this standard where deemed necessary. In such cases these fonts shall have been developed by the consultant or in the public domain. OC San shall not be held liable for copyright violations resulting from a consultant's intentional or inadvertent use of a proprietary font not known to OC San, nor shall OC San be responsible for assuring that the consultant obtained proper licensing for the proprietary fonts.

All fonts used shall be true type fonts as specified in Table 5-5.

Multiline text (Mtext) shall be used in favor of single line text whenever possible.

***** If font deviation is granted, consultant must provide custom font file(s) at every submittal.

Each of the text styles shall use the fonts specified in Table 5-5. Text style settings common to all styles are the following.

- Annotative = No (unchecked)
- Height = 0.0000
- Width Factor = 1.00
- Oblique Angle = 0

The following are typical uses for text heights:

- 0.09 text height is used for loop diagrams and control logic diagrams.
- 0.100 and 0.125 are appropriate for most uses including call outs, dimensions, and general notes.
- 0.175 text height is used when a slightly larger label is necessary such as street names, city or county names.
- 0.250 text height is generally used in conjunction with the bold text style and is used for titles.

Table 5-5	
Style: Monospaced Font: Monospac821 BT Font Style: Roman	Non-proportional text characters that are evenly spaced with a fixed width. A monospaced true type font should be used where text fields need to be aligned such as in schedules, indexes or, in some cases title blocks. ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
Style: Standard Font: Swis721 Lt BT Font Style: Light	Text where the characters are proportionally spaced. It is appropriate for general notes, labels, dimensions, or title blocks. ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
Style: Slanted Font: Swis721 Lt BT Font Style: Light Italic	Use the italic font option when text needs to be easily distinguished from other text. Do NOT use oblique angles to achieve the italics effect. *ABCDEFGHIJKLMNOPQRSTUVWXYZ* *abcdefghijklmnopqrstuvwxyz*
Style: Bold Font: Swis721 BT Font Style: Roman	Use the bold style primarily for titles and on cover sheets. (Note: In AutoCAD the TEXTFILL system variable needs to be set to “1”). ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
Style: Outline Font: Swis721 BlkOul BT	The outline style is used to label an open space or area. ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz
Style: Condensed Font: Swis721 Lt Cn BT Font Style: Light	The condensed style is appropriate in section or detail callouts where the standard font does not fit well. ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz

The Swis721 typeface is a true type family of fonts used primarily for its varying weights and variations, such as light, bold, semi-bold, italics, condensed, etc. Each variation is a different font.

5.7 Dimension Styles

Dimension styles shall use the following settings.

Color = By Block

Linetype = By Block

Lineweight = By Block

Arrowhead Size = 0.125

Text Color = By Block

Fill Color = None or Background

Text Alignment = Aligned with dimension line

Annotative = No (unchecked)

5.8 Multi-Leader Styles

Multi-Leaders shall be used wherever leaders are needed. These styles shall use the following settings.

Type = Straight

Color = By Block

Linetype = By Block

Lineweight = By Block

Arrowhead Size = 0.125

Annotative = No (unchecked)

Multileader Type = Mtext

Text Color = By Block

Always left justify = Yes (checked)

Leader connection = middle of top line

5.9 Border Sheets

5.9.1 Sheet Sizes

Table 5-6 indicates the standard sheet sizes and their typical uses:

Table 5-6

Size	Designator	Typical Uses
8.5 x 11	**A (ANSI A)**	Project book, Supplemental Drawings, Mock-up sheets.
11 x 17	**B (ANSI B)**	Reduced drawings from D Size originals, Collection system map books, Supplemental Drawings, Mock-up sheets, loop diagrams, B size Loop Drawings.
17 x 22	**C (ANSI C)**	Not used
22 x 34	**D (ANSI D)**	Construction drawings.
34 x 44	**E (ANSI E)**	Large projects accommodating preferred plan scale. Mapping and GIS. (Pre-approval)

5.9.2 Title Block

The Title Block area is that portion of the sheet containing project, client, designer, sheet identification, and sheet management information needed by the user of the sheet. The guidelines for the title block area (Figure 5-1) provide criteria for the location of like information shown in data blocks within the title block area for easy and consistent retrieval and filing of drawings. Data blocks include the following:

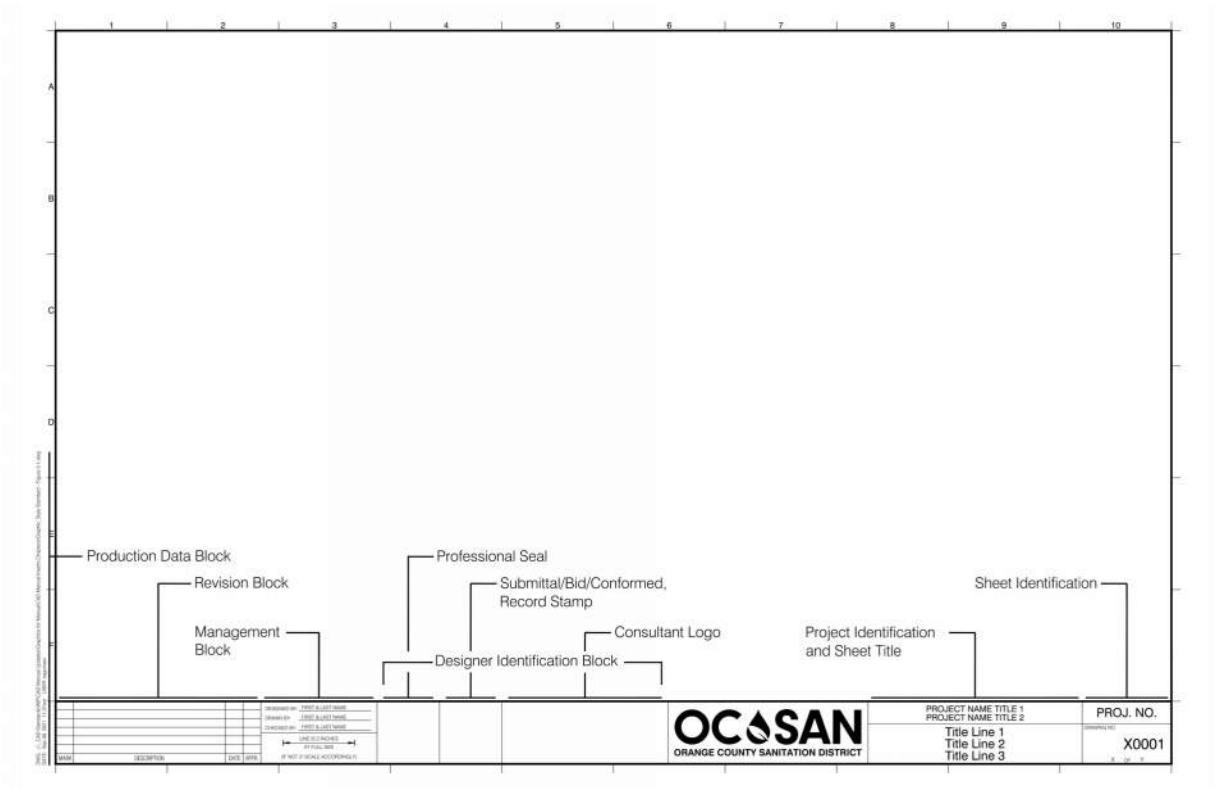


Figure 5-1

Sheet Identification Block

The Sheet identification block (Figure 5-2) contains project number, sheet identifier and sheet count. The project number identifier on top is used to display the OC San project number. The sheet identifier or Drawing Number is composed of the discipline code/designator, the sheet type designator, and the sheet sequence number described in Chapter 6, Drawing Set Organization. The “X” pertains to the sheet number, while the “Y” contains the total number of sheets for the entire drawing set.

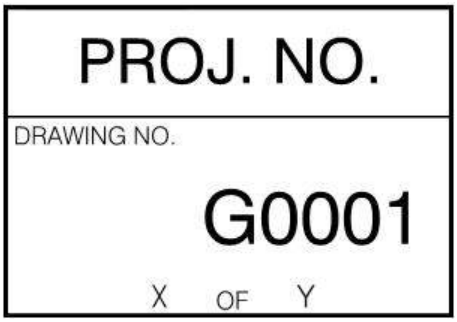


Figure 5-2

Project Identification Block/Sheet Title Block

The project identification block/sheet title block (Figure 5-3) contains two sets of information. First, the project name is identified, possibly with the location or phase of the project. The second set of information contains a description of the content of the sheet (e.g., Site Plan). If more than one type of information is presented on the sheet (i.e., plans, schedules, details, etc.) the most important information is identified.

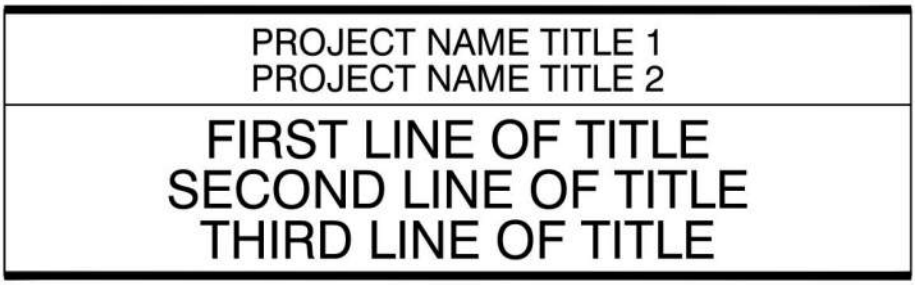


Figure 5-3

Designer Identification Block

The designer identification block (Figure 5-4) contains the logo or name of the company that designed the sheet. This space also includes an area to accommodate the placing of a Professional Seal when required, as well as a placeholder for the Submittal Phase stamp (Figure 5-9).

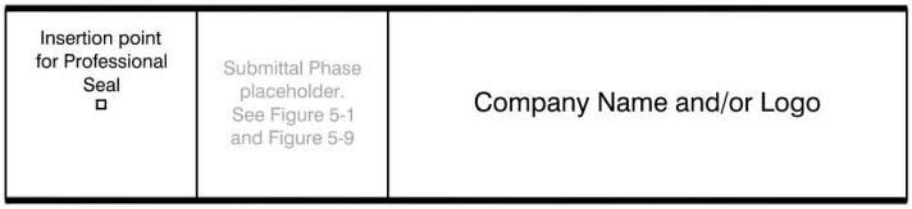


Figure 5-4

Management Block

The management block (Figure 5-5) contains information about the designer, drafter, and reviewer. In addition, the date of each of these activities is optional.

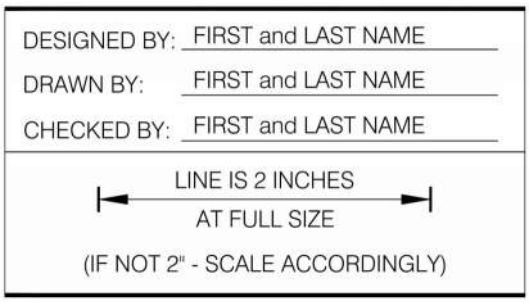


Figure 5-5

Revision Block

The revision block (Figure 5-6) contains a history of revisions, addenda, and/or clarifications to the sheet. The first entry should be placed on the lower left-hand line of the revision block and subsequent entries should be made above it. Should all the rows be filled and if additional row is needed for newer revision(s), remove the bottom entry, shift all other entries down and add newer revision description, date, etc., to the top row.

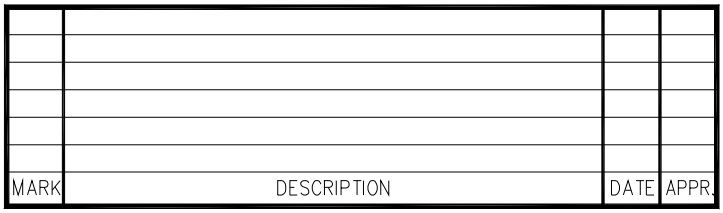


Figure 5-6

Production Data Block

The production data block (Figure 5-7) contains management information concerning the production of the sheet. Data that is assigned to this area includes file path, file name, username, plot date and plot time. The production data block is located vertically along the binding strip outside the border.



Figure 5-7

Document Reference

When using information from a record drawing or Instrumentation Drawing, a reference (Figure 5-8) to the original source document is required. The reference should be entitled “Source Document” and include the project number, project title, date, drawing number and sheet number. The preferred location for the source reference is the lower right corner of the Composite Drawing.

SOURCE DOCUMENT:
PROJECT NO, PROJECT TITLE
DATE, DRAWING NO, SHEET NO

Figure 5-8

DS1/DS2/DS3/FDS/Bid Set/Conformed/Record Stamp

At each submittal phase, the space will display the appropriate statement as shown in Figure 5-9 below.

The default location, as shown in Figure 5-1 and Figure 5-4, is the space between the Consultant Name/Logo box and Professional Seal box.

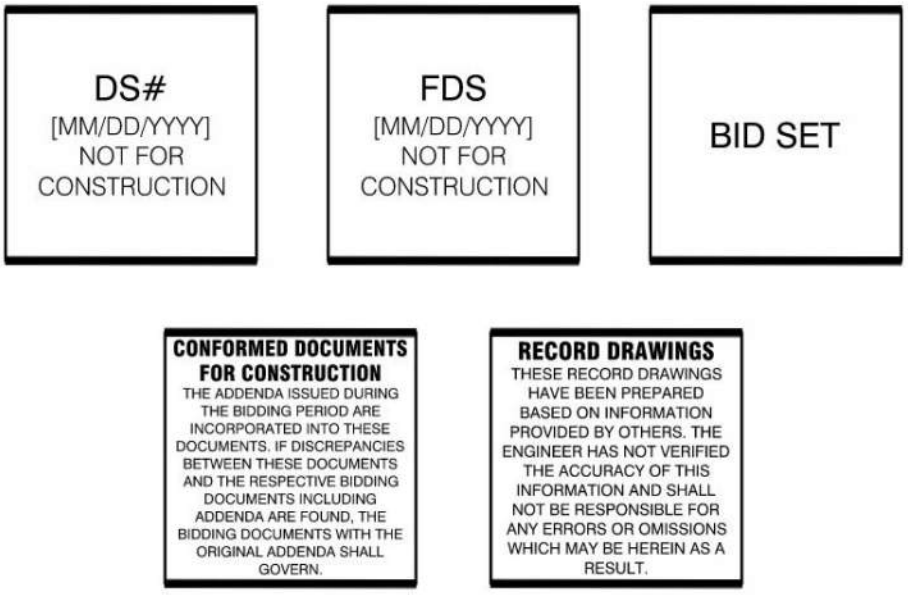


Figure 5-9

6.0 DRAWING SET ORGANIZATION

Table of Contents

6.0 DRAWING SET ORGANIZATION 6-1

6.1 HISTORY OF CHANGE 6-2
6.2 SHEET IDENTIFICATION 6-3
6.3 SET SHEET SEQUENCE 6-4

6.1 History of Change

Revision and Version	***Author***	***Date***	***Change***
A1	MAB	04/24/01	Initial Release of Manual
B	MAB	10/15/04	Removed instrumentation
F	SJM	7/22/10	Revised for Instrumentation Sheet Identification
F.1	DCR	11/1/10	Updates and revisions to content. Revised to show Enterprise Information Management as group responsible.
G	BAW	08/08/16	Redesignated as chapter 6 (previously chapter 8)
H	EIM	12/01/19	Updates and revision to content.
I	RVT	09/13/21	OCSD references to OC San. Grammatical revisions.

chap06-Drawing Set Organization.docx

This chapter details OC San's system for organizing a set of drawings. The organization of a drawing set is designed to support the requirements and facilitate the production efforts of the design and construction team. The following methodology is used:

- Segregate the information by discipline (both design and construction) to form subsets of the total drawing package.
- Order the subsets to correspond to the natural sequence of construction, closely associating disciplines where topics are similar.
- Present information within each subset from general to specific.

6.2 Sheet Identification

Sheet identifiers or Drawing Numbers are derived from the discipline code, type of information contained on the drawing and a sequence number. The sheet identifier is tightly related to the composite drawing file name.

Discipline Code:	**A**	Architectural	**M**	Mechanical
	B	Geotechnical	**N**	Instrumentation (See Section 3.5)
	C	Civil		
	D	Demolition	**S**	Structural
	E	Electrical	**T**	Telecom
	G	General	**V**	Survey & Mapping
	L	Landscape	**Z**	Contractor/Shop Dwgs

***Sheet Type:**	**0**	General (Symbols, legend, sheet index, notes, etc.)
	1	Plans (Horizontal views and plan and profile)
	2	Elevations (Vertical views)
	3	Sections (Sectional views)
	4	Large Scale (Plans, elev, or sections that are not details)
	5	Details
	6	Schedules and diagrams
	7	Photos – other images not from model
	8	3D views (isometrics, perspectives)
	9	User defined (reference drawings)

Sequence Number: 001 – 999

Examples:	C2001	Civil profile, sheet 1
	C1002	Civil plan, sheet 2
	M5004	Mechanical details, sheet 4

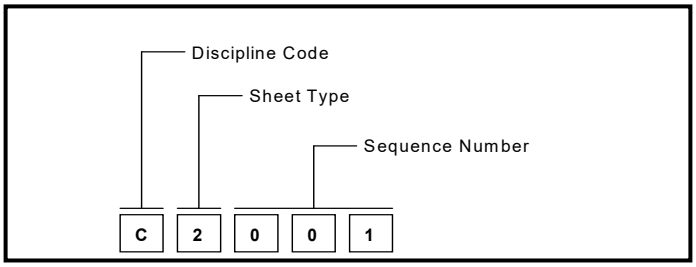
Group numbers may be used with prior approval from the OC San Project Manager and by Enterprise Information Management (EIM).

For P&ID sheet identification, see chapter 9.

*The use of sheet type designators permits the limited use of combining different types of drawings on the same sheet for simplicity. For instance, it is acceptable to:

- Place profile drawings on sanitary sewer or road plans.
- Place same scale sections on the same sheet as large-scale plans of stairs.
- Place schedules on a plan sheet when the information is closely associated.

When the type of drawings on a sheet is mixed, clearly identify all the drawings contained on the sheet in the sheet title block.



6.3 Set Sheet Sequence

Following the cover sheet, sheets should be organized into subsets in the order illustrated in Figure 6-1. All of the subsets may not apply, or more specific additional categories may be required depending on the size, scope and complexity of the project. Refer to Chapter 12 for instructions regarding inserted pages that result from changes made during construction (Addendum to Record phase). Traffic Control Plans (if available) and Temporary Plans can be added to the end of submitted package and numbered independently.

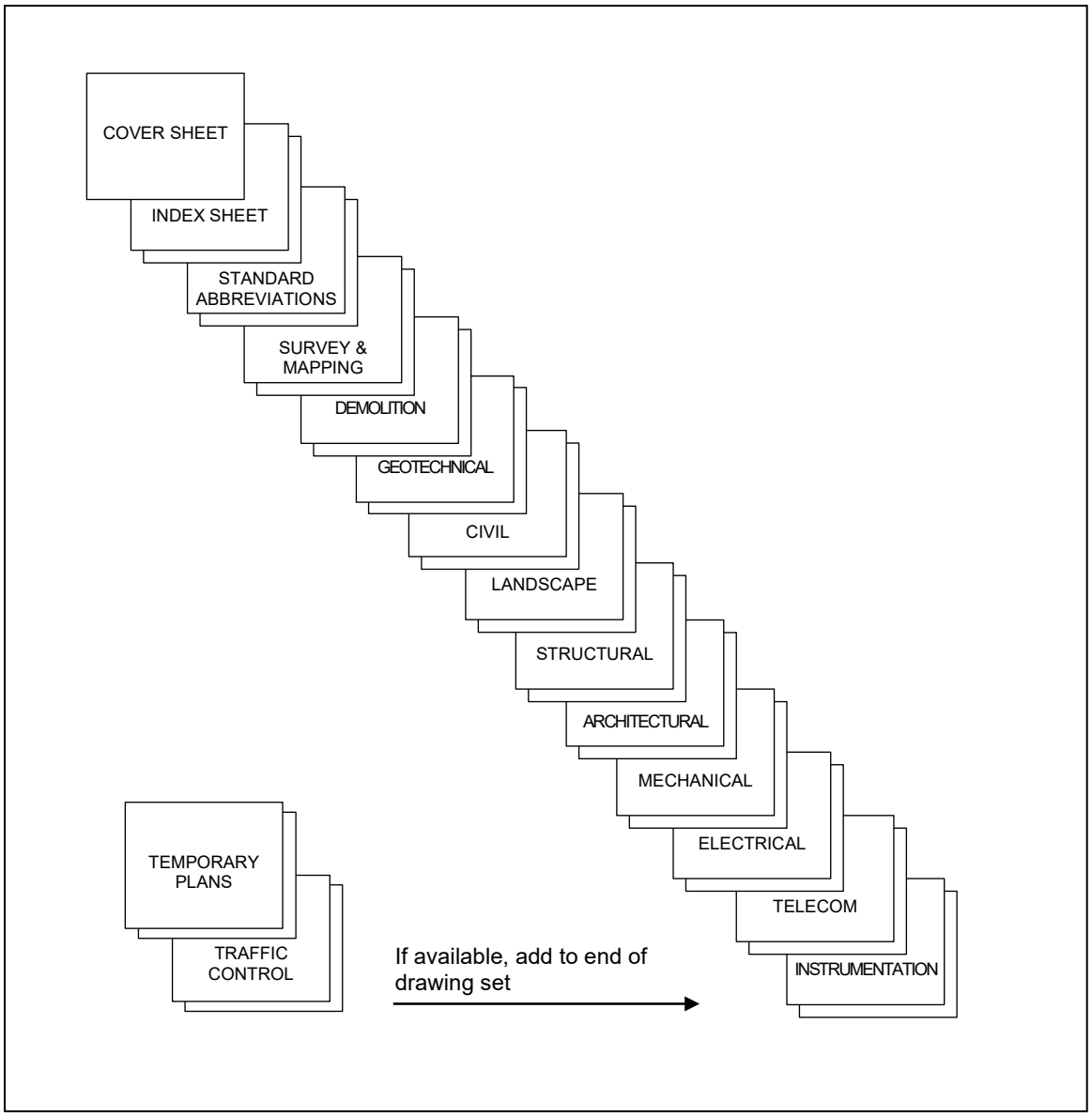


Figure 6-1

7.0 DELIVERABLES AND DATA EXCHANGE

Table of Contents

7.0 DELIVERABLES AND DATA EXCHANGE 7-1

7.1 HISTORY OF CHANGE 7-2
7.2 DELIVERY MEDIA 7-3
7.3 DATA FORMAT 7-4
7.3.1 CAD Files 7-4
7.3.2 3D Model (BIM) Files 7-4
7.3.3 Coordination Model Files 7-4
7.3.4 AutoCAD P&ID Files 7-5
7.3.5 PDF Files 7-5
7.3.6 3D Models within the AutoDesk Construction Cloud (ACC) 7-5
7.4 CONSTRUCTION PDF DOCUMENT GUIDELINES AND BEST PRACTICES 7-6
7.4.1 Best Practices for AutoCAD 7-6
7.4.2 Best Practices for Autodesk Revit 7-7
7.4.3 For Bluebeam (after PDF package(s) have been created) 7-7
7.5 DOCUMENTATION 7-8

7.1 History of Change

Revision and Version	***Author***	***Date***	***Change***
A1	MAB	04/24/01	Initial Release of Manual
B	MAB	10/14/04	Revised language
F	SJM	07/22/10	Revised for AutoCAD P&ID
F.1	DCR	03/02/11	Updates Data Delivery types. Revised to show Enterprise Information Management as group responsible.
G	BAW	08/08/16	Added folder structure. Redesignated as Chapter 7 (previously chapter 9)
G.1	RVT	10/04/17	Updates and revisions to content. Added Construction PDF Document Section 7.4
H	EIM	12/01/19	Updates and revisions to content.
I	RVT	09/13/21	OCSD references to OC San. Grammatical revisions.
J	EIM	03/30/23	Section 7.4.2 – Added Flatten function for all PDF packages verbiage.
K	TAC	05/29/24	Added Data Format and PDF Publishing Practices for 3D / BIM and Coordination Model.

chap07-Deliverables and Data Exchange.docx

This chapter describes the standard deliverables and data exchange formats required to exchange digital data (drawing files and database information) between OC San and consultants.

7.2 Delivery Media

Digital media shall be delivered according to Table 7-1.

Table 7-1

Submittal Phase	Electronic Submittal
Preliminary Design Report	• via the platform determined in the project-specific plan
Design Submittal 1	• via the platform determined in the project-specific plan
Design Submittal 2	• via the platform determined in the project-specific plan
Design Submittal 3	• via the platform determined in the project-specific plan
Final Design Submittal	• via the platform determined in the project-specific plan
Conformed Drawings	• via the platform determined in the project-specific plan
Record Drawings	• via the platform determined in the project-specific plan

Submission of package(s) are done electronically, file upload locations shall be verified by the consultant with OC San's Project Management Team. The link and instructions for uploading into OC San's file sharing location are available upon request.

When submitting package(s) it would be advisable to package the submittals using the Folder Structure as shown in Section 2.10.

7.3 Data Format

All files necessary to produce the drawing set (base maps, project model files, etc.) are to be delivered in both native format and PDF files, according to the Engineering Design Guidelines and the Scope of Work.

7.3.1 CAD Files

All CAD files shall be delivered in a format that is directly readable and compatible with OC San's CAD environment, as described in Section 2.2, Computer Aided Design Systems, and without conversion. Before a file is placed on the delivery media, the following procedures must be performed:

- Remove all extraneous graphics outside the border area.
- Make sure all reference (external reference drawing and image) files are present, use the overlay reference type, and have a relative path.
- Purge all files of unused blocks, layers, styles and unnecessary external references. Does not include P&IDs.
- Include all files, both graphic and non-graphic, required for the project (e.g., plot styles, fonts, tables, images, etc.).
- Include all standard sheets (i.e., abbreviation sheets, standard symbol sheets, etc.) necessary for a complete project set.

7.3.2 3D Model (BIM) Files

NOTE: Due to the larger size of BIM files and effort required to create separate record copies, native format copies are only required at Final Design, Conformed Phase, and Record Model submissions, unless otherwise specified by project requirements.

- Consultants shall generate CAD and PDF files of drawing sheets from each model. CAD exports from Revit are per OC San's settings.
- Create (or update) a print set definition that includes only those sheets that are included in the design submittal. Print set name should match the submittal, for example "Design Submittal 2".
- For CAD export, ensure that links are NOT exported as separate files.
- For PDF export, create the file using the Bluebeam addin
    - Verify the PDF Bookmarks are enabled before exporting.
    - Export with the Print Set for the current submittal

7.3.3 Coordination Model Files

Consultants shall create milestone copies of coordination models according to a project specific plan. The active 3D Coordination model is a collection of files with the .nwc file type. The coordination model for package submissions shall be the .nwd file type.

- Default publishing settings for NWD file creation are sufficient.
- The NWD file shall contain the data of creation in the filename.

7.3.4 AutoCAD P&ID Files

All AutoCAD P&ID files shall be delivered in AutoCAD Plant 3D (current version) format as described in Section 2.2.2 AutoCAD P&ID. A copy of the reference project that the consultant has been using will also be requested as needed. See Appendix C for reference project information.

7.3.5 PDF Files

PDF files shall be delivered in a format that is directly readable and compatible with OC San's PDF software, as described in Section 2.2.4 without conversion. Before the package is submitted, the following procedures must be performed:

- Verify that the appropriate construction drawings have been stamped and signed by a registered engineer for the respective disciplines in the State of California starting with the Final Design.
- Export each construction drawing including all standard sheets (i.e. abbreviation sheets, standard symbol sheets, etc.) necessary for a complete project set into individual sheets (*.pdf) files.
- PDFs should be created using the originating software the drawings were created in. Combine individual sheets into packages no larger than 100 MB. Use volume sets as needed without breaking any one discipline between two sets.
- View each (*.pdf) file and verify that the image is clear and readable.
- For additional guidelines and best practices for Construction PDF Document creation see Section 7.4.

7.3.6 3D Models within the AutoDesk Construction Cloud (ACC)

NOTE: Model files shall be regularly published within the cloud platform. This may be done automatically, at a minimum, files shall be published weekly.

To create record copies of Revit models the following procedures should be noted:

- First, publish each model.
- To create record copies that are independent of the cloud platform:
  - Select and download one model; all linked models are saved to the same package.
  - Verify that all models were included. If AutoCAD (dwg) references were linked to the models they must be manually added.
- To create record copies that are within the cloud platform:
  - Select the file(s) and use the copy command to create a copy to a named / dated folder.
  - DO NOT open a model and use the software's 'Save As…' command.

7.4 Construction PDF Document Guidelines and Best Practices

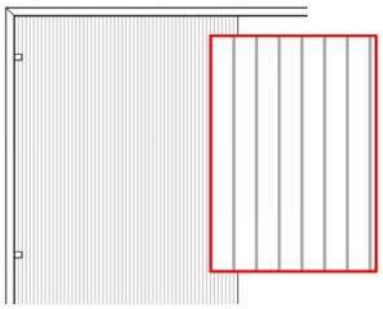
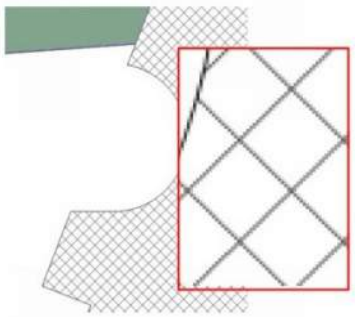
The following are suggested steps in creating Construction PDF Documents. These instructions do not nullify the need for the end user to have AutoCAD and Bluebeam production experience. OC San has standardized on the use of Bluebeam Revu for reviewing and providing comments to PDF files. To facilitate the use of Bluebeam, make sure to implement the suggestions below (7.4.1) into the AutoCAD drawings as best as possible, and to execute the following Bluebeam commands (7.4.2) prior to submission of PDF files.

7.4.1 Best Practices for AutoCAD

- Use TrueType Fonts, with no oblique angles and width factor set to 1, no exception. Refer to Section 5.6 for additional information.
- Text in embedded objects, such as Microsoft Excel tables, can't be converted as searchable text. Revu Complete processes these documents with OCR to make searchable text. Limit the use of text in embedded objects.
- Make sure that text in callouts and detail bubbles do not break or go outside of circles.

Callout / Detail Bubbles	
Correct	**Not Correct**
	

- Use Simple Hatch Patterns. Avoid or limit the use of Cross-hatching and fill patterns. These types of patterns create larger files and significantly slows PDF drawing load times and performance.

Hatch Patterns	
Efficient Hatch Fill	**Inefficient Hatch Fill**
	

- Vector-based drawings enable better navigation of information from digital PDF drawings, perform significantly better when zooming into drawings, taking measurements, snapping to content, etc. Limit the use of Raster

content to images/photos inserted into drawings/documents. If Raster images are the only option such as referencing scanned older Record drawings or tiff files, OCR scanning should be implemented before submission of PDF package(s). PDFs should never be submitted as rasters (bitmaps), whenever possible.
- When plotting, use the OC San provided page setup (PDF 34x22) per Section 2.9, which optimizes PDF, reduces file size, and manages bookmarks.
- In PDF Settings, make sure PDF Layers are turned off and Enable Bookmarks is selected.
- Plot to scale, DO NOT use Fit to Page.

7.4.2 Best Practices for Autodesk Revit

Generally, the requirements of 7.4.1 shall also apply for PDFs created via Revit

The Revit application utilizes two parallel sets of patterns:

- Drafting Patterns are analogous to the patterns found in AutoCAD. They are intended to display only in coarse scale views.
- Model Patterns reflect real-world conditions, and although these may still appear.
- Diagrammatic in nature, the pattern lines should represent real-world conditions. For example, 8” between vertical pattern lines on a CMU block wall.

The intended representations on drawings and other views can be readily achieved with either Drafting or Model patterns

7.4.3 For Bluebeam (after PDF package(s) have been created)

Prior to submitting electronic “PDF” files, format them as indicated below (underlined texts refer to commands and functions within Bluebeam Software)

- Reduce file size with Document\Process\Reduce File Size as much as possible, making sure everything is still legible.
- Use Flatten with Document\Flatten for all PDF packages.
- Make PDF searchable with Document\OCR especially when Raster Images or scanned files had been used to create Composite Sheet. There are to be no existing comments or markups in the PDF.
- Create page labels for drawings with Thumbnails Toolbar\Create Page Labels. (Refer to “OC San Exhibit 17 Designer Training Document for Submission”) for information regarding Page Label names and the use of special characters.
- Enable hyperlinks with File\Batch\Link\New. (All reference callouts shall be hyperlinked – e.g., reference to details, sections, elevations, drawing numbers, tables, exhibits, etc.)
- Verify that the PDF document is appropriately bookmarked at Conformed and Record Phases.

7.5 Documentation

Unless otherwise specified in the project scope of work, the following media types will be submitted with the appropriate submittal as listed in Table 7-2.

Table 7-2

Submittal Phase	Half Size/ Media	CAD / BIM Files	Full Size PDF
Preliminary Design Report	Bond	X	X
Design Submittal 1		X	X
Design Submittal 2	Bond	X	X
Design Submittal 3	Bond	X	X
Final Design Submittal		X	X
Conformed Drawings		X	X
Record Drawings**	Bond (2 sets)	X	X

Hardcopy media types must meet the following specifications:

- Bond is to be 20# white.

** The consultant shall be responsible for preparing the record drawings from the approved field markup set for all drawings except the contractor generated drawings and the shop drawings in accordance with the requirements in this CAD Manual. All record drawings must contain a stamp indicating “Record Drawings” (see Figure 5-9). The consultant shall also submit an electronic copy (see Table 7-2 above) of the record drawings to OC San for review and approval. The acceptance of the record drawings shall be deemed a condition for completion of work.

8.0 CAD STANDARDS IMPLEMENTATION TOOLS

Table of Contents

8.0 CAD STANDARDS IMPLEMENTATION TOOLS 8-1

8.1 HISTORY OF CHANGE 8-2
8.2 AUTOCAD TEMPLATES 8-3
8.3 REVIT TEMPLATES 8-3
8.3.1 Revit Parameters and Families 8-3
8.4 CAD COMPLIANCE 8-4
8.4.1 Process and Instrumentation Diagram (P&ID) CAD Compliance 8-5
8.4.2 Single Line Diagram (SLD) CAD Compliance 8-5
8.4.3 Instrument Loop Diagram (ILD) CAD Compliance 8-6
8.4.4 3D Model File – BIM Standards – CAD Compliance 8-6
8.4.5 CAD Compliance – All Other Drawing Types 8-7
8.5 CAD COMPLIANCE REVIEW PACKAGE 8-7

8.1 History of Change

Revision and Version	***Author***	***Date***	***Change***
A1	MAB	04/24/01	Initial Release of Manual
B	MAB	11/4/02	Included information on Batch Standards Checker
C	SJM	7/22/10	CAD Compliance Revision
F	DCR	03/02/11	Updates and revisions to content. Revised to show Enterprise Information Management as group responsible.
G	BAW	08/08/16	Redesignated as chapter 8 (previously chapter 10)
H	EIM	12/01/19	Updates and revisions to content.
I	RVT	09/13/21	OCSD references to OC San. Grammatical revisions.
J	EIM	03/30/23	Section 8.3.2 – Added reference to Project EID on “All attributes..” bullet.
K	TAC	05/29/24	Added Revit Template, Revit Family, and Share Parameter information to the chapter.

chap08-CAD Standards Implementation Tools.docx

8.2 AutoCAD Templates

A template file contains standard settings for use in creating a new drawing. OC San has created several discipline-specific template files for composite sheets and base models, as well as standard border templates. These files have the following conventions and settings included:

- Unit type and precision
- Title blocks, borders, and logos
- Layer names and properties
- Text styles, Dim styles, and Multileader styles
- Template files have a .dwt file extension and are included in the CAD Drawings folder.

8.3 Revit Templates

Revit models for OC San shall always be created from an approved template file. OC San's Revit Template include the following settings:

- Line styles, including lineweights and pattern. Text and dimension styles.
- Annotation symbols, tags, arrowheads
- Export to CAD settings
- Units and accuracy settings
- Project Parameters
- Template Schedules
- MEP settings (Where applies)
- Object Style settings

Revit Templates have an .rte extension

Some settings are not managed directly by the template file. A primary example of this would be a titble block, which may exist as a separate file with and .rfa extension.

- For convenience, title blocks for OC San use are loaded into the template files.

8.3.1 Revit Parameters and Families

All components of data within Revit are referred to as 'families'. Some such families exist as individual files that can be loaded into projects.

- Families from OC San libraries should be used
- Families that are not started from those in OC San libraries shall be checked for parameter consistency.

The family should contain those parameters that are required for the EID.

Before a custom family is loaded into a project, it must be checked for parameters similar to those in the EID. Similar parameters shall be removed.

As a mean of backchecking the parameters in a project, the Autodesk Interoperability Tools® suite may be used to verify correct parameters. It can add, remove, or edit parameters as required.

8.4 CAD Compliance

All CAD drawings must adhere to the standards put forward in the OC San CAD Manual. Drawings will be reviewed for CAD compliance during the course of projects as outlined in the Scope of Work for each job.

Consultants shall provide OC San all necessary CAD submittals per the Project's SOW and schedule, typically at the following milestones:

- Preliminary Design Report (PDR)
- Design Submittal 1 (DS1)
- Design Submittal 2 (DS2)
- Design Submittal 3 (DS3)
- Final Design Submittal (FDS)
- Conformed Submittal
- Draft Record Drawing Submittal
- Final Record Drawing Submittal

A CAD compliance review must take place before the consultant's final record drawing submittal. The draft review is to ensure that OC San's CAD Standards were adhered to prior to printing the final Record Drawings and submitting the PDF files.

At each submittal stage, the previous CAD compliance review package will be referenced to make certain that all comments from the previous review have been integrated into the current submittal. Consultant shall address all comments. If comments from prior review are not addressed, the submittal may be rejected for re-submittal.

8.4.1 Process and Instrumentation Diagram (P&ID) CAD Compliance

P&IDs have strict requirements since they will have to integrate into a baseline pool of P&IDs. Layers, colors, linetypes, etc., must be tightly controlled.

- Drawings must start with the appropriate .dwt file.
- Everything must be drawn within the model space bounding box.
- The layout must be proportioned to plot full size ANSI “D” (34x22) or half size ANSI “B” (11x17).
- The data fields inside the drawing must match the Reference Project data fields and must be filled in.
- The file format of the P&ID must match the contract agreed-upon format.
- The drawing must be laid out using good engineering practices for P&IDs.
- Nothing in the drawing can violate the criteria set by the Reference Project.

Refer to Chapter 9 for AutoCAD Plant 3D requirements.

8.4.2 Single Line Diagram (SLD) CAD Compliance

CAD Compliance reviews for Single Line Diagrams are typically done during each submittal stage of the project per SOW, along with the submitted Electrical Drawings.

Refer to the project SOW for specific Single Line Diagram CAD compliance review intervals.

- Single Line Diagrams must be based on the supplied SLD templates and block library.
- OC San blocks must not be exploded.
- OC San layers, colors, linetypes must not be changed.
- To encourage better data matching with tools like AutoCAD Electrical, consultants are permitted to add layers and blocks as long as visual fidelity is maintained, and blocks or attributes are not named in a manner that would interfere with our data extraction process and **with prior approval by EIM**.
- The information shown in the templates must be supplied.
- All attributes of each block shall be filled in as accurately as possible. Refer to Project EID (Equipment and Information Datasheet) for attribute data.
- The provided layout tab in the template must not be changed and contain only one layout per Composite Drawing.
- The border file may be changed by the consultant at several locations. Consultants can add a logo in the area provided to left of the OC San logo, add PE stamp, submittal phase, etc., and can edit the project description.
- Most importantly, the required data must extract properly.
- See Section 10.3, Single Line Diagram Best Practices, additional information.

Refer to Chapter 10 for Single Line Diagram requirements.

8.4.3 Instrument Loop Diagram (ILD) CAD Compliance

CAD Compliance reviews for Instrument Loop Diagrams are typically done during the construction phase of the project. It is suggested that a few sample loop drawings are submitted for review prior to mass production of the loop drawings. This pre-review can greatly reduce the changes required near the end of the submittal process and will streamline the contractor's submittal.

Refer to the project SOW for specific Instrument Loop Diagram CAD compliance review intervals.

- Loop Diagrams must be based on the supplied ILD templates and block library.
- OC San blocks must not be exploded.
- OC San layers, colors, linetypes must not be changed.
- Information shown in the templates must be supplied.
- Container zones must be maintained correctly.
- Correct blocks must be used to show a separate suffix where required.
- The UNITNO attribute which shows the area/subarea must be filled in even though invisible on the face of the drawing.
- The border file must be XREF'd (overlay) in Paper space with a relative path. (Do not bind or insert as a block.)
- The provided layout tab in the template must not be changed.
- The border file may be changed by the contractor in two areas only. Contractor can add a logo in the area above the OC San logo and contractor can edit the project description.
- Most importantly, the required data must extract properly.
- OC San PLC numbers must be supplied in the titleblock.
- Where the loop diagram documents a NON-OC San PLC, the information supplied should follow the OC San standard as closely as possible.

Refer to Chapter 11 for Instrumentation Loop Diagram requirements.

8.4.4 3D Model File – BIM Standards – CAD Compliance

Some Model File Compliance checks are performed manually, and others may be automated. Manually checked items may be required as specific milestones or at several milestones.

The consultant is responsible for running the automated checking tool and sharing the report with OC San.

- Model files are subject to the requirements below in section 8.4.5.
- Refer to Appendix E for the BIM Standards Compliance Matrix.

8.4.5 CAD Compliance – All Other Drawing Types

A typical CAD compliance review will include (but will not be limited to) the following:

- Ensure that the drawings are produced in an approved version of AutoCAD, AutoCAD Revit and/or AutoCAD Plant 3D.
- Verify drawing package organization as detailed in this manual.
- Identify whether the Project Model Files are done in the proper coordinate systems.
- Verify border and reference file usage techniques.
- Verify that file naming conventions are used correctly.
- Ensure proper usage of layer naming, lineweight, linetype, text/font style, text height, dim style, and multileader style.
- Verify proper page setup.
- Ensure correct border sheet and sequence in drawing set.

