



Seattle City Light

DRAFTING AND AutoCAD REQUIREMENTS FOR CONSULTANTS



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10/27/2023

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10/27/2023

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1. Introduction

This Drafting and AutoCAD requirements for Consultants is a guideline for Consultant(s), Contractor(s) and/or Design-Build Contractor(s) who are performing engineering design and Computer-aided-drafting (CAD) services for the City of Seattle, Seattle City Light (SCL) Engineering and Technology Operation Division. The purpose of Drafting and AutoCAD Requirements guideline is for the standardization of SCL drawing information and consistency for all new drawing sets. Adherence to these title and format standards is required in order for SCL's Electronic Document Management System (EDMS) to integrate new drawings into an archive of more than 280,000 drawings.

Prior to starting the design and drafting phase, an intake meeting between the SCL Technical Resources, Project Manager, Project Engineers, and the Consultant CAD Team is highly recommended to begin with researching existing drawings, survey base maps, 3D laser scans as well as to ensure a clear understanding of this Drafting and AutoCAD requirements guideline to effectively complete the design drawing for submittal at each phase.

All drawings and drawing files become property of Seattle City Light when the work is completed, unless expressly agreed otherwise by SCL.

2. Software

Seattle City Light currently uses the following CAD and GIS software products:

- AutoCAD
- AutoCAD Map 3D
- AutoCAD Inventor
- AutoCAD Civil 3D, Civil 3D Survey
- AutoCAD Electrical
- AutoCAD Plant 3D
- Autodesk Revit
- Autodesk Advance Steel
- ESRI ArcGIS
- FARO Scene

- Leica Cyclone 3DR

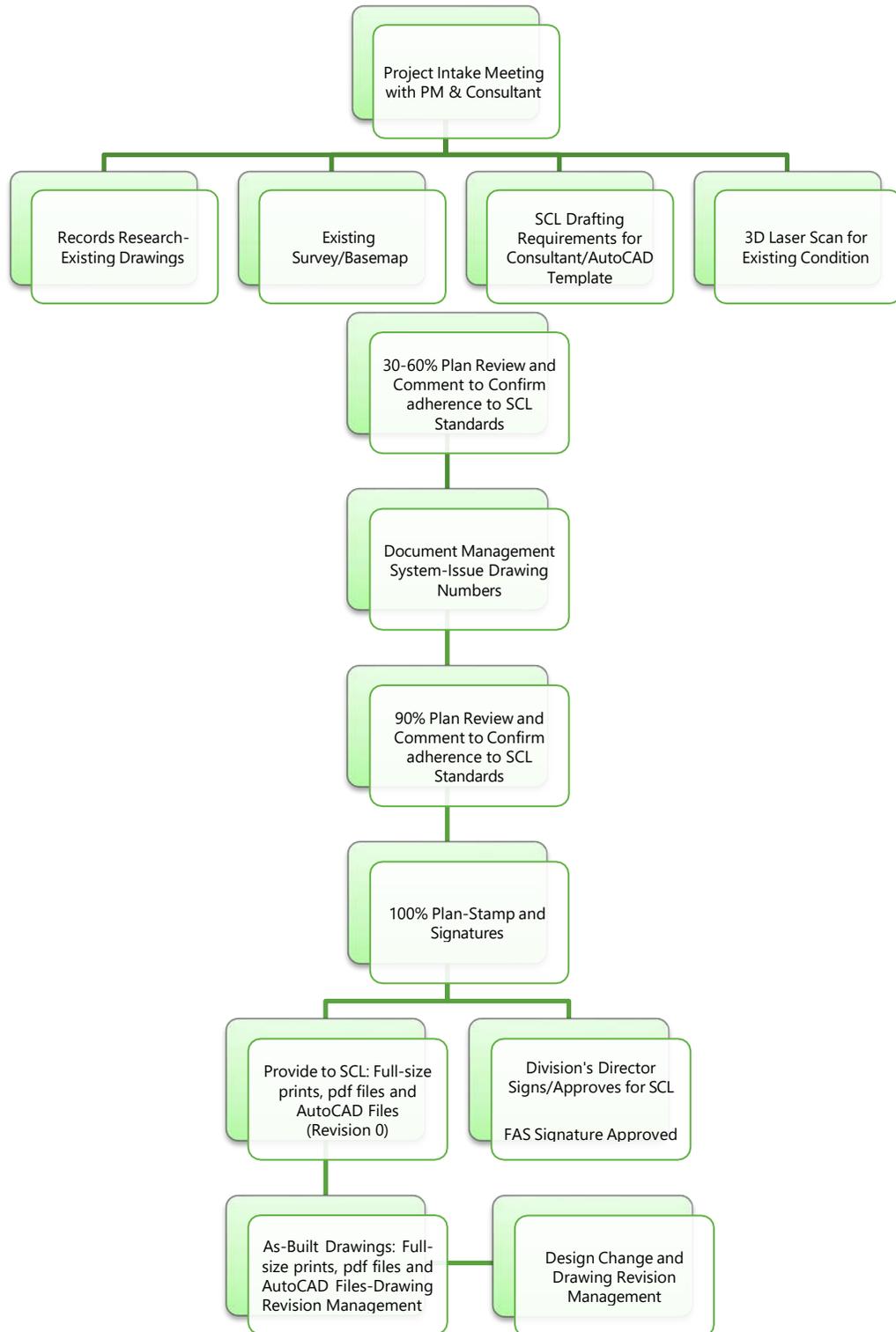
The current software version required by SCL will change from time to time. Therefore, please refer to the specific project contract or contact the Project Manager and SCL Technical Resources for guidance regarding version and submission requirements.

All new projects must use the latest version of the SCL drawing template, and supported blocks. Please coordinate with SCL Technical Resources for the current drawing template(s) and supporting files prior to beginning any SCL projects.

Advanced integrated design software other than AutoCAD may be used with prior SCL approval. The submittals and other drafting requirements of this standard must still be met. Design using 3D models created in Revit, AutoCAD Plant 3D, Civil 3D or Solidworks must also be provided to SCL after the project is completed.

3. Workflow for a Typical Consultant Project

The diagram below shows the workflow for a typical Consultant project.



4. General Requirements

4.1. AutoCAD dwg files

All CAD drawings shall be prepared in AutoCAD. If the drawings are prepared by other CAD software, they must be converted to dwg format with standard AutoCAD entities and objects.

4.2. 3-dimensional Models

3-dimensional design models shall be done in 1:1 scale. Layers should be used for different discipline's scope. Multiple models for a single project are not permitted without approval. Existing models shall be x-referenced into the model and not changed without SCL permission. Design models from Manufacturers shall not be changed without notice to SCL Engineering and approval.

Models' accuracy shall be 1/8 inch or less for equipment and 1/16 inch or less for structures. Point clouds used in models shall be reduced to the minimum size possible.