8.5 CAD Compliance Review Package

The CAD Compliance Submittal Review is included as a part of the overall review package that the Project Management Team returns to the consultant and/or contractor.

At each submittal during the course of a project, a CAD Compliance Submittal Review package is turned over to the Project Management Team.

A typical review package includes (but will not be limited to) the following:

- Submittal Review Comments Form – a comprehensive list of errors and what is expected to be fixed (all disciplines).
- Screenshots (as needed support document)

9.0 PROCESS & INSTRUMENTATION DIAGRAMS

Table of Contents

9.0 PROCESS & INSTRUMENTATION DIAGRAMS 9-1

9.1 HISTORY OF CHANGE 9-2
9.2 PROCESS & INSTRUMENTATION DIAGRAMS (P&ID) 9-3
9.2.1 P&ID Best Practices 9-3
9.2.2 Instrumentation 9-3
9.2.3 Input/Output 9-5
9.2.4 Equipment 9-6
9.2.5 Valve Label 9-6
9.2.6 Piping Labels 9-7
9.2.7 Off-Page Connector 9-7
9.2.8 Template Files and Border Sheets 9-7
9.2.9 Symbols 9-7
9.3 ADDITIONAL CONSIDERATIONS FOR P&IDS 9-8
9.3.1 Flow Arrows 9-8
9.3.2 Line Breaks 9-8
9.3.3 Line Spacing 9-8

9.1 History of Change

Revision and Version	*Author*	*Date*	*Change*
G	ICA	08/08/16	New chapter, expanded from portion of previous chapter 11
H	EIM	12/01/19	Updates and revisions to content.
I	RVT	09/13/21	OCSD references to OC San. Grammatical revisions.
K	TAC	05/29/24	Additional Considerations and Best Practices for P&IDs

chap09-Process & Instrumentation Diagrams.docx

This chapter defines the unique requirements of Instrumentation & Control (I&C) drawings. The standards shown are to be observed by all OC San staff members, consultants and contractors. Creation of I&C drawings are different from most other engineering disciplines. Process & Instrumentation Diagrams (P&ID) are to be developed using Autodesk™AutoCAD Plant 3D 2024 (included with AutoCAD) software to produce intelligent graphics.

9.2 Process & Instrumentation Diagrams (P&ID)

The Piping and Instrumentation Diagram (P&ID) is prepared based on the Process Flow Diagram. The P&ID provides greater detail and data that the PFD and is used in preparing detailed arrangements.

P&ID Drawings require that sufficient data be completed for each component to ensure that all the tag numbers are reflected in the database. The following guidelines shall be used when placing each type of component.

9.2.1 P&ID Best Practices

Refer to Engineering Design Guidelines Chapter 11 for typical layout requirements for P&IDs, including flow directions, tagging and general arrangement.

Additionally the P&IDs will show and/or list the following:

- All process equipment and instruments with proper tags.
- Heat tracing and insulation requirements and lines.
- Safety instruments and devices including set pressures for pressures and vacuum relief.
- Valves including automatic/control with flow direction and failure modes.
- Show only the size of relief, bypass, and control valves.
- Locate control valves as close to their transmitters as practical to keep instrument leads short (when instrumentation is called for)
- Indicate the tube and shell side of heat exhangers.
- Extend the relief system piping beyond the relief valves and bypass valves.

9.2.2 Instrumentation

AutoCAD Plant 3D requires each instrument component to have a unique tag that can be associated with an instrument loop (e.g., level, flow, alarm).

See Engineering Design Guidelines Chapter 13 for all equipment tagging procedures and requirements.

When an instrument component is placed, OC San requires that the TAG label have the following data:

Table 9-1

Annotation Attributes	Input
Area/Location Number	Required*
Instrument Function Code	Required
Instrument Loop Block Number	Required
Instrument Loop Suffix	When Required**
Note:	

For instrumentation located in a panel: "Location" column in Data Manager must be populated with the Panel Tag Number related to each instrument located in the panel.	Required*

*Will not display in the instrument bubble on drawing.

**The letters "I" & "O" shall not be used as a loop suffix.

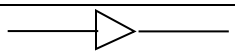
Note *(Grid and Snap)*: The default snap is set to 0.0625" and the default grid is set to 0.1250". These values correlate with the modular size on which most of the symbols were created. For example, an instrument bubble's quadrants will land on the default snap when placed on grid. The same applies for valves with respect to connection points as well as most of the other symbols.

This allows for a more accurate free form creation of P&ID's and generally makes for cleaner presentation allowing the user to easily align symbols.

9.2.3 Input/Output

OC San requires that when placing I/O points, four standard symbols be used. The symbols are part of the AutoCAD Plant 3D package and are on a tool palette provided in the P&ID Reference Project template file.

Table 9-2

Symbol Type		Description
	Digital Input PLC	Digital Input (DI)
	Digital Output PLC	Digital Output (DO)
	Analog Input PLC	Analog Input (AI)
	Analog Output PLC	Analog Output (AO)

When an I/O symbol is placed, OC San requires that a label have the following data:

Table 9-3

Attributes	Input
Area/Location Number	Required*
Instrument Function Code	Required
Instrument Loop Block Number	Required
Instrument Component Suffix	When Required
DESC2**	Required*
DESC3**	Required

*Will not display on drawing.

**Real I/O list requirements are found in the Engineering Design Guidelines Chapter 11.

9.2.4 Equipment

OC San requires that an Equipment Description Label be placed for each equipment group on the drawing and the data to be completed per Specification sections 16075 & 17075 for single or 2-line, or 3-line labels:

Table 9-4	
Attributes	**Input**
Area/Location Number	Required
Equipment Group Number Prefix	Required
Equipment Group Block Number	Required
Equipment Group Number Suffix	When Required
Description 1	Required
Description 2	Required
Description 3	Required

- The description tag should be placed inside the equipment if it is large enough.
- The tag name, which is displayed using the cell EQUIPID, contains the appropriate data fields for text input.
- The equipment description will be located 1/8” (0.125”) below the equipment name using the appropriate justification for equipment, as defined in the text justification dialog box in the P&ID software.

9.2.5 Valve Label

OC San requires that a Valve Label be placed for each valve on the drawing and the data to be completed per Specification sections 16075 & 17075 for single or 2-line, or 3-line labels. Below example for a single line label:

AAABBBCCCD		
Code	**Attribute**	**Input**
AAA	Area/Location Number	Required
BBB	Function Code	Required
CCC	Component Block Number	Required
D	Component Suffix*	When Required

*The letters “I” & “O” shall not be used as a component suffix.

9.2.6 Piping Labels

OC San requires that an intelligent label be placed for each pipe segment.

AAA-BB-CCCCC-DDDD-EEE		
Code	**Attribute**	**Input**
AAA	Nominal diameter	Required
BB	Nominal diameter units (Inch or Feet)	Required
CCCCC	Operator fluid code	Required
DDDD	Piping material class	Required
EEE	Area/Location Number	Required

Pipe line numbers change at:

- Major equipment, such as vessels, pumps, exchangers, etc.
- Piping class change-over points, such as, at pressure reducing stations.
- Branch lines from main headers
- Line identification line number shall remain the same even though the line size may change several times.
- Control valves and safety-relief valve bypass lines shall not be numbered.
- Equipment bypass lines shall be numbered.

9.2.7 Off-Page Connector

These connectors identify the continuation of pipelines to other drawings. There are two groups of connectors: Those that exit from the current drawing, and those that enter into the current drawing.

The off-page connector indentification shall adhere to the OC San AutoCAD P&ID Reference Project.

9.2.8 Template Files and Border Sheets

The preferred method of controlling the project border for OC San P&ID projects is through an external reference. By default the template (*OCSD-PIDTemplate.d*wt) references *OCSD-PID-DBDR.dwg*. *OCSD-PID-DBDR.dwg* is the drawing border and it contains the graphics and fixed information associated with the project. This file is provided in the …*ACAD Settings**Template* directory supplied with the OC San AutoCAD Plant 3D Reference Project. The border file should NOT be renamed. Users can modify the border drawing file as required to show consultant logos and project information. Locate the modified version of the border file in the same directory as the P&ID drawings or in a directory defined in the project environment.

9.2.9 Symbols

Symbols are stored in the OC San AutoCAD Plant 3D Reference Project within the drawing ProjSymbolStyle.dwg. Refer to Appendix B for pictorial versions of standard library symbols, to be used for E,I&C drawings. The addition of symbols is not allowed without prior approval of OC San's EIM group.

9.3 Additional Considerations for P&IDs

9.3.1 Flow Arrows

- Are placed at elbows.
- Are placed so that flow direction is understood.
- Are not placed in the middle of a line or at random.

9.3.2 Line Breaks

- When two separate lines cross:
- If the lines are both process or utility lines, the vertical line is to be broken at the intersection.
- If the lines are process and utility lines, the utility line(s) are broken at the intersection.

9.3.3 Line Spacing

- Spacing between line (e.g. process, service) is no closer than 1/4” (2-grids).
- It is desirable for lines to run as straight and smooth as possible and to avoid dog legs whenever possible.

10.0 SINGLE/ONE LINE DIAGRAMS

Table of Contents

10.0 SINGLE/ONE LINE DIAGRAMS 10-1

10.1 HISTORY OF CHANGE 10-2
10.2 SINGLE LINE DIAGRAMS 10-3
10.2.1 CAD Standards and Files 10-3
10.2.2 Border Reference File 10-3
10.2.3 Single Line Diagram and Templates 10-3
10.2.4 Block & Attribute Library for AutoCAD 10-4
10.2.5 Drawing Submittal Process 10-4
10.3 SINGLE LINE DIAGRAMS BEST PRACTICES 10-4
10.3.1 Creating an SLD 10-4
10.3.2 Drawing and Equipment Content 10-5

10.1 History of Change

Revision and Version	*Author*	*Date*	*Change*
G	RVT	08/08/16	New chapter
H	EIM	12/30/19	Updates and revisions to content
I	RVT	09/13/21	OCSD references to OC San. Grammatical revisions.
J	EIM	03/30/23	Section 10.3.2 – Added reference to Project EID on “For electrical equipment…” and “For load distribution…” bullets.
K	TAC	05/29/24	Updates to sections 10.2.1, 10.2.2 and 10.3.2

chap10-Single_One Line Diagrams.docx

This chapter defines the requirements for Single Line Diagram* (SLD) drawings. The standards shown are to be observed by all OC San staff members and consultants. SLD drawings are to be developed using Autodesk™AutoCAD or Autodesk™ Revit™ and require adherence to the OC San templates and AutoCAD users shall utilize CAD blocks which use extractable block attributes.

***Where the terms Single Line Diagram or SLD are used, they can also refer to One Line Diagram from this point forward*.**

10.2 Single Line Diagrams

The purpose of this document is to provide sufficient guidance to consultants so that SLDs conform to OC San standards in presentation and content required by Project Specifications. It is required of the consultants to follow these standards while producing, assembling, checking, coordinating and displaying all required information.

10.2.1 CAD Standards and Files

When performing work on OC San projects, standard correspondence for consultants and contractors is via email and/or access to the OC San external file sharing site. The email or project specific folder within the external file sharing site will contain all the native electronic files used to produce the SLDs.

To assist in the production of SLDs, an AutoCAD or Revit template file is provided. The OC San template file will help to ensure proper use of text styles, line weights and layer names. OCSAN -SLD Standards.dwt is the template file for AutoCAD. Refer to the AutoCAD User's Guide for more information on how to utilize a template file.
For projects utilizing BIM, the Revit model will be provided by OC San and based on a custom template for the Electrical discipline.

10.2.2 Border Reference File

Within the OC San templates folder is an AutoCAD drawing for the OC San D size border (XXXX-GDBDR.dwg). The border file is to be saved using the project number and is not to be modified except for the addition of a consultant/contractor logo, PE stamp, submittal phase, and edited project description. The border drawing is used as an external reference, inserted as an overlay with a relative path in paper space at 0,0. The title block information is inserted in the SLD drawing using a standard block (For AutoCAD: Block – Title Block Text.dwg). The Revit model includes the standard Title Block Family.

10.2.3 Single Line Diagram and Templates

SLDs typically start from OC San supplied Baseline SLD and templates. A series of SLD templates and sample drawings has been created to facilitate the production of project specific SLDs. The Baseline diagram should reflect the as-is conditions of electrical systems in the area specified in the Scope of Work; such as MCCs, Switchboards, Transformers, Generators, Motors, etc. The consultant will need to create the project-specific SLDs to incorporate the new design, including equipment to be removed and/or to remain.

For all BIM based projects, single line diagrams shall be created natively within Revit using the provided OC San Revit Template which houses the appropriate Baseline SLD. This SLD template will be comprised of: specified text styles, line weights/line type patterns, and electrical symbols. The consultant shall follow OC San standards for display locations of all texts, equipment ID callouts, and all pertinent electrical information regardless of the software used.

NOTE: The SLDs provide the format and the level of detail expected in the final product. The accuracy of the content is the responsibility of the consultant.

OC San will supply several SLD samples and a legend, as well as OC San Baseline SLDs. However, the consultant is required to produce all necessary Single Line drawings as defined by the 'scope of work', whether a Single Line drawing exists or not.

NOTE: These Baseline diagrams consist of the as-built condition of electrical systems. OC San Baseline SLDs are only to be used as a reference; modifications are not permitted.

10.2.4 Block & Attribute Library for AutoCAD

OC San requires that our standard attributed blocks be used when producing SLDs. Blocks are graphical elements that are treated as a unit. Attributes are text fields that are attached to those blocks. OC San utilizes blocks with attributes for quality assurance and data extraction purposes.

NOTE: Consultants are not permitted to explode or modify OC San blocks.

Standard blocks should be taken from the 1LIN-ELEC-LGND.dwg file or from the block library provided by OC San.

NOTE: The addition of unauthorized symbols or blocks is not allowed without prior approval of the OC San's EIM Group.

10.2.5 Drawing Submittal Process

10.2.5.1 Intermediate Submittals

Consultants shall provide OC San all CAD submittals per the Project's SOW and schedule, typically at the milestones listed in Section 8.4, CAD Compliance.

10.2.5.2 Final Submittal Record Drawings

At the completion of construction and in accordance with the project schedule, SLD record drawings shall be submitted for final review and acceptance by OC San. Record drawings are to be submitted in electronic format in accordance with the project specifications. If the project specifications require paper, those will also be submitted in accordance with the project specifications. Failure to submit record drawings may result in withholding of final payment.

10.3 Single Line Diagrams Best Practices

The following are suggested steps to create the SLDs.

10.3.1 Creating an SLD

- Using an OC San D size border (XXXX-GDBDR.dwg), Electrical SLD Template drawing (OCSAN - SLD Standards.dwt), or OC San supplied Baseline SLD reference drawings, modify the border drawing to add the Consultant Logo and edit the Plant/Service Area and project title as necessary.
- Open the desired Baseline SLD for the project area.
- In paper space, verify that the edited border is loaded as an external reference file, as an overlay type, and with a relative path.

- Use the Save As command to save the file. (See CAD Manual 3.4 for Composite Drawing file naming convention.)
- In lower-right corner, double-click on the drawing number to bring up the enhanced attribute dialog box and edit all fields in the block as needed.
- Save the drawing.
- Drawing is now ready for content to be added, modified, removed, screened for existing, etc. All information and accuracy of the drawings are the responsibility of the consultant.
- The drawing line work shall be completed in model space, not in paper space. Paper space will be used only for layout. Each drawing file will contain the externally referenced 22x34 border in paper space with viewport(s) containing the SLD in model space. The scale of the viewport should be 1:1.
- Verify all created SLDs conform to OC San CAD standards.

10.3.2 Drawing and Equipment Content

SLDs shall contain all the following information relevant to the affected electrical equipment per the scope of work for that project.

- Each SLD shall be comprised of distribution equipment with a common primary power source, same electrical building, or same plant process location.
- Each SLD shall be comprised of two sheets minimum, depending on size of SLD and project scope of work. One sheet to contain demolished equipment and the other sheet to indicate new equipment. Otherwise, one sheet minimum if all new equipment.
- Each SLD shall not be so densely populated as to obscure clarity when plotted.
- If multiple lines are needed for long bus configurations, keep a ‘left to right’ oriented layout.
- The title block shall be populated with the project name, file number, project area, location of electrical equipment, and equipment designation, as well as the Designer Identification Block (Figure 5-4) and Management Block (Figure 5-5)
- A new SLD’s appearance and information shall resemble OC San supplied Baseline SLDs.
- For electrical equipment:
  - All equipment types (SWGR, MCC, SWBD, etc.) shall be enclosed with a border polyline that encompasses components within that equipment.
  - Align equipment nomenclature title at upper-left side, just above the enclosure line.
  - Use only listed blocks from the 1LIN-ELEC-LGND.dwg file or OC San supplied block library, assuring all necessary block attribute values are correctly populated. Refer to Project EID for attribute data.
- For load distribution:
  - All loop tag numbers shall be boxed-in per sample found in SLD block library.
  - Use only blocks from 1LIN-ELEC-LGND.dwg file or OC San supplied block library, assuring all necessary block attribute values are correctly populated. Refer to Project EID for attribute data.
  - Identify circuit number just above bus tap point.

  - Bus feed circuits and equipment load circuits shall not share the same bus tap point.
  - Identify each ‘SPARE’ just within the bottom of the equipment enclosure polyline.
- Place all pertinent project-related notes where they are most legible, typically at the bottom-right or top-right side of drawing.

11.0 INSTRUMENTATION LOOP DIAGRAMS

Table of Contents

11.0 INSTRUMENTATION LOOP DIAGRAMS 11-1

11.1 HISTORY OF CHANGE 11-2
11.2 INSTRUMENT LOOP DIAGRAMS (ILD) 11-3
11.2.1 CAD Standards and Files 11-3
11.2.2 Border Reference File 11-3
11.2.3 Loop Template and Sample Loop Drawings 11-3
11.2.4 Drawing Zones 11-3
11.2.5 Block & Attribute Library 11-4
11.2.6 Drawing Submittal Process 11-4
11.3 INSTRUMENT LOOP DIAGRAMS (ILD) BEST PRACTICES 11-4
11.3.1 Creating an AutoCAD Loop Diagram 11-4

11.1 History of Change

Revision and Version	***Author***	***Date***	***Change***
G	RVT	08/08/16	New chapter, expanded from portion of previous chapter 11.
H	EIM	12/30/19	Updates and revisions to content.
I	RVT	09/13/21	OCSD reference to OC San. Grammatical revisions.

chap11-Instrumentation Loop Diagrams.docx

This chapter defines the unique requirements of Instrumentation Loop Diagrams. The standards shown are to be observed by all OC San staff members, consultants, and contractors. Instrument Loop drawings (ILD) are to be developed using standard AutoCAD and require adherence to the OC San templates and CAD blocks which use extractable block attributes.

11.2 Instrument Loop Diagrams (ILD)

The purpose of this document is to provide sufficient guidance to Contractors so that Loop Diagrams conform to OC San standards in their presentation and content as required by project specifications. The Contractor must follow these standards while producing, assembling, checking, coordinating and displaying all the required information.

11.2.1 CAD Standards and Files

When performing work on OC San projects, correspondence of standards for consultants and contractors is through emails and/or access to the OC San external file sharing site. The email or project specific folder within the OC San external file sharing site will contain all the native electronic files used to produce the Loop Diagram(s).

To assist in the production of loop diagrams, an AutoCAD template (.dwt) file is provided. The template file will help to ensure proper use of blocks, text fonts, line weights, and layer names. Refer to the AutoCAD User's Guide for more information on how to utilize a template file.

11.2.2 Border Reference File

Within the OC San template folder is an AutoCAD template for the OC San B size border (OCSAN-GBBDR.dwg). The border file is not to be modified except for the addition of a contractor logo and project description. The border drawing is used as an external reference, inserted as an overlay with relative path in Paper Space at 0,0. The title block information is inserted in the loop drawing using OC San standard block, TITLEBLK.

11.2.3 Loop Template and Sample Loop Drawings

Loop diagrams typically start from an OC San supplied loop template or sample drawing. A loop template and series of sample loop drawings have been created to facilitate the production of loop diagrams. A loop template is a drawing file that contains the blocks, layers, fonts, line weights, zones, etc., used to create loop diagrams. The supplied sample loop drawings are partially completed loop diagram which can be copied and completed for a specific project and consist of roughly 80% completed loop diagrams for specific applications; such as a Motor Operated Valve (MOV). The contractor must complete the drawing including the title, loop numbers, references, etc.

It is the responsibility of the Contractor to produce all necessary loop diagrams accurately and as defined by the scope of work/contract documents whether a loop sample exists or not.

11.2.4 Drawing Zones

Within each sample loop drawing and template, a series of zones have been established. These zones are used for QA/QC purposes and are not to be deleted. A closed polyline on the layer named N-ZONE defines the boundary of the zone. An attributed block in each zone identifies the zone name and must reside within the zone boundary. Zones must not overlap.

11.2.5 Block & Attribute Library

OC San requires that when producing loop diagrams, standard OC San blocks with attributes be used. OC San utilizes blocks with attributes extensively for QA/QC and data review purposes.

NOTE: Consultants are not permitted to explode or modify OC San blocks. The addition of unauthorized symbols and blocks is not allowed without the approval of OC San's EIM Group.

11.2.6 Drawing Submittal Process

11.2.6.1 Initial Sample Loops for Review

Prior to a project's intermediate submittals, a small sample set of loop diagrams can be provided to the EIM group for review to ensure that the correct format and content of diagrams are aligned with these guidelines.

11.2.6.2 Intermediate Submittals

During the construction phase, it is required that the contractor provide intermediate submittals of loop diagrams. The loop diagrams shall be submitted in both native DWG and PDF format.

11.2.6.3 Final Submittal "Record Drawings"

At the completion of construction and in accordance with the project schedule, the loop diagram record drawings shall be submitted for final review and acceptance by OC San. Record drawings are to be submitted in both native DWG and PDF format.

11.3 Instrument Loop Diagrams (ILD) Best Practices

Following are suggested steps in creating the loop diagrams.

11.3.1 Creating an AutoCAD Loop Diagram

- Using the OC San B size border (OCSAN-GBBDR.dwg), modify the border drawing to add the contractor logo, edit the plant/service area, and project title as necessary. **Do not rename the border file (OCSAN-GBBDR.dwg).**
- Open the desired sample loop drawing or new loop template drawing.
- In paper space, XREF the edited border file as an overlay with a relative path.
- Save the file as the loop filename being documented. (See CAD Manual Section 3.5 for Loop file naming conventions and Drawing Filename / Number Section 11.3.1.1 below for example).
- Edit all fields in the title block as appropriate. (See Drawing Titles, Section 11.3.1.2 below for example)
- The drawing line work shall be completed in model space. Paper space will be used only for the layout at 1:1.
- Each AutoCAD drawing file shall be dedicated to only one loop tag number. Up to five multiple I/O points that share the same loop tag number may be on the same sheet if space allows. Any additional sheet requires its own separate DWG file.

11.3.1.1 Drawing Filename / Number

Loop Drawings shall have numbering as follows; 10A-L-101-1; where ‘10A’ is location code of the device/equipment; ‘L’ denotes Loop; ‘101’ is the three digit block number in the device/equipment loop tag number; ‘1’ is the sheet number.

The sheet number is added for only loops having more than one sheet, where the first sheet shall be ‘-1’, second sheet shall be ‘-2,’ etc.

Note: The drawing file name must match drawing number.

11.3.1.2 Drawing Titles

Title of drawings shall provide clear understanding about location and function of the device, e.g., a pressure transmitter on digester mixing pump shall be on three lines with last line being only **ONE** tag number representing the primary device.

DIGESTER 8 MIXING PUMP 1
DISCHARGE PRESSURE TRANSMITTER
15BPIT101

Note: Refer to Engineering document 17405-Att A – Loop Specific Instructions for additional information.

12.0 INSTRUCTIONS FOR DRAWING UPDATES FROM BID SET THROUGH RECORD DRAWINGS

Table of Contents

12.0 INSTRUCTIONS FOR DRAWING UPDATES FROM BID SET THROUGH RECORD DRAWINGS 12-1

12.1 HISTORY OF CHANGE 12-2
12.2 ADDENDUMS 12-3
12.3 CONFORMED DRAWINGS 12-3
12.4 CONSTRUCTION CHANGES 12-4
12.5 RECORD DRAWINGS 12-5

12.1 History of Change

Revision and Version	Author	Date	Change
H	MK	01/01/2020	New Chapter to OCSD CAD Manual
I	RVT	09/13/21	OCSD references to OC San. Grammatical revisions.
J	EIM	03/30/23	Sections 12.3 and 12.5 – Updated Approved for Bidding Block note. Section 12.5 – Added Figure 12-1 Approved for Bidding sample.
K	EIM	04/16/25	Grammatical revisions.

chap12-Instructions for drawing updates from Bid Set through Record Drawings.docx

This chapter provides instructions used to update drawings from Bid Set through Record drawings.

12.2 Addendums

Drawing changes shall be indicated using the following annotations:

1. A cloud surrounding the change to the drawing.
2. The revision number inside a delta, adjacent the cloud.
3. In the bottom left Revision Block, provide the following:
    a. Revision number inside of a delta;
    b. Description (Addendum No. [#]);
    c. Issue date of the addendum ([MM/YY]); and
    d. Initials of person responsible for making the addendum changes.

If the entire drawing has changed, the entire drawing may be clouded using just one cloud.

Added drawing shall be entirely clouded with the appropriately numbered delta and revision block updates as noted above. The Drawing number and Sheet number shall be assigned to avoid renumbering of the proceeding drawings. For example, if adding a drawing between G0004 and G0005 (sheets 4 and 5 respectively) the new Drawing number shall be G0004A, with a Sheet number 4A.

Subsequent changes to a previously edited drawing by addendum:

1. Remove clouding from previously issued addenda but leave the delta on the plan and all revision block history in place.
2. Annotate the subsequent changes as defined above – utilize the next line above the prior within the revision block.

Note: The revision number should start at 1 and increase sequentially for each drawing. An addendum that covers multiple drawings may have different revision numbers on each sheet depending on what previous changes have been made thereon.

12.3 Conformed Drawings

Update the CAD files of any drawing changed through addenda by the following procedure.

1. Remove all clouds.
2. Where any deletions of work are shown with hatching or strike-through, remove the work entirely.
3. Be sure to keep the deltas in the areas where the drawings were changed, although clouds have been removed or the drawing was changed by erasing any deleted work.
4. If an area had a deletion and then added a new design, show only the new design, but keep the deltas with the corresponding notes as to the addendum that made the change.
5. In the bottom left revision block, retain the history of changes for reference purposes.

6. Update the stamp at the bottom, middle of the border of **all** drawings (not just the ones modified by addendum) with the Conformed disclaimer language provided by OC San, per Figure 5-9.
7. Provide the conformed drawings in accordance with the project scope of work deliverable requirements to OC San Project Manager and Engineering Assistant in charge of publishing conformed plans and specifications for construction.

Note: Wet signatures and/or digital signatures are not required in the Approved For Bidding Block. In place of signatures, “ORIGINAL SIGNED BY…” verbiage must be above each name on stamp, refer to Figure 12-1.

12.4 Construction Changes

Drawing changes shall be indicated using the following annotations:

1. A cloud surrounding the change to the drawing.
2. The revision number inside a delta, adjacent the cloud.
3. In the bottom left revision block provide the following:
    a. Revision number inside of a delta;
    b. Description (e.g., RFP No.4, RFI No.19);
    c. Issue date of the addendum ([MM\YY]); and
    d. Initials of person responsible for making the addendum changes.

If the entire drawing has changed, the entire drawing may be clouded using just one cloud.

Added drawings shall be entirely clouded with the appropriately numbered delta and revision block updates as noted above. The drawing number and sheet number shall be assigned to avoid renumbering of any following drawings. For example, if adding a drawing between G0004 and G0005 (sheets 4 and 5 respectively) the new drawing number shall be G0004A, with a Sheet number 4A.

Subsequent changes to a previously edited drawing:

1. Remove existing clouding from previously issued modifications but leave the revision block history and corresponding delta(s) on the plan.
2. Annotate the subsequent changes as defined above – utilize the next line above the prior within the revision block.

Note: The revision number should start at 1 and increase sequentially for each drawing. A change that covers multiple drawings may have different revision numbers on each sheet depending on what previous changes have been made thereon.

12.5 Record Drawings

Record drawings shall be indicated using the following annotations:

1. Remove existing clouding from previously issued modifications but leave the revision block history and leave the delta on the plan.
2. For field changes made during construction and shown on the Contractor's red-lined markups, add a delta with a corresponding R (for Record) in the revision block. This instruction only applies to drawings with field changes. (Drawings unaffected by field changes will just be updated with the Record Drawings stamp per Figure 5-9, and Step 4 below)
3. Add a delta with a corresponding R adjacent each revision in the drawing. No corresponding clouds are needed.
4. Update the stamp at the bottom, middle of the border on **all** drawings with the Record Drawings stamp, per Figure 5-9.
5. In addition, a note shall replace the engineer's seal stating:
   "THIS DRAWING WAS ORIGINALLY APPROVED FOR CONSTRUCTION, SEALED AND SIGNED ON [DATE] BY [NAME OF ENGINEER], A LICENSED PROFESSIONAL ENGINEER IN STATE OF CALIFORNIA NO. [LICENSE NUMBER]"

Note: Wet signatures and/or digital signatures are not required in the Approved For Bidding Block. In place of signatures, "ORIGINAL SIGNED BY…" verbiage must be above each name on stamp, refer to Figure 12-1.

Consultant shall submit an electronic copy of the record drawings to OC San for review and approval. The acceptance of the record drawings shall be deemed a condition for completion of work.

The contractor generated drawings described in the Design Guidelines and the shop drawings will not be updated by consultant.

Approved for Bidding Stamp at Conformed and Record Drawing package

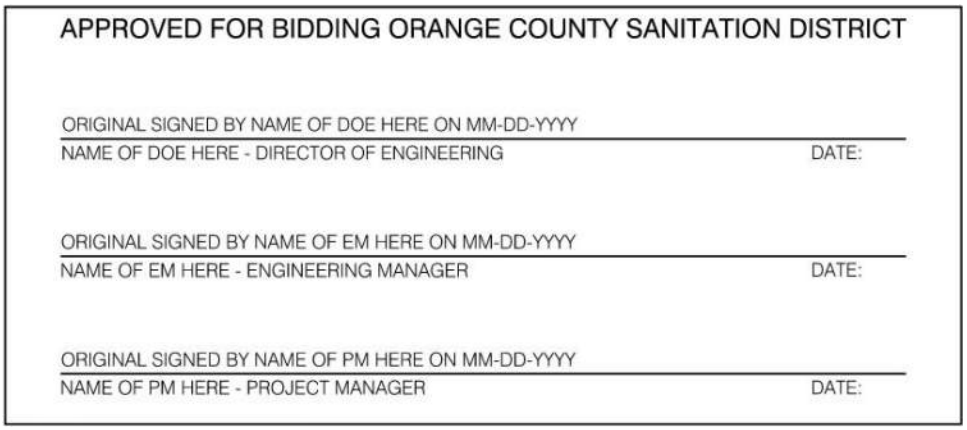


Figure 12-1

13.0 DESIGN DOCUMENTATION STANDARDS FOR 3D

Table of Contents

13.0 DESIGN DOCUMENTATION STANDARDS FOR 3D 13-1

13.1 HISTORY OF CHANGE 13-2
13.2 BIM EXECUTION PLAN 13-3
13.3 BIM USES 13-3
13.3.1 Design Authoring 13-3
13.3.2 3D Model Coordination Procedures 13-5
13.3.3 Existing Conditions and Record Modeling Procedures 13-7
13.3.4 Asset Management and Facility Maintenance Procedures 13-7

13.1 History of Change

Revision and Version	*Author*	*Date*	*Change*
K	TAC	05/29/24	Added Revit Template, Revit Family, and Share Parameter information to the chapter.

chap3-Design Documentation Standards for 3D.docx

This chapter defines the requirements for Building Information Modeling (BIM). The standards shown are to be observed by all OC San staff members and consultants. 3D design for Structural, Architectural, Fire Protection, Plumbing, HVAC, Electrical and Telecommunication scopes of work shall be documented per the requirements of this chapter and the project specific plan. OC San templates and family files which use shared parameters for Autodesk Revit are available for the purposes of meeting these requirements.

13.2 BIM Execution Plan

Following the Notice to Proceed (NTP), the Consultant must submit a BIM Execution Plan to the OC San PMO demonstrating how it will meet the requirements of this document. The PMO will evaluate the BIM Execution Plan and provide feedback to the Consultant for revision and resubmittal to the PMO.

The BIM Execution Plan must include, at a minimum, the following information:

(NOTE: The Consultant may reference their proposal in lieu of providing duplicate information in the plan)

- Project Goals and related BIM Uses
- Qualifications of BIM leadership staff to meet Project Goals
- The design-phase project stakeholders (both local and remote).
- Plan for file sharing, storage and retrieval, and data security.
- Schedule of BIM activities including milestones and submittals.
- Methodology for ensuring the validation of BIM and CAD files.
- Software selections, and file format.
- File folder structure and file naming conventions (nomenclature).
- Alignment to Established Coordinate Systems
- Model Data Attributes that conform to the EID system or SAT data fields.

13.3 BIM Uses

There are many advantages to be realized with 3D design when the 3D model is connected to business-critical properties and when quantities and associated costs are included in schedules.

This core competency is the foundational ‘BIM Use’ commonly known as Design Authoring. It is a prerequisite for all other BIM Uses:

13.3.1 Design Authoring

- Design Authoring Procedures
- Revit model files shall be created from OC San templates.
- Worksharing shall be enabled with central models hosted to the Autodesk Construction Cloud (ACC).
- All Revit models must be included in the same ACC project.
- All reference files shall be included as overlay.
- Automated Model Publishing shall be established. (Minimum weekly)
- Automated or Manual Model Maintenance -- Audit and Compact each model - is expected. (Weekly Preferred, Minimum Monthly)

When BIM is employed for an OC San project, the following uses shall be verified in the project’s BIM Execution Plan:

BIM Use	Description	Phase(s)
Required: Design Authoring	Develop the 3D Building Information Model based on the criteria defined for all required BIM Uses	Design
Required: 3D Coordination	Eliminate major system conflicts prior to installation by comparing 3D models	Design; Construct
Required: Existing Conditions Modeling	Documentation of existing component locations in the facility; includes required parameters.	Plan; Design; Construct; Operate
Required: Record Modeling	Depiction of the as-constructed facility, including serial codes, warranty and maintenance info.	Construct; Operate
Required: Asset Management	Maintenance of facility assets, including systems, equipment and surrounding environment, assists in short- and long-term planning and upgrades.	Operate
Required: Facility Maintenance	A Record Model is developed for use in CMMS/ BAS systems.	Operate
Optional: 4D Modeling	Models are developed in phases to depict the sequence of the construction plan.	Plan; Design; Construct; Operate
Optional: Programming	Accurately assess project objectives and identify needs and options relative to a spatial program.	Plan
Optional: Engineering Analysis	Verify that a design meets specifications via analysis of the BIM model. May include Structural, Lighting, Energy, Mechanical, etc.	Design
Optional: Site Utilization Planning *(4D Modeling Required)*	Graphically represent temporary and permanent facilities on site according to activities within the construction schedule.	Construct
Optional: 3D Control and Planning	Utilize the 3D model to layout assemblies and/or produce drawings used during on site construction.	Construct
Optional: Space Management	Analyze space and resource usage to plan for future space requirements.	Operate
Optional: Disaster Planning	Providing critical building information to emergency responders via 3D BIM and Building Automation System (BAS).	Operate

Table 13-1: Required and Optional BIM Uses for OC San Projects

13.3.2 3D Model Coordination Procedures

The project-specific plan should outline the expectations for 3D representations of the area of work. The plan should also indicate timeframes for model coordination activities within the design of the project.

Model Coordination includes three distinct model review activities:

1. Model Observation – all team members shall have access to review the 3D design and to apply comments as they observe conflicts or identify constructability or maintainability concerns.

2. Clash Detection – using the ability of the model review software, distinct systems can be compared to each other for both interference ('hard' clashes) and for proximity between dissimilar systems ('soft' clashes). Team review is required to evaluate these conflicts and determine if there are issues.

3. Maintenance Review – there are requirements for service trucks, forklifts, and personnel to have regular and unobstructed access to the area of work. 3D model review with Autodesk™ Navisworks™ allows for 'maintenance objects' to be navigated through the design to identify any areas of concern.

A project-specific timeline for 3D model review should be established at the start of design. (No later than DS1) A typical arrangement for these activities could be as follows:

Activity	**Process and Timeline**	**Team Members Involved**
0. Setup automated export of 3D to model review platform	At the earliest opportunity (once all design models have been established), the Model Coordination features should be enabled and setup for (minimum) weekly updates.	Consultant's Model Manager
1. Model Observation, Review, and Comment	With coordination models available to all, comments can be collated within the platform and reviewed at regular intervals for the duration of design.	All team members involved in design.
2. Clash detection and correction	A defined period of (typically 6-8) weeks allowing for several rounds of review – model manager to identify and assign clashes, design authors to correct, and team to review challenging issues in weekly coordination meetings. Schedule to conclude clash detection prior to assembly.	All team members involved in design and assembly.

3. Maintenance Review	Prior to DS3, coordinate expectations with maintenance team for access. Conduct at least one meeting with maintenance to demonstrate access (move maintenance objects through 3D model)	Design Team + Maintenance Personnel

Table 13-2 3D Model Coordination Activities

Issue Tracking via 3D Model Coordination – Observation

Fundamentally, all three of the review activities outlined above should be focused on the identification and resolution:of issues. An issue should be defined by the following minimum attributes:

- The individual who has reported the issue is known.
- The issue corresponds to a specific location in 3D.
- Still image(s) with or without written description is sufficient to describe the extent of the issue.
- One individual is assigned to resolve the issue.
    - NOTE: Design Model Observations reported as issues may not always have a clear assignee when they are first identified.
    - An OC San or Consultant project manager should be made he default assignee – an individual with the knowledge of the project and project team sufficient so that they can re-assign issues to the most appropriate individual.

Issue Tracking via 3D Model Coordination – Clash Detection

The process of Clash Detection is typically intensive at the outset. The model manager will need to work through the clash report to find items that may be dismissed (for example, ducts that run perpendicular through walls).

There is also some effort involved in grouping like items; several individual clashes may constitute a single issue, such as when two insulated process pipes collide in a 3D design. (A single conflict is reported by the software as four individual clashes because each pipe is represented as the outside diameter of the pipe itself and that of the insulating wrap.).

For those clashes assigned as issues to be solved, the model designers will need to make corrections and their model updates need to be reflected in the coordination model. The individual or team that manages the clash review efforts should endeavor to publish issue report in advance of weekly meetings. This allows the assignees necessary time to review their issue list and limits the time spent in the meetings just for discussions of hard to solve issues.

Issue Tracking via 3D Model Coordination – Maintenance Review

Concerns of equipment operation, constructability and maintainability also should be identified as issues. These may be sourced through clearance objects in the

model through machine rule checking for minimum clearances, (so called ‘soft’ clashes) or by reviewing the 3D design against a list of known challenges, whether that list is on paper or in the mind of the subject matter expert.

Within Navisworks the human scale figure can be displayed within the model. Access to controls and systems can be verified within the context of the 3D model. In the same manner, objects representing maintenance vehicles can be moved around inside the model to verify required clearances and to see if designed passageways provide sufficient access.

13.3.3 Existing Conditions and Record Modeling Procedures

The baseline models are provided as reference for project use. These existing conditions models are not intended to be changed. The only exception would be to indicate selective demolition that is part of the current project. Even in this instance, the modified file would be the copy of the baseline condition that was provided to the project.

When required, existing conditions may also be shown in project models and composite drawings via reality capture methods. (Examples include laser scan, GPR scans, photogrammetry).

Existing equipment that will remain shall begin with the correct operational parameters and values. Consultants are responsible for checking the parameters and data in baseline models for portions of the baseline that are relevant to the project. Any concerns shall be reported to the OC San PMO.

Record models shall be submitted to OC San at the conclusion of the project. The project models shall reflect the final level of development as specified in the project’s execution plan. Projects not developed and documented with 3D methods will meet the requirements put forth in the project execution plan – this may necessitate the use of 3rd party providers to create a project model that reflects the as-constructed conditions.

Coordination models shall also be provided to OC San. These shall include a visual representation of spaces to the defined level of development and a record of clash detection/corrections as noted throughout the design-assemble efforts.

OC San will have exclusive rights to the record model and final coordination model for their use and reference. (NOTE: This does not preclude a consultant from sharing images derived from the models for their own marketing purposes).

13.3.4 Asset Management and Facility Maintenance Procedures

Prior to Assembly, Maintainability Criteria shall be resolved to the satisfaction of Operations & Maintenance personnel.

All data required for Computerized Maintenance Management Systems (CMMS) shall be collected within the Project Model(s) and verified – at least once per each milestone deliverable – via Revit’s schedules.

The Revit Shared Parameters file is the only source to load these parameters to a Revit project or family. Manually created parameters may not operate as the same parameters and results in data reporting errors. Required design parameters per the EID are:

- Asset Action
- LTN Action
- Asset Description
- Equipment Classification
- Capacity
- Loop Code; Loop Code Description
- Loop Tag Number (LTN); Loop Tag Number (LTN) Description
- Drawing Number
- Location
- Parent

A.0 APPENDIX A – COMPOSITE SHEET DRAWINGS

Table of Contents

A.0 APPENDIX A – COMPOSITE SHEET DRAWINGS A-1

A.1 HISTORY OF CHANGE A-2
A.2 TYPICAL COVER SHEET-NON-SUBDIVIDED PROJECT A-3
A.3 TYPICAL COVER SHEET – SUBDIVIDED PROJECT (CHILD CONTRACT PART OF PARENT PROJECT, DIVIDED INTO VOLUMES) A-4
A.4 TYPICAL COVER SHEET – SUBDIVIDED PROJECT (CHILD CONTRACT PART OF PARENT PROJECT, DIVIDED INTO VOLUMES, FOR SUBSEQUENT VOLUMES – NO APPROVED FOR BIDDING BLOCK) A-5
A.5 TYPICAL COVER SHEET – SUBDIVIDED PROJECT (SEPARATE PROJECT INCLUDED AS PART OF PARENT PROJECT) A-6
A.6 TYPICAL INDEX OF DRAWINGS SHEET A-7
A.7 TYPICAL STANDARD ABBREVIATIONS SHEET A-8
A.8 TYPICAL INDEX, SYMBOLS AND ABBREVIATIONS SHEET A-9
A.9 TYPICAL STAGING AREA AND WORK BOUNDARY PLAN SHEET A-10
A.10 TYPICAL PLAN AND PROFILE SHEET A-11
A.11 P&ID INSTRUMENTATION AND COMPONENTS, LEGENDS AND ABBREVIATIONS A-12
A.12 P&ID COMPONENTS, LEGEND AND ABBREVIATIONS A-13
A.13 P&IN GENERAL LEGEND AND ABBREVIATIONS A-14
A.14 P&ID GENERAL SOFTWARE TEMPLATE 1 ..... A-15
A.15 P&ID GENERAL SOFTWARE TEMPLATE 2 ..... A-16
A.16 P&ID GENERAL SOFTWARE TEMPLATE 3 ..... A-17
A.17 P&ID GENERAL SOFTWARE TEMPLATE 4 ..... A-18
A.18 P&ID SAMPLE 1 ..... A-19
A.19 P&ID SAMPLE 2 ..... A-20
A.20 TYPICAL STANDARD ELECTRICAL ABBREVIATIONS A-21
A.21 SINGLE LINE DIAGRAM LEGEND AND DESCRIPTION A-22
A.22 CONTROL SCHEMATICS SYMBOLS AND DESCRIPTION A-23
A.23 PLAN DRAWING SYMBOLS AND DESCRIPTION A-24
A.24 LIGHTING FIXTURE SCHEDULE A-25
A.25 SINGLE LINE DIAGRAM SAMPLE 1 ..... A-26
A.26 SINGLE LINE DIAGRAM SAMPLE 2 ..... A-27
A.27 LOOP DIAGRAM LEGEND 1 ..... A-28
A.28 LOOP DIAGRAM LEGEND 2 ..... A-29
A.29 LOOP DIAGRAM SAMPLE 1 ..... A-30
A.30 LOOP DIAGRAM SAMPLE 2 ..... A-31

A.1 History of Change

Revision and Version	***Author***	***Date***	***Change***
A1	MAB	04/24/01	Initial Release of Manual
F	SM	07/22/10	Revised with AutoCAD requirements
F.1	DCR	03/02/11	Reformatted pages.
G	BAW	08/08/16	Revised with AutoCAD requirements
H	RVT	01/31/20	Updates and revisions to content and sample sheets
I	RVT	09/13/21	OCSD references to OC San. Grammatical revisions and sample sheet updates.

App A-Composite Sheet Drawings.docx

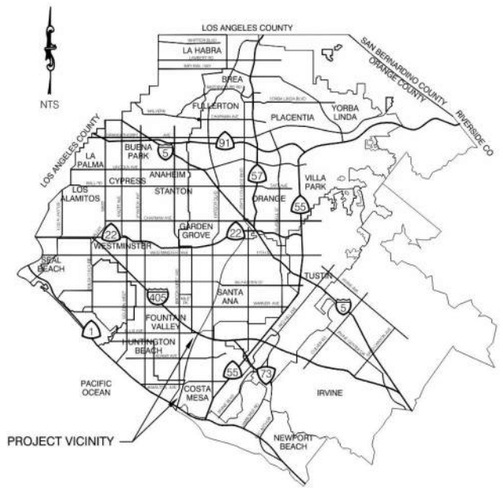
A.2 Typical Cover Sheet-Non-subdivided Project

ORANGE COUNTY SANITATION DISTRICT

PROJECT NO. P1-123

(8)

TRUNKLINE ORDER CONTROL IMPROVEMENTS



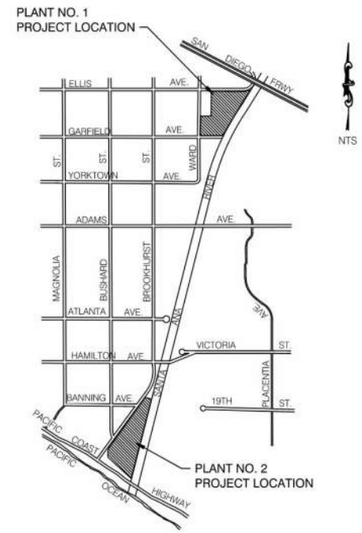
VICINITY MAP

(9)

VOLUME 3 OF 3

DRAWINGS:

GENERAL, CIVIL, ARCHITECTURAL



LOCATION MAP

(1) APPROVED FOR BIDDING ORANGE COUNTY SANITATION DISTRICT

KATHLEEN T. MILLEA - DIRECTOR OF ENGINEERING DATE:

JEFFREY D. MOHR - ENGINEERING MANAGER DATE:

NAME OF PM HERE - PROJECT MANAGER DATE:

MARK	DESCRIPTION	DATE	APPR.
(3)			

DESIGNED BY: FIRST & LAST NAME
DRAWN BY: FIRST & LAST NAME
CHECKED BY: FIRST & LAST NAME
LINE IS 2 INCHES AT FULL SIZE
(IF NOT 2"-SCALE ACCORDINGLY)

(4) (2) (5)

OCSAN ORANGE COUNTY SANITATION DISTRICT

(6) PROJECT NAME TITLE 1
PROJECT NAME TITLE 2

COVER SHEET

(7) PROJ. NO.

DRAWING NO. G0001

X OF Y

DWG: J:_CAD Standards\CAD Drawings\Construction\App A-2 G0001_NON-SUBDIVIDED.dwg
DATE: Sep 05, 2021 9:35am USER: tagumasi

"BIDDING" COVER SHEET
NOTES FOR NON-SUBDIVIDED PROJECT COVER SHEET

(1) ADD WET SIGNATURES AND DATES.
(2) UPDATE SUBMITTAL STAMP TO REFLECT BID SUBMITTAL PHASE PER SECTION 5.9 FIGURE 5-9.
(3) REVISION BLOCK SHALL BE LEFT BLANK DURING BID PHASE.
(4) ADD P.E. SEAL, WET SIGNATURE AND SIGNATURE DATE
(5) CONSULTANT'S LOGO(S) (ON ALL SHEETS).
(6) PROJECT NAME (ON ALL SHEETS).
(7) PROJECT NUMBER (ON ALL SHEETS).
(8) PROJECT NAME AND NUMBER.
(9) VOLUME NUMBER AND RELATED DRAWINGS (e.g., ARCHITECTURAL, CIVIL, MECHANICAL, ETC.), AS NEEDED.

"CONFORMED" COVER SHEET
NOTES FOR NON-SUBDIVIDED PROJECT COVER SHEET

(1) UTILIZE BID SET COVERSHEET MAKING SURE THE FOLLOWING ARE PRESENT:
- APPROVED FOR BIDDING BLOCK, ADD TEXT IN PLACE OF SIGNATURES STATING "ORIGINAL SIGNED BY [NAME] ON [DATE]"
- COMSULTANT'S LOGO(S)
- P.E. SEAL, WET SIGNATURE AND DATE
- PROJECT NAME AND NUMBER

(2) UPDATE SUBMITTAL STAMP TO REFLECT CONFORMED SUBMITTAL PHASE PER SECTION 5.9 FIGURE 5-9.
(3) REVISION BLOCK SHALL RETAIN ADDENDA HISTORY.
(4) NEW P.E. SEAL, WET SIGNATURE AND SIGNATURE DATE ARE REQUIRED ONLY ON EACH REVISED SHEET.

"RECORD" COVER SHEET
NOTES FOR NON-SUBDIVIDED PROJECT COVER SHEET

(1) UTILIZE CONFORMED COVER SHEET.
(2) UPDATE SUBMITTAL STAMP TO REFLECT RECORD SUBMITTAL PHASE PER SECTION 5.9 FIGURE 5-9.
(3) REVISION BLOCK SHALL RETAIN ADDENDA AND CONSTRUCTION CHANGES (e.g., RFP No. xx, RFI No. xx, ETC.).
(4) P.E. SEAL, WET SIGNATURE AND SIGNATURE DATE. THIS SHALL BE REPLACED WITH THE FOLLOWING STATEMENT. "THIS DRAWING WAS ORIGINALLY APPROVED FOR CONSTRUCTION, SEALED AND SIGNED ON [DATE] BY [NAME OF ENGINEER], A LICENSED PROFESSIONAL ENGINEER IN THE STATE OF CALIFORNIA NO. [LICENSE NUMBER]"

A.3 Typical Cover Sheet – Subdivided Project (Child contract part of parent project, divided into Volumes)

ORANGE COUNTY SANITATION DISTRICT

CONTRACT NO. J-117B

(8)

OUTFALL LOW FLOW PUMP STATION

(9)

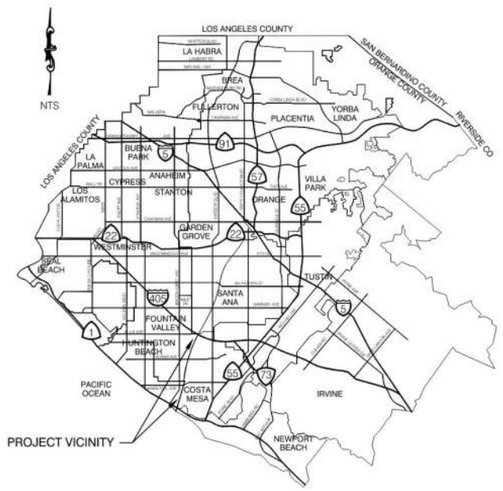
PART OF:

PROJECT NO. J-117
OCEAN OUTFALL SYSTEM
REHABILITATION

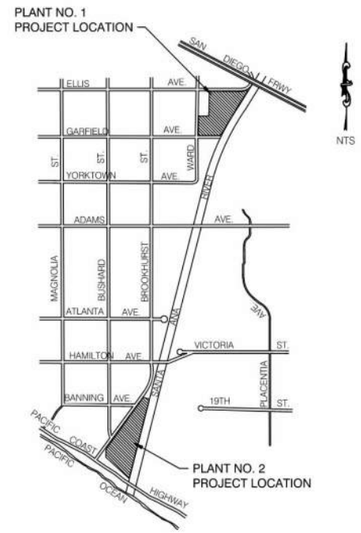
(10)

VOLUME 5 OF 9

DRAWINGS:
GENERAL, CIVIL, STRUCTURAL,
ARCHITECTURAL, MECHANICAL AND HVAC



VICINITY MAP



LOCATION MAP

APPROVED FOR BIDDING ORANGE COUNTY SANITATION DISTRICT

(1)

KATHLEEN T. MILLEA - DIRECTOR OF ENGINEERING DATE:

JEFFREY D. MOHR - ENGINEERING MANAGER DATE:

NAME OF PM HERE - PROJECT MANAGER DATE:

MARK	DESCRIPTION	DATE	APPR.
(3)			

DESIGNED BY: FIRST & LAST NAME
DRAWN BY: FIRST & LAST NAME
CHECKED BY: FIRST & LAST NAME
LINE IS 2 INCHES AT FULL SIZE
(IF NOT 2"-SCALE ACCORDINGLY)

(4) (2) (5)

OCSAN
ORANGE COUNTY SANITATION DISTRICT

(6) PROJECT NAME TITLE 1
PROJECT NAME TITLE 2

COVER SHEET

(7) PROJ. NO.
DRAWING NO.
G0001
X OF Y

DWG: J:_CAD Standards\CAD Drawings\Construction\App A.3 G0001_SUBDIVIDED.dwg
DATE: Sep 05, 2021 9:37am
USER: tagumasi

"BIDDING" COVER SHEET
NOTES FOR SUBDIVIDED PROJECT COVER SHEET

1. *ADD WET SIGNATURES AND DATES.*
2. *UPDATE SUBMITTAL STAMP TO REFLECT BID SUBMITTAL PHASE PER SECTION 5.9 FIGURE 5-9.*
3. *REVISION BLOCK SHALL BE LEFT BLANK DURING BID PHASE.*
4. *ADD P.E. SEAL, WET SIGNATURE AND SIGNATURE DATE.*
5. *CONSULTANT'S LOGO(S) (ON ALL SHEETS).*
6. *CONTRACT NAME FOR SUBDIVIDED PROJECT (ON ALL SHEETS).*
7. *CONTRACT NUMBER FOR SUBDIVIDED PROJECT (ON ALL SHEETS).*
8. *CONTRACT NAME AND NUMBER OF SUBDIVIDED PROJECT.*
9. *NAME AND NUMBER OF THE RESPECTIVE SUBDIVIDED (PARENT) PROJECT.*
10. *VOLUME NUMBER AND RELATED DRAWINGS (e.g., ARCHITECTURAL, CIVIL, MECHANICAL, ETC.), AS NEEDED.*

"CONFORMED" COVER SHEET
NOTES FOR A SUBDIVIDED PROJECT COVER SHEET

1. *UTILIZE BID SET COVERSHEET MAKING SURE THE FOLLOWING ARE PRESENT:*
   - *APPROVED FOR BIDDING BLOCK: ADD TEXT IN PLACE OF SIGNATURES STATING "ORIGINAL SIGNED BY [NAME] ON [DATE]"*
   - *CONSULTANT'S LOGO(S)*
   - *P.E. SEAL, WET SIGNATURE AND DATE*
   - *NAME AND NUMBER OF THE RESPECTIVE SUBDIVIDED (PARENT) PROJECT*
2. *UPDATE SUBMITTAL STAMP TO REFLECT CONFORMED SUBMITTAL PHASE PER SECTION 5.9 FIGURE 5-9.*
3. *REVISION BLOCK SHALL RETAIN ADDENDA HISTORY.*
4. *NEW P.E. SEAL, WET SIGNATURE AND SIGNATURE DATE ARE REQUIRED ONLY ON EACH REVISED SHEET.*

"RECORD" COVER SHEET
NOTES FOR SUBDIVIDED PROJECT COVER SHEET

1. *UTILIZE CONFORMED COVER SHEET.*
2. *UPDATE SUBMITTAL STAMP TO REFLECT RECORD SUBMITTAL PHASE PER SECTION 5.9 FIGURE 5-9.*
3. *REVISION BLOCK SHALL RETAIN ADDENDA AND CONSTRUCTION CHANGES (e.g., RFP No. xx, RFI No. xx, ETC.).*
4. *P.E. SEAL, WET SIGNATURE AND SIGNATURE DATE. THIS SHALL BE REPLACED WITH THE FOLLOWING STATEMENT: "THIS DRAWING WAS ORIGINALLY APPROVED FOR CONSTRUCTION, SEALED AND SIGNED ON [DATE] BY [NAME OF ENGINEER], A LICENSED PROFESSIONAL ENGINEER IN THE STATE OF CALIFORNIA NO. [LICENSE NUMBER]"*

A.4 Typical Cover Sheet – Subdivided Project (Child contract part of parent project, divided into Volumes, for subsequent volumes – no Approved For Bidding block)

ORANGE COUNTY SANITATION DISTRICT

CONTRACT NO. J-117B

(8)

OUTFALL LOW FLOW PUMP STATION

(9)

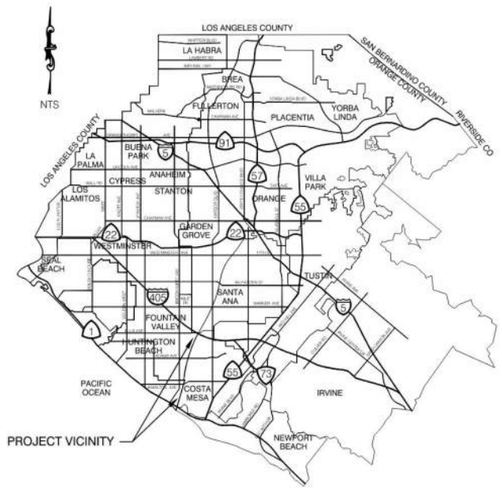
PART OF:

PROJECT NO. J-117
OCEAN OUTFALL SYSTEM REHABILITATION

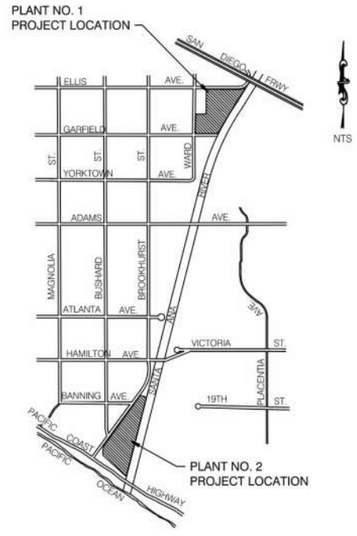
(10)

VOLUME 6 OF 9
DRAWINGS:
ELECTRICAL AND INSTRUMENTATION

(1)



VICINITY MAP



LOCATION MAP

MARK	DESCRIPTION	DATE	APPR.
(3)			

DESIGNED BY: FIRST & LAST NAME
DRAWN BY: FIRST & LAST NAME
CHECKED BY: FIRST & LAST NAME
LINE IS 2 INCHES AT FULL SIZE
(IF NOT 2"-SCALE ACCORDINGLY)

(4) (2) (5)

OCSAN
ORANGE COUNTY SANITATION DISTRICT

(6) PROJECT NAME TITLE 1
PROJECT NAME TITLE 2

COVER SHEET

(7) PROJ. NO.

DRAWING NO. (11)

X OF Y

DWG: J:_CAD Standards\CAD Drawings\Construction\Arp A 4 G0001_SUBDIVIDED-2.dwg
DATE: Sep 20, 2021 9:40am USER: tagumbay

"BIDDING" COVER SHEET
NOTES FOR SUBDIVIDED PROJECT COVER SHEET

1. REMOVE APPROVED FOR BIDDING BLOCK AND SIGNATURES.
2. UPDATE SUBMITTAL STAMP TO REFLECT BID SUBMITTAL PHASE PER SECTION 5.9 FIGURE 5-9.
3. REVISION BLOCK SHALL BE LEFT BLANK DURING BID PHASE..
4. ADD P.E. SEAL, WET SIGNATURE AND SIGNATURE DATE.
5. CONSULTANTS LOGO(S) ON ALL DRAWINGS.
6. CONTRACT NAME FOR SUBDIVIDED PROJECT (ON ALL SHEETS).
7. CONTRACT NUMBER FOR SUBDIVIDED PROJECT (ON ALL SHEETS).
8. CONTRACT NAME AND NUMBER OF SUBDIVIDED PROJECT.
9. NAME AND NUMBER OF THE RESPECTIVE SUBDIVIDED (PARENT) PROJECT.
10. VOLUME NUMBER AND RELATED DRAWINGS (e.g., ARCHITECTURAL, CIVIL, MECHANICAL, ETC.), AS NEEDED.
11. DRAWING NUMBER NOT REQUIRED ON COVER SHEET AND SHEET INDEX(S) FOR ADDITIONAL SUBSEQUENT DRAWINGS VOLUMES.

"CONFORMED" COVER SHEET
NOTES FOR A SUBDIVIDED PROJECT COVER SHEET

1. UTILIZE BID SET COVERSHEET MAKING SURE THE FOLLOWING ARE PRESENT:
   - CONSULTANTS LOGO(S)
   - P.E. SEAL, WET SIGNATURE AND DATE
   - NAME AND NUMBER OF THE RESPECTIVE SUBDIVIDED (PARENT) PROJECT
2. UPDATE SUBMITTAL STAMP TO REFLECT CONFORMED SUBMITTAL PHASE PER SECTION 5.9 FIGURE 5-9.
3. REVISION BLOCK SHALL RETAIN ADDENDA HISTORY.
4. NEW P.E. SEAL, WET SIGNATURE AND SIGNATURE DATE ARE REQUIRED ONLY ON EACH REVISED SHEET.

"RECORD" COVER SHEET
NOTES FOR SUBDIVIDED PROJECT COVER SHEET

1. UTILIZE CONFORMED COVER SHEET.
2. UPDATE SUBMITTAL STAMP TO REFLECT RECORD SUBMITTAL PHASE PER SECTION 5.9 FIGURE 5-9.
3. REVISION BLOCK SHALL RETAIN ADDENDA AND CONSTRUCTION CHANGES (e.g., RFP No. xx, RFI No. xx, ETC.).
4. P.E. SEAL, WET SIGNATURE AND SIGNATURE DATE. THIS SHALL BE REPLACED WITH THE FOLLOWING STATEMENT. "THIS DRAWING WAS ORIGINALLY APPROVED FOR CONSTRUCTION, SEALED AND SIGNED ON [DATE] BY [NAME OF ENGINEER]. A LICENSED PROFESSIONAL ENGINEER IN THE STATE OF CALIFORNIA NO. [LICENSE NUMBER]"

A.5 Typical Cover Sheet – Subdivided Project (Separate project included as part of parent project)

ORANGE COUNTY SANITATION DISTRICT

CONTRACT NO. J-117B

(8)

OUTFALL LOW FLOW PUMP STATION

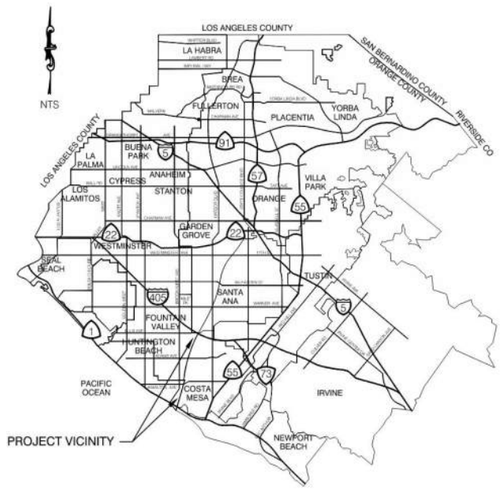
(9)

PART OF:

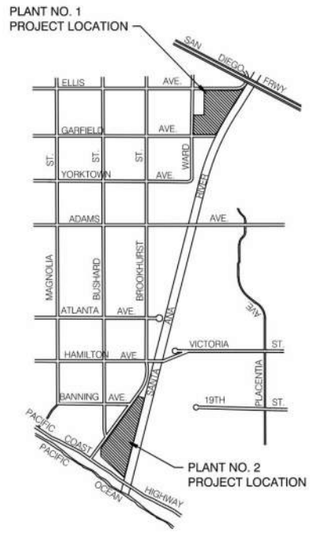
PROJECT NO. J-117
OCEAN OUTFALL SYSTEM
REHABILITATION

(10)

VOLUME 7 OF 9
DRAWINGS:
P2-107 SCADA SYSTEM AND NETWORK UPGRADES



VICINITY MAP



LOCATION MAP

(1) APPROVED FOR BIDDING ORANGE COUNTY SANITATION DISTRICT

KATHLEEN T. MILLEA - DIRECTOR OF ENGINEERING — DATE:

JEFFREY D. MOHR - ENGINEERING MANAGER — DATE:

NAME OF PM HERE - PROJECT MANAGER — DATE:

MARK	DESCRIPTION	DATE	APPR.
(3)			

DESIGNED BY: FIRST & LAST NAME
DRAWN BY: FIRST & LAST NAME
CHECKED BY: FIRST & LAST NAME
LINE IS 2 INCHES AT FULL SIZE
(IF NOT 2"-SCALE ACCORDINGLY)

(4) (2) (5)

OCSAN ORANGE COUNTY SANITATION DISTRICT

(6) PROJECT NAME TITLE 1
PROJECT NAME TITLE 2

COVER SHEET

(7) PROJ. NO.
DRAWING NO. G0001
X OF Y

DWG: J:_CAD Standards\CAD Drawings\Construction\App A\S G0001_SUBDIVIDED-3.dwg
DATE: Sep 20, 2021 9:41am USER: tagumeo

"BIDDING" COVER SHEET

NOTES FOR SUBDIVIDED PROJECT COVER SHEET

(1) ADD WET SIGNATURES AND DATES.
(2) UPDATE SUBMITTAL STAMP TO REFLECT BUD SUBMITTAL PHASE PER SECTION 5.9 FIGURE 5-9.
(3) REVISION BLOCK SHALL BE LEFT BLANK DURING BID PHASE.
(4) ADD P.E. SEAL, WET SIGNATURE AND SIGNATURE DATE OF DESIGN CONSULTANT ON ALL DRAWINGS. FOR IN-HOUSE DESIGN PROJECTS, OCSD STAFF TO SEAL, SIGN AND DATE INSTEAD.
(5) CONSULTANT'S LOGO(S) ON ALL DRAWINGS.
(6) CONTRACT NAME FOR SUBDIVIDED PROJECT (ON ALL SHEETS).
(7) CONTRACT NUMBER FOR SUBDIVIDED PROJECT (ON ALL SHEETS).
(8) CONTRACT NAME AND NUMBER OF SUBDIVIDED PROJECT.
(9) NAME AND NUMBER OF THE RESPECTIVE SUBDIVIDED (PARENT) PROJECT.
(11) VOLUME NUMBERING AND DRAWINGS OF SEPARATE PROJECT THAT WILL BE INCLUDED INTO THE SUBDIVIDED CONTRACT PROJECT.

"CONFORMED" COVER SHEET

NOTES FOR A SUBDIVIDED PROJECT COVER SHEET

(1) UTILIZE BID SET COVERSHEET MAKING SURE THE FOLLOWING ARE PRESENT:
- APPROVED FOR BIDDING BLOCK. ADD TEXT IN PLACE OF SIGNATURES STATING "ORIGINAL SIGNED BY [NAME] ON [DATE]
- CONSULTANT'S LOGO(S)
- P.E. SEAL, WET SIGNATURE AND DATE
- CONTRACT NAME AND NUMBER
- NAME AND NUMBER OF THE RESPECTIVE SUBDIVIDED (PARENT) PROJECT

(2) UPDATE SUBMITTAL STAMP TO REFLECT CONFORMED SUBMITTAL PHASE PER SECTION 5.9 FIGURE 5-9.
(3) REVISION BLOCK SHALL RETAIN ADDENDA HISTORY.
(4) NEW P.E. SEAL, WET SIGNATURE AND SIGNATURE DATE ARE REQUIRED ONLY ON EACH REVISED SHEET.

"RECORD" COVER SHEET

NOTES FOR SUBDIVIDED PROJECT COVER SHEET

(1) UTILIZE CONFORMED COVER SHEET.
(2) UPDATE SUBMITTAL STAMP TO REFLECT RECORD SUBMITTAL PHASE PER SECTION 5.9 FIGURE 5-9.
(3) REVISION BLOCK SHALL RETAIN ADDENDA AND CONSTRUCTION CHANGES (e.g., RFP No. xx, RFI No. xx, ETC.).
(4) P.E. SEAL, WET SIGNATURE AND SIGNATURE DATE. THIS SHALL BE REPLACED WITH THE FOLLOWING STATEMENT. "THIS DRAWING WAS ORIGINALLY APPROVED FOR CONSTRUCTION, SEALED AND SIGNED ON [DATE] BY [NAME OF ENGINEER], A LICENSED PROFESSIONAL ENGINEER IN THE STATE OF CALIFORNIA NO. [LICENSE NUMBER]"

A.6 Typical Index of Drawings Sheet

INDEX OF DRAWINGS

GENERAL

SHT NO	DWG NO	DRAWING TITLE
1	G0001	COVER SHEET AND SITE LOCATION
2	G0002	INDEX OF DRAWINGS
3	G0003	STANDARD ABBREVIATIONS AND NOTES
4	G0004	DRAWING IDENTIFICATION AND DESIGNATION SYSTEMS
5	G0005	LEGENDS AND SYMBOLS
6	G1001	OVERALL SITE PLAN
7	G1002	STAGING AREA AND WORK BOUNDARY PLAN
8	G6001	PROCESS FLOW DIAGRAM 2-STAGE TRUCK LOADING BAY ODOR CONTROL SCRUBBERS
9	G6002	DIGESTERS IJK PROCESS FLOW DIAGRAM

DEMOLITION

SHT NO	DWG NO	DRAWING TITLE
10	D1001	TRUCK LOADING BAY DEMOLITION
11	D1002	DIGESTER IJK YARD DEMOLITION PLAN
12	D1003	DIGESTER IJK STRUCTURAL DEMOLITION PLAN
13	D1004	DIGESTER IJK MECHANICAL PUMP ROOM DEMOLITION PLAN
14	D1005	DIGESTER IJK ELECTRICAL ROOM DEMOLITION PLAN
15	D1006	DIGESTER IJK PUMP ROOM POWER AND CONTROL DEMOLITION PLAN
16	D3001	DIGESTER IJK STRUCTURAL DEMOLITION SECTION
17	D3002	DIGESTER IJK MECHANICAL PUMP ROOM DEMOLITION SECTION
18	D5001	DIGESTER IJK STRUCTURAL DEMOLITION DETAILS
19	D5002	DIGESTER IJK MECHANICAL DEMOLITION DETAILS

CIVIL

SHT NO	DWG NO	DRAWING TITLE
20	C1001	GENERAL LAYOUT PLAN
21	C1002	PAVING AND GRADING PLAN
22	C1003	DIGESTERS IJK HORIZONTAL CONTROL, GRADING AND PAVING PLAN
23	C1004	DIGESTERS IJK YARD PIPING PLAN
24	C3001	YARD PIPING PROFILE - 1
25	C3002	YARD PIPING PROFILE - 2
25	C5001	CIVIL STANDARD DETAILS - 1
27	C5002	CIVIL STANDARD DETAILS - 2

STRUCTURAL

SHT NO	DWG NO	DRAWING TITLE
28	S0001	GENERAL STRUCTURAL NOTES
29	S1001	DIGESTERS IJK FOUNDATION PLAN
30	S1002	DIGESTERS IJK ROOF PLAN
31	S1003	DIGESTERS IJK ENLARGED ROOF PLAN AND DETAILS
32	S1004	DIGESTERS IJK MODIFICATION PLAN
33	S3001	DIGESTERS IJK MODIFICATION SECTIONS
34	S3002	DIGESTERS IJK ELECTRICAL ROOM SECTIONS
35	S5001	GENERAL STRUCTURAL STANDARD DETAILS - 1
36	S5002	GENERAL STRUCTURAL STANDARD DETAILS - 2
37	S5003	GENERAL STRUCTURAL STANDARD DETAILS - 3

ARCHITECTURAL

SHT NO	DWG NO	DRAWING TITLE
38	A0001	DIGESTERS IJK ROOM CODE DATA AND LIFE SAFETY PLAN
39	A1001	DIGESTERS IJK FLOOR PLAN
40	A1002	DIGESTERS IJK ELECTRICAL ROOM FLOOR PLAN
41	A1003	DIGESTERS IJK ROOF PLAN
42	A2001	DIGESTERS ELECTRICAL ROOM EXTERIOR ELEVATIONS
43	A5001	GENERAL ARCHITECTURAL DETAILS
44	A5002	GENERAL ARCHITECTURAL DOOR AND ROOF DETAILS
45	A6001	GENERAL ARCHITECTURAL DOOR AND FINISH SCHEDULES

MECHANICAL

SHT NO	DWG NO	DRAWING TITLE
46	M1001	OVERALL DIGESTER IJK PLAN
47	M1002	DIGESTERS IJK TRANSFER PUMP PLAN AND SECTIONS
48	M1003	DIGESTERS IJK PLAN
49	M1004	DIGESTERS IJK ROOF PLAN
50	M1005	DIGESTERS IJK PUMP ROOM FLOOR PLAN
51	M1006	DIGESTERS IJK PUMP ROOM ROOF PLAN
52	M2001	DIGESTERS IJK PUMP ROOM ELEVATIONS
53	M3001	DIGESTERS IJK PUMP ROOM SECTIONS - 1
54	M3002	DIGESTERS IJK PUMP ROOM SECTIONS - 2
55	M4001	DIGESTERS IJK ENLARGED SUMP PUMP PLANS AND SECTIONS
56	M5001	MECHANICAL DETAILS - 1
57	M5002	MECHANICAL DETAILS - 2
58	M5003	MECHANICAL DETAILS - 3
59	M5004	MECHANICAL DETAILS - 4

HVAC & PLUMBING

SHT NO	DWG NO	DRAWING TITLE
60	H0001	HVAC GENERAL NOTES
61	H1001	DIGESTERS IJK PUMP ROOM HVAC PLAN AND SECTION
62	H1002	HVAC DIGESTER IJK ELECTRICAL ROOM AND ROOF PLANS
63	H5001	HVAC DETAILS - 1
64	H5002	HVAC DETAILS - 2
65	P0001	PLUMBING LEGEND, ABBREVIATIONS AND GENERAL NOTES
66	P1001	DIGESTERS IJK PUMP ROOM ELECTRICAL RESTROOM PLAN
67	P4001	DIGESTERS IJK PUMP ROOM ELECTRICAL RESTROOM ISOMETRICS
68	P5001	PLUMBING STANDARD DETAILS

ELECTRICAL

SHT NO	DWG NO	DRAWING TITLE
69	E0001	SYMBOLS AND ABBREVIATIONS - 1
70	E0002	SYMBOLS AND ABBREVIATIONS - 2
71	E0003	SYMBOLS AND ABBREVIATIONS - 3
72	E1001	OVERALL ELECTRICAL SITE PLAN
73	E1002	PARTIAL SCADA NETWORK SITE PLAN
74	E1003	DIGESTERS IJK ELECTRICAL SITE PLAN
75	E1004	DIGESTERS IJK HAZARDOUS AREA CLASSIFICATION SITE PLAN
76	E1005	DIGESTER TUNNEL PLAN - 1
77	E1006	DIGESTER TUNNEL PLAN - 2
78	E1007	DIGESTER TUNNEL PLAN - 3
79	E1008	DIGESTERS IJK ELECTRICAL ROOM POWER AND CONTROL PLAN
80	E1009	DIGESTERS IJK ELECTRICAL ROOM LIGHTING AND GROUNDING PLAN
81	E1010	DIGESTERS IJK ELECTRICAL ROOM ROOF POWER AND CONTROL PLAN
82	E1011	DIGESTERS IJK ELECTRICAL ROOM SPECIAL SYSTEMS PLAN
83	E1012	DIGESTERS IJK PUMP ROOM POWER AND CONTROL PLAN
84	E1013	DIGESTERS IJK PUMP ROOM LIGHTING AND GROUNDING PLAN
85	E1014	DIGESTERS IJK PUMP ROOM ROOF POWER AND CONTROL PLAN
86	E1015	DIGESTERS IJK PUMP ROOM SPECIAL SYSTEMS PLAN
87	E3001	DUCTBANK SECTIONS
88	E5001	ELECTRICAL STANDARD DETAILS - 1
89	E5002	ELECTRICAL STANDARD DETAILS - 2
90	E5003	ELECTRICAL STANDARD DETAILS - 3
91	E6001	LIGHTING FIXTURE SCHEDULE
92	E6002	DIGESTERS IJK PANEL SCHEDULES
93	E6003	DIGESTERS IJK ELECTRICAL ROOM MCC-SHX ELEV. & SINGLE-LINE DIAGRAM
94	E6004	DIGESTERS IJK ELECTRICAL ROOM MCC-SHZ ELEV. & SINGLE-LINE DIAGRAM
95	E9001	DIGESTERS MIXING PUMP WIRING SCHEMATIC
96	E9002	DIGESTERS TRANSFER PUMP CONTROL WIRING SCHEMATIC - 1
97	E9003	DIGESTERS TRANSFER PUMP CONTROL WIRING SCHEMATIC - 2
98	E9004	DIGESTERS SLUDGE RECIRCULATION PUMP CONTROL WIRING SCHEMATIC

INSTRUMENTATION

SHT NO	DWG NO	DRAWING TITLE
99	10-NG-100	PROCESS AND INSTRUMENTATION DIAGRAM INSTRUMENTATION AND COMPONENTS LEGENDS AND ABBREVIATIONS
100	10-NG-110	PROCESS AND INSTRUMENTATION DIAGRAM INSTRUMENTATION AND COMPONENTS LEGENDS AND ABBREVIATIONS
101	10-NG-120	PROCESS AND INSTRUMENTATION DIAGRAM GENERAL LEGENDS AND ABBREVIATIONS
102	10-NG-130	PROCESS AND INSTRUMENTATION DIAGRAM GENERAL SOFTWARE TEMPLATES 1
103	10-NG-140	PROCESS AND INSTRUMENTATION DIAGRAM GENERAL SOFTWARE TEMPLATES 2
104	10-NG-150	PROCESS AND INSTRUMENTATION DIAGRAM GENERAL SOFTWARE TEMPLATES 3
105	10-NG-160	PROCESS AND INSTRUMENTATION DIAGRAM GENERAL SOFTWARE TEMPLATES 4
106	10-NG-170	PROCESS AND INSTRUMENTATION GENERAL STANDARD DETAILS - 1
107	10-NG-180	PROCESS AND INSTRUMENTATION GENERAL STANDARD DETAILS - 2
108	10-NG-190	PROCESS AND INSTRUMENTATION GENERAL STANDARD DETAILS - 3
109	22I-NP-330	PRESSURE WASHER
110	22I-NP-500	ELECTRICAL I/O
111	22I-NP-500	ELECTRICAL BUILDING EQUIPMENT
112	25B-NP-230	DIGESTER I
113	25B-NP-231	DIGESTER I MIXING PUMPS
114	25B-NP-241	DIGESTER I SLUDGE HEATING
115	25B-NP-250	DIGESTER J
116	25B-NP-251	DIGESTER J MIXING PUMPS
117	25B-NP-252	DIGESTER J SLUDGE HEATING
118	25B-NP-253	DIGESTER J TRANSFER PUMP
119	25B-NP-260	DIGESTER K AND MIXING PUMP
120	25B-NP-261	DIGESTER K SLUDGE HEATING
121	25B-NP-262	DIGESTER K TRANSFER PUMP
122	25B-NP-265	DIGESTER IJK PUMP ROOM HVAC
123	25B-NP-510	DIGESTER IJK ELECTRICAL EQUIPMENT
124	25B-NE-130	DIGESTER I RIO LAYOUT - 25BFCP723
125	25B-NE-140	DIGESTER J RIO LAYOUT - 25BFCP723B
126	25B-NE-150	DIGESTER K RIO LAYOUT - 25BFCP723C
127	25B-ND-230	DIGESTER I AND MIXING PUMP DEMO
128	25B-ND-240	DIGESTER J AND MIXING PUMP DEMO
129	25B-ND-250	DIGESTER K AND MIXING PUMP DEMO
130	27B-ND-150	POTABLE/INDUSTRIAL WATER DISTRIBUTION (AREA 22 & 25)
131	27C-ND-240	PLANT WATER DISTRIBUTION (DIGESTER I & J)
132	27C-ND-340	RECLAIMED WATER - SOUTHWEST

MARK	DESCRIPTION	DATE	APPR.

DESIGNED BY: FIRST & LAST NAME
DRAWN BY: FIRST & LAST NAME
CHECKED BY: FIRST & LAST NAME
LINE IS 2 INCHES AT FULL SIZE
(IF NOT 2"-SCALE ACCORDINGLY)

OCSAN
ORANGE COUNTY SANITATION DISTRICT

PROJECT NAME TITLE 1
PROJECT NAME TITLE 2

INDEX OF DRAWINGS

PROJ. NO.