4.3. Scale and Units

All scaled drawings shall be drawn at true scale and true coordinates in model space. Civil drawings such as plan views, profile, cross sections, details shall be drawn at full scale in engineering units such that one drawing unit equals one foot. Structural, Mechanical, Electrical and Architectural may use architectural units such that one drawing unit equals one inch. Mechanical fabrication drawings shall be in decimal inches for machined components and fractional inches for piping fabrications or supports. Tolerances for mechanical drawing must be shown on the drawing with the dimensions or by standard tables.

The SCL title border shall be inserted in paper space at 0,0,0.

4.4. External References

All external references "Xref" drawings shall be overlaid into the sub sheet at 0,0,0. This is permitted during the design phases only, 30%, 60% and 90% design phases. At final phase 100% submittal, all external references "Xref" files must be bound as blocks to each individual drawing file. No xref should be remained on the IFC/IFB drawings.

4.5. Images

Consultant shall avoid using background images (raster images) such as jpeg, tiff, pdf, png in drawings, if possible. If images are required, they shall be inserted into the drawings as embedded objects by using Insert OLE. If images cannot be inserted into the drawings as embedded objects, the consultant shall provide the image file(s) when submitting the final drawings to SCL.

4.6. Electronic file and Layouts

Electronic AutoCAD files shall match exactly with the printed submittal package delivered to SCL. There shall be no difference in contents between hard copies and electronic files.

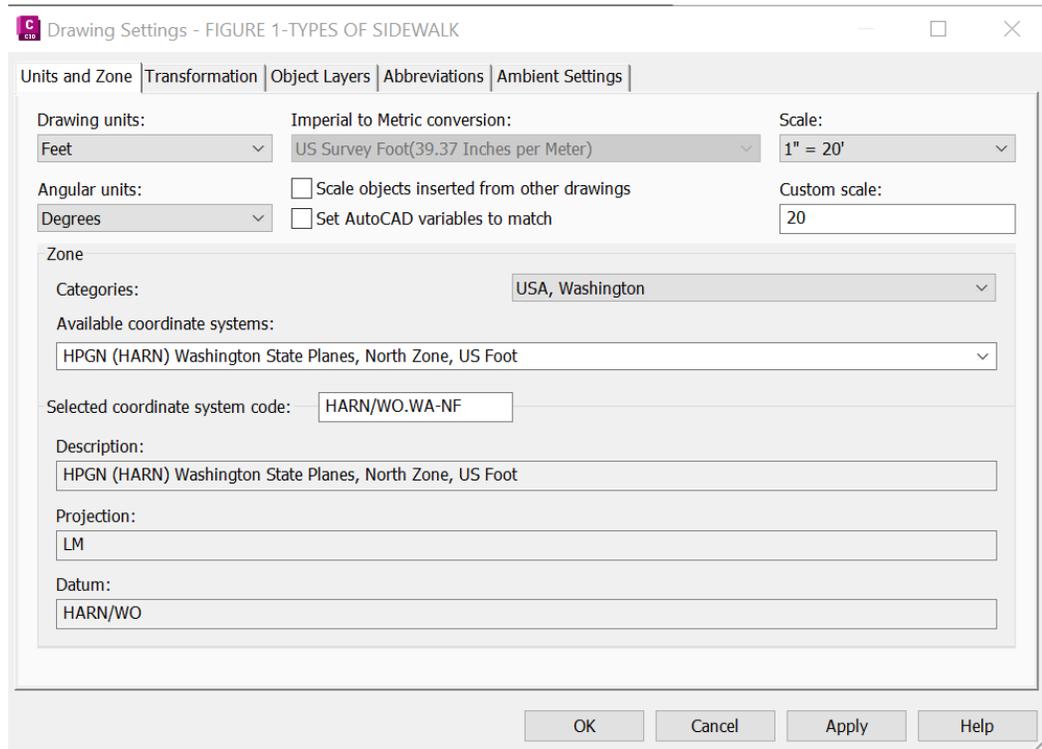
Each drawing file shall contain only one layout. Multiple layout tabs in the single drawing file are not acceptable.

4.7. North Arrow and Site Plan

All site plan drawings shall utilize the same coordinate system used in the original survey drawing. The survey base data shall remain throughout all phases of the project. All site plans shall be prepared at their true geo-reference locations and drawing settings shall be matched with the current datum on the original survey drawings.

The North Arrow should be placed in the upper right of all plan views. Preferably, all north arrows should point to the top of the drawing. If this is not possible, it should point to the left or right. It is not recommended to point the arrow down, except in limited circumstances.

Civil drawings shall be set with Units and Zone to match with the original survey drawing datum.



5. Drawing Classifications (Class Codes)

SCL has established the following discipline codes based on the data integrated and designed on the Electronic Document Management System (EDMS). The Consultant shall not create any other class codes.

| Class Code | Class Code Description |
|------------|--------------------------------|
| A | Architectural |
| C | Civil |
| E | Electrical |
| G | General (cover & index sheets) |
| M | Mechanical |
| L | Land Surveying (or Landscape) |
| S | Structural |
| R | Communications |
| T | Transmission |

| | |
|---|-------------|
| U | Underground |
|---|-------------|

6. Drawings Datum

- All drawings should be in the World UCS with the (0,0) point defined by Survey if project survey drawings are provided.
- Horizontal Datum should be the most recent projections reported by the National Geodetic Survey (<http://www.ngs.noaa.gov/>) and/or tied to a local network such as the WSRN (<http://www.wsrn3.org/>)
- Vertical Datum should be tied to a published benchmark found on the Washington Geodetic Survey website, <http://gsow.org/map/>. Datum should be the North American Vertical Datum of 1988 (NAVD 88) or the latest projection determined by the National Geodetic Survey.

7. Drawing Setup

7.1. Drawing Template

- SCL AutoCAD and Civil 3D standard drawing template can be found at <https://www.seattle.gov/city-light/construction-services/requirements-and-standards>.
- All dwg files created for any SCL project must use the default template GenPS.dwt GenPS_Digital.dwt or GenPS_C3D.dwt
- This template includes SCL specific Civil 3D styles, fonts, dimension styles/variables, linetypes, and block symbols.

7.2. Drawing Title Border

- Standard ANSI-D (22x34) drawing sheets are preferably used for Public Works design, construction, and as-constructed drawings.
- Standard SCL-D (28x40) drawing sheets should be prior approval before used per project. Consultants shall delete other unused layouts in the template.
- **DO NOT under any circumstances modify or explode the attributed title block.**

| | | |
|--------------------|--------|----------|
| Dimension Text | Romans | 0.125" |
| All Other Notes | Romans | 0.125" |
| Revision Note Text | Romans | 0.09375" |

- Annotation callouts, dimensions, notes and general texts within the body of the drawing must be upper case letters. Lower case letters are only allowed for unit measurements, symbols, and technical designations such as Fc', Fy etc.
- All lettering shall be oriented to facilitate reading from the bottom or from the right side of the sheet.
- Use Mtext for all notes and callouts / multileaders. Dtext from converted REVIT files is acceptable, however it is not ideal.
- Many special symbols (Ω , the "ohm" symbol, for example) can be selected from the "@" list in the Multiline Text tool. Other symbols (e.g., μ , the "micro" symbol), can be selected from the 'Other' palette of special characters. Use these for creating text like " μ F" for "microfarads".
- All text within the body of the drawing shall be vertical UPPER CASE letters except for the symbols for units of measure, which shall use UPPER and lower case based on NIST and SI standards.
- Do not use text smaller than 0.09 (9/100") in the body of drawings.
- All fraction formats shall not be stacked, such as: 1/8".

7.4. Dimensioning

The consultant shall use the GENPSSTANDARD dimension style from SCL provided in the drawing template file. This may be modified, but the consultant is encouraged to use the GENPSSTANDARD setting variables and select "Override" to temporarily change settings only if necessary.

Dimension style settings used in the GENPSSTANDARD:

- Dimension line color: Yellow
- Baseline spacing: 0.5
- Extension line color: Yellow
- Extend beyond dim lines: 0.0625
- Offset from origin: 0.0625

- Arrowheads: Closed filled
- Arrow size: 0.125
- Center Mark: 0.0625
- Dimension break: 0.125
- Text style: ROMANS
- Text color: Green
- Text height: 0.125
- Text placement vertically: Above
- Text placement horizontally: Centered
- Offset from dim line: 0.09
- Text alignment: Aligned with dimension line
- Linear dimension unit format: Architectural
- Linear dimension precision: 0'-0 1/16"
- Linear dimension fraction format: Not stacked
- Angular dimension unit format: Decimal Degrees
- Angular dimension precision: 0

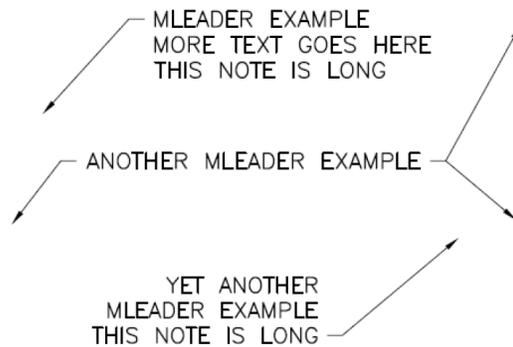
7.5. Leaders

All callouts shall be shown using multileader. The leader shall be at approximately 45 degrees whenever possible.

Multileader style settings used in the GENPS:

- Leader format type: Straight
- Color: Yellow
- Arrowhead symbol: Closed filled
- Arrowhead size: 0.125
- Leader break size: 0.125
- Landing distance: 0.125
- Multileader type: Mtext
- Text style: ROMANS
- Text angle: Keep horizontal

- Text color: Green
- Text height: 0.125
- Leader connection: Horizontal
- Left attachment: Middle of top line
- Right attachment:: Middle of bottom line
- Landing gap: 0.09



7.6. Layers, Colors and Linetypes

- SCL uses the National CAD Standard layer naming conventions. A selection of layers exists in the template. For additional layers, follow the NCS convention.
- When starting a new drawing, layer 0 will be set as the current layer. No objects shall be drawn on layer 0. Use layer 0 to insert blocks and xrefs. Do not freeze layer 0.
- Include layer description for all layers. All entities in the drawings shall be drawn with colors and layers set to "By Layer" only.

7.7. Plot Style Table (ctb file)

The plot style is intended to provide consistency throughout the drawing package. The Consultant shall use GenPS Standard-Black.ctb file provided by SCL. If the Consultant believes the ctb file requires modification, contact SCL Technical Resources for approval prior to implementing changes.

8. Title Blocks

Design and Construction drawings created by or submitted to Seattle City Light shall be used the standard SCL title block. Although the drawing template contains six standard layouts within the title block, the Consultant shall use the ANSI-D (22x34) drawing title for Public Works design and construction documents.

| | | | | | | |
|---|------------------|-----------------|---|------------------------------|-----------------|--|
|  Seattle City Light Generation and Substations | | SUBJECT | EQUIPMENT GENERAL | SHEET 1 OF 10 | | |
| | | LOCATION | CEDAR FALLS GENERAL | CLASS. \ SHEET G-1 | | |
| APPROVED FOR SEATTLE CITY LIGHT | | TITLE | PENSTOCK INSPECTION HATCHES ACCESS STAIR COVER SHEET | DRAWING NO. D12345 | | |
| DATE | APPROVED FOR SCL | | | SCALE | REV. NO. | |
| DATE | | | | AS NOTED | 0 | |

Subject Heading (See 8.1 & Appendix A) points to EQUIPMENT GENERAL
 Location Heading (See 8.2 Appendix B) points to CEDAR FALLS GENERAL
 Title (See 8.3) points to PENSTOCK INSPECTION HATCHES ACCESS STAIR COVER SHEET
 Total Number of Sheet In Set points to 1 OF 10
 Sheet Number Drawing Classification (See 8.4) points to G-1
 Drawing Number points to D12345
 Scale points to AS NOTED
 Revision Number points to 0

8.1. Subject Heading

Use only the appropriate subject heading that is provided by SCL and is applicable to the project, i.e. Overhead Transmission, Underground Distribution Network, Equipment General, or Telecommunications. Subject Heading should be spelled out on the AutoCAD title block. If there is no applicable subject heading, leave this block blank. See Appendix A for the official list of subject headings.

8.2. Location Heading

The location heading should be the officially designated facility name and location heading as designed in SCL EDMS. See Appendix B for the official list of location headings.

8.3. Drawing Titles

The standard City Light title block for AutoCAD drawings includes three lines of titles: General Description, Detailed Description, and Drawing Type. These titles are AutoCAD attribute text that is also associated with metadata embedded in

our Document Management System. Your effort to fill out it properly will make drawing search in SCL Document Management system more efficient.

For consistency of title format in drawings, please follow the recommended structure example below:

General Description Example:

UNIT 24
ACCESS ROAD
DAM AND TUNNEL
SUSPENSION FOOT BRIDGE
ENTRANCE ROADWAY REALIGNMENT

Detailed Description Example:

EXCITATION SYSTEM
GOVERNOR CONTROL
GENERAL NOTES
STEEL TOWER
DELUGE CONTROL

Drawing Types Example:

SITE PLAN
GENERAL LAYOUTS
FOUNDATION PLAN
ONE-LINE DIAGRAM
DC ELEMENTARY

8.4. Drawing Classifications (Class Codes)

See Section 5 for the official list of class codes used in the drawings. The Class\Sheet number assigned shall be in consecutive numbers such as A-1, A-2, A-3, etc. **DO NOT use A-001, A-002 or A1.1, A1.2.** See Appendix C for sample drawing set.

8.5. Drawing Number

Technical Resources will provide the drawing numbers to the Consultant at 90% design review.