DRAWING NO. G0002

X OF Y

DWG: J:\ CAD Standards\CAD Drawings\Construction\App A\6 Typical Index of Drawings Sheet.dwg
DATE: Sep 07, 2021 12:14pm USER: bgomez

A.7 Typical Standard Abbreviations Sheet

ABBREVIATION	MEANING
@	AT
AB	ANCHOR BOLT
ABAN	ABANDONED
ABC	AGGREGATE BASE COURSE
ABS	ACRYLONITRILE-BUTADIENE STYRENE
AC	ASPHALT CONCRETE
ACET	ACETYLENE GAS
ACP	ASBESTOS CEMENT PIPE
ADD'L	ADDITIONAL
ADJ	ADJUSTABLE
ALM	ALARMS
ALT	ALTERNATE
ALUM	ALUMINUM
AN	AQMD AN NUMBER
APPROX	APPROXIMATE
B&S	BELL AND SPIGOT JOINT
BC	BOLT CIRCLE
BF	BLIND FLANGE
BFP	BELT FILTER PRESS
BFV	BUTTERFLY VALVE
BL	BITUMINOUS LINING
BLDG	BUILDING
BM	BEAM
BOC OR BC	BEGINNING OF CURVE
BOL	BOILER
BOP	BOTTOM OF PIPE
BOTT	BOTTOM
BS	BOTTOM SLUDGE
BSP	BLACK STEEL PIPE
BSR	BARSCREEN
BTW	BETWEEN
BV	BALL VALVE
BWR	BLOWER
BYP	BYPASS
C	CHILLED WATER
CA	CONCRETE ANCHOR
CAP	CAP/PLUG/BLIND FLANGE
CB	CATCH BASIN
CC	CEMENT-MORTAR COATING
CEN	CENTRIFUGE
CF	CUBIC FEET
CFM	CUBIC FEET MINUTE
CFS	CUBIC FEET PER SECOND
CHEM	CHEMICAL
CHEMD	CHEMICAL DRAIN
CI	CAST IRON
CJ	CONSTRUCTION JOINT
CL	CENTER LINE
CL SOL OR CS	CHLORINE SOLUTION
CLF	CHAIN LINK FENCE
CLR	CLEAR
CML	CEMENT MORTOR LINED
CMP	CORRUGATED METAL PIPE
CMU	CONCRETE MASONRY UNIT
CND	CONDENSER
CO	CLEAN OUT
COL	COLUMN
COMM	COMMUNICATION
COMP	COMPRESSOR
CONC	CONCRETE
COND	CONDENSATE
CONN	CONNECTION
CONST	CONSTRUCT
CONT	CONTINUATION, CONTINUOUS
CPLG	COUPLING
CPVC	CHLORINATED PVC
CS	CHLORINE SOLUTION
CSK OR CRSK	COUNTERSINK
CSL	CAUSTIC SOLUTION
CV	CHECK VALVE
CVY	CONVEYOR
CW	CITY WATER
D	DRAIN
DAFU	DAF UNDERFLOW
DB	DATABASE
DC	DIGESTER CLEANING
DEMO	DEMOLITION

ABBREVIATION	MEANING
DET	DETAIL
DG	DIGESTER GAS
DI	DUCTILE IRON
DIA	DIAMETER
DIG	DIGESTER
DIM	DIMENSION
DIP	DUCTILE IRON PIPE
DISCH	DISCHARGE
DN	DOWN
DS	DIGESTER SLUDGE
DSUP	SUPERNATANT
DV	DIAPHRAGM VALVE
DWG	DRAWING
E	EAST
EA	EACH
EC	ELECTRICAL CONDUIT
ECC	ECCENTRIC
ECT	ELETRICAL CABLE TRAY
ED	EQUIPMENT DRAIN
EDB	ELECTRICAL DUCT BANK
EDMS	ELECTRONIC DOCUMENT MANAGEMENT SYSTEM
EF	EACH FACE
FJB	ELECTRICAL JUNCTION BOX
ELEC	ELECTRIC(AL)
ELEV	ELEVATION
ELL	ELBOW
ENG	ENGINE
EOC	END OF CURVE
EP	EDGE OR PAVEMENT
EQ	EQUAL
EQUIP	EQUIMPMENT
ES	EACH SIDE
EVP	EVAPORATOR
EW	EACH WAY
EXIST	EXISTING
EXP JT	EXPANSION JOINT
EXR	EXCHANGER
FA	FOUL AIR
FAN	FAN
FC	FLEXIBLE CONDUIT
FD	FLOOR DRAIN
FE	FLOW ELEMENT/METER
FECL2	FERROUS CHLORIDE
FECL3	FERRIC CHLORIDE
FF	FINISHED FLOOR
FG	FINISHED GRADE
FIG	FIGURE
FILT	FILTRATE
FLEX	FLEXIBLE
FG	FLANGE JOINT
FLR	FLOOR
FLT	FILTER
FLV	FLAPPER VALVE
FLX	FLEXIBLE COUPLING
FM	FORCE MAIN
FO	FUEL OIL
FOC	FIBER OPTIC CABLE
FP	FIRE PROTECTION WATER
FRP	FIBERGLASS REINFORCED PLASTIC
FT	FOOT OR FEET
FTG	FOOTING
FUT	FUTURE
G	GAS
GA	GAUGE
GAL	GALLONS
GALV	GALVANIZED
GAT	GATE
GAT-FL	FLAPPER GATE
GAT-PG	SLIDE GATE
GAT-SG	SLUICE GATE
GAT-ST	STOP LOG
GAT-W	WEIR GATE
GB	GRADE BREAK
GDR	GRINDER
GE	GROOVED END JOINT
GL	GLASS LINING
GLV	GLOBE VALVE
GMU	GLAZED MASONRY UNIT

ABBREVIATION	MEANING
GP	GUARD POST
GPD	GALLONS PER DAY
GPM	GALLONS PER MINUTE
GR	GRIT
GSP	GALVANIZED STEEL PIPE
GV	GATE VALVE
GWB	GYPSUM WALL BOARD
H1E	HOOK ONE END
H202	HYDROGEN PEROXIDE
H2E	HOOK TWO ENDS
HCF	HOSE CONNECTION FITTING
HCL	HYDROCHLORIC ACID
HDPE	HIGH DENSITY POLYETHYLENE
HDWKS	HEADWORKS
HORIZ	HORIZONTAL
HP	HORSEPOWER OR HIGH POINT
HPA	HIGH PRESSURE AIR
HPDG	HIGH PRESSURE DIGESTER GAS
HPNG	HIGH PRESSURE NATURAL GAS
HR	HANDRAIL
HV	HOSE VALVE
HVAC	HEATING, VENTILATION & AIR CONDITIONING
HW	HOT WATER
HWR	HOT WATER RETURN
HWS	HOT WATER SUPPLY
HXW	HEIGHT BY WIDTH
HYD	HYDRANT
HYPO	SODIUM HYPO CHLORITE
I	INSULATED
IA	INSTRUMENT AIR
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
IN OR "	INCH
INSTR	MISCELLANEOUS INSTRUMENTATION
INTER	INTERPLANT
INV	INVERT
IRRIG	IRRIGATION
IST	INACTIVE SERVICE TAP
IW	INDUSTRIAL WATER
J	JACKET (PER SPECIFICATION FOR INSULATED PIPE)
JB	JUNCTION BOX
JOS	JOINT OUTFALL SEWER
JT	JOINT
LE	LADDER ENTRANCE
LG	LONG
LLV	LONG LEG VERTICAL
LO	LUBE OIL
LP	LOW POINT
LPA	LOW PRESSURE AIR
LPDG	LOW PRESSURE DIGESTER GAS
MATL	MATERIAL
MAX	MAXIMUM
MCC	MOTOR CONTROL CENTER
MECH	MECHANICAL
MFR	MANUFACTURER OR MANUFACTURE
MG/L	MILLIGRAMS PER LITER
MGD	MILLION GALLONS PER DAY
MH	MANHOLE
MI	MALLEABLE IRON
MIN	MINIMUM
MJ	MECHANICAL JOINT
MK	MARK
MOV	MOTORIZED VALVE OPERATOR
MIX	MIXER
N	NORTH
N/P	NAME PLATE
NAOCL	SODIUM HYPOCHLORITE
NAOH	SODIUM HYDROXIDE
NG	NATURAL GAS
NIC	NOT IN CONTRACT
NO OR #	NUMBER
NOH	NO-HUB JOINT
NPT	NATIONAL PIPE THREAD
NTS	NOT TO SCALE
NWB	NON WATER BEARING
O2	GASEOUS OXYGEN
OA	OUTSIDE AIR

ABBREVIATION	MEANING
OBD	OPPOSED BLADE DAMPER
OC	ON CENTER
OC SAN	ORANGE COUNTY SANITATION DISTRICT
OCWD	ORANGE COUNTY WATER DISTRICT
OD	OUTSIDE DIAMETER
OF	OVERFLOW
OH	OPPOSITE HAND
OPNG	OPENING
OSC	OPERATIONAL SERVICE CONNECTION
OUT	OUTFALL
P	PROPANE GAS
P/L	PROPERTY LINE
P1	PLANT 1 (FOUNTAIN VALLEY)
P2	PLANT 2 (HUNTINGTON BEACH)
PA	PIPE ANCHOR
PCC	PORTLAND CEMENT CONCRETE
PCF	POUNDS PER CUBIC FOOT
PCW	PLASTIC COATING OR WRAPPING
PD	PROCESS DRAIN
PE	PRIMARY EFFLUENT
PEN	POLYETHYLENE ENCASED
PG	PRESSURE GAUGE
PH OR ϕ	PHASE
PHTO	PHOTO
PI	PRIMARY EFFLUENT
PIV	PINCH VALVE
PL	PLATE
PLAS	PLASTER
PLCS	PLACES
PMP	PUMP
PMP-C	CENTRIFUGAL PUMP
PMP-D	DIAPHRAGM PUMP
PMP-M	METERING PUMP
PMP-P	PROGRESSING CAVITY PUMP
PMP-SC	SCREW PUMP
PMP-SU	SUBMERSIBLE PUMP
PMP-V	VERTICAL TURBINE PUMP
PN	AQMD PN NUMBER
PO	PUT-ON JOINT
POB	POINT OF BEGINNING
POC	POINT OF CONNECTION
POD	POINT OF DEMOLITION
POI	POINT OF INTERSECTION
POL	POLYMER
POTW	POTABLE WATER
POV	PNEUMATIC VALVE OPERATOR
PP	POWER POLE
PPMV	PARTS PER MILLION (VOLUME)
PRC	POINT OF REVERSE CURVE
PRV	PRESSURE REDUCING VALVE
PRVB	AIR RELEASE VALVE
PS	PRESSURE SWITCH
PS	PRIMARY SLUDGE
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PT	POINT OF TANGENT
PV	PLUG VALVE
PVC	POLYVINYL CHLORIDE
PW	PLANT WATER
QCF	QUICK CONNECT
R	RISER
R/D	RADIUS TO DIAMETER
RAS	RETURN ACTIVATED SLUDGE
RC	REINFORCED CONCRETE
RCP	REINFORCED CONCRETE PIPE
REC	RECIRCULATION
RED	REDUCER
REF	REFERENCE
REINF	REINFORCEMENT OR REINFORCING
REQ'D	REQUIRED
REV	REVISION
RF	ROOF
RG	RUBBER GASKET
RL	RUBBER LINED
RPD	REDUCED PRESSURE BACKFLOW PREVENTER
RPM	REVOLUTIONS PER MINUTE
RS	RAW SEWAGE
RW	RECLAIM WATER

ABBREVIATION	MEANING
S	SOUTH
S	SCUM
SAM	SAMPLE
SBR	FOUL AIR SCRUBBER
SC	SCREWED JOINT
SCFM	STANDARD CUBIC FEET PER MINUTE
SCH	SCHEDULE
SD	SANITARY DRAIN
SD	STORM DRAIN
SE	SECONDARY EFFLUENT
SEC	SECOND
SECT	SECTION
SEW	SEWER
SG	SLIDE GATE
SHT	SHEET
SI	SECONDARY INFLUENT
SIM	SIMILAR
SL	SLUDGE
SMP	SUMP
SN	DIGESTER SUPERNATANT
SOL	SOLUTION
SP	CAST IRON SOIL PIPE
SPECS	SPECIFICATIONS
SPK	LOUD SPEAKERS
SQ	SQUARE
ST	STEAM
SSTL	STAINLESS STEEL
STA	STATION
STC	STEAM CONNECTION
STD	STANDARD
STL	STEEL
STRUCT	STRUCTURAL
SUPT	(PIPE) SUPPORT OR SUPPORT
SW	SOLVENT WELDED JOINT
SYMM	SYMMETRICAL
T	TREAD
T&B	TOP OF CURB
TC	TOP OF CURB
TEMP	TEMPERATURE
TFE	TRICKLING FILTER EFFLUENT
THK	THICK
TK	TANK
TMPY	TEMPORARY
TNK	TANK
TOC	TOP OF CONCRETE
TOP	TOP OF PIPE
TOS	TOP OF SLAB OR STEEL
TOW	TOP OR WEIR OR TOP OR WALL
TPOB	TRUE POINT OF BEGINNING
TRANS	TRANSVERSE
TRP	CONDENSATE TRAP
TUR	TURBINE
TWAS	THICKENED WASTE ACTIVATED SLUDGE
TWV	THREE WAY VALVE
TYP	TYPICAL
UK	UNKNOWN
UNO	UNLESS NOTED OTHERWISE
V	VENT
VAC	VACUUM
VB	VALVE BOX
VCP	VITRIFIED CLAY PIPE
VERT	VERTICAL
VKG	KNIFE GATE VALVE
VLT	VAULT
VLV	VALVE
VTR	VENT THTOUGH ROOF
W	WEST
W	WATER
W	WELDED
W	WITH
W/O	WITHOUT
WAS	WASTE ACTIVAVITTED SLUDGE
WB	WATER BEARING
WL	WATER LEVEL
WP	WORKING POINT
WS	WATER STOP OR WATER SURFACE
WSS	WASTE SIDE STREAM
WWF	WELDED WIRE FABRIC

MARK	DESCRIPTION	DATE	APPR.

DESIGNED BY: FIRST & LAST NAME
DRAWN BY: FIRST & LAST NAME
CHECKED BY: FIRST & LAST NAME
LINE IS 2 INCHES AT FULL SIZE
(IF NOT 2"-SCALE ACCORDINGLY)

OCSAN
ORANGE COUNTY SANITATION DISTRICT

PROJECT NAME TITLE 1
PROJECT NAME TITLE 2

STANDARD ABBREVIATIONS

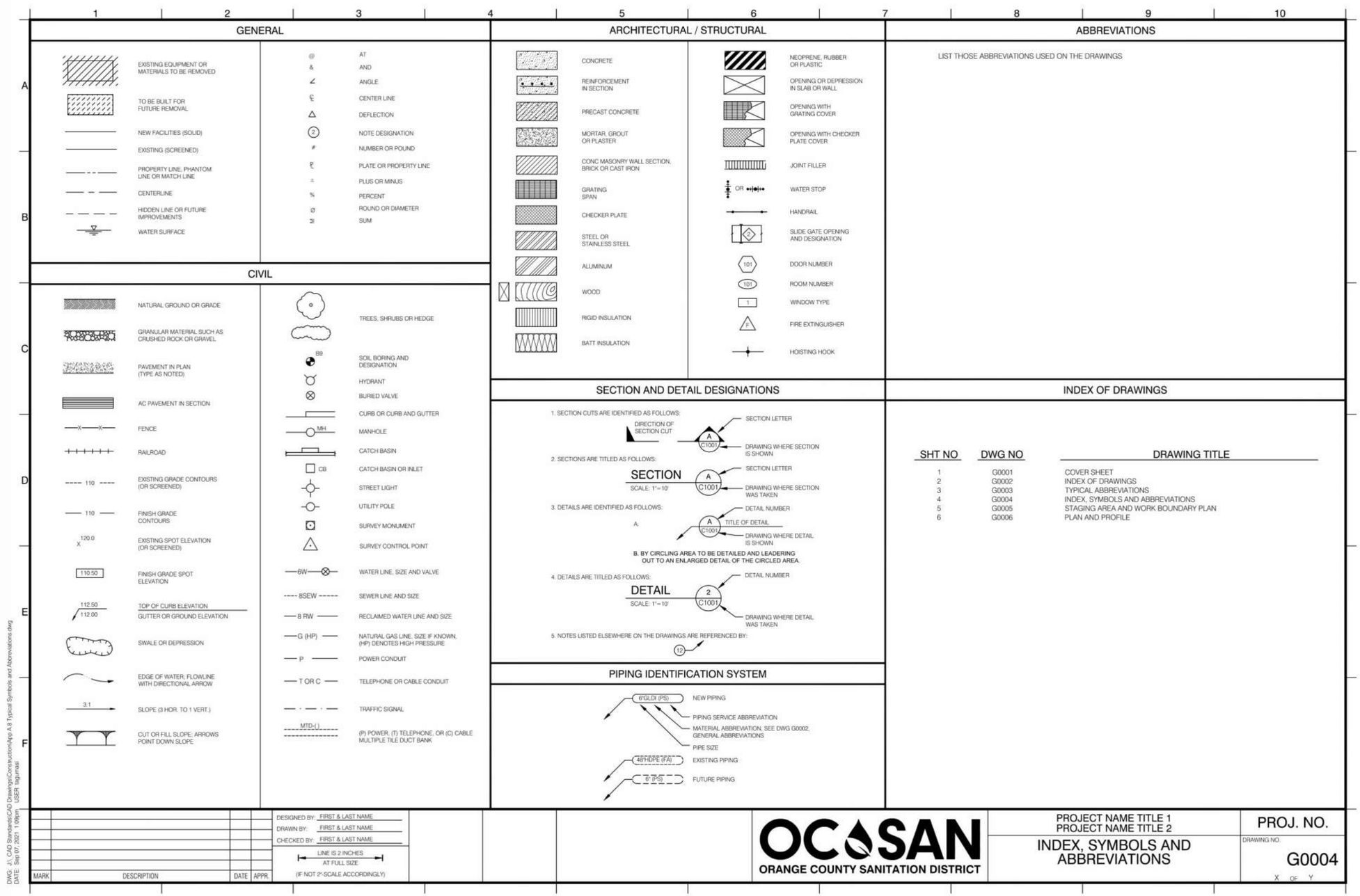
PROJ. NO.

DRAWING NO. G0003

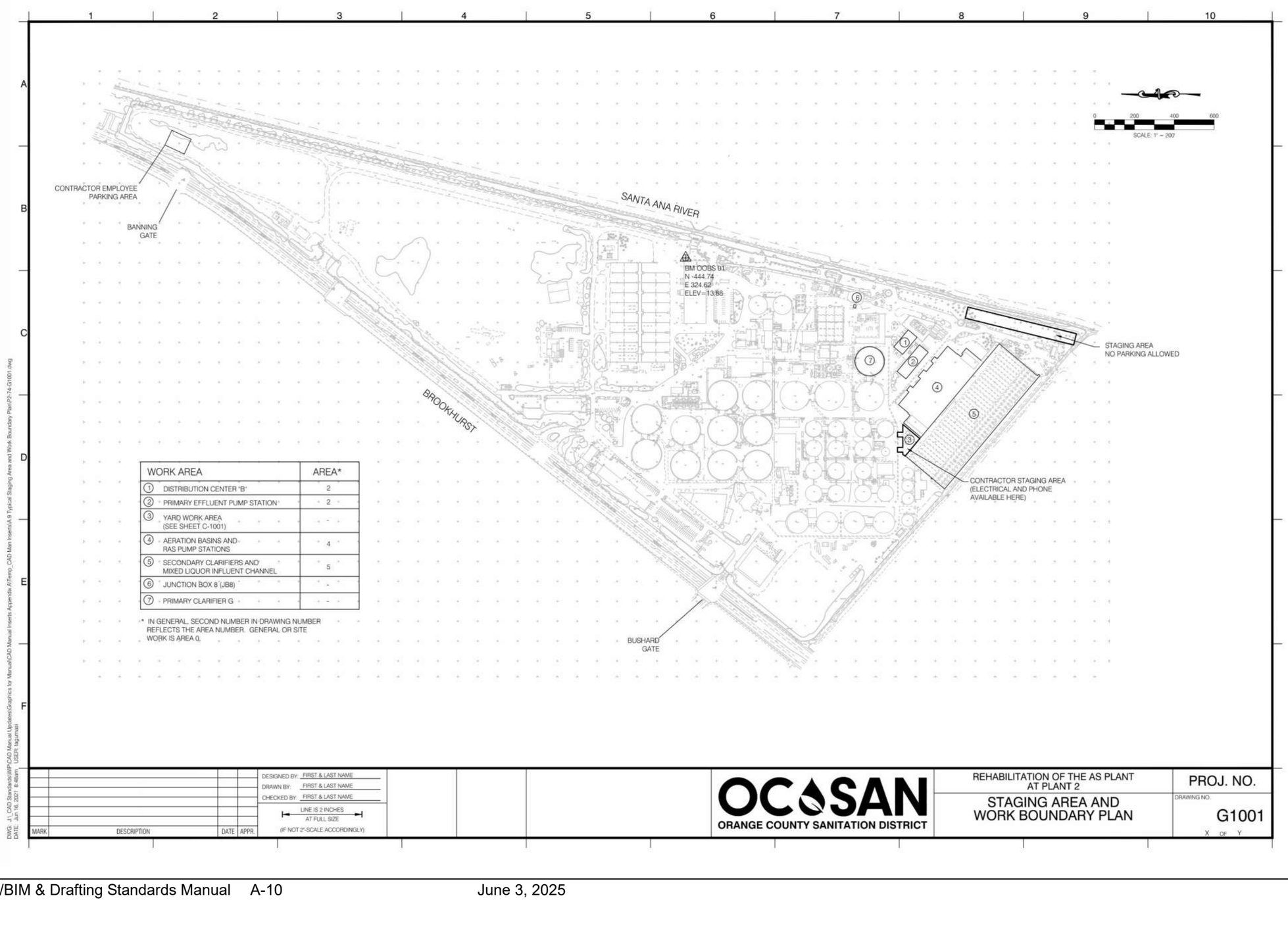
X OF Y

DWG: J:_CAD Standards\CAD Drawings\Construction\App A.7 Typical Abbreviations.dwg
DATE: Sep 07, 2021 12:46pm USER: tagumisa

A.8 Typical Index, Symbols and Abbreviations Sheet



A.9 Typical Staging Area and Work Boundary Plan Sheet



WORK AREA		AREA*
①	DISTRIBUTION CENTER 'B'	2
②	PRIMARY EFFLUENT PUMP STATION	2
③	YARD WORK AREA (SEE SHEET C-1001)	-
④	AERATION BASINS AND RAS PUMP STATIONS	4
⑤	SECONDARY CLARIFIERS AND MIXED LIQUOR INFLUENT CHANNEL	5
⑥	JUNCTION BOX 8 (JB8)	-
⑦	PRIMARY CLARIFIER G	-

* IN GENERAL, SECOND NUMBER IN DRAWING NUMBER REFLECTS THE AREA NUMBER. GENERAL OR SITE WORK IS AREA 0.

DESIGNED BY: FIRST & LAST NAME
DRAWN BY: FIRST & LAST NAME
CHECKED BY: FIRST & LAST NAME
LINE IS 2 INCHES AT FULL SIZE
(IF NOT 2"-SCALE ACCORDINGLY)

MARK | DESCRIPTION | DATE | APPR.

OCSAN
ORANGE COUNTY SANITATION DISTRICT

REHABILITATION OF THE AS PLANT AT PLANT 2

STAGING AREA AND WORK BOUNDARY PLAN

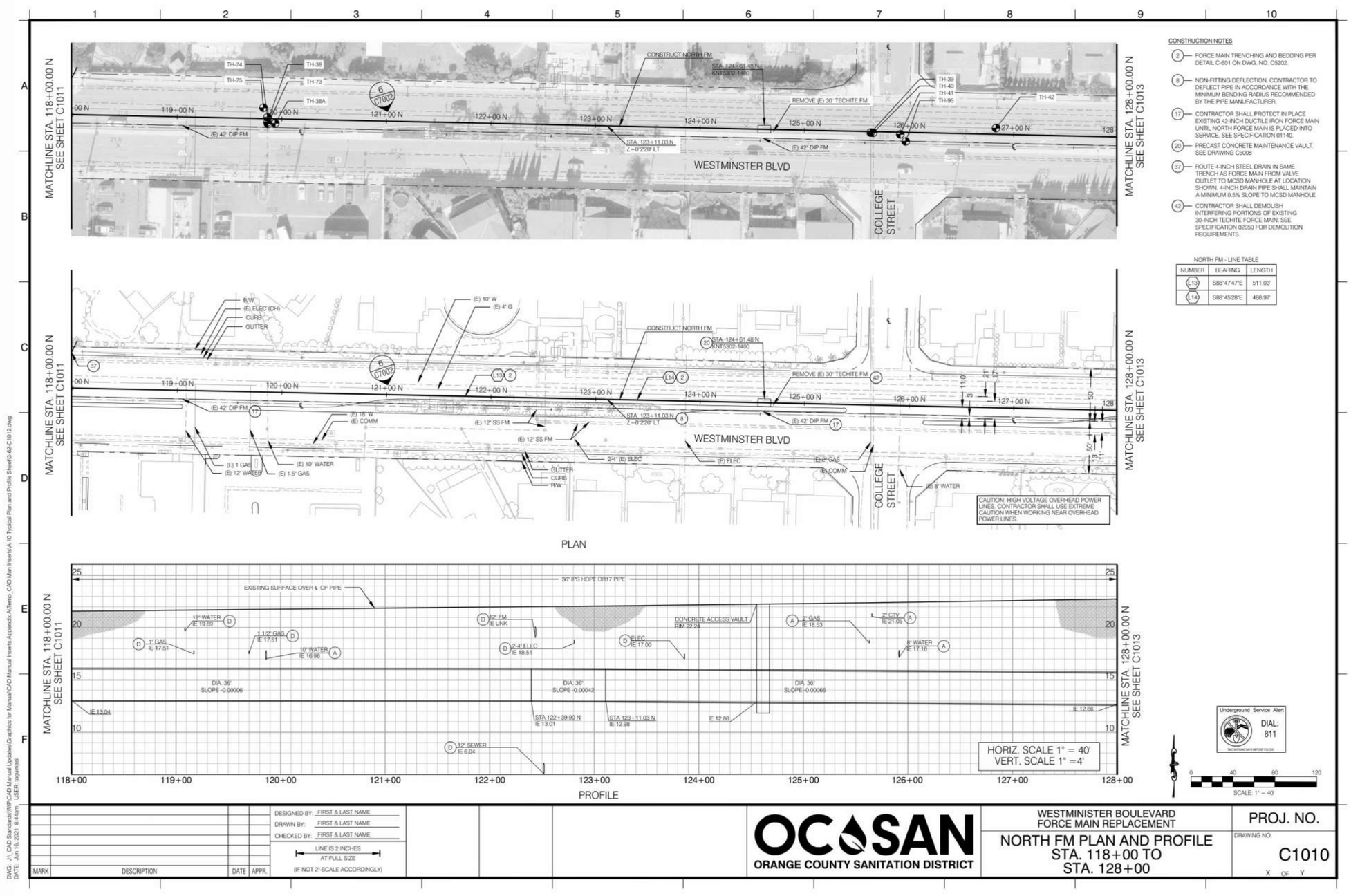
PROJ. NO.

DRAWING NO. G1001

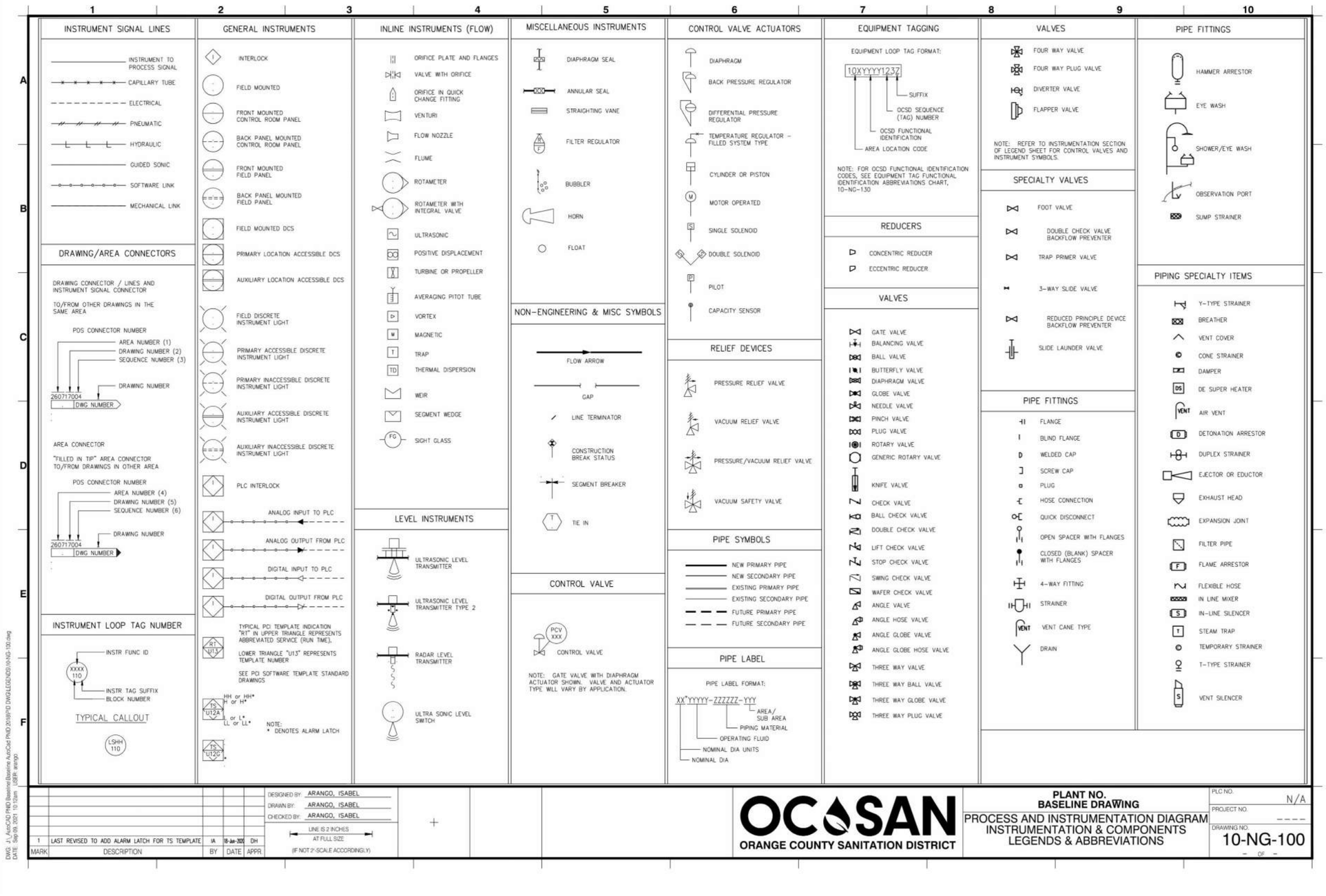
X OF Y

DWG: J:_CAD Standards\WIP\CAD Manual Updates\Graphics for Manual\CAD Manual Inserts Appendix A\Temp_CAD Man Inserts\A.9 Typical Staging Area and Work Boundary Plan\P2-74-G1001.dwg
DATE: Jun 16, 2021 - 8:48am | USER: tagumisa

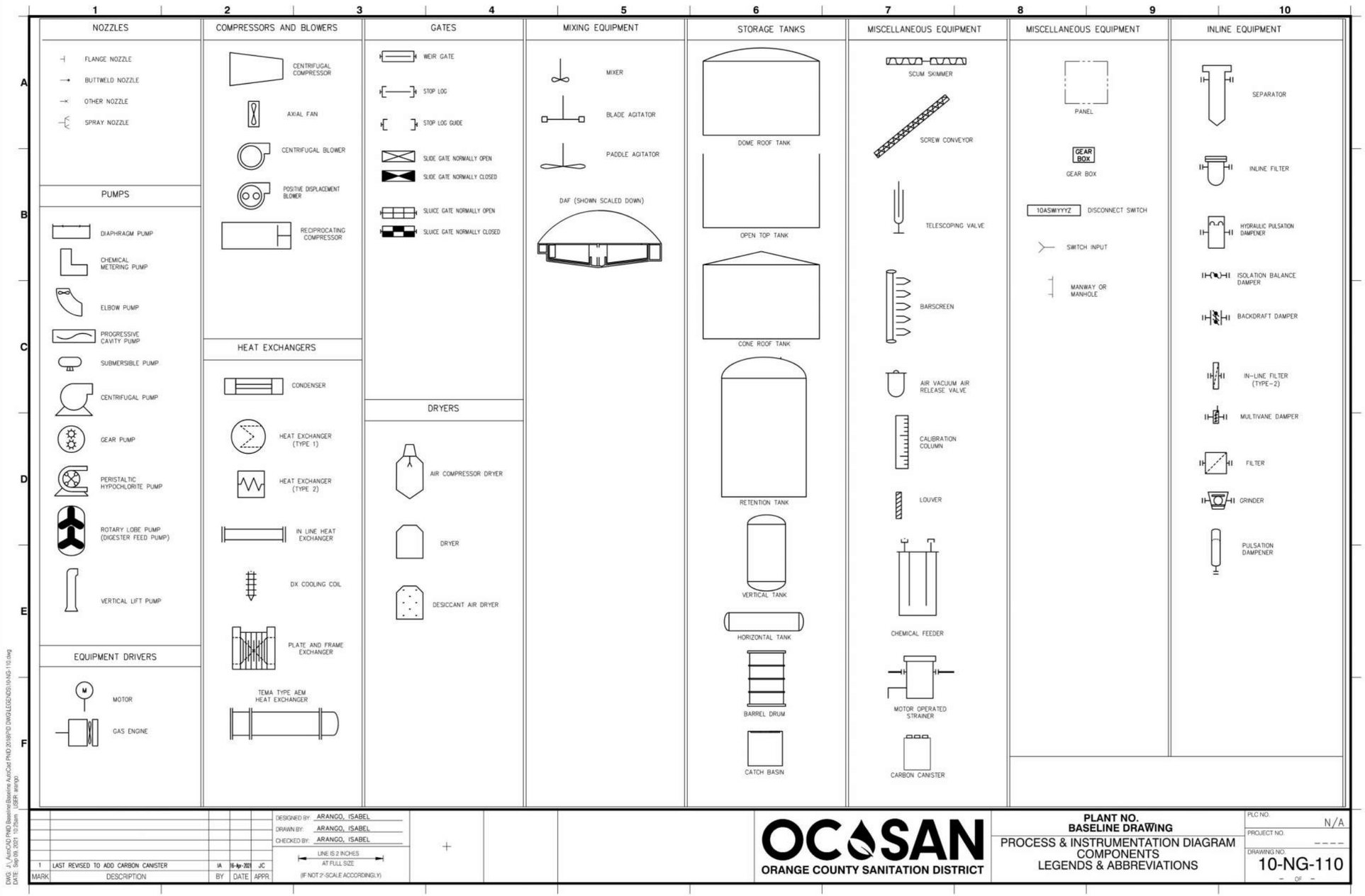
A.10 Typical Plan and Profile Sheet



A.11 P&ID Instrumentation and Components, Legends and Abbreviations



A.12 P&ID Components, Legend and Abbreviations



A.13 P&IN General Legend and Abbreviations

FUNCTION LABELS

- SUMMING FUNCTION
- AVERAGING FUNCTION
- DIFFERENCE FUNCTION
- PROPORTIONAL FUNCTION
- INTEGRAL FUNCTION
- DERIVATIVE FUNCTION
- MULTIPLYING FUNCTION
- DIVIDING FUNCTION
- SQ ROOT EXTRACTION FUNCTION
- N=1 RAISE TO POWER FUNCTION
- UNSPECIFIED FUNCTION
- TIME FUNCTION
- HIGH SELECTING FUNCTION
- LOW SELECTING FUNCTION
- HIGH LIMITING FUNCTION
- LOW LIMITING FUNCTION
- REVERSE PROPORTIONAL FUNCTION
- BIAS FUNCTION
- BIAS FUNCTION
- BIAS FUNCTION
- CURRENT TO CURRENT
- CURRENT TO PNEUMATIC OR PNEUMATIC TO CURRENT
- RESISTANCE TO CURRENT
- MONITORING FUNCTION
- AVERAGE
- DIRECT ACTION FUNCTION
- REVERSE FUNCTION
- ON – OFF FUNCTION

INSTRUMENTATION FUNCTION DESIGNATORS AND ABBREVIATIONS

ACK	ACKNOWLEDGE
AMB	AMBIENT
ATM	ATMOSPHERE
BOP	BOTTOM OF PIPE
BTL	BOTTOM TANGENT LINE
BC	BATCH COMPLETE
BF	BATCH FAILURE
BIP	BATCH IN PROGRESS
BIL	BATCH INRATE LEVEL
CA	CORROSION ALLOWANCE
CE	COMBUSTION ENGINE
CL	CENTERLINE ELEVATION
CONN	CONNECTION
CPLG	COUPLING
CSC	CAR SEAL CLOSED
CSO	CAR SEAL OPEN
CTA	COMMON TROUBLE ALARM
DE	DE–ENERGIZED
DCS	DISTRIBUTED CONTROL SYSTEM
DEC	DE–ENERGIZED CLOSE
DEO	DE–ENERGIZED OPEN
DES	DESIGN
DIA	DIAMETER
DIAG	DIAGRAM
DO	DISSOLVED OXYGEN
DP	DESIGN PRESSURE
DR	DRAIN
DT	DESIGN TEMPERATURE
DWG	DRAWING
EC	ENERGIZED CLOSE
EL	ELEVATION
EN	ENERGIZED
EO	ENERGIZED OPEN
ES	EMERGENCY STOP
ETM	ELECTRONIC TIME METER
FC	FAIL CLOSED ON LOSS OF MOTIVE POWER OR SIGNAL
FL	FAIL LAST
FLC	FAIL LAST POSITION ON LOSS OF CONTROL SIGNAL AND FAIL CLOSED ON LOSS OF AIR SUPPLY
FLO	FAIL LAST POSITION ON LOSS OF CONTROL SIGNAL AND FAIL OPEN ON LOSS OF AIR SUPPLY
FO	FAIL OPEN
FOF	FACE OF FLANGE
FOF EL	FACE OF FLANGE ELEVATION
FT	FEET
FV	FULL VACUUM
FS	FAST/SLOW
FTB	FAIL TO BATCH
FTC	FAIL TO CLOSE
FTO	FAIL TO OPEN
FTS	FAIL TO STOP
GPM	GALLONS PER MINUTE
GR	GRADE
HC	HOSE CONNECTION
HH	HIGH HIGH (ADD * IF LATCH)
H	HIGH (ADD * IF LATCH)
HT	HYDRAULIC TURBINE
HA	HAND/AUTO
HOA	HAND/OFF/AUTO
HOR	HAND/OFF/REMOTE
H2S	HYROGEN SULFIDE
ID	INSIDE DIAMETER
IN	INCHES
INS	INSERTION FLOW METER
INST	INSTRUMENT
ISBL	INSIDE BATTERY LIMITS
ID	INCREASE/DECREASE
LA	LOCAL/AUTO
LC	LOCKED CLOSED
L	LOW (ADD * IF LATCH)
LL	LOW LOW (ADD * IF LATCH)
LO	LOCKED OPEN
L/L	LEAD/LAG
LEL	LOW EXPLOSION LEVEL
LF	LOSS OF FLOW
LOR	LOCAL/OFF/REMOTE
LOS	LOCKOUT STOP
LR	LOCAL/REMOTE
LRA	LOCAL/REMOTE/AUTOMATIC
M	MEDIUM
M1,M2	MULTIPLE MEDIUM
MAX	MAXIMUM
MIN	MINIMUM
MOV	MOTOR OPERATED VALVE
MA	MANUAL/AUTO
MO	MANUAL/OFF
MOA	MANUAL/OFF/AUTO
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
OA	OFF/AUTO
OC	OPEN/CLOSE
OCA	OPEN/CLOSE/AUTO
OL	OVERLOAD
OO	ON/OFF
OSC	OPEN/STOP/CLOSE
OVHD	OVERHEAD
pH	ACIDITY LEVEL
PLC	PROGRAMMABLE LOGIC CONTROLLER
PRES	PRESSURE
PRV	PRESSURE RELIEF VALVE
R	RESET
RPM	REVOLUTION PER MINUTE
S	START
SD	SHUTDOWN
SEL	SELECTOR
SOV	SOLENOID VALVE
SP	SET POINT
SS	START/STOP
TEMP	TEMPERATURE
VIB	VIBRATION

INSTRUMENT SYMBOLOGY DEFINITION

MEANINGS OF IDENTIFICATION LETTERS THIS TABLE APPLIES ONLY TO THE FUNCTIONAL IDENTIFICATION OF INSTRUMENTS

	FIRST–LETTER		SUCCEEDING–LETTERS		
	MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS		ALARM		
B	BURNER, COMBUSTION		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
C	USER'S CHOICE			CONTROL	CLOSE
D	DENSITY	DIFFERENTIAL			
E	VOLTAGE		SENSOR (PRIMARY ELEMENT)		
F	FLOW RATE	RATIO (FRACTION)			
G	USER'S CHOICE		GLASS, VIEWING DEVICE		
H	HAND				HIGH
I	CURRENT (ELECTRICAL)		INDICATE		
J	POWER	SCAN			
K	TIME, TIME SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT		LOW, LEFT
M	MOISTURE	MOMENTARY			MIDDLE, INTERMEDIATE
N	USER'S CHOICE	COMPUTATION	USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
O	USER'S CHOICE		ORIFICE		OPEN
P	PRESSURE, VACUUM		POINT (TEST) CONNECTION		
Q	QUANTITY	INTEGRATE, TOTALIZE			
R	RADIATION		RECORD		RIGHT
S	SPEED, FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	PLC/MMI		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VIBRATION, MECHANICAL ANALYSIS			VALVE, DAMPER, LOUVER	
W	WEIGHT, FORCE, TORQUE		WELL		
X	UNCLASSIFIED	X AXIS	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE OR PRESENCE	Y AXIS		RELAY, COMPUTE, CONVERT, SOLENOID VALVE	
Z	POSITION, DIMENSION	Z AXIS		DRIVER, ACTUATOR UNCLASSIFIED FINAL CONTROL ELEMENT	

NOTE: FOR FURTHER EXPLANATORY NOTES WITH REGARD TO ABOVE TABLE, SEE ANSI/ISA–S5.1 STANDARD ENTITLED "INSTRUMENTATION SYMBOLS AND IDENTIFICATION"

TEMPLATE SERVICE ABBREVIATIONS

CSM	CONSTANT SPEED MOTOR
VSM	VARIABLE SPEED MOTOR
DCV	DRIVE VALVE CONTROL
VC	PNEUMATIC VALVE CONTROL
MV	MODULATING VALVE
FP	FLOW PACING
DGN	DIAGNOSTIC
PID	PID CONTROL
LL	LEAD/LAG/STAND BY CONSTANT SPEED
LL	LEAD/LAG/STAND BY VARIABLE SPEED
TS	TRANSMITTER SIGNALS
RT	MOTOR RUN TIME
AM	AUTO MANUAL STATION
CS	CASCADE STATION
MLS	MANUAL LOADING STATION
TT	TOTALIZER TEMPLATE

EQUIPMENT TAG FUNCTIONAL IDENTIFICATION ABBREVIATIONS

AC	AIR CONDITIONING
AHU	AIR HANDLING UNIT
ALM	ALARM
ARV	AIR RELEASE VALVE
BCV	BALL CHECK VALVE
BFP	BELT FILTER PRESS
BFV	BUTTERFLY VALVE
BLV	BALANCING VALVE
BOL	BOILER
BV	BALL VALVE
BSR	BARSCREEN
BWR	BLOWER
CEN	CENTRIFUGE
CLR	SCUM OR SLUDGE COLLECTOR
CV	CHECK VALVE
CLS	CLASSIFIER
CMP	COMPRESSOR
CND	CONDENSER
CVY	CONVEYOR
DCV	DOUBLE CHECK VALVE
DRY	DRYER
DV	DIAPHRAGM VALVE
ENC	ECONIMIZER
ENG	ENGINE
EVP	EVAPORATOR
EXH	EXHAUST
EXR	EXCHANGER
FAP	FIRE ALARM PANEL
FBK	FEEDER BREAKER
FH	FIRE HYDRANT
FIL	FILTRATE
FLR	FLARE
FLA	FLAME ARRESTOR
FLT	FILTER
FLV	FLAPPER VALVE
FTV	FOOT VALVE
GAT	GATE
GBX	GEARBOX
GDR	GRINDER
GEN	GENERATOR
GLV	GLOBE VALVE
GV	GATE VALVE
HTR	HEATER
HTP	HEAT PUMP
MTR	MOTOR
MXR	MIXER
NV	NEEDLE VALVE
OPS	OPERATOR (ACTUATOR)
PC	PRIMARY CLARIFIER
PIV	PINCH VALVE
PV	PLUG VALVE
PMP	PUMP
PNL	PANEL
PRD	PRES REDUCING VALVE
PRG	PRES REGULATING VALVE
PRV	PRES RELIEF VALVE
PRVB	PRES RELIEF/VACUUM BREAKER
RPD	REDUCED PRINCIPLE DEVICE
SAM	SAMPLE
SBR	SCRUBBER
SOF	SOFTENER
SPD	SUMP PUMP DISCHARGE
SPR	SEPARATOR
ST	STEAM
STR	STRAINER
SWP	SWEEP ARM ASSEMBLY
TNK	TANK
TUB	TUB (ELECTRICAL)
TUR	TURBINE
TSV	TELESCOPING VALVE
VFD	VARIABLE FREQUENCY DRIVE
VNTV	VENT VALVE
WKG	KNIFE VALVE
WSS	WASTESIDE STREAM