The file name of the AutoCAD file should be named according to the drawing numbers. For example, if a drawing number is D12345, the file name should be D12345.dwg

Remove the CONFIDENTIAL stamp by freezing the layer "XSERTSYMBCONF", then insert block CHECK STAMP

| | | | | | |
|---|--|-------------------|---------------------------------|-------------|---|
|  CONSULTANT'S LOGO | <p>PRELIMINARY 8/6/2019</p> <p><small>THIS DRAWING IS THE PROPERTY OF THE CITY OF SEATTLE AND ITS SEATTLE CITY LIGHT DEPARTMENT. IT IS PRODUCED SOLELY FOR THE USE BY SEATTLE CITY LIGHT AND OTHER CITY DEPARTMENTS. THE USE, REPRODUCTION, AND TRANSFER OF THIS DRAWING AND/OR ANY INFORMATION CONTAINED IN THE DRAWING REQUIRES THE WRITTEN PERMISSION OF SEATTLE CITY LIGHT.</small></p> | <p>P.E. STAMP</p> | ENDORSEMENTS | |  Seattle City Light Generation and Substations |
| | | | APPROVED FOR SEATTLE CITY LIGHT | | |
| | | | SIGNATURE: _____ | DATE: _____ | |
| | | | DRAWN: DRAFTER DATE | | |
| | | | CHECK: CHECKER DATE | | |
| | | | DESIGN: DESIGNER DATE | | |
| | | | CHECK: CHECKER DATE | | |

8.6. Endorsements Box Signatures

SCL requires the endorsement box initials/signatures and dates to be filled out along with PE stamp and signature for all drawings at final (100%) design phase.

- Drafter: The person that created the AutoCAD drawings.
- Drafter Checker: CAD Manager or designated CAD QC person.
- Designer: The Engineer.
- Engineering Checker: The Engineer's Supervisor or designated Engineering QC person.
- Leave boxes under Approved for SCL blank.

8.7. Engineering PE Stamp and Signature

State of Washington professional engineer, architect, or land surveyor stamp(s) shall be placed in a block immediately to the left of the "Endorsements". Final Issued For Bid (IFB) or Issued For Construction (IFC) set shall be stamped and sealed on all drawings. Wet signatures may be placed on either wet or electronic seals and they shall meet the requirements of Washington State WAC [Chapter 196-23 WAC](#):

Electronic engineer's or architect's stamps shall not be included in the electronic CAD file unless agreed to by SCL.

8.8. Engineering Digital PE Stamp and Signature

Upon agreement between SCL and Consultant to use digital stamping and signatures for the project, Consultant's CAD Team shall download an AutoCAD template that will be used for digital stamping called GenPS_Digital.dwt or expand the PE stamping box by 4.5 inches by using Block Editor (BEDIT) command. See image below for an example.

| | | | |
|-------|---------------------|------|--|
| 4.50' | ENDORSEMENTS | |  Seattle City Light Generation and Substations |
| | SIGNATURE | DATE | |
| | DRAWN: | | |
| | CHECK: | | APPROVED FOR SEATTLE CITY LIGHT |
| | DESIGN: | | |
| | CHECK: | | DATE |

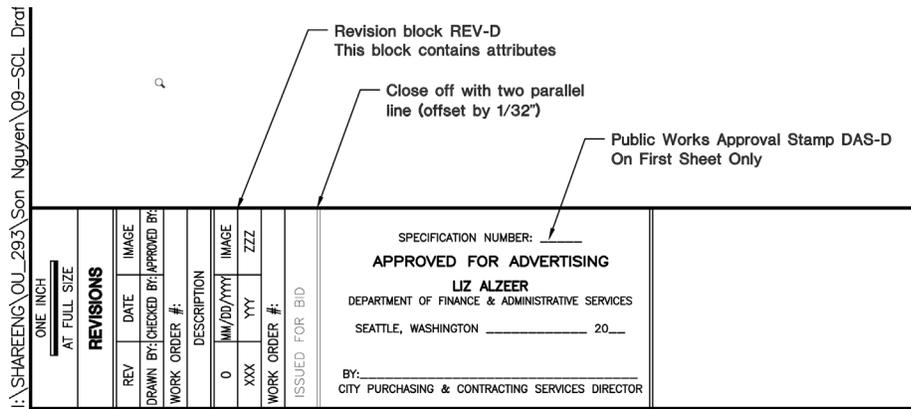
Digital stamping and signature shall meet the requirements of Washington State WAC [Chapter 196-33 WAC](#); [Chapter 196-23 WAC](#):

Digital stamping and signatures shall be made individually on each drawing. Consultant shall not use multiple drawings at once when performing digital stamping and signatures.

8.9. Drawing Revision Block

The drawing revision block for revision 0 is already inserted in each layout of SCL drawing template. Revisions shall begin as Rev 0 for Issued for Bid (IFB) or Issued for Construction (IFC).

The figure below is for general arrangements of revision and Public Works Approval blocks.



9. Standard Blocks

Consultant shall use the following standard blocks on drawings. These are AutoCAD Dynamic blocks containing rules that allow Users to configure parameters and changes the appearance of the blocks. No other standard blocks shall be allowed on the drawings.

- Use letter for PLAN, SECTION, ELEVATION and SECTION CUT VIEWS.
- Use number for DETAIL VIEWS.

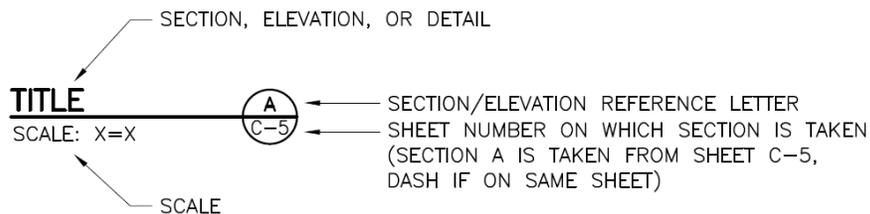
DETAIL AND SECTION REFERENCING



- ← DETAIL REFERENCE NUMBER
- ← SHEET NUMBER ON WHICH DETAIL APPEARS



- ← SECTION/ELEVATION REFERENCE LETTER
- ← SHEET NUMBER ON WHICH SECTION APPEARS (SECTION A IS SHOWN ON SHEET C-12)



| VIEW SYMBOLS | FILE NAME |
|---|--------------------------|
|  | SECT-CUT.dwg |
|  | ELEV-CUT.dwg |
|  | VIEW-ELEV.dwg |
|  | VIEW-SECT.dwg |
| <u>SECTION</u> SCALE: 1/2"=1'-0"  | SECTION-NOTATION.dwg |
| <u>ELEVATION</u> SCALE: 1/2"=1'-0"  | ELEVATION-NOTATION.dwg |
| <u>DETAIL</u> SCALE: 3"=1'-0"  | DETAIL-NOTATION.dwg |
| <u>PLAN DETAIL</u> SCALE: 1"=5'  | PLAN-DETAIL-NOTATION.dwg |
|  | N-ARROW.dwg |
| PRELIMINARY 5/16/2023 | CHECK STAMP.dwg |

10. Drawings Submittal

10.1. Submittal for 30%, 60% and 90% Design Phases

- Submit prints and pdf files of all drawings to SCL Technical Resources for review and comment in accordance with the project contract.
- Provide one (1) set of half size (11x17) drawings for all internal submittals (30/60/90%). All electronic files and PDFs shall be created at full-size (ANSI D, 22x34).
- SCL Technical Resources will provide comments on AutoCAD drawings. Consultants shall incorporate the comments into the next design phase.
- For the 30% and 60% deliverables, only a representative sample needs to be provided – not the entire drawing set (i.e., a few examples from each type of

drawing – general, plans, profiles, details, etc.). Approximately 10% of the total number of drawings is expected.