OPERATING FLUID

BD	BLOWDOWN
BS	BOTTOM SLUDGE
BYP	BYPASS
C	CHILLED WATER
CHEMD	CHEMICAL DRAIN
CND	CONDENSER
CNDS	CONDENSATE
CS	CHLORINE SOLUTION
CSL	CAUSTIC SOLUTION
CW	CITY WATER
D	DRAIN
DC	DIGESTER CLEANING
DG	DIGESTER GAS
DS	DIGESTED SLUDGE
FA	FOUL AIR
FD	FLOOR DRAIN
FECL2	FERROUS CHLORIDE
FECL3	FERRIC CHLORIDE
FM	FORCE MAIN
FO	FUEL OIL
FW	FEED WATER
GR	GRIT
HCL	HYDROCHLORIC ACID
HPA	HIGH PRESSURE AIR
HPDG	HIGH PRESSURE DIGESTER GAS
HW	HOT WATER
HWR	HOT WATER RETURN
HWS	HOT WATER SUPPLY
HYPO	SODIUM HYPOCHLORITE
H2O2	HYDROGEN PEROXIDE
IA	INSTRUMENT AIR
IW	INDUSTRIAL WATER
JWR	JACKET WATER RETURN
JWS	JACKET WATER SUPPLY
JOS	JOINT OUTFALL SEWER
LPA	LOW PRESSURE AIR
LPDG	LOW PRESSURE DIGESTER GAS
LO	LUBE OIL
MA	MURIATIC ACID
MGOH2	MAGNESIUM HYDROXIDE
NAOH	SODIUM HYDROXIDE
NG	NATURAL GAS
OF	OVERFLOW
O2	OXYGEN
P	PROPANE
PD	PROCESS DRAIN
PE	PRIMARY EFFLUENT
PI	PRIMARY INFLUENT
POL	POLYMER
POTW	POTABLE WATER
PS	PRIMARY SLUDGE
PW	PLANT WATER
RS	RAW SEWAGE
RAS	RETURN ACTIVATED SLUDGE
REC	RECIRCULATION
RCYC	RECYCLE FLOW
RFR	REFRIGERANT RETURN
RFS	REFRIGERANT SUPPLY
RW	RECLAIMED WATER
S	SCUM
SEW	SEWER
SC	SLUDGE CAKE
SD	SANITARY DRAIN
SE	SECONDARY EFFLUENT
SI	SECONDARY INFLUENT
SN	SUPERNATANT

OPERATING FLUID

SO	SLOP OIL
SOD	SLOP OIL DRAIN
SPD	SLUDGE PUMP DISCHARGE
ST	STEAM
SS	SANITATION SEWER
SW	SEAL WATER
SWR	SOFTENED WATER
TFE	TRICKLING FILTER CLARIFIER EFFLUENT
TFS	TRICKLING FILTER CLARIFIER SLUDGE
TWAS	THICKENED WASTE ACTIVATED SLUDGE
UF	UNDERFLOW
V	VENT
WAS	WASTE ACTIVATED SLUDGE
WS	WASTE SECONDARY SLUDGE

PIPING MATERIAL

AC	ASPHALTIC COATING
BI	BITUMINOUS LINING
BC	BITUMINOUS COATING
BS	BELL AND SPIGOT JOINT
BSP	BLACK STEEL PIPE
CC	CEMENT–MORTAR COATING
CI	CAST IRON
CL	CEMENT– MORTAR LINED
CPVC	CHLORINATED PVC
DI	DUCTILE IRON
EC	ENCASED IN CONCRETE
ES	EXTRA STRENGTH OR EXTRA HEAVY
FC	FLEX COUPLING, HARNESSED AS REQ'D
FIG	FLANGED JOINT
GAL	GALVANIZED
GE	GROOVED END JOINT
GL	GLASS LINING
GSP	GALVANIZED STEEL PIPE
HDPE	HIGH DENSITY POLYTHYLENE
I	INSULATED
J	JACKET ON PIPE INSULATION
MI	MALLEABLE IRON
MJ	MECHANICAL JOINT
NoH	No–HUB JOINT
P	PAINTED
PCW	PLASTIC COATING OR WRAPPING
PE	PLAIN END
PEN	POLYETHYLENE ENCASED
PL	PLASTIC LINER (PVC)
PO	PUSH–ON JOINT
PVC	POLY VINYL CHLORIDE
RCP	REINFORCED CONCRETE PIPE
RG	RUBBER GASKET
RL	RUBBER LINED
SC	SCREWED JOINT
SP	CAST IRON SOIL PIPE
STD	STANDARD STEEL
STL	STEEL
ST STL	STAINLESS STEEL
SW	SOLVENT WELDED JOINT
VCP	VITRIFIED CLAY PIPE
W	WELDED
WC	WATER COLUMN

MARK	DESCRIPTION	BY	DATE	APPR.
1	LAST REVISED TO ADD ALARM LATCH FOR TS TEMPLATE	IA	18-Jan-2021	DH

DESIGNED BY: ARANGO, ISABEL
DRAWN BY: ARANGO, ISABEL
CHECKED BY: ARANGO, ISABEL

LINE IS 2 INCHES AT FULL SIZE
(IF NOT 2"-SCALE ACCORDINGLY)

ORANGE COUNTY SANITATION DISTRICT

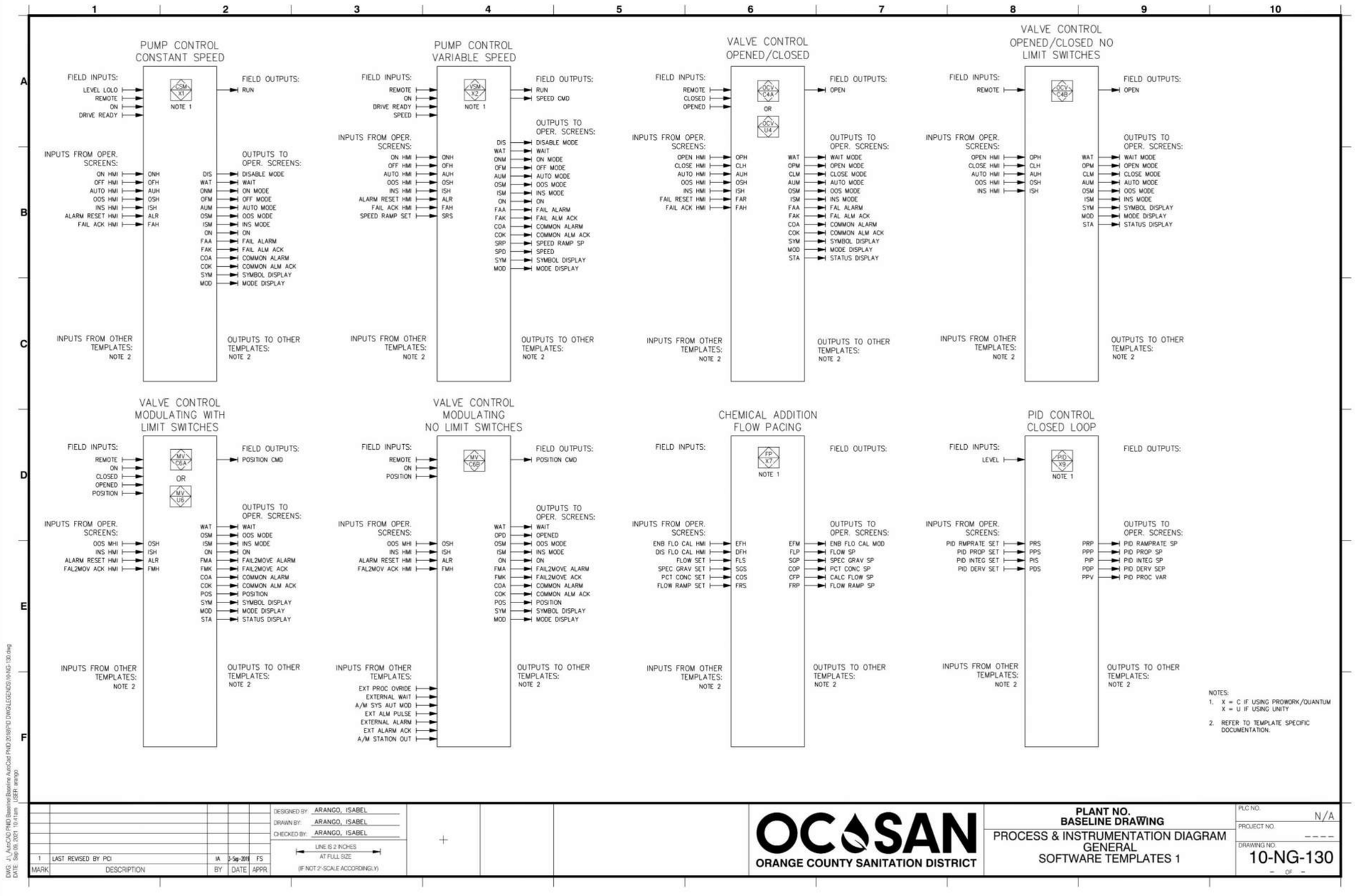
PLANT NO.
BASELINE DRAWING

PROCESS & INSTRUMENTATION DIAGRAM
GENERAL
LEGENDS & ABBREVIATIONS

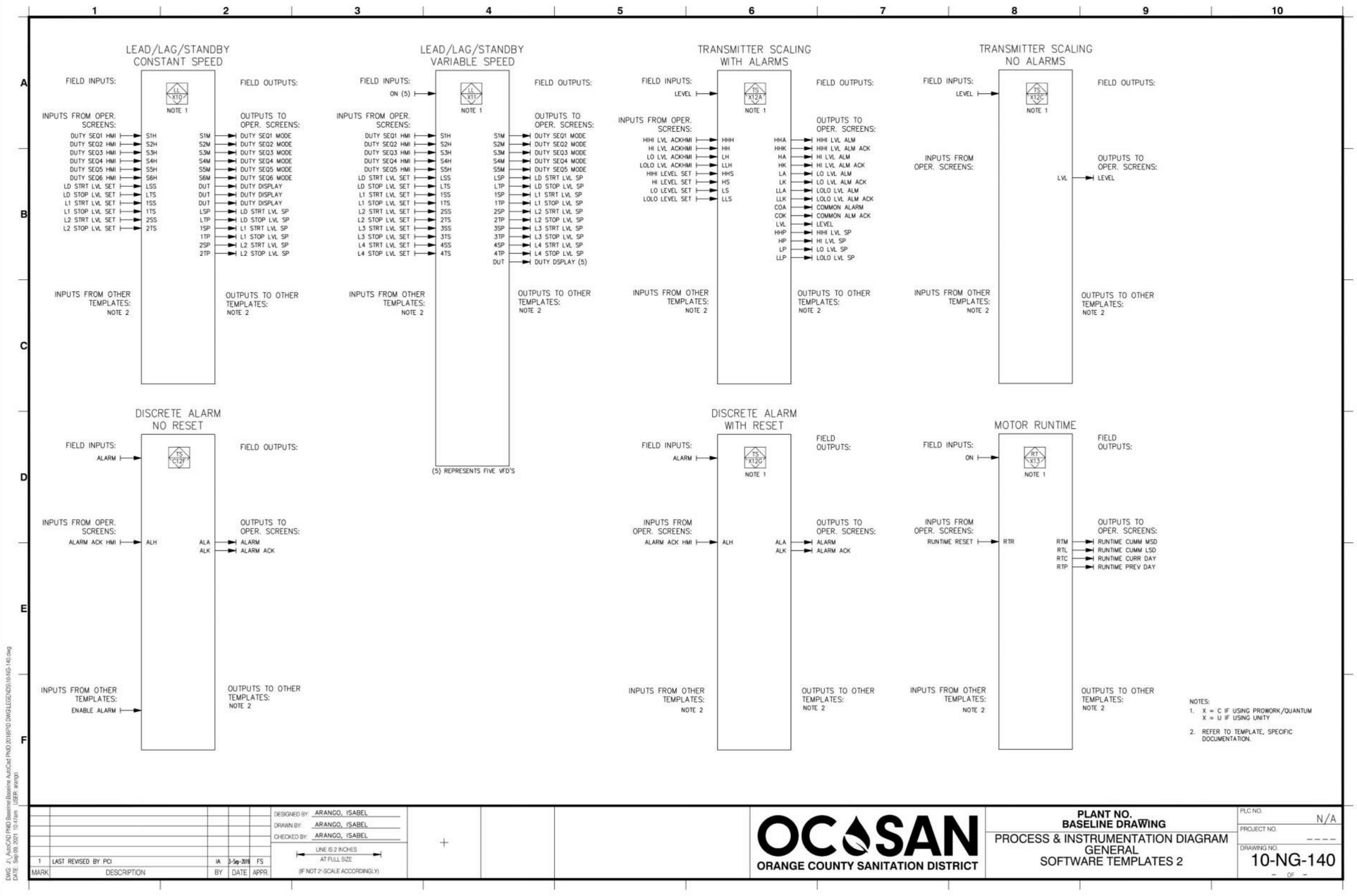
PLC NO. N/A
PROJECT NO. ----
DRAWING NO. 10-NG-120
– OF –

DWG: U: \AutoCAD PWD Baseline\Baseline AutoCad Pw\D 2018\PID DWG\LEGEND\10-NG-120.dwg
DATE: Sep 09, 2021 10:33am USER: arango

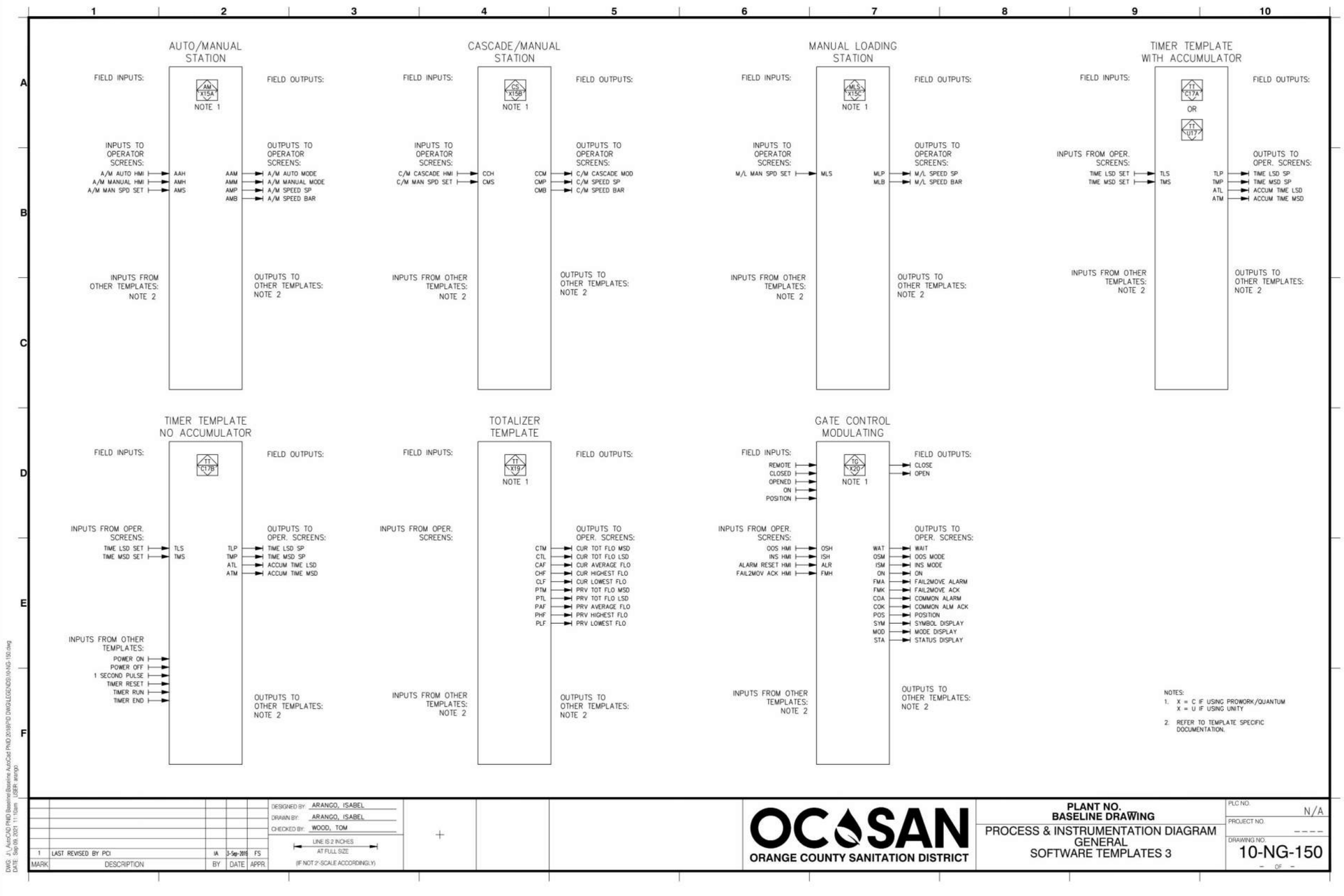
A.14 P&ID General Software Template 1



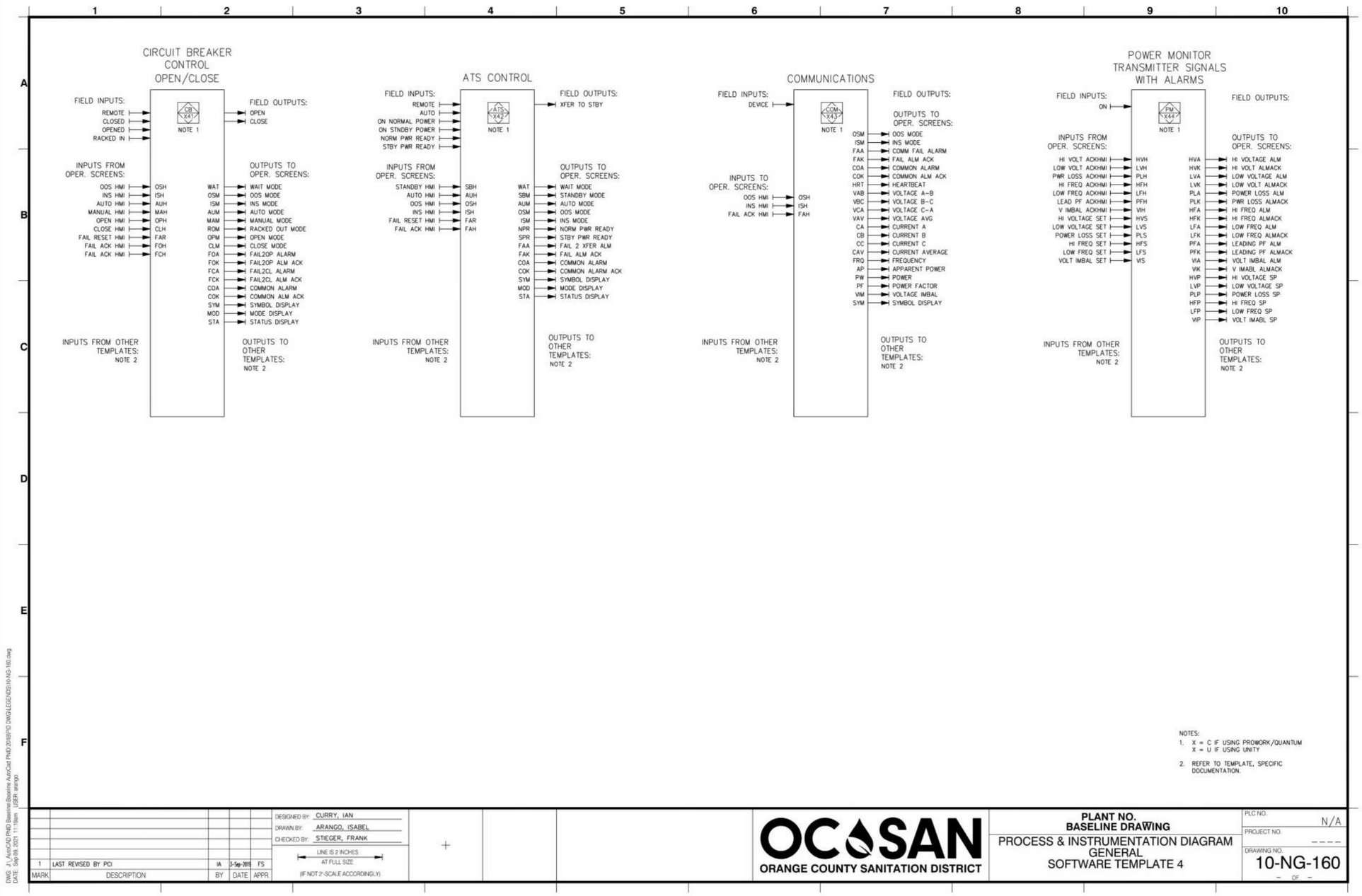
A.15 P&ID General Software Template 2



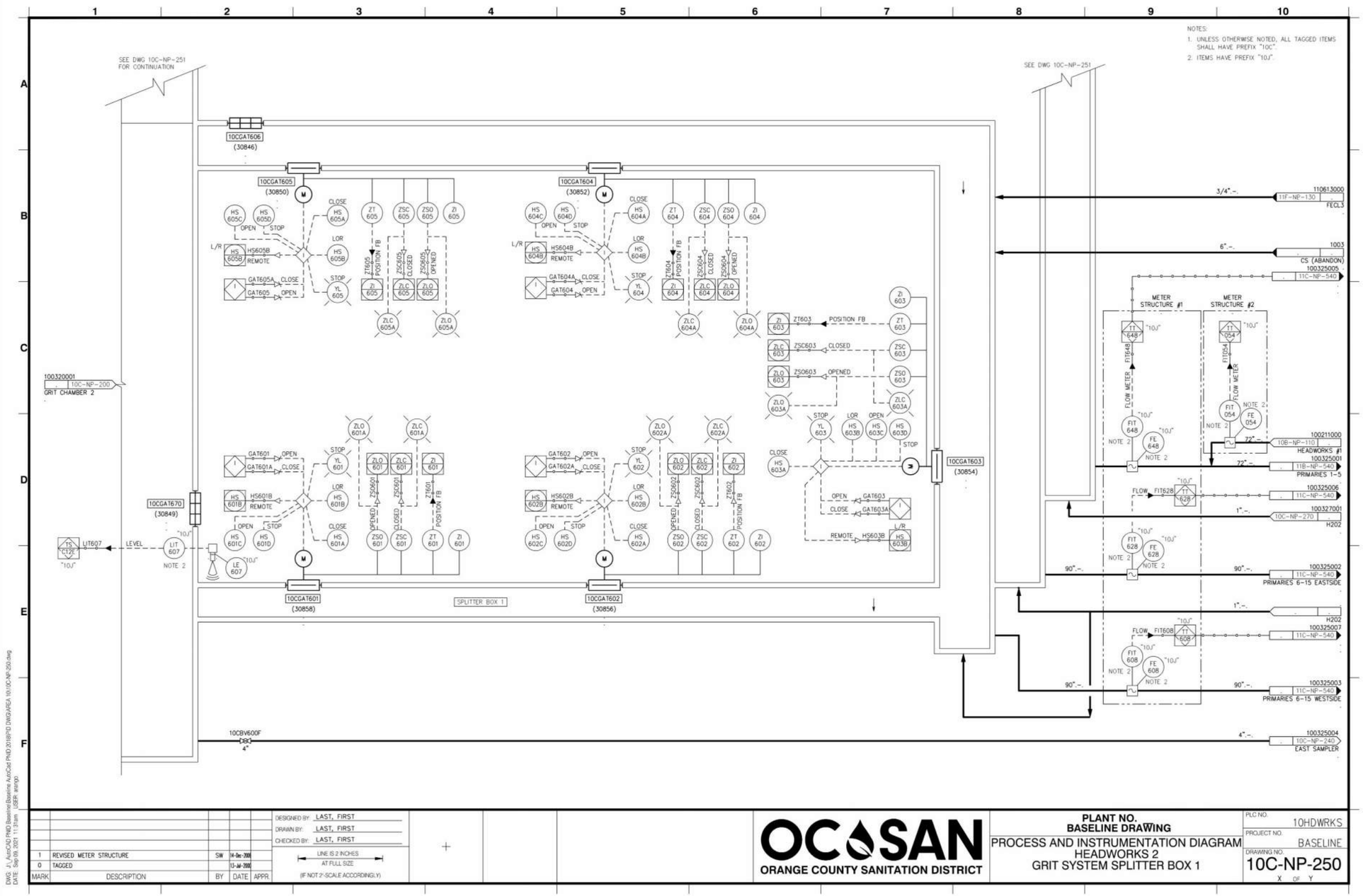
A.16 P&ID General Software Template 3



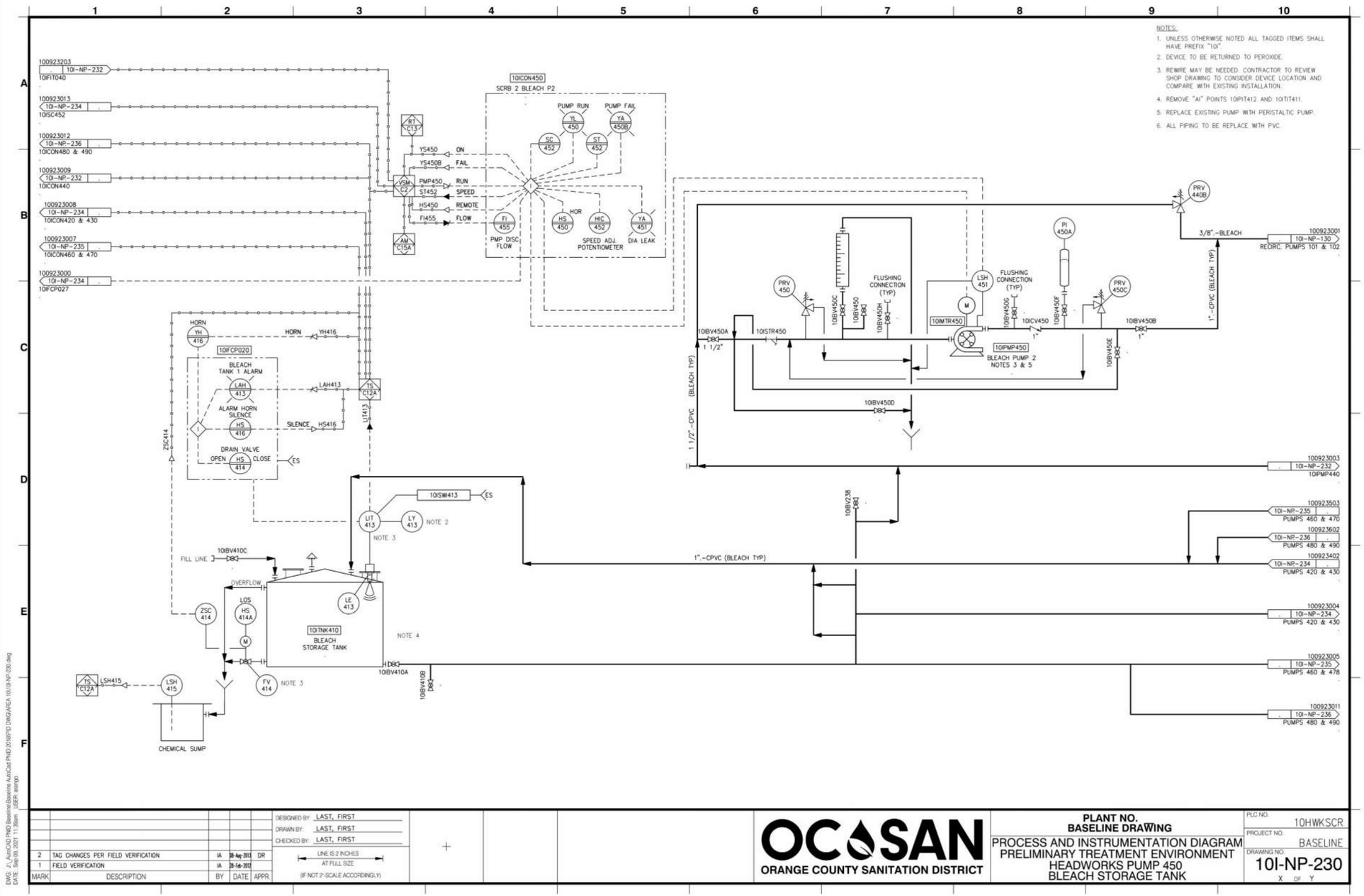
A.17 P&ID General Software Template 4



A.18 P&ID Sample 1



A.19 P&ID Sample 2



A.20 Typical Standard Electrical Abbreviations

ABBREVIATION	MEANING
A or AMP	AMPERE
ACB	AIR CIRCUIT BREAKER
AC	ALTERNATING CURRENT
A/C	AIR CONDITIONER
AF	AMPERE FRAME
AFF	ABOVE FINISHED FLOOR
A/G	ABOVE GROUND
ALUM	ALUMINUM
ALM	ALARM
AM	AMMETER
ANN	ANNUCIATOR
APPOX.	APPROXIMATE
AS	AMMETER SWITCH
ASSY	ASSEMBLY
AT	AMPERE TRIP
ATS	AUTOMATIC TRANSFER SWITCH
AUX	AUXILIARY
AWG	AMERICAN WIRE GAUGE
B	BLACK
BC	BARE COOPER
BKR	BREAKER
BL	BLUE
BLDG	BUILDING
BOC	BOTTOM OF CONDUIT
BOD	BOTTOM OF DUCT
BOM	BILL OF MATERIALS
BOT	BOTTOM OF TRENCH, BOTTOM OF TRAY
BPS	BYPASS SWITCH
BRN	BROWN
C	CONDUIT, CONDUCTOR OR COMMON
CAB	CABINET
CAT	CATALOG
CCTV	CLOSED CIRCUIT TELEVISION
C.O.	CONDUIT ONLY
CB	CIRCUIT BREAKER
CBM	CABLE BY MANUFACTURER
CC	CLOSING COIL
CGD	COMBUSTIBLE GAS DETECTOR
CKT	CIRCUIT
CL	CLEAR
COL	COLUMN
CONC	CONCRETE
CONN	CONNECTION
CONT'D	CONTINUED
CP	CONTROL PANEL
CPT	CONTROL POWER TRANSFORMER
CR	CONTROL RELAY
CS	CONTROL SWITCH
CT	CURRENT TRANSFORMER
CTD	CAPACITOR TRIP DEVICE
CTRL	CONTROL
CU	COPPER
CUB	CUBICLE
DC	DIRECT CURRENT
DET	DETAIL
DF	DEMAND FACTOR
DI	DIGITAL INPUT
DIA	DIAMETER
DIAG	DIAGRAM
DIFF	DIFFERENTIAL
DISC	DISCONNECT (SWITCH)
DISCH	DISCHARGE
DIST OR DISTR	DISTRIBUTION
DN	DOWN
DO	DIGITAL OUTPUT
DP	DISTRIBUTION PANEL
DPDT	DOUBLE POLE DOUBLE THROW
DPST	DOUBLE POLE SINGLE THROW
DSD	DUCT SMOKE DETECTOR
DWG	DRAWING
E	EAST
EGC	ELECTRONIC GOVERNOR CONTROL
ELL	ELBOW
ELEC	ELECTRICAL
ELEM	ELEMENTARY (DIAGRAM)
ELEV OR EL	ELEVATION
E.O.	ELECTRICALLY OPERATED
EMERG	EMERGENCY
ENCL	ENCLOSURE
EP	EXPLOSION PROOF
EPC	ELECTRICAL PRESET CONTROLLER
ESD	EMERGENCY SHUTDOWN
ETM	ELAPSED TIMER METER
(E)	EXIST, EXISTING
EXP	EXPLOSION PROOF
FA	FIRE ALARM
FAR	FREQUENCY ADJUSTING REGULATOR
FCB	FIBER CABINET
FCP	FIELD CONTROL PANEL
FCV	FLOW CONTROL VALVE
FD	FIRE DETECTOR
FDR	FEEDER
FE	FIELD EXCITER
FL	FLOOR
FLA	FULL LOAD AMPERE
FLEX	FLEXIBLE
FLTR	FILTER
FM	FREQUENCY METER
FPX	SUDDEN PRESSURE
FO	FIBER OPTIC
FREQ	FREQUENCY
FSH/L	FLOW SWITCH HIGH/LOW
FTU	FIBER TERMINATION UNIT
FU	FUSE
FUR	FURNISHED
FUT	FUTURE
FVNR	FULL VOLTAGE NON-REVERSING
FVR	FULL VOLTAGE REVERSING
FWD	FORWARD
G	GREEN
GALV	GALVANIZED
GEN	GENERATOR
GFI	GROUND FAULT INTERRUPTER
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GFT	GROUND FAULT TRANSFORMER
GND	GROUND
GRES	GROUND RESISTOR
GSP	GOVERNOR SPEED POT
HDWR	HARDWARE
H-O-A	HAND-OFF-AUTOMATIC
H-O-R	HAND-OFF-REMOTE
HP	HORSEPOWER
HS	HAND SWITCH
HT	HEIGHT
HTR	HEATER
ID	INSIDE DIAMETER
IM	INPUT MODULE
IN	INPUT
INST	INSTANTANEOUS OR INSTRUMENT
INSUL	INSULATE, INSULATION
IR	INPUT REGISTER
ISB	INTRINSIC SAFE BARRIER
IT	INSTANTANEOUS TRIP
J	JOG
JB OR J-BOX	JUNCTION BOX
K	KEY INTERLOCK
KCMIL OR MCM	THOUSAND CIRCULAR MILLS
KVA	KILOVOLT-AMPERE
KVAR	KILOVOLT-AMPERE REACTIVE
KW	KILOWATT
L	LOCAL
LA	LIGHTING ARRESTOR
LAH/L	LEVEL ALARM HIGH/LOW
LC	LIGHTING CONTACTOR
LCP	LOCAL CONTROL PANEL
LDG	LOADING
LP	LIGHTING PANEL
LOR	LOCAL-OFF-REMOTE
LOS	LOCK-OUT STOP
LR	LOADING RACK
L/R	LOCAL/REMOTE
LS	LIMIT SWITCH
LSCC	LIMIT SWITCH CLOSED WHEN VALVE IS CLOSED
LSCO	LIMIT SWITCH CLOSED WHEN VALVE IS OPEN
LSH/L	LEVEL SWITCH HIGH/LOW
LSM	LOAD SHARING MODULE
LSP	LOCAL STOP STATION
LST	LOCAL START STATION
LT	LIGHT
LTG	LIGHTING
M	MOTOR
MAINT	MAINTENANCE
MAN	MANUAL
MC	MOTOR STARTER CONTACTOR
MCA	MINIMUM CIRCUIT AMPACITY
MCC	MOTOR CONTROL CENTER
MCP	MOTOR CIRCUIT PROTECTOR
MFR	MANUFACTURER
MH	MANHOLE
MIN	MINUMUM
MLO	MAIN LUGS ONLY
MOT	MOTOR
MOV	MOTOR OPERATED VALVE
M.O.	MANUALLY OPERATED
MPR	MOTOR PROTECTION RELAY
MPT	METER PULSE TRANSMITTER
MSP	MAIN SEWAGE PUMP
MTD	MOUNTED
MTG	MOUNTING
MTU	MASTER TERMINAL UNIT
MV	MEDIUM VOLTAGE, MERCURY VAPOR
MW	MEGAWATT
N	NORTH
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRICAL CODE
NEG OR (-)	NEGATIVE
NEUT	NEUTRAL
NEMA	NATIONAL ELECTRICAL MFRS ASSOCIATION
NESC	NATIONAL ELECTRICAL SAFETY CODE
NETA	NATIONAL ELECTRICAL TESTING ASSOCIATION
NIS	NOT IN SERVICE
NL	NIGHT LIGHT (UNSWITCHED)
NO	NORMALLY OPEN
NTS	NOT TO SCALE
OC	OPENING COIL
OCB	OIL CIRCUIT BREAKER
OD	OUTSIDE DIAMETER
OL	OVERLOAD
OM	OUTPUT MODULE
OPR	OPERATOR
OR	OUTPUT REGISTER
P	PUMP, POLE
PAH/L	PRESSURE ALARM HIGH/LOW
PB	PULLBOX OR PUSHBUTTON
PCB	POWER CIRCUIT BREAKER
PDP	POWER DISTRIBUTION PANEL
PDM	POSITIVE DISPLACEMENT METER
PERM	PERMISSIVE
PE	PHOTOELECTRIC UNIT
PF	POWER FACTOR
PH OR Ø	PHASE
PLC	PROGRAMMABLE LOGIC CONTROLLER
PM, PM1, PM2	POWER MONITOR
PMG	PERMANENT MAGNET GENERATOR
PNL	PANEL
POS OR (+)	POSITIVE
PR	PAIR
PRI	PRIMARY
PS	PRESSURE SWITCH
PT	PRESSURE TRANSMITTER, POTENTIAL TRANSFORMER
PRX	PRESSURE RELIEF
PWR	POWER
QTY	QUANTITY
R	REMOTE, RELAY OR RED
RCVR	RECEIVER
RDU	REMOTE DATA UNIT
RED	REDUCER
RECPT	RECEPTABCLE
RECT	RECTIFIER
REF	REFERENCE
REQD	REQUIRED
RES	RESET, RESISTOR
REV	REVERSE
RGS	RIGID GALVANIZED STEEL
RHEO	RHEOSTAT
RIO	REMOTE I/O
RSP	REMOTE STOP
RST	REMOTE START
RTD	RESISTANCE TEMPERATURE
RTU	REMOTE TERMINAL UNIT
RVAT	REDUCED VOLTAGE AUTO TRANSFORMER
S	SOUTH
SALS	STEVE ANDERSON LIFT STATION
SB	SHORTING TERMINAL BLOCK
SCH	SCHEDULE
SCHEM	SCHEMATIC (DIAGRAM)SEC SECONDARY OR SECOND
SECT	SECTION
S/D	SHUTDOWN
SF	SERVICE FACTOR
SHLD	SHIELD, SHIELDED
SLO	STATION LOCKOUT
SOV	SOLENOID VALVE
SP	STOP
SPLY	SUPPLY
SPDT	SINGLE POLE DOUBLE THROW
SPST	SINGLE POLE SINGLE THROW
SPR	SUDDEN PRESS RELAY
SPS	STAND-BY POWER SUPPLY
SS	SYNCH SWITCH
SST	SOLID STATE TRIP
SSTL	STAINLESS STEEL
ST	START
STA	STATION
STD	STANDARD
STL	STEEL
STP	SHIELDED TWISTED PAIR CABLE
STR	STARTER
STRD	STRANDED
ST/SP	START-STOP CONTROL STATION
STBY	STANBY
SUB	SUBSTATION
SUBM	SUBMERSIBLE
SW	SWITCH
SWGR	SWITCHGEAR
SWRK	SWITCHRACK
SYM	SYMMETRICAL
SYNCH	SYNCHROSCOPE
SYS	SYSTEM
TAH/L	TEMPERATURE ALARM HIGH/LOW
TB	TERMINAL BLOCK OR TEST BLOCK
TC	TRAY CABLE OR THERMOCOUPLE
TD	TIME DELAY
TDR	TIME DELAY RELAY
TDU	TUBE DISTRIBUTION UNIT
TERM	TERMINAL
TF	TRICKLING FILTER
TFR	TRANSFORMER
TR	SHIELDED TRIAD CABLE
THR'D	THREADED
TI	TEMPERATURE INDICATOR
TK	TANK
TM	TURBINE METER OR THERMAL MAGNETIC
TSH/L	TEMPERATURE SWITCH HIGH/LOW
TOD	TOP OF DUCT
TOP	TOP OF PLATFORM
TS	TORQUE SWITCH
T-SAT	THERMOSTAT
TT	TEMPERATURE TRANSMITTER
TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSOR
TYP	TYPICAL
U/G	UNDERGROUND
UL	UNDERWRITER LABORATORY
ULO	UNIT LOCKOUT
UPS	UNINTERRUPTIBLE POWER SUPPLY
V	VOLT
VA	VOLT-AMPERE
VAMOP	VOLTAGE ADJUST MOTOR OPERATED POTENTIOMETER
VAR	VOLT ADJUSTING REGULATOR
VFD	VARIABLE FREQUENCY DRIVE
VFR	VOLTAGE FREQUENCY RELAY
VM	VOLTMETER OR VIBRATION MONITOR
VR	VOLTAGE REGULATOR
VS	VIBRATION SWITCH OR VOLTMETER SWITCH
VCS	VOLTAGE CONTROL SWITCH
VM	VOLTMETER
VR	VOLTAGE REGULATOR
VS	VOLTMETER SWITCH
VT	VIBRATION TRANSMITTER
W	WEST, WATT OR WHITE
WH	WATT-HOUR
WHM	WATT-HOUR METER
WM	WATT METER
WP	WEATHERPROOF
XFR	TRANSFER
XFMR	TRANSFORMER
XMTR	TRANSMITTER
ZS	POSITION SWITCH
2S2W	2 SPEED, 2 WINDING

MARK	DESCRIPTION	DATE	APPR.

DESIGNED BY: FIRST & LAST NAME
DRAWN BY: FIRST & LAST NAME
CHECKED BY: FIRST & LAST NAME
LINE IS 2 INCHES AT FULL SIZE
(IF NOT 2"-SCALE ACCORDINGLY)

DWG: J:_CAD Standards\CAD Drawings\Electrical\Plan Symbols\Sample Drawings\ELEC-ABBR.dwg
DATE: Sep 07, 2021 1:18pm USER: tagumasi

ORANGE COUNTY SANITATION DISTRICT

PROJECT NAME TITLE 1
PROJECT NAME TITLE 2

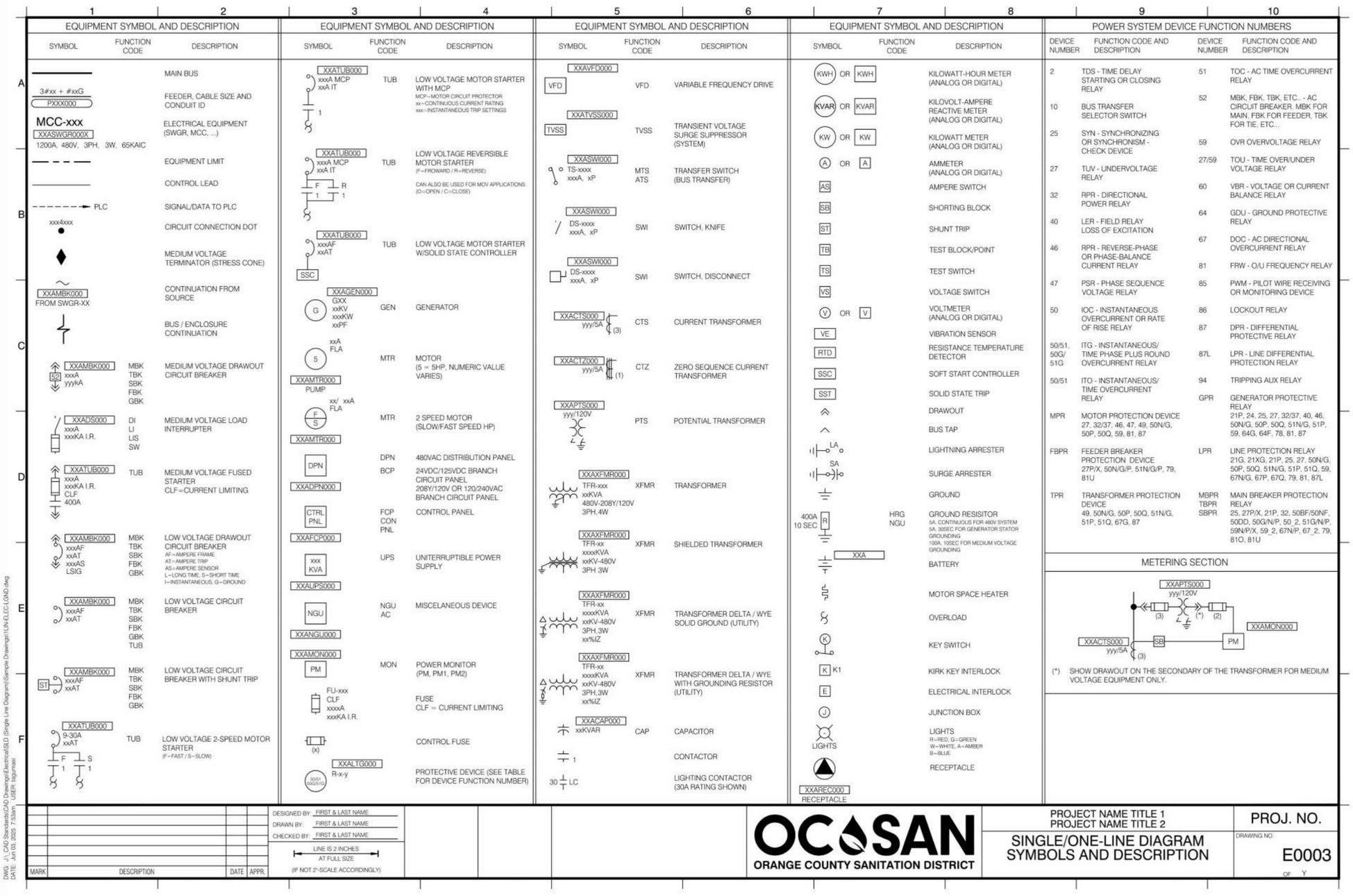
ELECTRICAL ABBREVIATIONS

PROJ. NO.

DRAWING NO. E0001

OF Y

A.21 Single Line Diagram Legend and Description



A.22 Control Schematics Symbols and Description

CONTROL SCHEMATICS

SYMBOL	DESCRIPTION
	TIMER CONTACT, NORMALLY OPEN, TIME DELAY TO CLOSE AFTER COIL IS ENERGIZED
	TIMER CONTACT, NORMALLY CLOSED, TIME DELAY TO OPEN AFTER COIL IS ENERGIZED
	TIMER CONTACT, NORMALLY OPEN, TIME DELAY TO OPEN AFTER COIL IS DE-ENERGIZED
	TIMER CONTACT, NORMALLY CLOSED, TIME DELAY TO CLOSE AFTER COIL IS DE-ENERGIZED
CR	RELAY COIL C = CONTACTOR CR = CONTROL RELAY FR = FLASHING RELAY IR = INTERPOSING RELAY M = MOTOR STARTER TDE = TIME DELAY ON ENERGIZING TDD = TIME DELAY ON DE-ENERGIZING TR = ON-OFF REPEAT TIME DELAY
50/51	PROTECTIVE RELAY DEVICE, NUMBER REFERS TO ANSI C37.2 DEVICE FUNCTION NUMBER.
	SOLENOID OPERATED VALVE
	THERMAL OVERLOAD RELAY
	MOTOR SPACE HEATER
	HIGH RESISTANCE NUETRAL GROUNDING RESISTOR
ETM	ELAPSED TIME METER
	POTENTIONMETER
	SURGE SUPPRESSOR
MTR	MOTOR
KWH	KILOWATT HOUR METER OR VAR-VARMETER (KW-KILOWATT METER)
A	A-AMMETER, V-VOLTMETER
AS	SWITCH, AS-AMMETER, VS-VOLTMETER
CLF	FUSE (CLF INDICATES CURRENT LIMITING FUSE)
	FUSE WITH BLOWN FUSE INDICATOR
R	PUSH-TO-TEST INDICATING LIGHT: R=RED, G=GREEN, Y=YELLOW, W=WHITE, B=BLUE, A=AMBER
H O R XOO OXO OOX	3 POSITION SELECTOR SWITCH WHERE SHOWN INDICATES SPRING RETURN TO CENTER POSITION INDICATED
XO OX	2 POSITION SELECTOR SWITCH WHERE SHOWN INDICATES SPRING RETURN TO CENTER POSITION INDICATED

CONTROL SCHEMATICS

SYMBOL	DESCRIPTION
	LIMIT SWITCH OPEN
	LIMIT SWITCH CLOSED
	TORQUE SWITCH OPEN
	SPEED SWITCH - OPENS AT PRESET SPEED
	SPEED SWITCH - CLOSES AT PRESET SPEED
	LIQUID LEVEL SWITCH, NORMALLY OPEN (CLOSES ON RISING LEVEL)
	LIQUID LEVEL SWITCH, NORMALLY CLOSED (OPENS ON RISING LEVEL)
	PRESSURE SWITCH, NORMALLY OPEN (CLOSES ON INCREASING PRESSURE)
	PRESSURE SWITCH, NORMALLY CLOSED (OPENS ON INCREASING PRESSURE)
	TEMPERATURE SWITCH, NORMALLY OPEN (CLOSES ON INCREASING TEMPERATURE)
	TEMPERATURE SWITCH, NORMALLY CLOSED (OPENS ON INCREASING TEMPERATURE)
	FLOW SWITCH, NORMALLY OPEN (CLOSES ON INCREASING FLOW)
	FLOW SWITCH, NORMALLY CLOSED (OPENS ON INCREASING FLOW)
	VIBRATION SWITCH, NORMALLY OPEN (CLOSES ON INCREASING VIBRATION)
	VIBRATION SWITCH, NORMALLY CLOSED (OPENS ON INCREASING VIBRATION)
	TOGGLE SWITCH, SPST
	TOGGLE SWITCH, SPDT
OFF ON	ON-OFF SWITCH
	NORMALLY OPEN PUSH BUTTON, MOMENTARY TYPE
	NORMALLY CLOSED PUSH BUTTON, MOMENTARY TYPE
	NORMALLY CLOSED PUSH TO OPEN, PULL TO CLOSE MAINTAINED TYPE, E-STOP
1CR	NORMALLY OPEN WHEN DE-ENERGIZED (1CR DENOTES THAT CONTACT IS ASSOCIATED WITH CONTROL RELAY #1)
1CR	NORMALLY CLOSED WHEN DE-ENERGIZED (1CR DENOTES THAT CONTACT IS ASSOCIATED WITH CONTROL RELAY #1)

CONTROL SCHEMATICS

SYMBOL	DESCRIPTION
XX	MCC OR SWITCHGEAR TERMINAL
	PLC OR REMOTE I/O TERMINAL
	VFD OR FIELD PANEL TERMINAL
	EQUIPMENT OR DEVICE TERMINAL
	RELAY PANEL TERMINAL
DI	PLC DISCRETE INPUT
DO	PLC DISCRETE OUTPUT
AI	PLC ANALOG INPUT
AO	PLC ANALOG OUTPUT
	MOTOR CIRCUIT PROTECTOR
	CONTROL POWER TRANSFORMER
● OR ○	TERMINAL CONNECTIONS
OL	MOTOR OVERLOAD RELAY CONTACT
	LIMIT SWITCH (POSITION AS NOTED)

NOTES

1. ALL TAG NUMBERS ARE PREFIXED WITH THE SAME LOCATION CODE (xxX) AS THE EQUIPMENT NUMBER.
2. THIS DRAWING REPRESENTS DRAWING ELEMENTS AND COMPOSITION ONLY AND IS NOT INTENDED TO PROVIDE DESIGN DIRECTION.
3. ELEMENTARY DIAGRAMS (SCHEMATICS) SHALL COMPLY WITH NFPA-79 EXAMPLE DRAWINGS AND DESIGN REQUIREMENTS.
4. IN ADDITION TO NFPA-79 REQUIREMENTS, COMPONENT LOCATIONS SHALL BE SHOWN.
5. ALL CONTACTS WITH COILS ON OTHER DRAWINGS SHALL INCLUDE A CONTACT DESCRIPTION.
6. TERMINATE NO MORE THAN 2 WIRES PER TERMINAL SCREW.
7. BOLD LINEWORK DESIGNATES NEW, SCREENED LINEWORK DESIGNATES EXISTING.

MARK	DESCRIPTION	DATE	APPR.

DESIGNED BY: FIRST & LAST NAME
DRAWN BY: FIRST & LAST NAME
CHECKED BY: FIRST & LAST NAME
LINE IS 2 INCHES AT FULL SIZE
(IF NOT 2"-SCALE ACCORDINGLY)

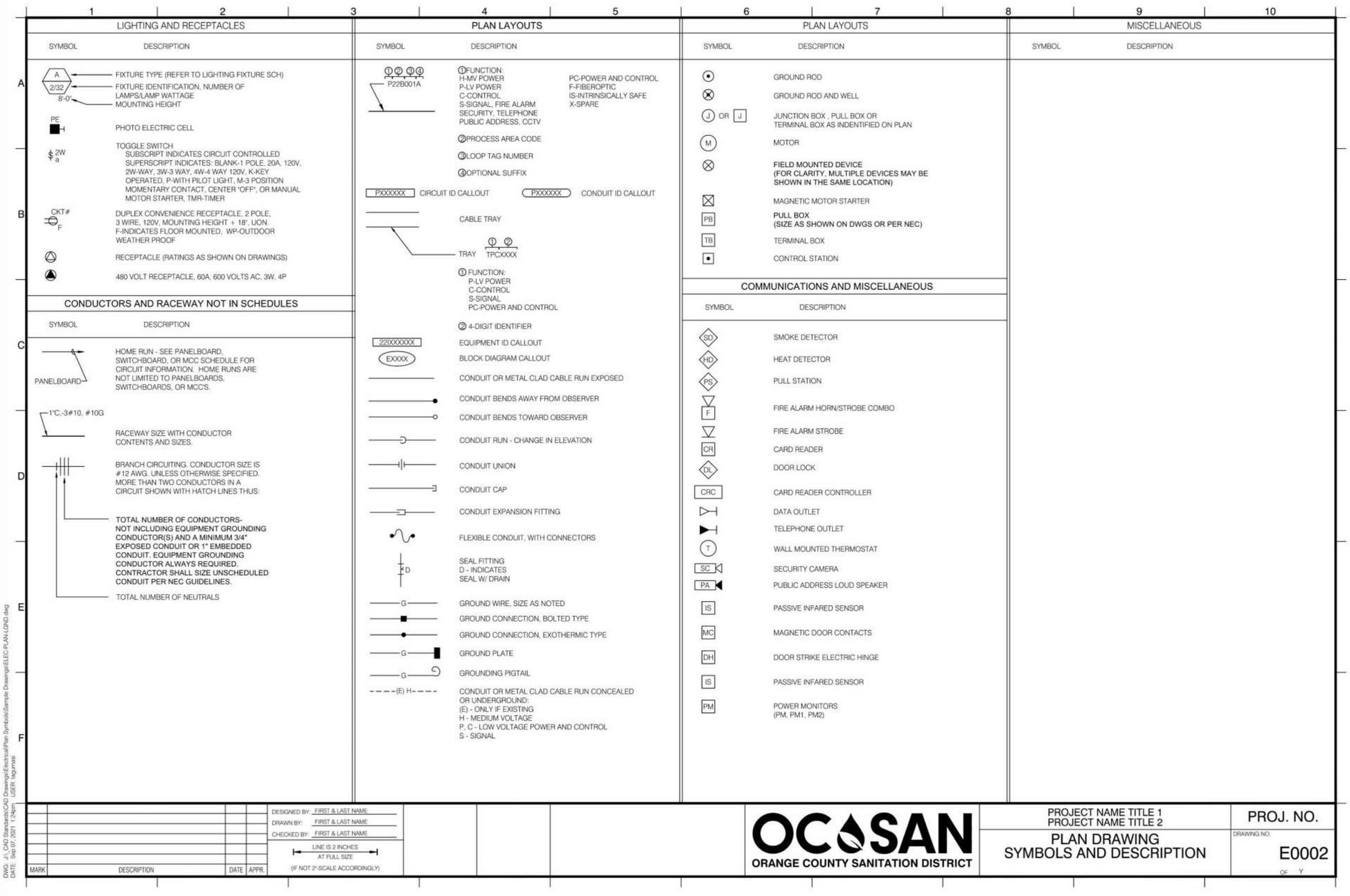
OCSAN
ORANGE COUNTY SANITATION DISTRICT

PROJECT NAME TITLE 1
PROJECT NAME TITLE 2
CONTROL SCHEMATICS SYMBOLS AND DESCRIPTION

PROJ. NO.
DRAWING NO. E0004
OF Y

DWG: J:_CAD Standards\CAD Drawings\Electrical\Control Schematics\Sample Drawings\CTRL-SCHE-LGND.dwg
DATE: Jun 16, 2021 10:52am USER: tagumasi

A.23 Plan Drawing Symbols and Description



LIGHTING AND RECEPTACLES

SYMBOL	DESCRIPTION
A / 2/32 / 8'-0"	FIXTURE TYPE (REFER TO LIGHTING FIXTURE SCH) FIXTURE IDENTIFICATION, NUMBER OF LAMPS/LAMP WATTAGE MOUNTING HEIGHT
PE H	PHOTO ELECTRIC CELL
$ 2W a	TOGGLE SWITCH SUBSCRIPT INDICATES CIRCUIT CONTROLLED SUPERSCRIPT INDICATES: BLANK-1 POLE, 20A, 120V, 2W-WAY, 3W-3 WAY, 4W-4 WAY 120V, K-KEY OPERATED, P-WITH PILOT LIGHT, M-3 POSITION MOMENTARY CONTACT, CENTER "OFF", OR MANUAL MOTOR STARTER, TMR-TIMER
CKT# F	DUPLEX CONVENIENCE RECEPTACLE, 2 POLE, 3 WIRE, 120V, MOUNTING HEIGHT + 18", UON. F-INDICATES FLOOR MOUNTED, WP-OUTDOOR WEATHER PROOF
	RECEPTACLE (RATINGS AS SHOWN ON DRAWINGS)
	480 VOLT RECEPTACLE, 60A, 600 VOLTS AC, 3W, 4P

CONDUCTORS AND RACEWAY NOT IN SCHEDULES

SYMBOL	DESCRIPTION
PANELBOARD	HOME RUN - SEE PANELBOARD, SWITCHBOARD, OR MCC SCHEDULE FOR CIRCUIT INFORMATION. HOME RUNS ARE NOT LIMITED TO PANELBOARDS, SWITCHBOARDS, OR MCC'S.
1"C.-3#10, #10G	RACEWAY SIZE WITH CONDUCTOR CONTENTS AND SIZES.
	BRANCH CIRCUITING. CONDUCTOR SIZE IS #12 AWG. UNLESS OTHERWISE SPECIFIED. MORE THAN TWO CONDUCTORS IN A CIRCUIT SHOWN WITH HATCH LINES THUS:
	TOTAL NUMBER OF CONDUCTORS- NOT INCLUDING EQUIPMENT GROUNDING CONDUCTOR(S) AND A MINIMUM 3/4" EXPOSED CONDUIT OR 1" EMBEDDED CONDUIT. EQUIPMENT GROUNDING CONDUCTOR ALWAYS REQUIRED. CONTRACTOR SHALL SIZE UNSCHEDULED CONDUIT PER NEC GUIDELINES.
	TOTAL NUMBER OF NEUTRALS

PLAN LAYOUTS

SYMBOL	DESCRIPTION
①②③④ P22B001A	①FUNCTION: H-MV POWER P-LV POWER C-CONTROL S-SIGNAL, FIRE ALARM SECURITY, TELEPHONE PUBLIC ADDRESS, CCTV PC-POWER AND CONTROL F-FIBEROPTIC IS-INTRINSICALLY SAFE X-SPARE ②PROCESS AREA CODE ③LOOP TAG NUMBER ④OPTIONAL SUFFIX
PXXXXXX	CIRCUIT ID CALLOUT
PXXXXXX	CONDUIT ID CALLOUT
	CABLE TRAY
① ② TRAY TPCXXXX	① FUNCTION: P-LV POWER C-CONTROL S-SIGNAL PC-POWER AND CONTROL ② 4-DIGIT IDENTIFIER
22IXXXXXX	EQUIPMENT ID CALLOUT
EXXXX	BLOCK DIAGRAM CALLOUT
	CONDUIT OR METAL CLAD CABLE RUN EXPOSED
	CONDUIT BENDS AWAY FROM OBSERVER
	CONDUIT BENDS TOWARD OBSERVER
	CONDUIT RUN - CHANGE IN ELEVATION
	CONDUIT UNION
	CONDUIT CAP
	CONDUIT EXPANSION FITTING
	FLEXIBLE CONDUIT, WITH CONNECTORS
D	SEAL FITTING D - INDICATES SEAL W/ DRAIN
G	GROUND WIRE, SIZE AS NOTED
	GROUND CONNECTION, BOLTED TYPE
	GROUND CONNECTION, EXOTHERMIC TYPE
G	GROUND PLATE
G	GROUNDING PIGTAIL
(E) H	CONDUIT OR METAL CLAD CABLE RUN CONCEALED OR UNDERGROUND: (E) - ONLY IF EXISTING H - MEDIUM VOLTAGE P, C - LOW VOLTAGE POWER AND CONTROL S - SIGNAL

PLAN LAYOUTS

SYMBOL	DESCRIPTION
	GROUND ROD
	GROUND ROD AND WELL
J OR J	JUNCTION BOX , PULL BOX OR TERMINAL BOX AS INDENTIFIED ON PLAN
M	MOTOR
	FIELD MOUNTED DEVICE (FOR CLARITY, MULTIPLE DEVICES MAY BE SHOWN IN THE SAME LOCATION)
	MAGNETIC MOTOR STARTER
PB	**PULL BOX (SIZE AS SHOWN ON DWGS OR PER NEC)**
TB	TERMINAL BOX
	CONTROL STATION

COMMUNICATIONS AND MISCELLANEOUS

SYMBOL	DESCRIPTION
SD	SMOKE DETECTOR
HD	HEAT DETECTOR
PS	PULL STATION
F	FIRE ALARM HORN/STROBE COMBO
	FIRE ALARM STROBE
CR	CARD READER
DL	DOOR LOCK
CRC	CARD READER CONTROLLER
	DATA OUTLET
	TELEPHONE OUTLET
T	WALL MOUNTED THERMOSTAT
SC	SECURITY CAMERA
PA	PUBLIC ADDRESS LOUD SPEAKER
IS	PASSIVE INFARED SENSOR
MC	MAGNETIC DOOR CONTACTS
DH	DOOR STRIKE ELECTRIC HINGE
IS	PASSIVE INFARED SENSOR
PM	POWER MONITORS (PM, PM1, PM2)

MISCELLANEOUS

SYMBOL	DESCRIPTION

MARK	DESCRIPTION	DATE	APPR.

DESIGNED BY: FIRST & LAST NAME
DRAWN BY: FIRST & LAST NAME
CHECKED BY: FIRST & LAST NAME
LINE IS 2 INCHES AT FULL SIZE
(IF NOT 2"-SCALE ACCORDINGLY)

OCSAN
ORANGE COUNTY SANITATION DISTRICT

PROJECT NAME TITLE 1
PROJECT NAME TITLE 2
PLAN DRAWING SYMBOLS AND DESCRIPTION

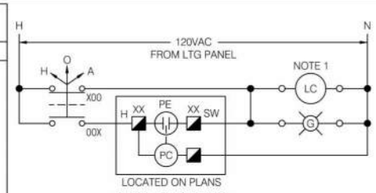
PROJ. NO.
DRAWING NO. E0002
OF Y

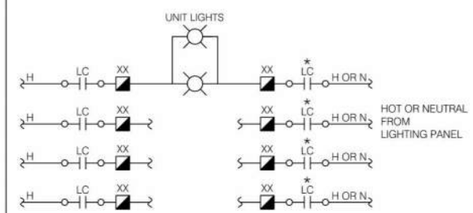
DWG: J:_CAD Standards\CAD Drawings\Electrical\Plan Symbols\Sample Drawings\ELEC-PLAN-LGND.dwg
DATE: Sep 07, 2021 1:24pm USER: tagumsal

A.24 Lighting Fixture Schedule

LIGHTING LUMINAIRE SCHEDULE

TYPE	VOLTS	LAMPS	DESCRIPTION	CATALOG NOMENCLATURE	REMARKS	SYMBOLS
A	120V	60W LED	CEILING PENDANT MOUNT 1'X4' LED LUMINAIRE, ENCLOSED & GASKETED FIBERGLASS HOUSING, HIGH-IMPACT CLEAR ACRYLIC LENS, HIGH EFFICIENT LED AND DRIVER, INTEGRAL 10kV SURGE PROTECTION. CALCULATED L80 LIFE = 60,000 HRS +. LITHONIA FEM: L48-8000LM-IMACD-MD-120-40K-90CRI-SPD-STSL, OR EQUAL	LITHONIA FEM LED, L48=48", 8000LM=8000 LUMENS, IMACD=CLEAR ACRYLIC LENS, MD=MEDIUM DIST., 120=120VAC, 40K=4000K, 90CRI, SPD=10KV SPD, STSL=SS LATCHES.	PENDANT MOUNTED	
B	120V	122W LED	WALL MOUNTED LOW PROFILE LED LUMINAIRE, DIE-CAST ALUMINUM HOUSING, UL WET LOCATION LISTED, QUICK MOUNT INSTALLATION BRACKET. CALCULATED L70 LIFE = 340,000 HRS +. EATON LUMARK: CLCSLED-117-SM-UNV-10kV, OR EQUAL	EATON LUMARK CLCSLED, 117=121W, SM=SURFACE MOUNT, UNV=120-277V, 10kV=10kV SPD.	WALL MOUNTED, ANGLE 60 DEGREES DOWN	
C	120V	344W LED	HIGH BAY LED LUMINAIRE, DIE-CAST ALUMINUM HOUSING, <10% THD, PF>90, 6kV SURGE PROTECTION, UL WET LOCATION LISTED. CALCULATED L70 LIFE = 100,000 HRS +. LITHONIA JHBL: 40000LM-GL-WD-120-40K-80CRI OR EQUAL	LITHONIA JHBL LED, 40000LM=40000LUMENS, GL=GLASS, WD=WIDE DISTR., 120=120VAC, 40K=4000K, 80CRI.	PENDANT MOUNTED	
D	120V	35W LED	2'x2' RECESSED TROFFER LED LUMINAIRE, STEEL HOUSING, A19 LENS, <10% THD, PF>90. CALCULATED L90 LIFE = 60,000 HRS+. LITHONIA 2TL: 2TL2-40L-FW-A19-LP840 OR EQUAL	LITHONIA 2TL2 2X2 RECESSED LED, 40L=4000LUMENS, FW=FLUSH AL, WHITE, A19=#19 PATTERN ACRYLIC, LP840=4000K.	T-BAR GRID	
EM1	120V	6W LED	EMERGENCY LIGHT FIXTURE (BATTERY BACKUP) PROVIDE EXIT SIGNS WITH ARROWS AS INDICATED, ARROWS INDICATES DIRECTION OR EGRESS. INDUSTRIAL LED EMERGENCY LIGHT, UL WET LOCATION NEMA 4X RATED. FULL LUMEN OUTPUT FOR FULL 90 MINUTE OF BATTERY DISCHARGE WITH NO LIGHT DEGRADATION. EMERGENCY LIGHT FIXTURE SHALL BE PROVIDED WITH SELF-DIAGNOSTICS MONITORS LED STATUS. LED DRIVER CIRCUIT. BATTERY CAPACITY AND CHARGER FUNCTION AND DISPLAYS ANY FAULT DETECTION BY MEANS OF FLASHING CODE. FLAME RATED UV STABLE THERMOPLASTIC HOUSING, FULLY GASKETED AND CORROSION RESISTANT. LED BASED LAMP HEADS CONSTRUCTED OF HIGH STRENGTH, DIE-CAST ALUMINUM WITH POLYCARBONATE LENS. BATTERY SHALL BE MAINTENANCE-FREE, LITHIUM IRON PHOSPHATE TYPE. LED COLOR TEMPERATURE SHALL BE 5000K.	HUBBELL LIGHTING DUAL LITE DYNAMO DYN SERIES OR EQUAL	* = FIXTURE TYPE W = WALL MOUNT C = CEILING MOUNT	*W
E1	120V	3W LED	LED EXIT SIGN. CONSTRUCTED OF DIE-CAST ALUMINUM. BRUSHED ALUMINUM FACEPLATE WITH MATT BLACK ELECTROSTATIC POLYMETRIC TRIM. CLEAR LACQUER FINISH ON BRUSHED ALUMINUM FACE. LED LAMPS SHALL BE RATED FOR 10 YEARS. EXIT SIGN SHALL BE PROVIDED WITH SELF-DIAGNOSTICS MONITORS LED STATUS, LED DRIVER CIRCUIT, BATTERY CAPACITY AND CHARGER FUNCTION AND DISPLAYS ANY FAULT DETECTION BY MEANS OF FLASHING CODE. BATTERY SHALL BE MAINTENANCE-FREE, SEALED NICKLE-CADMIUM TYPE AND SHALL PROVIDE 90 MINUTES OF EMERGENCY POWER. LETTERS SHALL BE RED, 6-INCH HIGH WITH 3/4-INCH STROKE WITH 100-FEET VIEWING DISTANCE RATING, LISTED FOR UL924. UL LISTED FOR DAMP LOCATIONS. PROVIDE DUAL OR SINGLE FACE EXIT SIGNS AS INDICATED ON THE DRAWINGS. PROVIDE STEM KIT FOR CEILING MOUNT EXIT SIGNS.	LITHONIA LIGHTING QUANTUM LE SERIES OR EQUAL	* = FIXTURE TYPE W = WALL MOUNT C = CEILING MOUNT	*W
F	120V	129W LED	HEAVY DUTY, CORROSION RESISTANCE, TUNNELS AND GALLERIES LED CAST ALUMINUM HOUSING WITH LOW COPPER CONTENT RATED -40 DEGREES F TO 122 DEGREES F. PRISMATIC BOROSILICATE GLASS OPTICS. 10kV/10kA SURGE PROTECTION TYPE 5 HIGH ANGLE DISTRIBUTION UL 1598 LISTED FOR WET LOCATIONS, IP66 RATED. HOLOPHANE PETROLUX LED: PLED2-12L-4K-12-UN-NA-CRG-L5H OR EQUAL	12L= 12,000 LUMENS, 4K=4000K CCT, 12=120V. UN=UNIVERSAL MOUNT, NA=NO CORD CRG=CORROSION-RESISTANT GRAY, L5H=TYPE 5 HIGH ANGLE GLASS	CEILING/PENDANT	
G1	120V	65W LED	LED FULL CUTOFF WALLPACK. LOW COPPER ALUMINUM HOUSING. ST STL HARDWARE. HIGH EFFICACY LED WITH INTEGRAL ALUMINUM HEAT SINK FOR LONG LIFE. L70/650,000 HRS. PF>90%, 10KV SURGE RATING. UL LISTED WET LOCATIONS, IP66 RATED. IDA DARK SKY APPROVED. KIM LIGHTING 14" WALL DIRECTOR LED: WD14D-4-E35-60L-3K-120-DB-SF OR EQUAL	4=TYPE IV, E35=350mA, 60L=60 LEDs 65W, 3K=3000K, 120=120V, DB=DARK BRONZE, SF=SINGLE FUSING	WALLPACK	
H	120V	28W LED	LED WALL/SURFACE MOUNTED STRIPLIGHTS. CODE-GAUGE STEEL, LINEAR FACETED REFRACTOR, L90/60,000 HRS. DRIVER DISCONNECT. UL LISTED FOR DAMP LOCATIONS. LITHONIA WL4-30L-LP840-SC OR EQUAL	LITHONIA WL4 4' WALL-MOUNT LED, 30L=3000LUMENS, LP840=4000K.	SURFACE	
J	120V	54W LED	SURFACE MOUNTED LED FIXTURE. UL LISTED FOR DAMP LOCATIONS. LITHONIA STL4-48L-LP840-SC2 OR EQUAL	LITHONIA STL4 4' SURFACE-MOUNT LED, 48L=4800LUMENS, LP840=4000K.	SURFACE	
D2	120V	47W LED	2'x4' RECESSED TROFFER LED LUMINAIRE, STEEL HOUSING, A19 LENS, <10% THD, PF>90. CALCULATED L90 LIFE = 60,000 HRS+. LITHONIA 2TL: 2TL4-60L-FW-A19-LP840 OR EQUAL	LITHONIA 2TL4 2X4 RECESSED LED, 60L=6000LUMENS, FW=FLUSH AL, WHITE, A19=#19 PATTERN ACRYLIC, LP840=4000K.	T-BAR GRID	
			STANCHION MOUNTED LIGHTING FIXTURE A/B = PHASE WIRING			A/B
			POLE MOUNTED LIGHTING FIXTURE			





LIGHTING CONTROL PANEL SCHEMATIC (E6000)

*IF REQUIRED

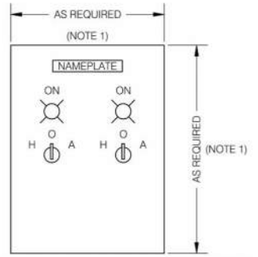


PHOTO CELL CONTROL PANEL LAYOUT ①

LEGEND:

XX EXTERNAL TERMINAL

O TERMINAL IN DEVICE OR EQUIPMENT

GENERAL NOTES:

1. PROVIDE AS MANY RELAYS AS REQUIRED TO ACCOMMODATE THE NUMBER OF LIGHTING CIRCUITS SHOWN ON THE PLANS FOR EACH CONTROL PANEL AND SIZE PANEL ACCORDINGLY.

KEY NOTES:

① PANEL SHALL BE UL LISTED.

PHOTOCELL CONTROL PANEL ADAPTOR TABLE	
EXAMPLE	NAMEPLATE
1	24KFCP916A LOFLO PS PHOTO CELL CONTROL PANEL
2	24GFCP486A OOBS PHOTO CELL CONTROL PANEL

MARK	DESCRIPTION	DATE	APPR.

DESIGNED BY: FIRST & LAST NAME
DRAWN BY: FIRST & LAST NAME
CHECKED BY: FIRST & LAST NAME

LINE IS 2 INCHES AT FULL SIZE
(IF NOT 2"-SCALE ACCORDINGLY)

OCSAN
ORANGE COUNTY SANITATION DISTRICT

PROJECT NAME TITLE 1
PROJECT NAME TITLE 2

LIGHTING FIXTURE SCHEDULE

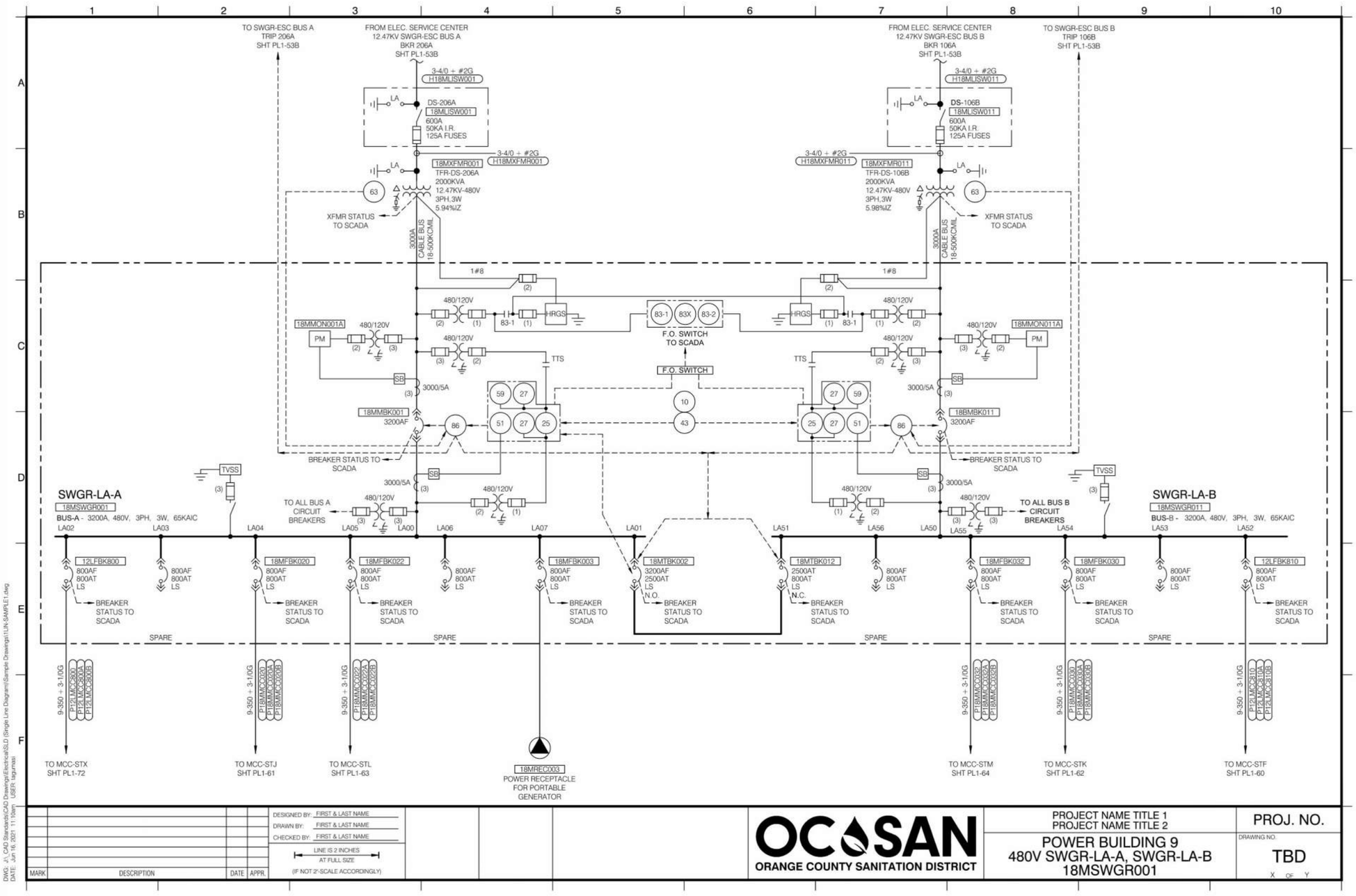
PROJ. NO.