- For the 90% submittal, all drawing files including 3D model shall be reviewed by SCL Project Engineers and SCL Technical Resources. This is considered the final CAD review – no additional CAD comments (from SCL) should be expected after this submittal.

10.2. Final Phase (100%) Submittal

- These drawings shall incorporate all of the final design changes. Drawings shall be of such quality that electronic scans or copies can be made without loss of details. No drawings shall be considered 'final' until all SCL comments have been resolved, as well as design and all contractor provided construction changes have been incorporated into the drawings.
- The Consultant shall provide one (1) set of full-size prints (ANSI D, 22x34 or other sizes as approved), plotted using 'paper space', with original signatures and seals on all drawings. Wet signatures may be placed on either wet or electronic seals. Drawings shall be produced on standard bond paper.
- The Consultant shall provide one set of the final stamped drawings in pdf format. Wet signed drawings shall be scanned to make the PDF set.
- Each AutoCAD file will contain only one (1) layout for each drawing sheet. All review corrections from 90% review comments should be included in this submittal.
- If Xrefs or attributed objects are used by the Consultant during design phases, all reference files required to generate the complete drawing shall be bound to the drawing file.
- A complete 3D model and project files shall be submitted to SCL as records of the design model. Any major changes made during construction shall be updated in the model at as-built phase.

11. Requirements for Electrical Drawings

Use IEEE C37.2 (latest active revision) **Standard Electrical Power System Device Function Numbers and Contact Designations** to designate all relay and control equipment and devices on all electrical diagrams. Relays shall also indicate the specific relay manufacturer and model designation on connection diagrams. On elementary diagrams, provide the complete manufacturer's model number in the drawing legend, uniquely identified with an IEEE device number and device-specific identifier.

Use IEEE 100, **The Authoritative Dictionary of IEEE Standards Terms** for all electrical terms.

11.1. Connection Diagrams:

- **Labeling of Devices:** On connection drawings, all devices shall be assigned a two (2) letter code above and to the left of each device (e.g. AA, AB, AC, BA, BB, BC...CA, CB, CC, etc.) Devices shall also be marked with the ANSI device function number above and to the right of each device. Also, the model number of the equipment shall be indicated on or near the device (see Figure 1).
- **Connections:** Connection drawings shall show every point-to-point connection using the two (2) letter device designation described above, not the IEEE device function number. Provide space for showing and listing external cables to be installed by others. All external cabling shall be terminated on the terminal blocks. Interconnections from one drawing to another shall be referenced by drawing number and terminal block position. (See Figure 2).

11.2. Elementary Diagrams:

Elementary diagrams shall conform to SCL standards as follows:

- Terminal block connections, when practical, shall be shown.
- An open circle (○) shall be used to designate terminal points.
- The two (2) letter designations for the terminal block shall be to the right of the circle and the terminal block point number on the left.

11.3. Detail Drawings:

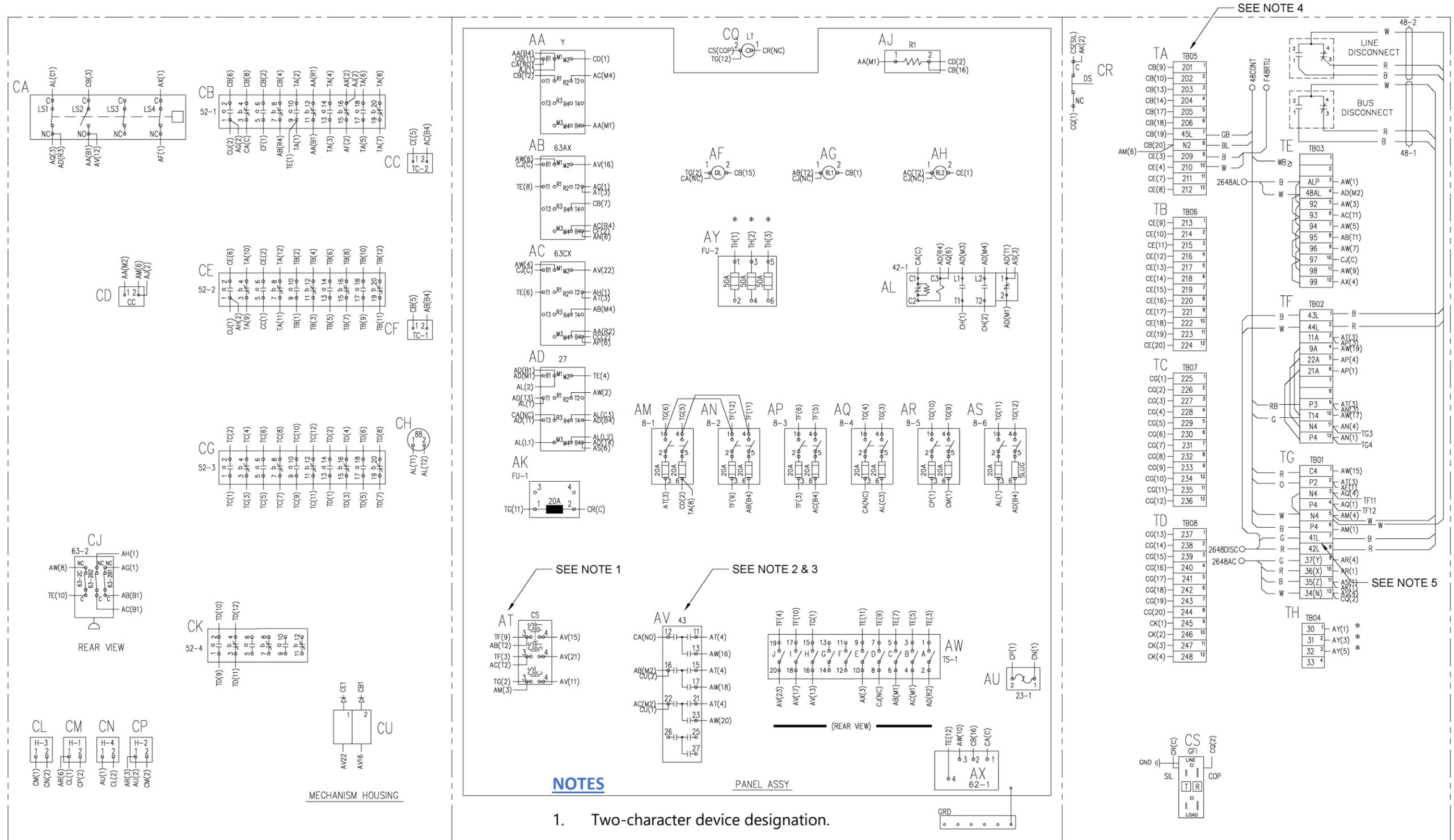
- **Equipment layout:** Provide equipment layout drawings showing the location, size and dimensions for all equipment, parts and components to be installed, built or constructed.
- **Wiring, Piping and Ducts:** All wireway, conduit, and cable tray drawings shall include all pertinent information to show the route, size, and material for wireway, conduit, or cable tray as appropriate.
- **Equipment Assembly drawing:** Provide drawings showing equipment assembly detail and detailed connections between components, equipment and their appurtenances, so the completed system will function as designed once the construction or installation work is completed.

- **Other Detailed Drawings:** Provide detailed drawings indicating all visible interference and obstruction to the new installation or construction. Also provide drawings showing solutions to the interference or obstruction. Visible interference and obstruction are defined as object, parts or materials that are exposed and can be seen without removing permanent structures or materials.

See Figure 1 – Example of Connection Diagram

See Figure 2 - Example of Elementary Diagram

Figure 1 – Example of Connection Diagram



CABLE LIST

| | |
|----------|---|
| 48CONT | 9CC #12 FDR BKR 2648 CONTROL TO PNL 29 (D-17500) |
| 2648DISC | 4CC #12 FDR BKR 2648 DISC LIGHT TO PNL 29 (D-17500) |
| F48RTU | 2CC #12 FDR BKR 2648 BKR SOE TO RTU (D-21482) |
| 2648AL | 2CC #12 FDR BKR 2648 ALARM TO PNL 29 (D-17500) |
| 2648AC | 4CC #10 FDR BKR 2648 AC SUPPLY (D-20228) |

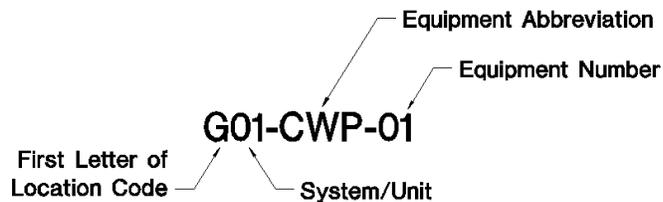
NOTES

1. Two-character device designation.
2. Device definition.
3. Device model number or part number should be noted below (on important components only). Ex: 43 GE SG218
4. Provide terminal blocks for external customer connections.
5. Use terminal block labels as circuit designations on elementary diagram.

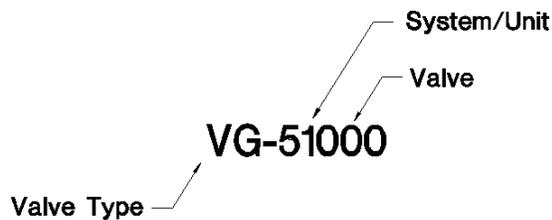
12. Requirements for Mechanical Drawings

12.1. Piping and Instrumentation Diagram (P&ID)

- Drawings that diagram piping system shall contain all major piping components, valves, equipment, penetrations, and instruments. The drawing layout shall be based on a flow of left to right. Standard symbols for equipment and valves shall be used.
- Equipment Tagging shall be based on location, system/unit, and type. For equipment that is not specifically for one generation/turbine, the common system number are listed below. Standard equipment abbreviations can be used.
- Tag format is:



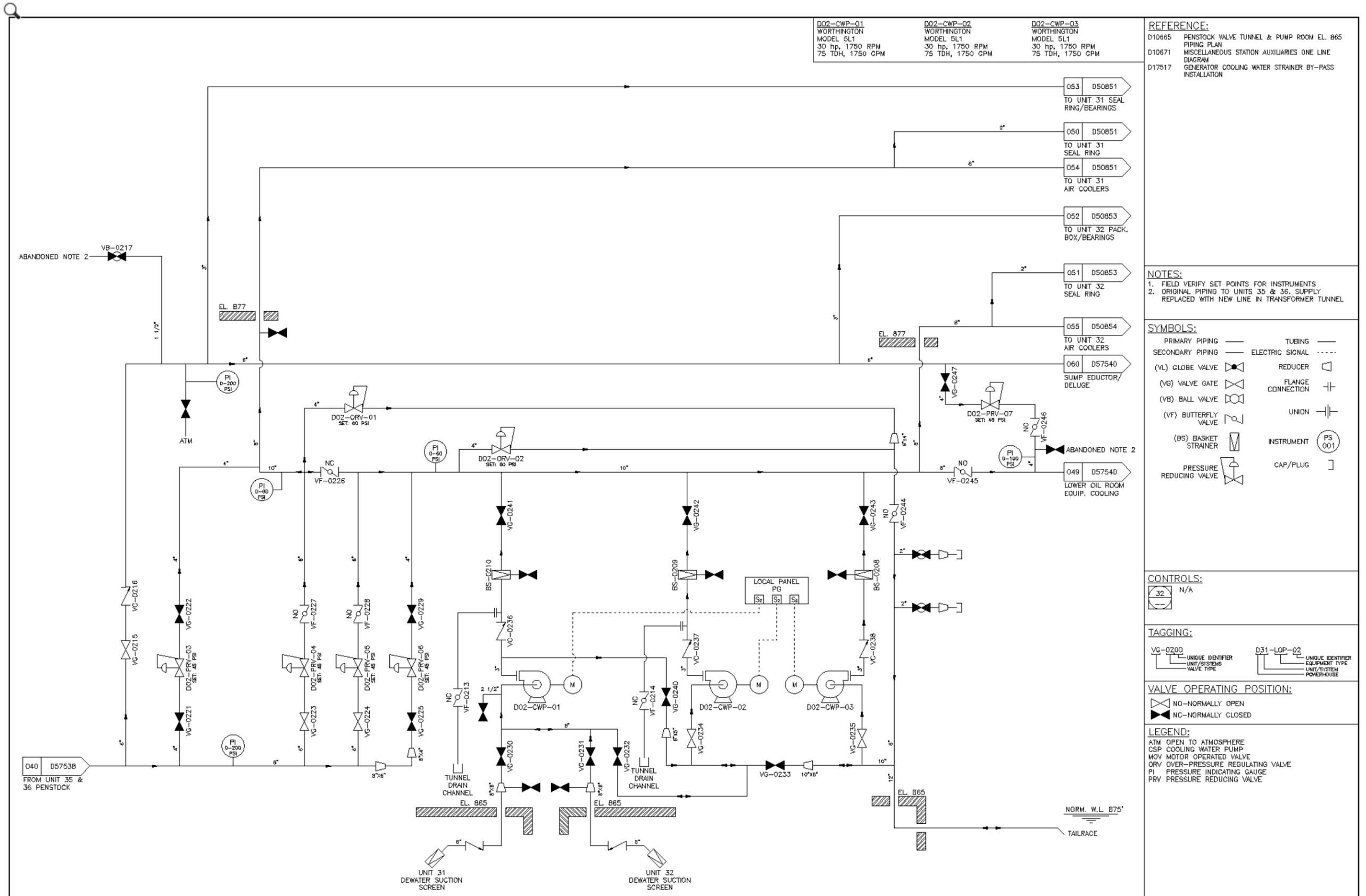
- Valve Tagging shall be based on valve type, system/unit, and unique number. For valves that are not specifically for one generator/turbine, the common system numbers are listed below. Instrument root valves, drain valves, and vent valves do not receive tag numbers.