DRAWING NO. E0005

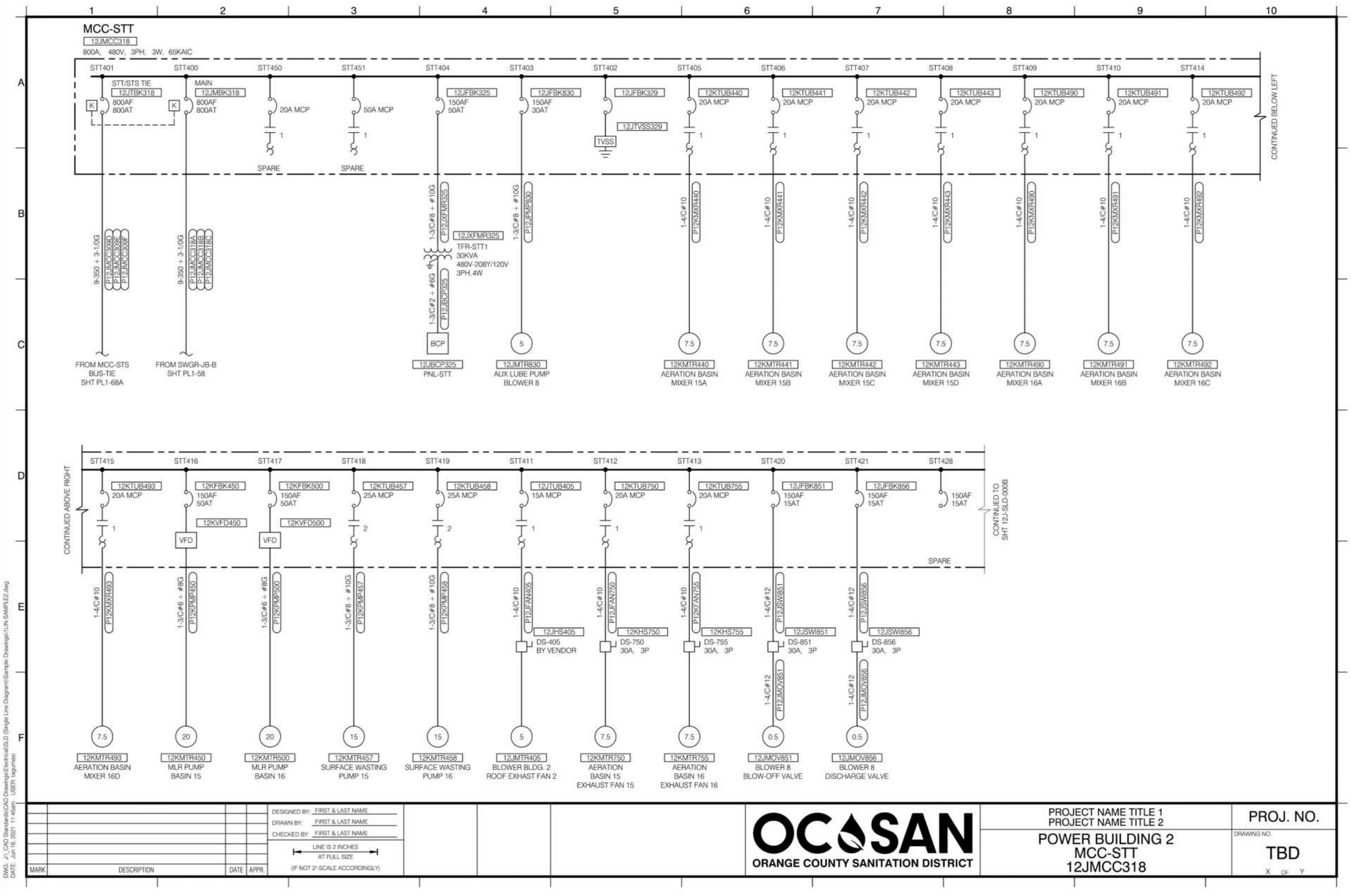
OF Y

DWG: J:_CAD Standards\CAD Drawings\Electrical\Lighting Fixture Schedule\Sample Drawings\LITE-FXTR-LGND.dwg
DATE: Sep 07, 2021 1:25pm USER: tagumai

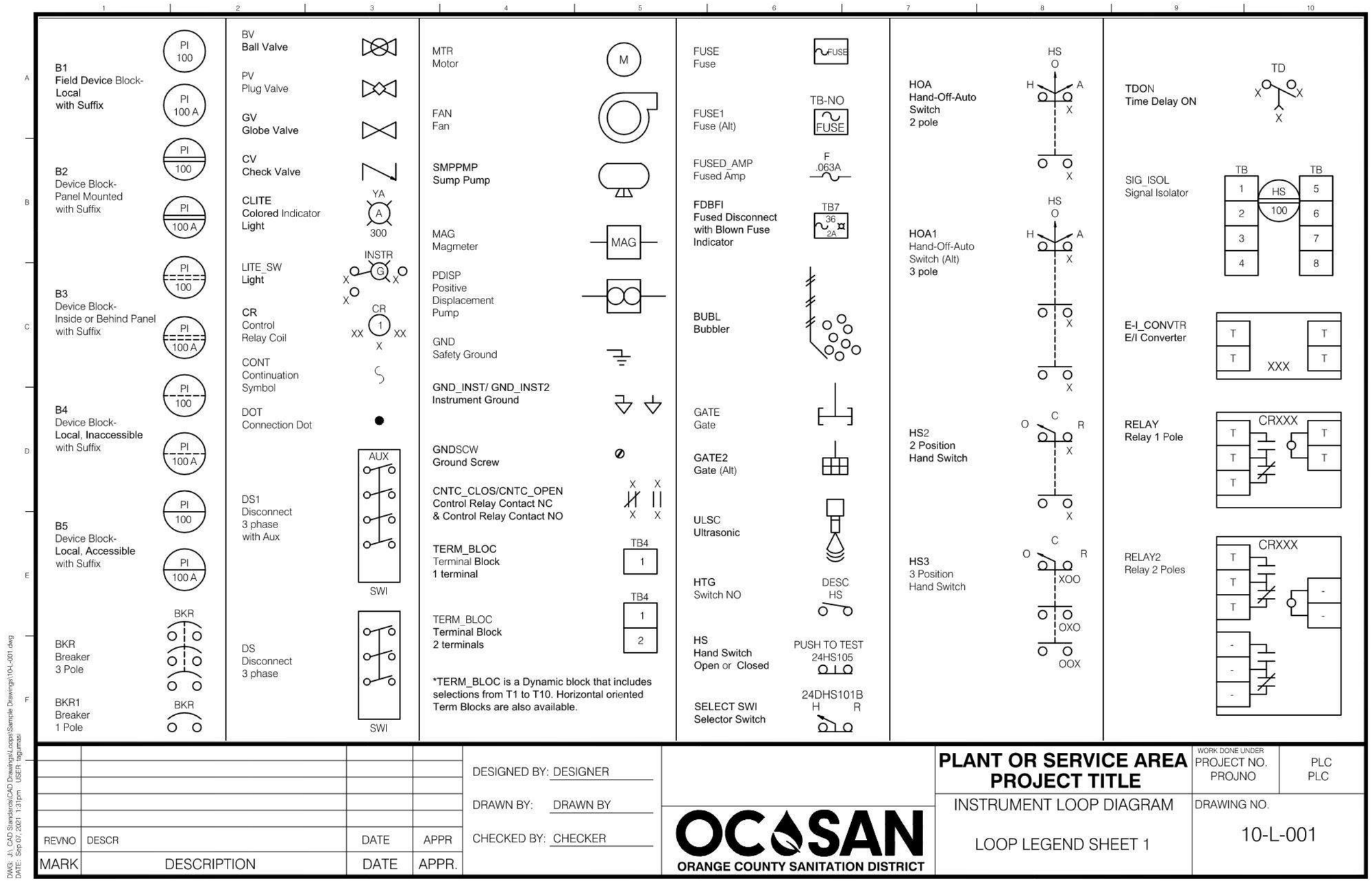
A.25 Single Line Diagram Sample 1



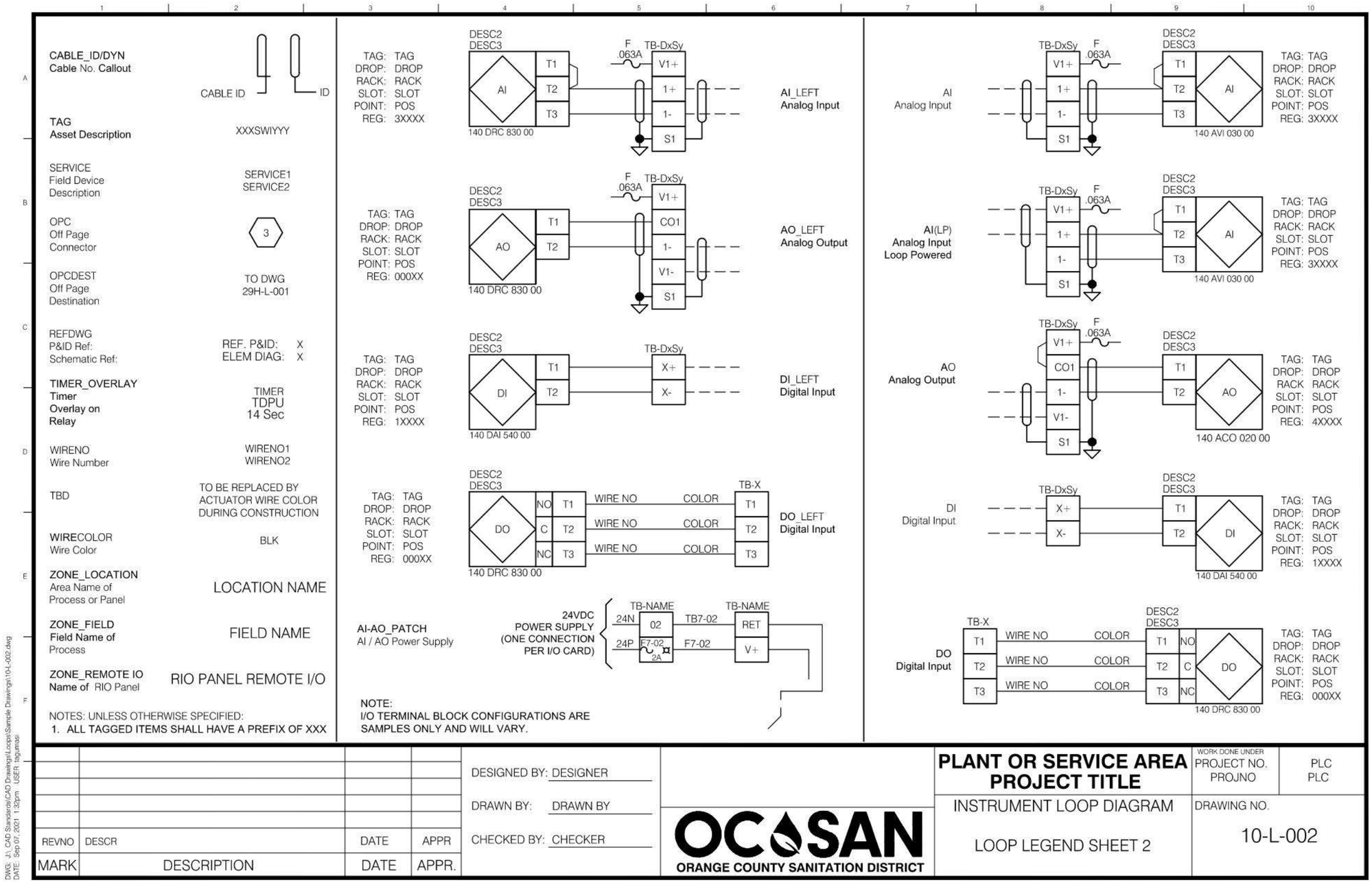
A.26 Single Line Diagram Sample 2



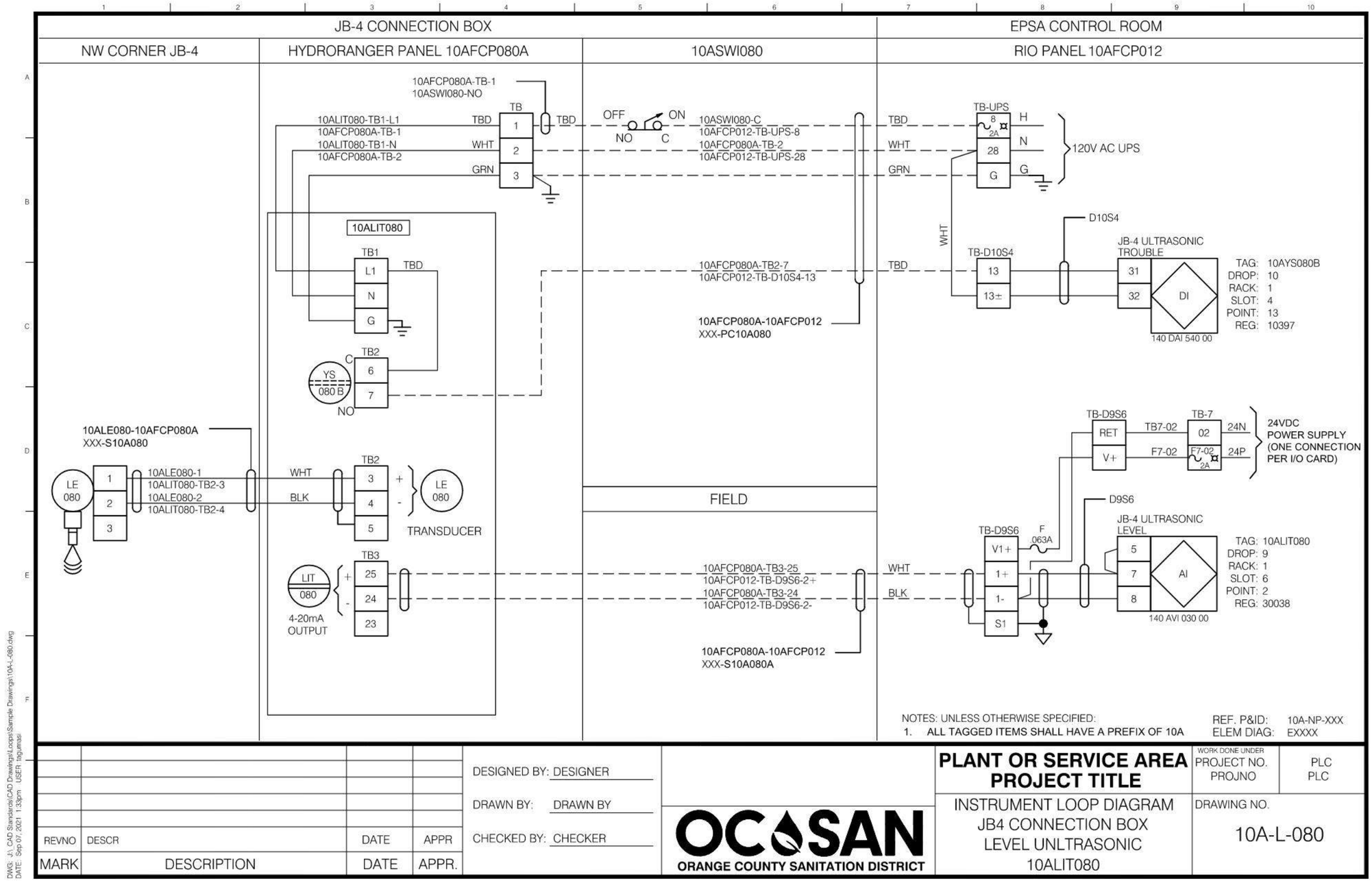
A.27 Loop Diagram Legend 1



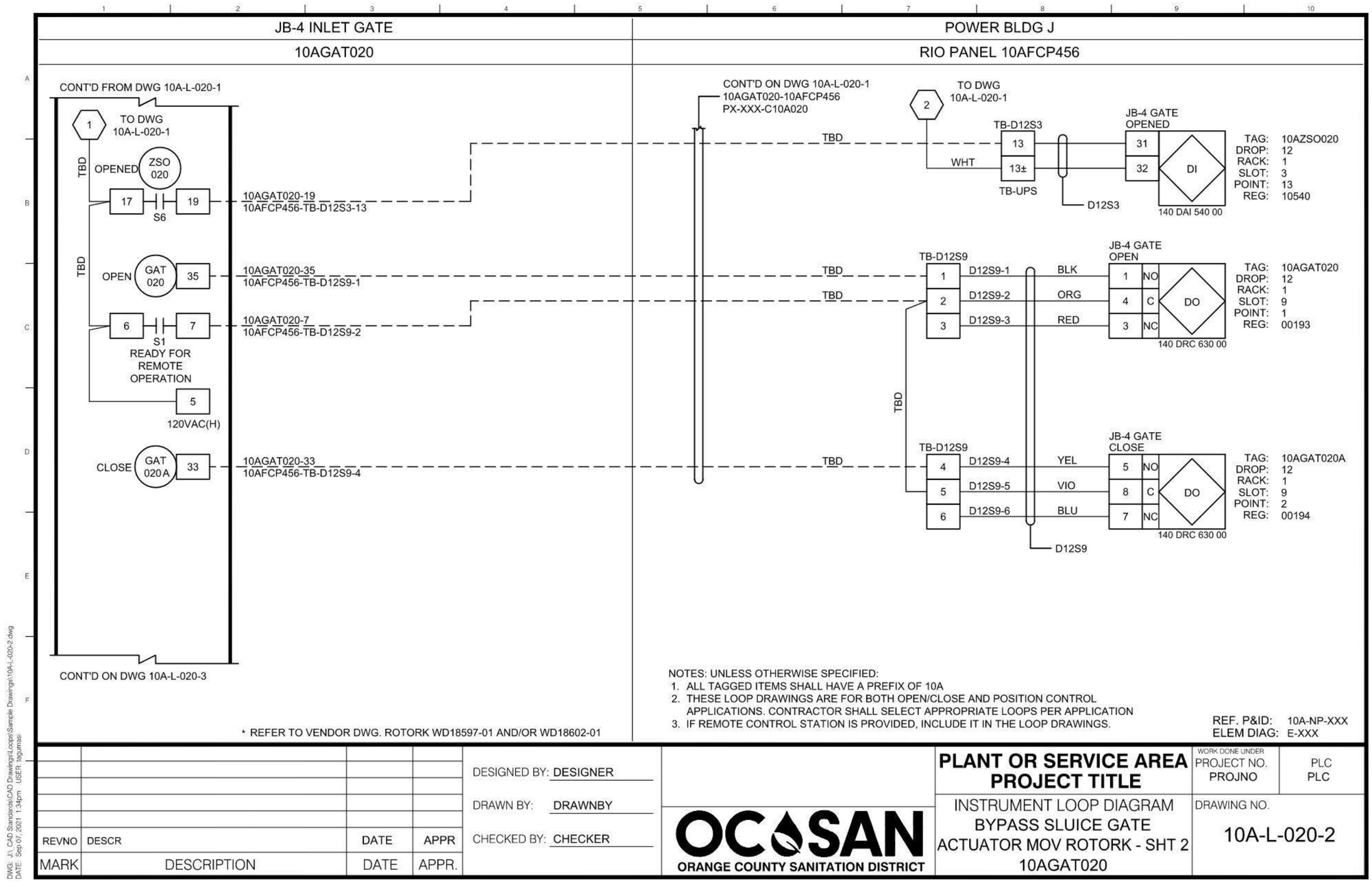
A.28 Loop Diagram Legend 2



A.29 Loop Diagram Sample 1



A.30 Loop Diagram Sample 2



B.0 APPENDIX B - STANDARD SYMBOLS

Table of Contents

B.0 APPENDIX B - STANDARD SYMBOLS 1

B.1 HISTORY OF CHANGE 2
B.2 AUTOCAD PLANT 3D PALETTES (BLOCK LIBRARIES) 3
B.3 DRAWING / AREA CONNECTORS 12
B.4 ILD BLOCK LIBRARY 13
B.5 SINGLE LINE DIAGRAM (SLD) BLOCK LIBRARY 19
B.6 STANDARD BLOCKS 19
B.6.2 Collection System Blocks 19
B.6.3 Facility (Plant based) Blocks 19

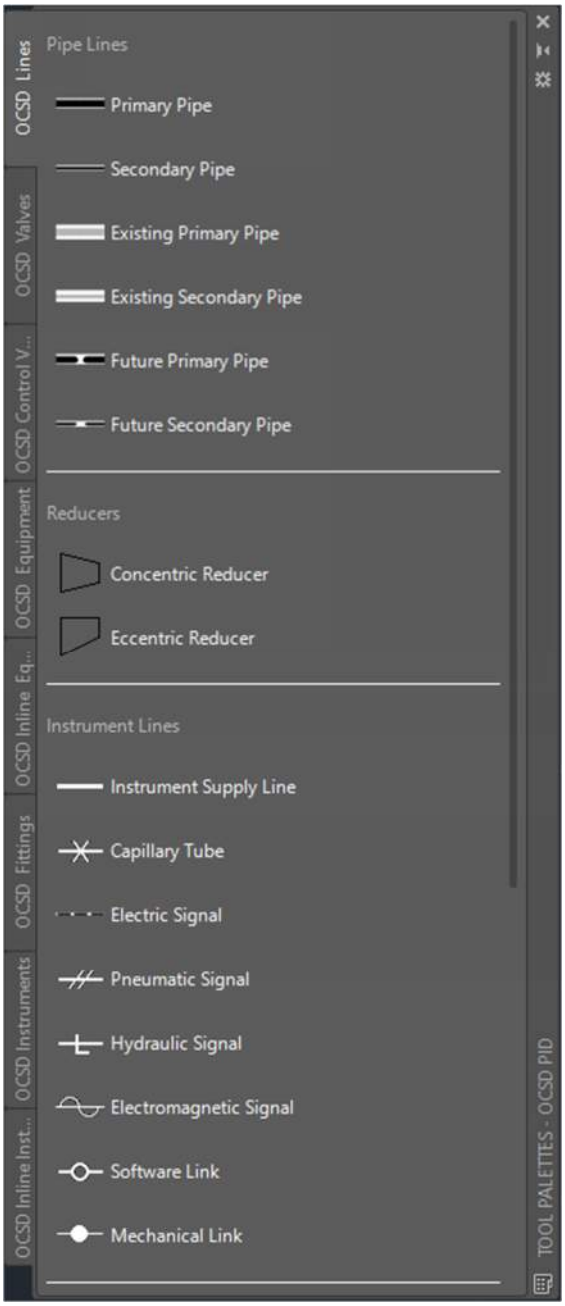
B.1 History of Change

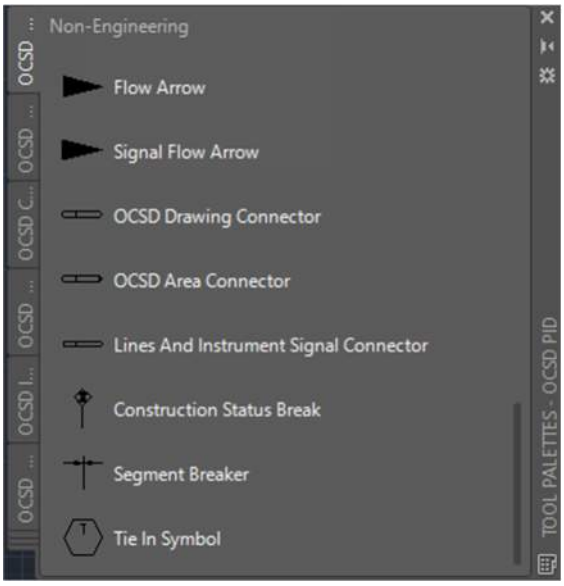
Revision and Version	***Author***	***Date***	***Change***
A1	MAB	04/24/01	Initial Release of Manual
B	MAB	3/1/06	Added ILD block library
C	SJM	07/22/10	Added AutoCAD P&ID References – Removed PDS2D references
C.1	DCR	03/02/11	Relocated Sample Drawings to Appendix A
G	ICA	08/08/16	Revised palettes
H	RVT	01/30/20	Updates and revisions to content and palettes
I	RVT	09/13/21	OCSD references to OC San. Grammatical revisions.

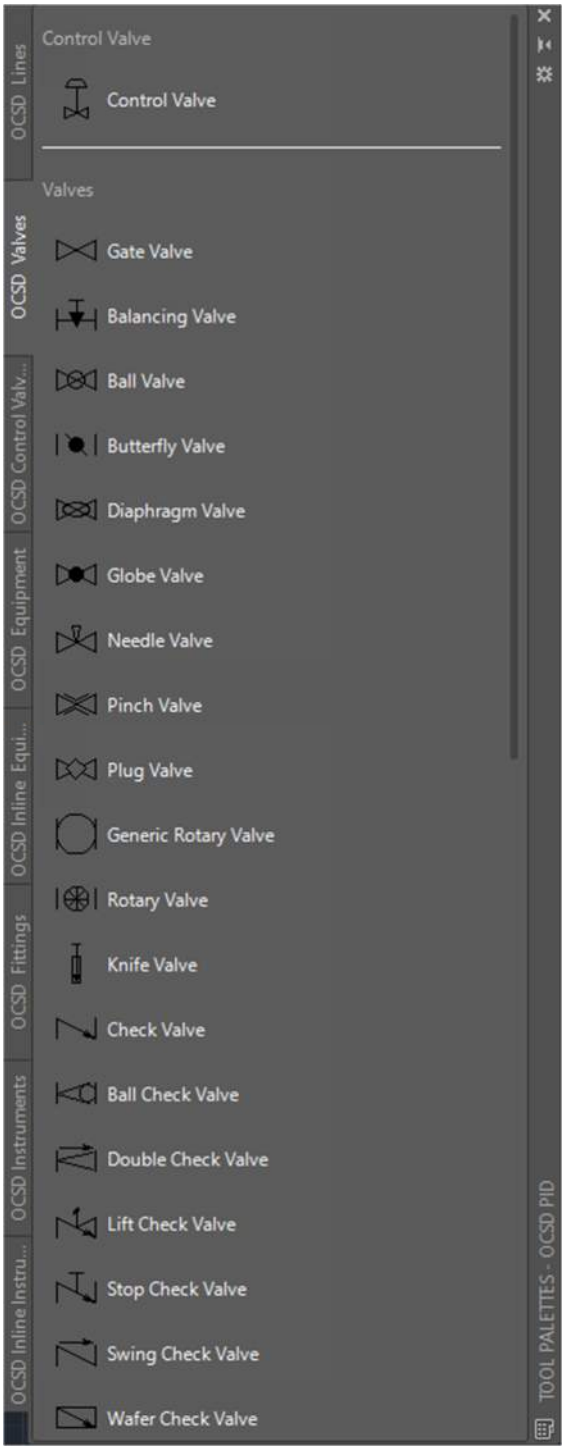
App B-Standard Symbols.docx

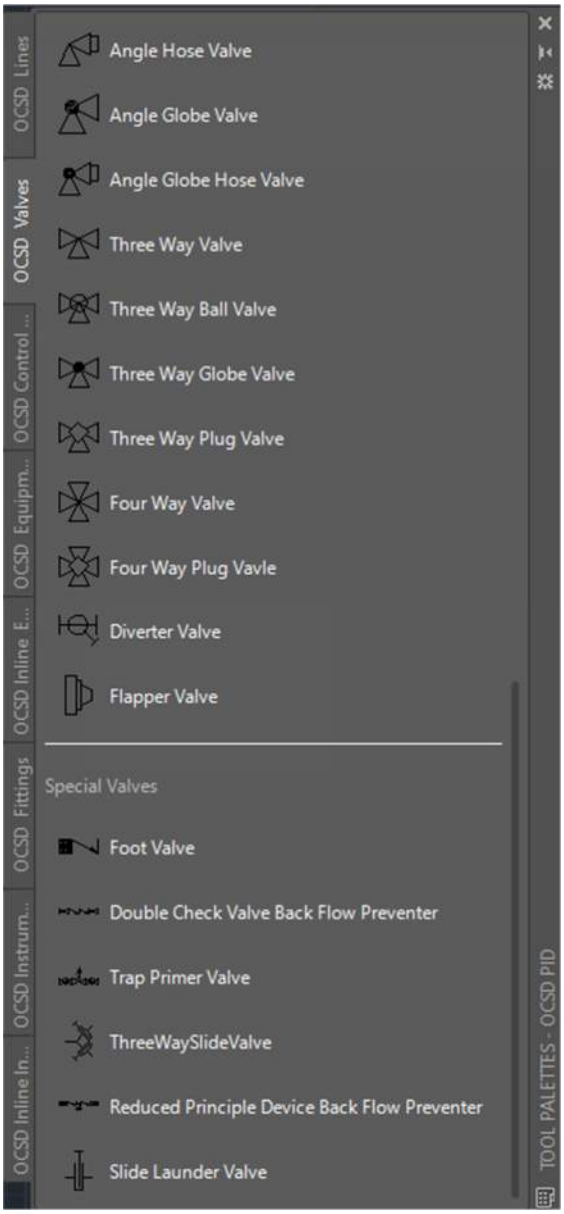
B.2 AutoCAD Plant 3D Palettes (Block Libraries)

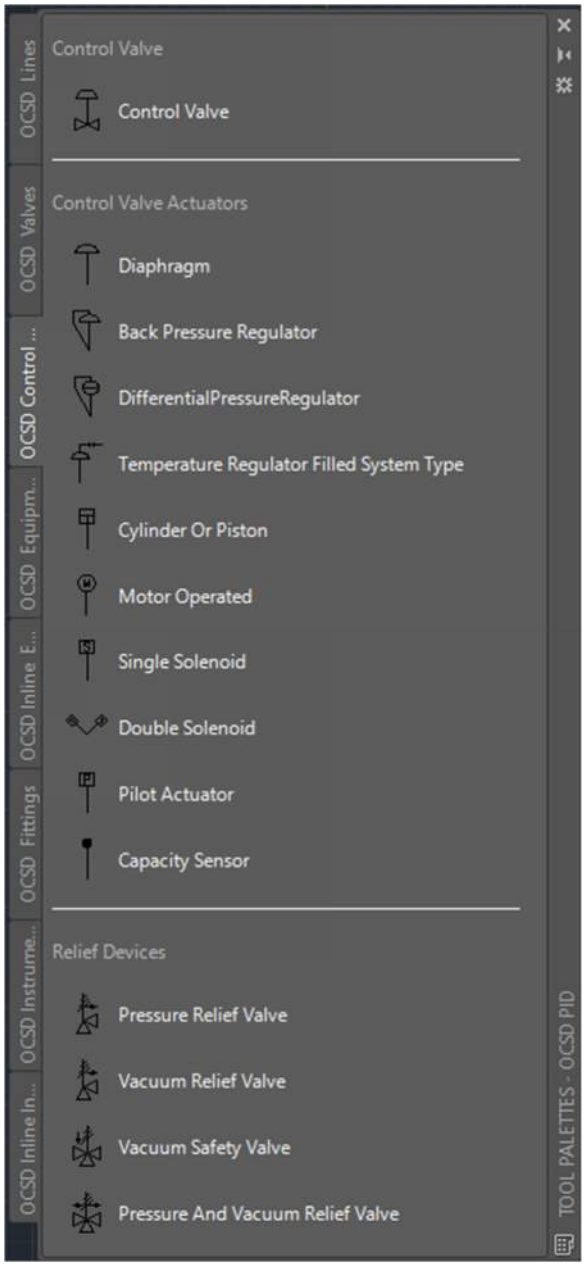
Appearance and content of palettes may vary from examples shown. Contact the OC San P&ID Subject Matter Expert (SME) for the current version of the palettes from the OC San AutoCAD Plant 3D Reference Project.

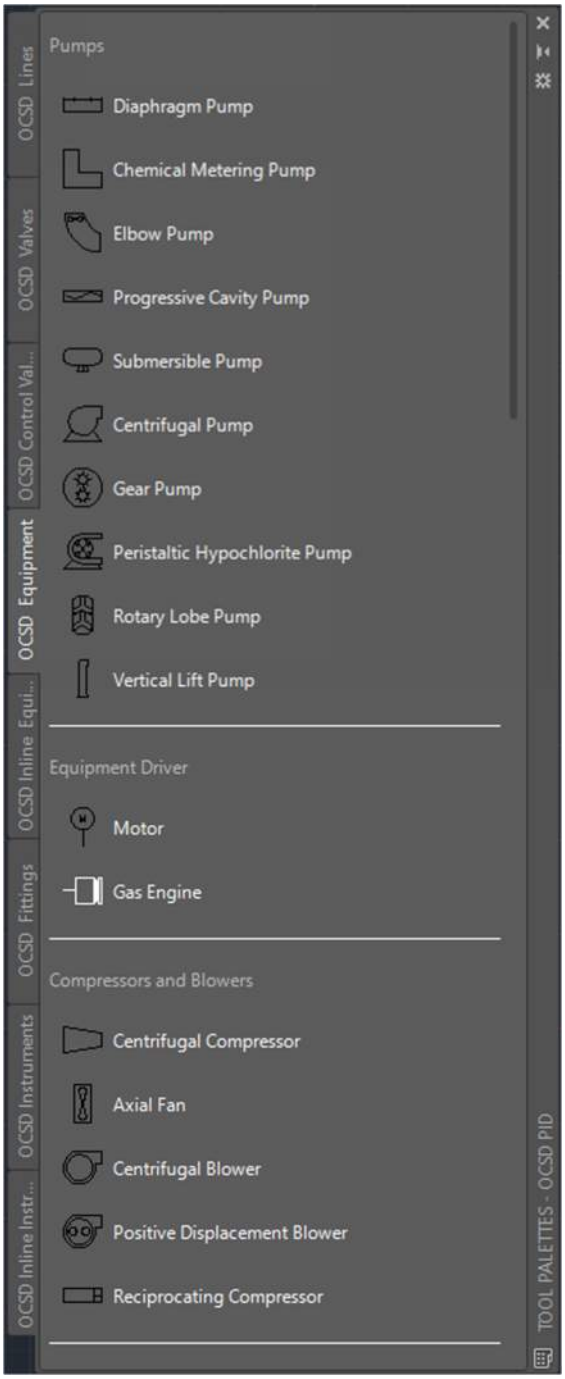


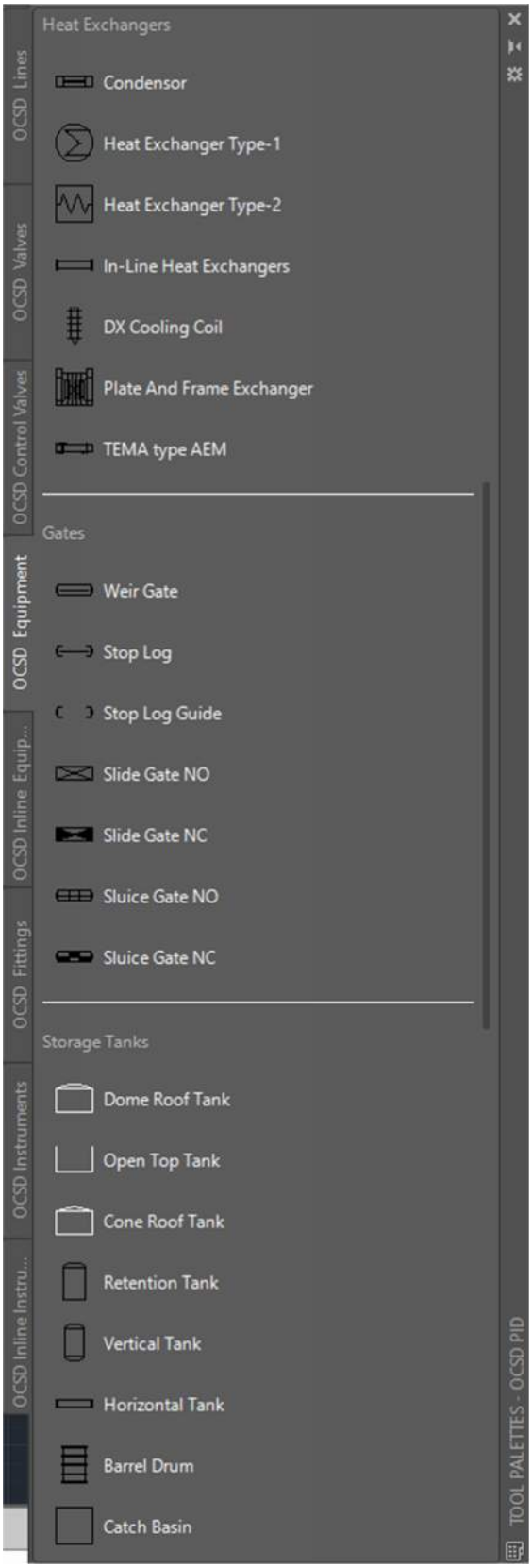


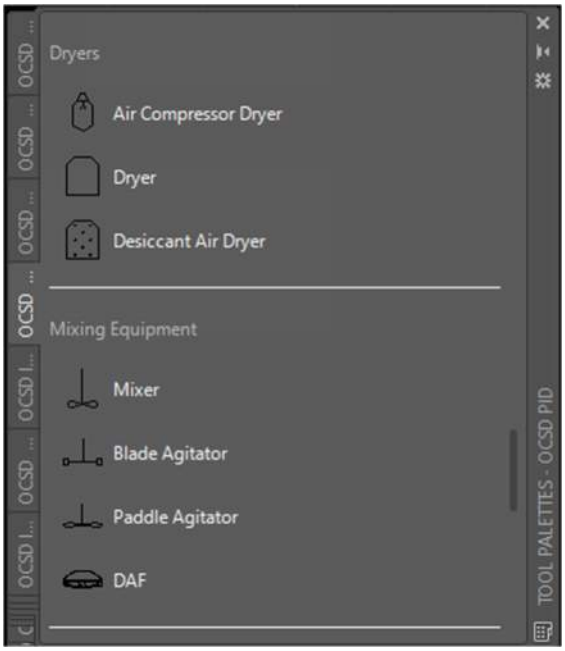

OCSD Lines
OCSD Valves
OCSD Control Valv...
OCSD Equipment
OCSD Inline Equi...
OCSD Fittings
OCSD Instruments
OCSD Inline Instru...
Control Valve
Control Valve
Valves
Gate Valve
Balancing Valve
Ball Valve
Butterfly Valve
Diaphragm Valve
Globe Valve
Needle Valve
Pinch Valve
Plug Valve
Generic Rotary Valve
Rotary Valve
Knife Valve
Check Valve
Ball Check Valve
Double Check Valve
Lift Check Valve
Stop Check Valve
Swing Check Valve
Wafer Check Valve
TOOL PALETTES - OCSD PID

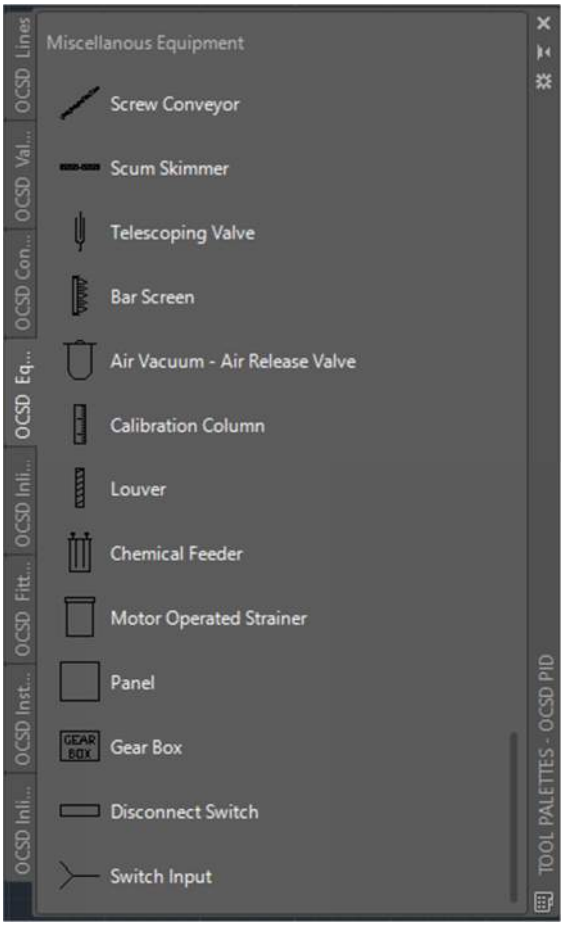

OCSD Lines
OCSD Valves
OCSD Control ...
OCSD Equipm...
OCSD Inline E...
OCSD Fittings
OCSD Instrum...
OCSD Inline In...
Angle Hose Valve
Angle Globe Valve
Angle Globe Hose Valve
Three Way Valve
Three Way Ball Valve
Three Way Globe Valve
Three Way Plug Valve
Four Way Valve
Four Way Plug Vavle
Diverter Valve
Flapper Valve
Special Valves
Foot Valve
Double Check Valve Back Flow Preventer
Trap Primer Valve
ThreeWaySlideValve
Reduced Principle Device Back Flow Preventer
Slide Launder Valve
TOOL PALETTES - OCSD PID

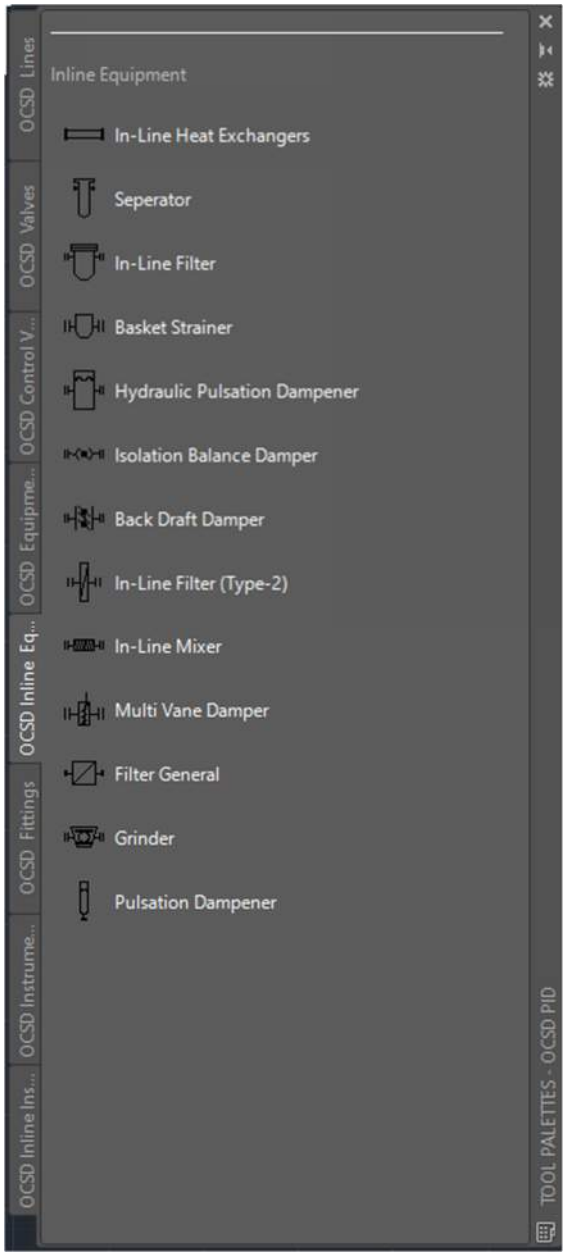

OCSD Lines
OCSD Valves
OCSD Control ...
OCSD Equipm...
OCSD Inline E...
OCSD Fittings
OCSD Instrume...
OCSD Inline In...
Control Valve
Control Valve
Control Valve Actuators
Diaphragm
Back Pressure Regulator
DifferentialPressureRegulator
Temperature Regulator Filled System Type
Cylinder Or Piston
Motor Operated
Single Solenoid
Double Solenoid
Pilot Actuator
Capacity Sensor
Relief Devices
Pressure Relief Valve
Vacuum Relief Valve
Vacuum Safety Valve
Pressure And Vacuum Relief Valve
TOOL PALETTES - OCSD PID

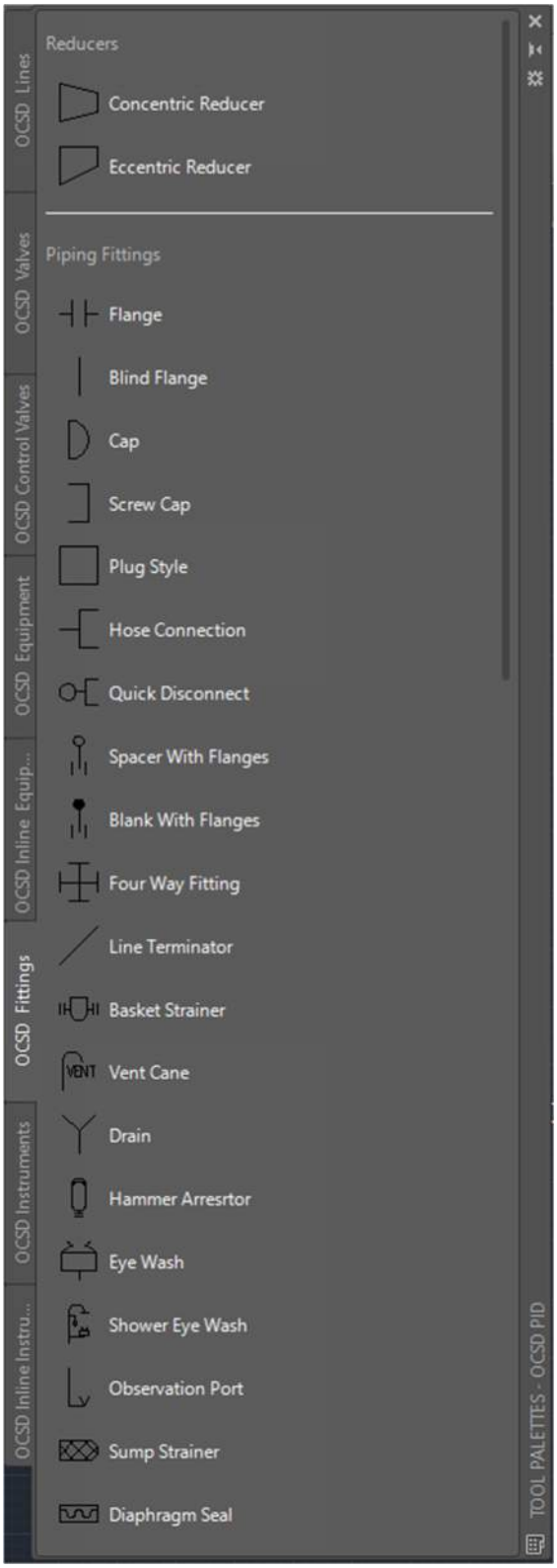

OCSD Lines
OCSD Valves
OCSD Control Val...
OCSD Equipment
OCSD Inline Equi...
OCSD Fittings
OCSD Instruments
OCSD Inline Instr...
Pumps
Diaphragm Pump
Chemical Metering Pump
Elbow Pump
Progressive Cavity Pump
Submersible Pump
Centrifugal Pump
Gear Pump
Peristaltic Hypochlorite Pump
Rotary Lobe Pump
Vertical Lift Pump
Equipment Driver
Motor
Gas Engine
Compressors and Blowers
Centrifugal Compressor
Axial Fan
Centrifugal Blower
Positive Displacement Blower
Reciprocating Compressor
TOOL PALETTES - OCSD PID