- Instrument Tagging is done with standard abbreviations in ISA 5. Tag specific numbers are supplied by SCL. Consultant can request tab numbers at 60% design.

- **See Figure 3 for example of Piping and Instrumentation Diagram**

Figure 3 – Example of Piping and Instrumentation Diagram



| <u>System Codes</u> | | <u>Unit Codes</u> | | | |
|---------------------|----------------------|-------------------|--------------------|----|------------------|
| 01 | Air | 5 | Cedar Falls Unit 5 | 41 | Ross Unit 41 |
| 02 | Water | 6 | Cedar Falls Unit 6 | 42 | Ross Unit 42 |
| 03 | Oil | 21 | Gorge Unit 21 | 43 | Ross Unit 43 |
| 04 | CO2/Fire Suppression | 22 | Gorge Unit 22 | 44 | Ross Unit 44 |
| 05 | Instrument Air | 23 | Gorge Unit 23 | 51 | Boundary Unit 51 |
| 06 | Other | 24 | Gorge Unit 24 | 52 | Boundary Unit 52 |
| | | 31 | Diablo Unit 31 | 53 | Boundary Unit 53 |
| | | 32 | Diablo Unit 32 | 54 | Boundary Unit 54 |
| | | 35 | Diablo Unit 35 | 55 | Boundary Unit 55 |
| | | 36 | Diablo Unit 36 | 56 | Boundary Unit 56 |
| | | | | 81 | Tolt Unit 81 |

Table 1: Codes for System and Units

| | | | |
|----|-----------------|-----|-------------------------|
| VA | Angle Valve | FCV | Flow Control Valve |
| VB | Ball Valve | MOV | Motor Operated Valve |
| VC | Check Valve | PRV | Pressure Reducing Valve |
| VF | Butterfly Valve | PSV | Pressure Safety Valve |
| VG | Gate Valve | SSV | Solenoid Shutoff Valve |
| VK | Knife Valve | | |
| VL | Globe Valve | | |
| VN | Needle Valve | | |
| VP | Plug Valve | | |
| VZ | 3-way Valve | | |

Table 2: Valve Abbreviations

12.2. Mechanical Fabrication/Assembly Drawing

- Drawings for fabrication or machine of components shall be standard Orthograph or Multiview drawings. Isometric views may be added to drawings for clarity. Multi-component drawings should not be used for components that require multistep machining. Drawing scales should be standard (1:2, 1:4, 1:16, 1:24). Specific materials for all components must be listed in a table on the drawings.
- Drawing size should be based on the smallest practical to provide details needed for fabrication. Preferred drawing sizes are ANSI C or ANSI B.

- Dimensioning should not be done on isometric views unless it is for piping fabrication.
- Dimensions shall be in imperial units with the option to have metric units in parentheses. Tolerances shall be per ASME Y14.5 and weld symbols per AWS A2.4.

12.3. Mechanical Installation Drawings

- Drawings which show installation of equipment or other mechanical components shall contain all pertinent information for installation and notes for details which are determined by the field. Notes may be used for guidance information on location or possible clashes. Breaks between existing and additions must be called out.

Appendix A - Subject Codes

| City Light Facility Subject Codes | |
|-----------------------------------|--|
| Subject Code | Subject Code Description |
| AEQ | Auxiliary Equipment (pumps, backup generators, cranes, special tools, etc.) |
| BRG | Bearings (turbine/generator bearings) |
| BLD | Building |
| BUS | Bus Fabrication (High & Low Voltage) |
| CCA | Computer Control Automation (PLC, HMI, Thin Client, etc.) |
| CRM | Cable Routing Map |
| CPS | Cathodic Protection Systems |
| AIR | Compressed Air Systems (includes; tanks, after cooler, dryer) |
| CON | Conservation |
| COV | Cover Title Page (Sheet Index) |
| DGM | Dam Gates (Mechanical; intake, broom, taintor, sluice, etc.) |
| DVS | Development Studies (see UND) |
| DIS | Distribution Substation |
| DTS | Draft Tube to Stop Log |
| EQP | Equipment General |
| FRC | Federal Energy Regulatory Commission (FERC Exhibits) |
| FDS | FERC Dam Safety (FERC related miscellaneous) |
| FPS | Fire Protection Systems (water and gas) |
| FMS | Forms |
| FDN | Foundation |
| GCS | Generation Cooling Systems (water or air) |
| GEN | Generator |
| GEO | Geologic Content (Geology related: rocks mechanics, etc.) |
| GOV | Governor System (pressure tank, sump, pumps, filters, servomotor) |
| GRD | Grading for Drainage |
| GND | Ground Electrical |
| HCO | HVAC Controls (diagrams sequence of operations etc.) |
| HPI | HVAC Piping (heat, vent, air conditioning) |
| HSY | HVAC Systems (schema & details and equipment schedule) |
| IND | Industrial Substations |
| INS | Instrumentation (schem & det-perf test equip install-conn diag are "E" dwgs) |
| LSC | Landscape |
| LOG | Log (record of drill log) |
| LUB | Lube Oil Systems (tanks, pumps, filters, etc.) |
| MAP | Mapping (general, survey, topographic) |

| | |
|-----|---|
| MVS | Medium Voltage Switchgear |
| MCR | Meter Communications & Relay |
| MTR | Meter Division (NSC equipment) |
| OCS | Oil Containment System |
| OHD | Overhead Distribution |
| OHS | Overhead Distribution Standards |
| OHF | Overhead Fiberoptic |
| OHT | Overhead Transmission |
| PAS | Panel Schedule |
| PEN | Penstock and Tunnel |
| PER | Permits |
| PHP | Physical Plant |
| PIP | Piping Systems (all fluid or gas piping) |
| PLT | Plot Plan |
| PDS | Plumbing Drainage Sewer |
| REL | Relay and Control |
| REM | Remodel |
| RAP | Roads (access & paving) |
| ROF | Roofing (any facility) |
| STY | Safety (equipment or systems) |
| SCA | Scada System (Power System Monitor, Oscillograph) |
| SEI | Seismic Improvement |
| SMS | Security Systems |
| SKC | Skagit Communications |
| SLS | Slope Stabilization |
| SPC | Spill Prevention Control Countermeasure |
| SPE | Specifications |
| STD | Standards General |
| SYS | System Engineering & Diagrams |
| TUG | Tanks Underground |
| TEL | Telecommunications |
| TLM | Telemetry (remote sensors-communication) |
| XMH | Transmission High Voltage (over 100kV) |
| XML | Transmission Low Voltage (under 100kV) |
| XSD | Transmission Standards |
| TUR | Turbines (include from stay vanes to the nose cone) |
| UGA | Underground Distribution - Arterial |
| UGS | Underground - System |
| UGX | Underground - Transmission (Cable) |
| UGG | Underground Distribution - General (miscellaneous) |
| UGI | Underground Distribution - Industrial, Commercial & Medical |
| UGN | Underground Distribution - Network |

| | |
|-----|---|
| UGR | Underground Distribution - Residential |
| USD | Underground Distribution - Standards |
| UND | Undeveloped Proposals - Maps & Surveys (see DVS) |
| WTF | Wastewater Treatment Facilities |
| WTR | Water Systems (filtration, disinfection) |
| WIC | Wicket gates (include shift ring, linkage, shear pin) |
| WLA | Wireless Antenna Telecommunications |
| | |
| | |

Appendix B - Location Codes

| Active City Light Facilities | |
|------------------------------|---|
| Location Code | Location Code Description |
| BAB | Babcock Creek (communication) |
| BCN | Beacon Hill Cable Terminus (cable to tower transition) |
| BES | Bethlehem Substation (steel mill; Bethlehem, Birmingham, Nucor) |
| BOE | Boeing Corporation (was East Property now all sites list equip site in title 1) |
| BPA | Bonneville Power Administration (BPA) |
| BOT | Bothell Receiving Substation |
| BOS | Boundary Off Site (communication external to facility) |
| BDG | Boundary Project General |
| BDM | Boundary Dam & Reservoir |
| BHW | Boundary Headworks |
| BPH | Boundary Powerhouse |
| BSS | Boundary Switching Station |
| BOX | Box Canyon (dam & facilities-Pend Oreille PUD) |
| BSA | Broad Street Annex (to Receiving Substation) |
| BST | Broad Street Receiving Substation |
| CAN | Canal Receiving Station |
| CFG | Cedar Falls General |
| CHS | Cedar Falls Housing & Camp |
| CFM | Cedar Falls Masonry Dam |
| CFL | Cedar Falls Morse Lake Dam |
| CNS | Cedar Falls North Switchyard |
| CFP | Cedar Falls Penstock |
| CPH | Cedar Falls Powerhouse |
| CFS | Cedar Falls Switchyard |
| CID | Columbia Basin Irrigation District (GCPHA-Grand Coulee Project Hydroelectric Authority) |
| CEF | Commercial Electrical Facility (SCL equip on private industrial site) |
| COU | Cougar Mountain Radio Site (communication) |
| COV | Covington Substation (BPA) |
| CRT | Creston Nelson Receiving Station |
| CRI | Crista Ministries Radio Site (communication) |
| DAW | Dawson Substation (energized 4kV unit sub) |
| DEL | Delridge Receiving Station |
| DEU | Delridge Unit Substation (see also DEL-4kV unit sub decomm files) |
| DEN | Denny Substation (New facility Location) |
| DHS | Diablo Camp & Housing |
| DDM | Diablo Dam & Reservoir |
| DPH | Diablo Powerhouse |

| | |
|---------|--|
| DSS | Diablo Switching Station |
| DND | Downtown Network Distribution |
| DTP | Downtown Transit Project (public transport systems; bus,street car,rail) |
| DUW | Duwamish Receiving Station |
| EGR | Eagle Ridge (communication) |
| EPS | East Pine Receiving Station |
| ETC | East Telecommunication (communication) |
| EAT | East Transmission |
| ELC | Environmental Learning Center (North Cascades) |
| FCR | French Creek Repeater (communication) |
| GTS | Georgetown Steam Plant (facility not active) |
| GMT | Gold Mountain Radio Site (communication) |
| GDM | Gorge Dam & Reservoir (Gorge High Dam) |
| GPH | Gorge Powerhouse |
| GSS | Gorge Switching Station |
| HIS | Highline Substation (future site-Burien) |
| HUD | Hudson Cable Terminus |
| LAH | Laurelhurst Substation (energized 4kV unit sub) |
| LPP | Lucky Peak Project |
| MLF | Maple Leaf Reservoir (communication) |
| MPV | Maple Valley Substation (BPA) |
| MRS | Massachusetts Receiving Station |
| MET | Metro-West Point Treatment Plant |
| MIL | Miller Ledge Repeater (communication) |
| MOR | Morgan Substation (energized 4kV unit sub) |
| MYR | Myrtle Street Reservoir (communication-decomm sub) |
| NEW | Newhalem Camp & Facilities |
| NCD | Newhalem Creek Dam |
| NCP | Newhalem Creek Powerhouse |
| NOD | North Distribution |
| NMS | North Mountain Substation (SnoPUD intertie) |
| NSC | North Service Center |
| NOR | North Substation |
| NTC | North Telecommunications (communication) |
| NOT | North Transmission |
| NES | Northeast Substation (future site in City of Shoreline) |
| Objects | Objects (WAMS interface links) |
| OTHER | Other (multiple or no location code) |
| PCC | Power Control Center (communication) |
| QUA | Queen Anne Tower (communication) |
| RAT | Rattle Snake Radio Terminal (communication) |
| RKP | Rockport (the town of) |

| | |
|-----|---|
| RDM | Ross Dam & Reservoir (Ruby Dam) |
| RPH | Ross Powerhouse |
| SBU | Salmon Bay Undercrossing |
| SMT | Seattle Municipal Tower (was KEY-Key Tower) |
| SSF | Seattle Safeco Field (baseball stadium) |
| STM | Seattle Steam Plant (2014 new owner-continue STM) |
| SEG | Segelsen Ridge (communication) |
| SHR | Shoreline Substation |
| SKG | Skagit General (select more specific Code Location) |
| SNO | Snohomish Substation (BPA intertie) |
| SNK | Sno-King Substation (BPA intertie) |
| SOD | South Distribution |
| SSC | South Service Center |
| SOU | South Substation |
| STC | South Telecommunications (communication) |
| SOT | South Transmission |
| SRT | SR 99 Seattle Tunnel (replaced Alaskan Way Viaduct) |
| STL | Street Lights (City of Seattle all facilities) |
| SCC | System Control Center (System Operation Center) |
| SYS | System Wide (SCL multiple facilities) |
| TAL | Talbot Hill Substation (PSE) |
| TTC | Technical Training Center |
| TOL | Tolt River (26kV pole line) |
| TSF | Tolt River-South Fork (dam, powerhouse & penstock) |
| TDP | Transmission Distribution Planning |
| UST | Union Street Receiving Station |
| UWE | University of Washington, East |
| UWW | University of Washington, West |
| URC | University Receiving Station |
| VLD | Viewland-Hoffman Receiving Station |
| WFB | West Seattle Freeway Bridge |
| | |

Appendix C – Sample Drawings Available Upon Request

Drafting&AutoCAD Requirements for Consultants 2023_R3.4

Final Audit Report

2023-10-27

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