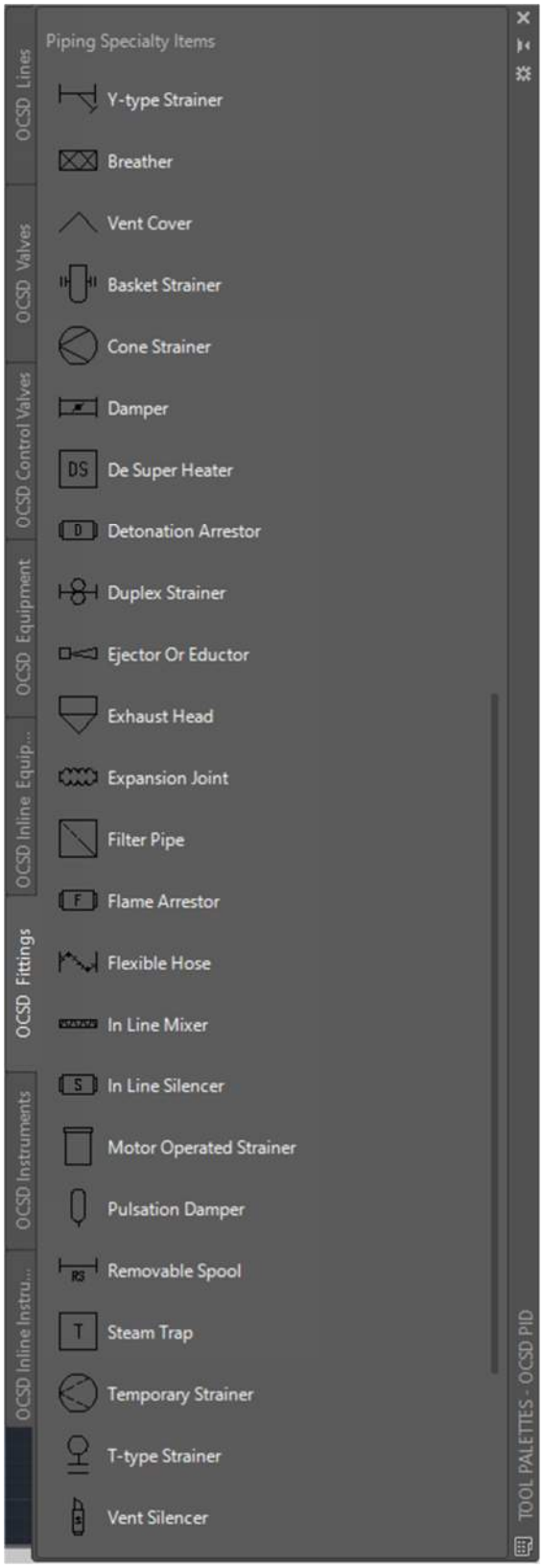

OCSD Lines
OCSD Valves
OCSD Control Valves
OCSD Equipment
OCSD Inline Equip...
OCSD Fittings
OCSD Instruments
OCSD Inline Instru...
Heat Exchangers
Condensor
Heat Exchanger Type-1
Heat Exchanger Type-2
In-Line Heat Exchangers
DX Cooling Coil
Plate And Frame Exchanger
TEMA type AEM
Gates
Weir Gate
Stop Log
Stop Log Guide
Slide Gate NO
Slide Gate NC
Sluice Gate NO
Sluice Gate NC
Storage Tanks
Dome Roof Tank
Open Top Tank
Cone Roof Tank
Retention Tank
Vertical Tank
Horizontal Tank
Barrel Drum
Catch Basin
TOOL PALETTES - OCSD PID


Dryers
Air Compressor Dryer
Dryer
Desiccant Air Dryer
Mixing Equipment
Mixer
Blade Agitator
Paddle Agitator
DAF
TOOL PALETTES - OCSD PID

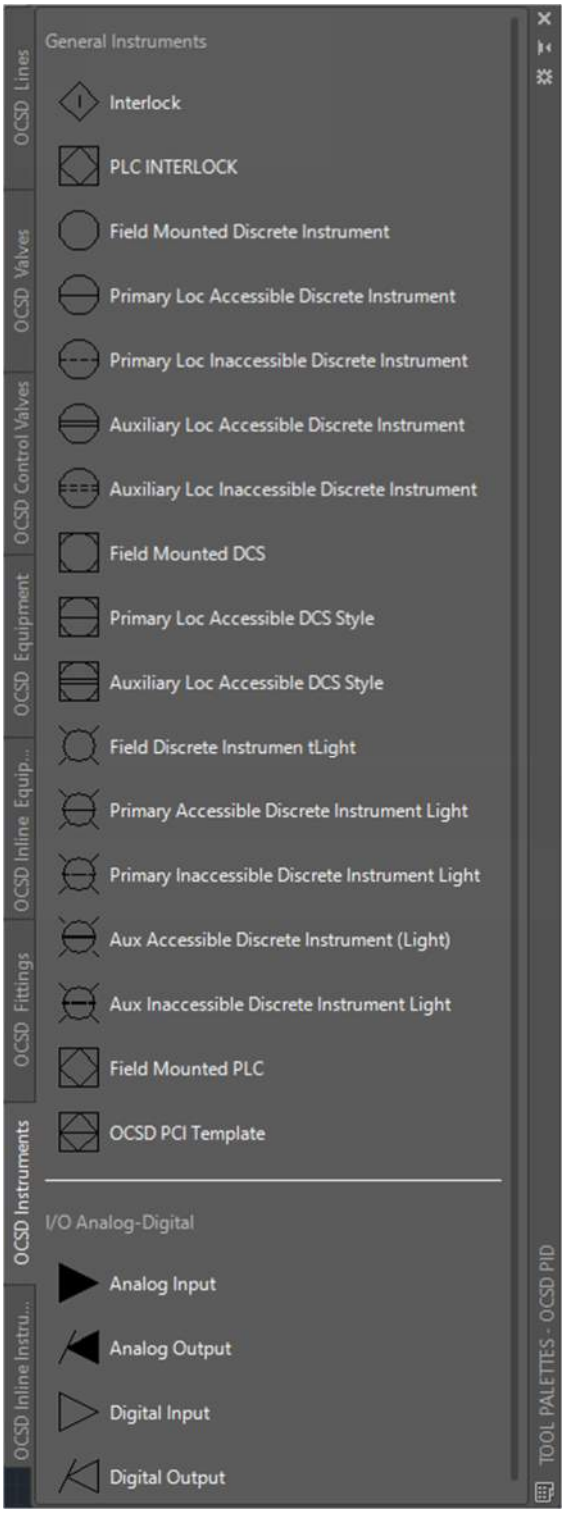

Miscellanous Equipment
Screw Conveyor
Scum Skimmer
Telescoping Valve
Bar Screen
Air Vacuum - Air Release Valve
Calibration Column
Louver
Chemical Feeder
Motor Operated Strainer
Panel
Gear Box
Disconnect Switch
Switch Input
TOOL PALETTES - OCSD PID

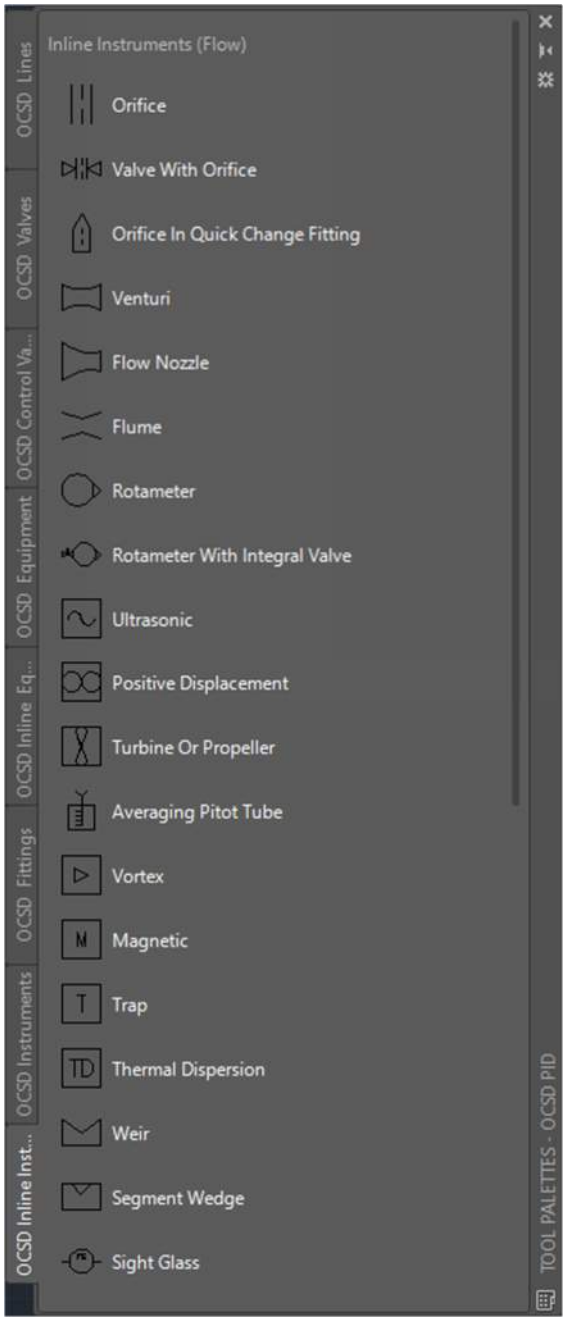

OCSD Lines
OCSD Valves
OCSD Control V...
OCSD Equipme...
OCSD Inline Eq...
OCSD Fittings
OCSD Instrume...
OCSD Inline Ins...
Inline Equipment
In-Line Heat Exchangers
Seperator
In-Line Filter
Basket Strainer
Hydraulic Pulsation Dampener
Isolation Balance Damper
Back Draft Damper
In-Line Filter (Type-2)
In-Line Mixer
Multi Vane Damper
Filter General
Grinder
Pulsation Dampener
TOOL PALETTES - OCSD PID

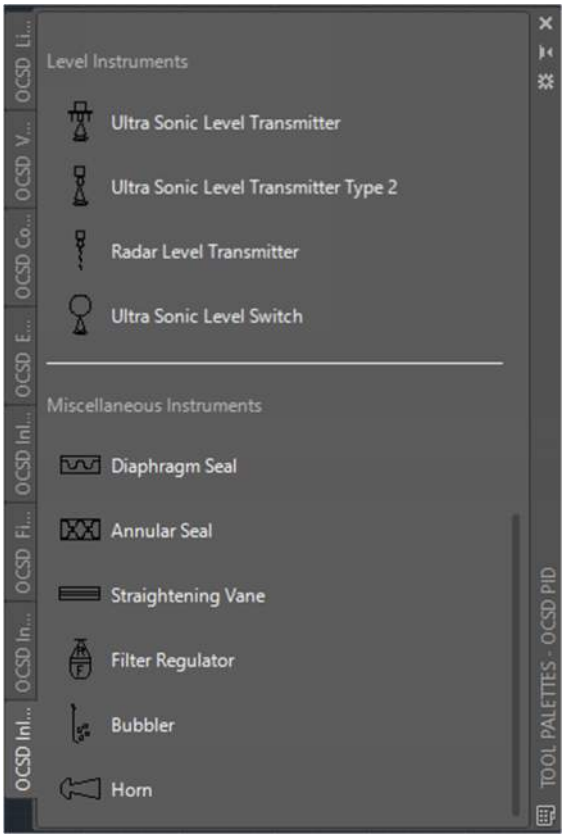

OCSD Lines
OCSD Valves
OCSD Control Valves
OCSD Equipment
OCSD Inline Equip...
OCSD Fittings
OCSD Instruments
OCSD Inline Instru...
Reducers
Concentric Reducer
Eccentric Reducer
Piping Fittings
Flange
Blind Flange
Cap
Screw Cap
Plug Style
Hose Connection
Quick Disconnect
Spacer With Flanges
Blank With Flanges
Four Way Fitting
Line Terminator
Basket Strainer
Vent Cane
Drain
Hammer Arresrtor
Eye Wash
Shower Eye Wash
Observation Port
Sump Strainer
Diaphragm Seal
TOOL PALETTES - OCSD PID


Piping Specialty Items
Y-type Strainer
Breather
Vent Cover
Basket Strainer
Cone Strainer
Damper
De Super Heater
Detonation Arrestor
Duplex Strainer
Ejector Or Eductor
Exhaust Head
Expansion Joint
Filter Pipe
Flame Arrestor
Flexible Hose
In Line Mixer
In Line Silencer
Motor Operated Strainer
Pulsation Damper
Removable Spool
Steam Trap
Temporary Strainer
T-type Strainer
Vent Silencer
OCSD Lines
OCSD Valves
OCSD Control Valves
OCSD Equipment
OCSD Inline Equip...
OCSD Fittings
OCSD Instruments
OCSD Inline Instru...
TOOL PALETTES - OCSD PID

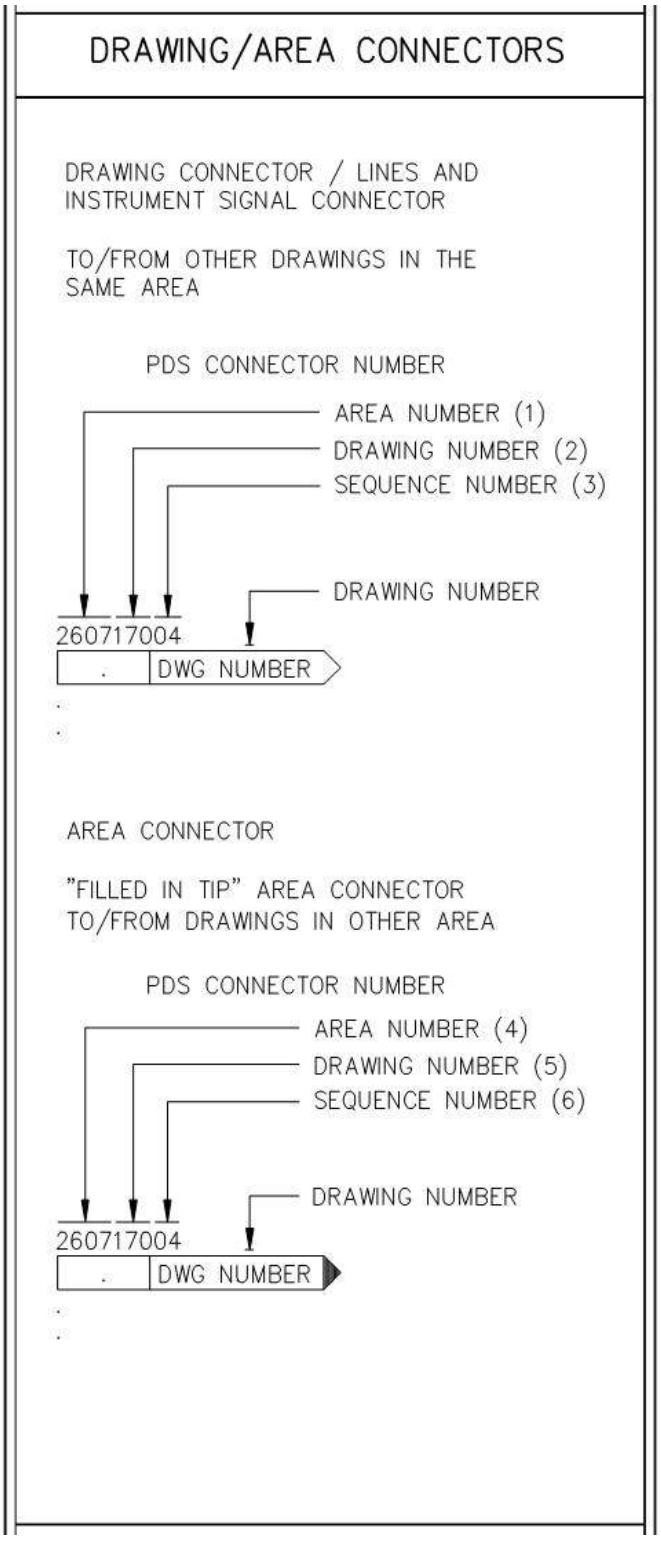

Nozzles
Flanged Nozzle
Buttweld Nozzle
Other Nozzle
Spray Nozzle
Manway or Manhole
TOOL PALETTES - OCSD PID


OCSD Lines
OCSD Valves
OCSD Control Valves
OCSD Equipment
OCSD Inline Equip...
OCSD Fittings
OCSD Instruments
OCSD Inline Instru...
General Instruments
Interlock
PLC INTERLOCK
Field Mounted Discrete Instrument
Primary Loc Accessible Discrete Instrument
Primary Loc Inaccessible Discrete Instrument
Auxiliary Loc Accessible Discrete Instrument
Auxiliary Loc Inaccessible Discrete Instrument
Field Mounted DCS
Primary Loc Accessible DCS Style
Auxiliary Loc Accessible DCS Style
Field Discrete Instrumen tLight
Primary Accessible Discrete Instrument Light
Primary Inaccessible Discrete Instrument Light
Aux Accessible Discrete Instrument (Light)
Aux Inaccessible Discrete Instrument Light
Field Mounted PLC
OCSD PCI Template
I/O Analog-Digital
Analog Input
Analog Output
Digital Input
Digital Output
TOOL PALETTES - OCSD PID


Inline Instruments (Flow)
Orifice
Valve With Orifice
Orifice In Quick Change Fitting
Venturi
Flow Nozzle
Flume
Rotameter
Rotameter With Integral Valve
Ultrasonic
Positive Displacement
Turbine Or Propeller
Averaging Pitot Tube
Vortex
Magnetic
Trap
Thermal Dispersion
Weir
Segment Wedge
Sight Glass
OCSD Lines
OCSD Valves
OCSD Control Va...
OCSD Equipment
OCSD Inline Eq...
OCSD Fittings
OCSD Instruments
OCSD Inline Inst...
TOOL PALETTES - OCSD PID

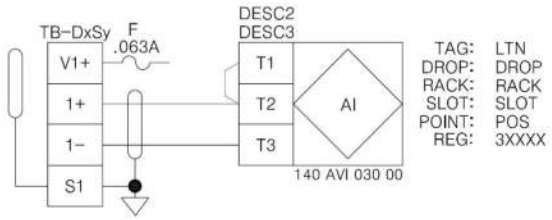
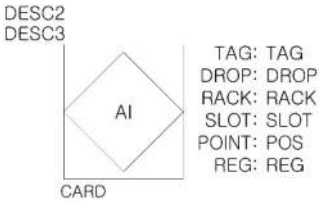
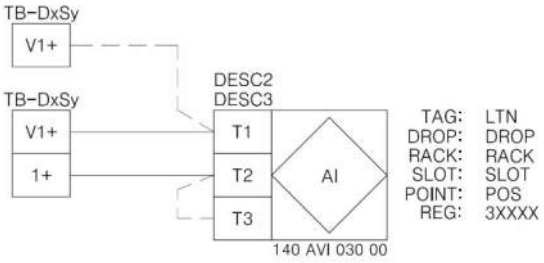
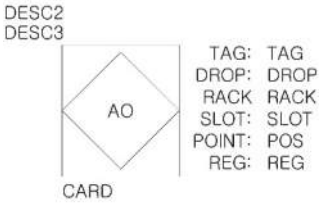
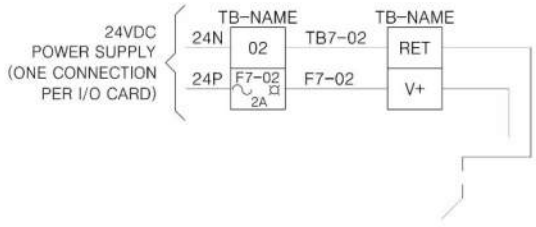
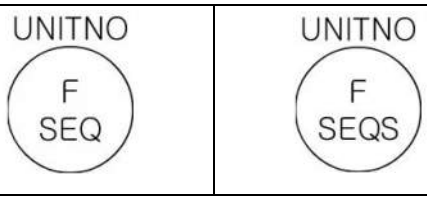

Level Instruments
Ultra Sonic Level Transmitter
Ultra Sonic Level Transmitter Type 2
Radar Level Transmitter
Ultra Sonic Level Switch
Miscellaneous Instruments
Diaphragm Seal
Annular Seal
Straightening Vane
Filter Regulator
Bubbler
Horn
OCSD Li...
OCSD V...
OCSD Co...
OCSD E...
OCSD Inl...
OCSD Fl...
OCSD In...
OCSD Inl...
TOOL PALETTES - OCSD PID

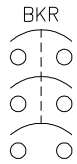
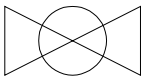
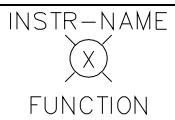
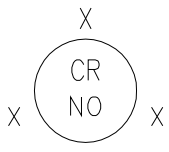
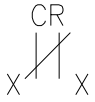
B.3 Drawing / Area Connectors

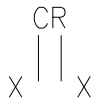
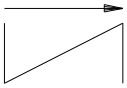
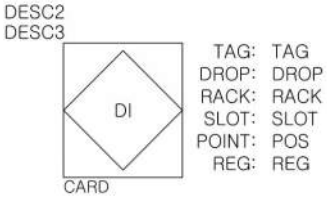
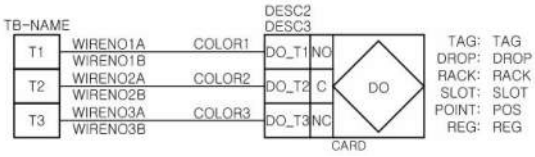
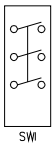
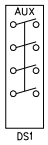
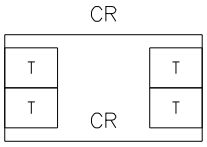
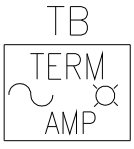


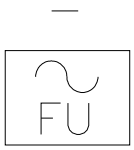
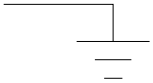
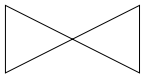
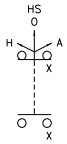
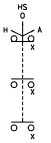
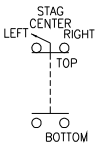
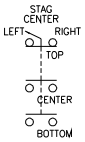
B.4 ILD Block Library

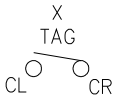
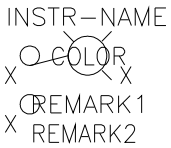
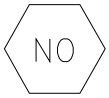
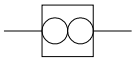
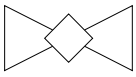
Refer to Chapter 11 for additional Instrument Loop Drawing (ILD) Information. Also see Master Spec 17405 for OC San Standard Loop Diagram Drawing System.

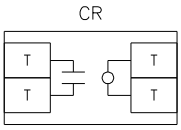
Symbol	Block Name and Description
	AI(LP).dwg Analog Input (Loop Powered) to PLC ***Note:** • I/O terminal block configuration may vary.
	AI.dwg Analog Input (Not Loop Powered) to PLC ***Note:** • AI_Left.dwg - Left oriented block is also available. • I/O terminal block configuration varies.
	AI(2P).dwg Analog Input 2-POLE to PLC ***Note:** • I/O terminal block configuration may vary.
	AO.dwg Analog Output from PLC ***Note:** • AO_Left.dwg - Left oriented block is also available. • I/O terminal block configuration varies.
	AI-AO_Patch.dwg AI / AO Power Supply
	B1.dwg Field Device Block Includes attribute for Suffix input

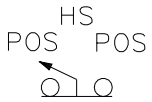
Symbol		Block Name and Description
		B2.dwg Device Block - Panel Mounted Includes attribute for Suffix input
		B3.dwg Device Block - Inside or Behind Panel Includes attribute for Suffix input
		B4.dwg Device Block – Local, Inaccessible Includes attribute for Suffix input
		B5.dwg Device Block – Local Accessible Includes attribute for Suffix input
		BKR.dwg Breaker 3Ø, 3 Wire
		BKR1.dwg Breaker 1Ø
		VALVE.dwg (Dynamic Block) Ball Valve
		CLITE.dwg Indicator Light
		CR.dwg Control Relay Coil
		CNTC_CLOS.dwg Control Relay Contact NC

Symbol	Block Name and Description
	CNTC_OPEN.dwg Control Relay Contact NO
	VALVE.dwg (Dynamic Block) Check Valve
	DI.dwg Digital Input to PLC ***Note:** • DI_Left.dwg - Left oriented block is also available. • I/O terminal block configuration varies.
	DO.dwg Digital Output from PLC (Relay) ***Note:** • DO_Left.dwg - Left oriented block is also available. • I/O terminal block configuration varies.
	DS.dwg 3Ø Disconnect
	DS1.dwg 3Ø Disconnect with Aux contact
	E-I_CONVTR.dwg E-I Converter
	FAN.dwg Fan
	FDBFI.dwg Fused terminal with blown fuse indicator

Symbol	Block Name and Description
	FUSE.dwg Fuse
	FUSE_TB.dwg Fuse (alt)
	FUSED_AMP.dwg Fused Amp
	GND.dwg Ground
	GNDSCW.dwg Ground screw
	VALVE.dwg (Dynamic Block) Gate Valve
	HOA.dwg Hand-Off-Auto Switch
	HOA1.dwg Hand-Off-Auto Switch (alt)
	HS2.dwg Two position hand switch
	HS3.dwg Three position hand switch

Symbol	Block Name and Description
	HS.dwg Pushbutton NC
	HTG.dwg Switch NO
	LITE_SWI.dwg Light (Alt)
	MAG.dwg Magmeter
	MTR.dwg Motor
	OPC.dwg Off Page Connector
	OPCDEST.dwg Sheet Connector Number
	PDISP.dwg Positive Displacement Pump
	VALVE.dwg (Dynamic Block) Plug Valve
	CABLE_ID.dwg Cable No. Callout
	CABLE_ID-DYN.dwg (Dynamic Block) Cable No. Callout (Alt)

Symbol	Block Name and Description
REF. P&ID: P&ID ELEM DIAG: ELEM	REFDWG.dwg Reference to P&ID & Elementary Drawings
	RELAY.dwg Relay (alt)
HS POS POS	SWDES.dwg Switch Description
XXXSWIYYY	TAG.dwg Asset Description
	TDON.dwg Time delay ON
	TERM_BLOC.dwg (Dynamic Block) Terminal Block 1 position
	TERM_BLOC.dwg (Dynamic Block) Terminal Block 2 positions
	TERM_BLOC.dwg (Dynamic Block) Terminal Block 3 positions
	TERM_BLOC.dwg (Dynamic Block) Terminal Block 4 positions
	TERM_BLOC.dwg (Dynamic Block) Terminal Block 5 positions
	TERM_BLOC.dwg (Dynamic Block) Terminal Block 6 positions
	TERM_BLOC.dwg (Dynamic Block) Terminal Block 7 positions

Symbol	Block Name and Description
	TERM_BLOC.dwg (Dynamic Block) Terminal Block 8 positions
	TERM_BLOC.dwg (Dynamic Block) Terminal Block 9 positions
	TERM_BLOC.dwg (Dynamic Block) Terminal Block 10 positions
	TOGSW.dwg Toggle Switch
	US.dwg Ultrasonic Level Detector
WIRENO1 WIRENO2	WIRENO.dwg Wire Numbers From-To

NOTE: Not all blocks have been included. See also Block Library and Loop Legends for additional Blocks.

B.5 Single Line Diagram (SLD) Block Library

(Refer to Appendix A)

B.6 Standard Blocks

These blocks can be used in any discipline other than Instrument Loop Diagrams, Single Line Drawings and Process and Instrumentation Diagrams. These applications have their own set of unique required blocks.

B.6.2 Collection System Blocks

(Refer to Appendix A)

B.6.3 Facility (Plant based) Blocks

(Refer to Appendix A)

C.0 APPENDIX C – AUTOCAD PLANT 3D REFERENCE PROJECT

Table of Contents

C.0 APPENDIX C - AUTOCAD PLANT 3D REFERENCE PROJECT 1

C.1 HISTORY OF CHANGE 2
C.2 AUTOCAD PLANT 3D DEFINITION OF THE REFERENCE PROJECT 3
C.3 AUTOCAD PLANT 3D USE OF THE REFERENCE PROJECT 4
C.4 BEST PRACTICE FOR P&ID'S 4

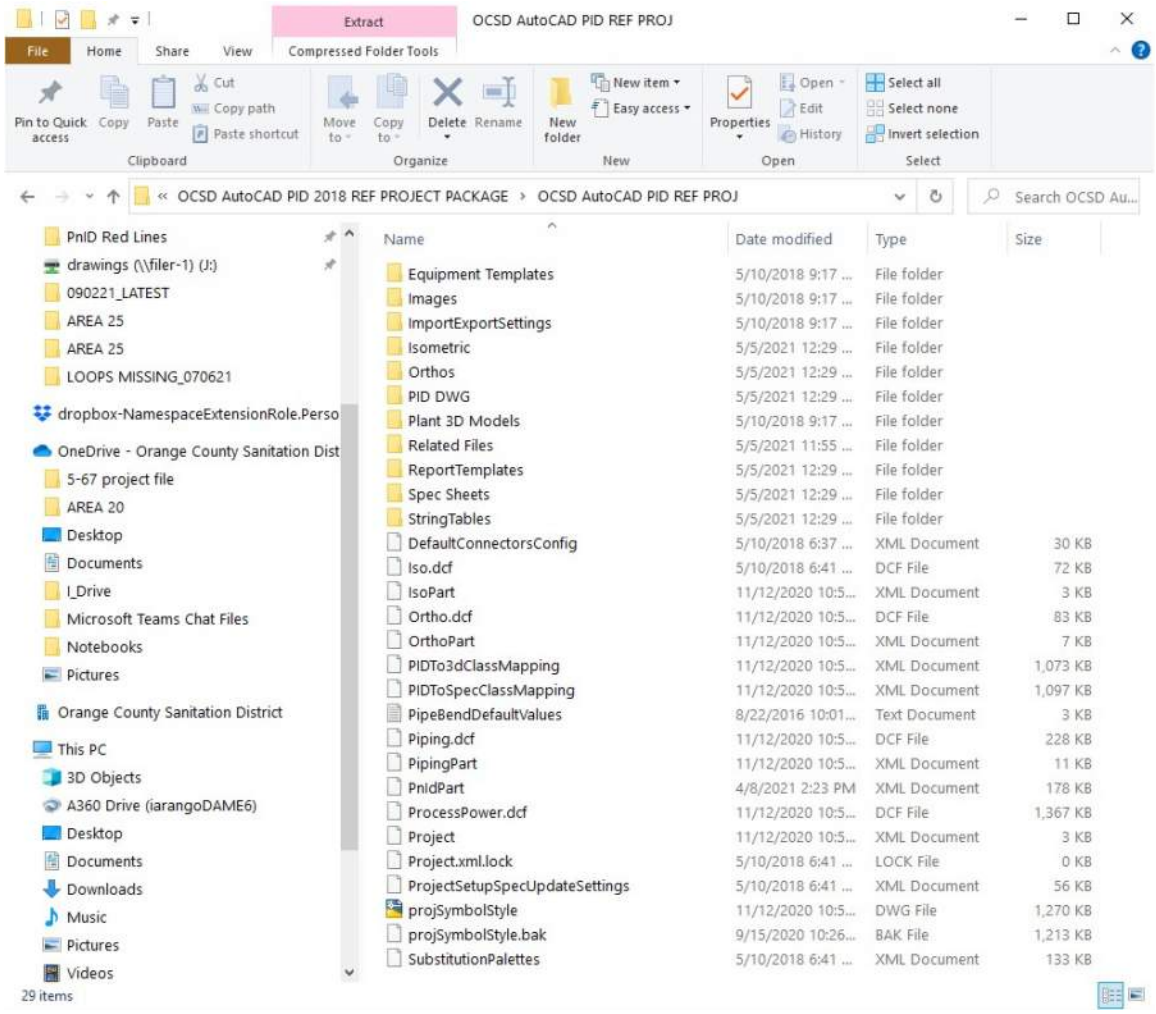
C.1 History of Change

Revision and Version	***Author***	***Date***	***Change***
A	SJM	7-22-10	New Section
B	DCR	03/02/11	Revised to show Enterprise Information Management as group responsible
H	EIM	01/30/20	Updates and revisions to content
I	RVT	09/13/21	OCSD references to OC San. Grammatical revisions.
K	EIM	04/10/25	Grammatical revisions to content update on Section C.4.

App C-AutoCAD Plant 3D Reference Project.docx

C.2 AutoCAD Plant 3D Definition of the Reference Project

AutoCAD Plant 3D is controlled by what is called a “Project”. This “Project” contains everything you need to create Process and Instrumentation Diagrams. Symbols, annotations, templates, and storage locations are part of your Project. Each Project is controlled through specific files that contain all settings, values, and other necessary information. These files are located in the project folder.



OC San has a customized version of an AutoCAD Plant 3D Project – referred to as the *“OC San AutoCAD Plant 3D Reference Project”*.

The OC San Reference Project System has the palettes, symbols, values, annotations, layering, templates, borders, etc., that are needed to produce AutoCAD Plant 3D drawings for OC San.

C.3 AutoCAD Plant 3D Use of the Reference Project

Contact OC San's EIM P&ID Subject Matter Expert (SME) for the following:

- OC San Reference Project System
- Updated version of the OC San "AutoCAD Plant 3D Functionality Documentation".

It is expected that users of AutoCAD Plant 3D have either been trained in AutoCAD Plant 3D basics and/or are familiar with AutoCAD's current version.

AutoCAD Plant 3D uses AutoCAD template files, AutoCAD symbol palettes and the "OC San AutoCAD Plant 3D Reference Project" to control layering, symbols, borders and other aspects of the drawing and database content.

Adherence to the "OC San AutoCAD Plant 3D Reference Project" and the AutoCAD Plant 3D Functionality Documentation is essential. PNID drawings and their attached database will be analyzed for CAD Compliance. See Section 8.3.1 for CAD Compliance information.

C.4 Best Practices for P&ID's

Regular interfacing with the OC San Plant 3D Subject Matter Expert (SME) will help ensure that best practice guidelines are followed. The "OC San AutoCAD Plant 3D Functionality Documentation" is the guiding force behind OC San Best Practices.

Contact the OC San P&ID SME for the latest documentation and the OC San Reference Project System.

The OC San SCADA Administration Tool (SAT) database will be compared to the database information that is contained in the AutoCAD Plant 3D drawings. It is essential that the correct annotations are used with the appropriate symbols, so the database is populated properly as the drawing is generated.

See Chapter 8.3.1 for CAD Compliance information. Refer to Chapter 9.2 for detailed requirements on the following:

Instrumentation related:

- For instrumentation located on a panel – Enter the Panel Tag Number in "Location" column of the Data Manager for each instrument on the panel.

Input/Output related:

- Tags must be complete for all IO in a drawing. (No question marks can be apparent in the TAG column relating to IO in the database.)
- IO Tag and Desc3 annotations must be used for all occurrences of IO symbols in a drawing.
- Desc2 column in the Data Manager must be populated related to all IO in a drawing.

Equipment related:

Best practices for AutoCAD Plant 3D suggest that equipment is placed first and that lines are connected afterwards.

Add an annotation to equipment by right clicking the equipment and selecting the Annotate option. You will be presented with available annotations for that specific piece of equipment. Select the desired annotation and place it at the desired location in the drawing.

D.0 APPENDIX D – CAD STANDARDS COMPLIANCE CHECKLIST

Table of Contents

D.0 APPENDIX D – CAD STANDARDS COMPLIANCE CHECKLIST 1

D.1 HISTORY OF CHANGE 2
D.2 CAD STANDARDS COMPLIANCE CHECKLIST 3

D.1 History of Change

Revision and Version	***Author***	***Date***	***Change***
G	BAW	08/08/16	New Appendix
H	EIM	01/31/20	Updates and revisions to checklist
I	RVT	09/13/21	OCSD references to OC San. Grammatical revisions.
K	TAC	05/29/24	BIM Design Documentation. Coordination Models. Updates to Facility Model and use of GIS for BIM.

App D-CAD Standards Compliance Checklist.docx

D.2 CAD Standards Compliance Checklist

OC San CAD Standards Compliance Checklist		
Section	**Standard**	**Complies**
Chapter 2 - Design Systems and Drawings		
2.2.1	Construction drawings are created with AutoCAD software	
2.2.2	P&IDs are created with AutoCAD Plant 3D software	
2.4.1	Base Maps have not been modified	
2.4.2	Baseline Model files have not been modified	
2.4.3	Proposed design linework is contained in Project Model files	
2.4.4	Each composite drawing file contains a single layout (plan sheet)	
2.4.4	Annotation for the models are created in the paper space of the composite drawing	
2.4.5	Each AutoCAD sheet has the border file overlaid as an Xref in paper space	
2.5.1	Xref files are attached using the "overlay" method	
2.5.2	Xref files are attached using a relative path	
2.5.3	All Xref files should be loaded or detached for submittals	
2.6	Baseline Model files and Project Model files are separated by discipline	
2.7	Model files are drawn at "full size" in imperial units	
2.7	The model is drawn at the correct coordinates	
2.8	Model files are not rotated	
2.8	Viewports in composite sheets are not rotated by greater than 90 degrees	
2.9	Composite sheets are set to plot to a saved page setup	
2.9	OC San standard page setup is used	
2.10	Files are organized according to the standard file structure	
Chapter 3 - File Naming Convention		
3.3	Baseline Model files are correctly named	
3.3	Project Model files are correctly named	
3.4	Composite drawing files are correctly named	
3.5	Instrumentation drawing files are correctly named	
3.6	Project Border files are correctly named	
3.7	Scanned drawing files are correctly named	
Chapter 4 - Layer Conventions		
4.2	Layer names follow the correct format	
4.3 - 4.13	Drawing objects are created on the appropriate layers	
Chapter 5 - Graphic/file Standards		
5.2	Layers use appropriate lineweights	
5.3	Layers use appropriate linetypes	
5.3	AutoCAD Linetype scale (LTSCALE) is set 0.5	
5.3	AutoCAD Paper space line type scale (PSLTSCALE) is set to 1	
5.4	The current plot style table is set to OCSAN.stb (AutoCAD)	
5.4	Appropriate plot styles are selected for each layer (AutoCAD)	
5.5	Viewports are set to appropriate drawing scales	
5.5	Viewport scales are locked (AutoCAD)	
5.6	OC San standard text styles are used	

5.6	Text styles are used appropriately	
5.7	OC San Standard dimension styles are used	
5.8	OC San Standard multi-leader styles are used	
5.9	The appropriate sheet size is used	
5.9.2	The appropriate title block is used, and title block data is complete	
Chapter 6 - Drawing Set Organization		
6.2	Composite sheets are correctly named	
6.2	Composite sheets are correctly ordered by sheet number within each discipline	
6.3	Sheets are correctly ordered by discipline	
Chapter 7 - Deliverables and Data Exchange		
7.3.1	CAD files are readable in OC San's CAD environment	
7.3.1	All supporting files are present	
7.3.1	Drawing does not contain extraneous graphics, geometry, annotation, etc.	
7.3.4	P&ID files are readable by AutoCAD Plant 3D	
7.3.5	PDF files are readable with a pdf viewer and correspond to CAD sheets	
7.4	Usage of suggested steps and best practice in the creation of PDF files was followed	
7.5	PDF sheets are created at full size	
Chapter 8 - CAD Standard Implementation Tools		
8.2	OC San provided drawing templates have been used	
Chapter 9 - Process & Instrumentation Diagrams (P&ID)		
9.1	P&IDs are created with AutoCAD Plant 3D software	
9.3.1	Each TAG label contains the required data	
9.3.3	Standard I/O symbols are used	
9.3.3	Each I/O symbol label contains the required data	
9.3.4	Each Equipment Description label contains the required data	
9.3.5	Each Valve label contains the required data	
9.3.6	Each Piping label contains the required data	
9.3.7	Off-page connectors are used correctly	
9.3.8	Template and border drawings are used correctly	
9.3.9	Symbols used are from the OC San P&ID reference project	
Chapter 10 - Single Line Diagrams (SLD)		
10.2.2	Border file is correctly used as an external reference	
10.2.3	OC San provided drawing templates have been used	
10.2.4	OC San provided blocks are used and attributes are correctly entered	
10.3.1	Drawing uses proper page setup per Section 2.9	
10.3.2	Appearance of SLDs is created similar to OC San Baseline SLD Sample Dwgs	
Chapter 11 - Instrument Loop Diagrams (ILD)		
11.2.2	Border file is correctly used as an external reference	
11.2.3	OC San provided drawing templates have been used	
11.2.4	Drawing zones are used correctly	
11.2.5	OC San provided blocks are used and attributes are correctly entered	
11.3.1	Drawing uses proper page setup per Section 2.9 (PDF 17x11)	
11.3.1.1	Drawing Filename and Drawing numbers match	

11.3.1.2	Only ONE tag number representing primary device is used on third line of title	
Chapter 12 – Instructions for drawing updates from Bid Set through Record Drawings		
12.2	Addendums drawing changes have been updated correctly	
12.3	Conformed drawing changes have been updated correctly	
12.4	Construction changes have been updated correctly	
12.5	Record drawing changes have been updated correctly	

E.0 APPENDIX E – BUILDING INFORMATION MODEL QC CHECKLIST

Table of Contents

E.0 APPENDIX E – BUILDING INFORMATION MODEL QC CHECKLIST 1

E.1 HISTORY OF CHANGE 2
E.2 CHECKLIST 3
E.3 AUTOMATED CHECKING 4

E.1 History of Change

Revision and Version	***Author***	***Date***	***Change***
K	TAC	05/29/24	New matrix table of manual and automated Quality Control checks for BIM.

App E-Building Information Model QC Checklist.docx

This appendix describes the required model checks at key design milestones.

E.2 Checklist

Audit Checklist for Revit Projects

The following criteria should be checked prior to each design submittal. Any items not achieved for the DS3 submittal to be addressed (completed and checked) PRIOR To the final drawings.

AUDIT CHECK	Method of Checking	DS1 (or first 3D submittal)	DS2	DS3 & FINAL
For each Revit model, Worksharing is enabled.	Manual	☒	N/A	N/A
Each linked file is on a dedicated workset	Manual	☒	N/A	N/A
Each linked file is pinned in place	Both	☒	☒	☒
Coordination Review Warnings are resolved	Manual	☒	☒	☒
Levels and Grids are copy/monitored	Manual		☒	☒
Site Survey Point is a known State Plane Coord.	Manual		☒	☒
Project Parameters are only those from OC San	Automated		☒	☒
Shared Parameters conform to OC San standard	Automated		☒	☒
Design Options are resolved at milestone	Manual	☒	☒	☒
Modeled information is accurate to project phase	Manual	☒	☒	☒
Equip. Attribute Data Conforms to EID Standard	Automated	☒	☒	☒
Required Attribute Data Exists for all instances	Automated		☒	☒
Unused Schedules and Model Views Removed	Both			☒
Revit Warnings are below 100 total line items	Both	☒	☒	☒
AutoCAD references are Linked; NOT Imported	Both	☒	☒	☒
Non-standard families are approved by OC San	Manual	☒	☒	☒
A 3D View entitled ‘Navis’ exists in the model	Automated		☒	☒

Table E.1: QC Checklist for Revit Project

E.3 Automated Checking

The consultant will be responsible for running the automated checking from within Autodesk™ Revit™ using the checksets provided by OC San, at intervals required in the project specific plan.

The consultant will provide copies of the model check report(s) to the OC San PMO.