

1.2 Water and Waste Electrical Design Guide

The work to be performed will be comprised of the following:

1.2.1 Review of the Existing Guide

An existing Electrical, Instrumentation, and Control Design Guide was originally produced by Ed Ryczkowski for the City approximately 25 years ago for the NEWPCC facility. However, this document is outdated and requires significant revision and discussion of additional topics. In addition, it would be beneficial for the City to have the document updated to reflect specific requirements for other water and waste facilities. The first step will be to review the existing document and utilize this as the basis for a new Electrical Design Guide. This design guide is intended to be the basis for general electrical designs and is not intended to be applicable to every conceivable application.

1.2.2 Development of an Electrical Design Guide

The design guide will be comprised of the following topics:

- .1 Scope
- .2 Codes and Standards
- .3 Design Requirements
 - .1 SCCR – Short Circuit Current Rating
 - .2 System Configuration
 - .3 Redundancy and multiple power sources.
 - .4 Voltage Levels
- .4 Identification
 - .1 Reference Identification Standard
- .5 Environmental Requirements
 - .1 Identify typical environmental requirements.
 - .2 Identify typical enclosure types.
- .6 Wiring and Cabling
 - .1 Use of Conduits vs Cables
 - .2 Cable Types and Ratings
 - .3 Conduit Materials and Sizes
 - .4 Device and Pull Boxes
 - .5 Junction Boxes
 - .6 Cable Trays
 - .7 Terminations
- .7 Lighting
 - .1 Identify typical locations within wastewater and water facilities, and specify the type of lighting to be employed, voltage rating, etc
 - .2 Identify minimum illumination requirements for various spaces.
 - .3 Identify means of lighting control.

- .4 Identify general guidelines regarding lighting switching and control.
- .5 Identify requirements regarding essential lighting and the associated power source.
- .6 Identify code and good practice requirements regarding the use of emergency lighting.
- .7 Identify code and good practice requirements regarding the use of exit lighting.
- .8 Note that security lighting is not included and is being undertaken as part of a separate initiative.
- .8 Equipment – Identify design requirements for
 - .1 Transformers
 - .2 Panelboards
 - .3 Motor Control Centers
 - .4 Soft starters
 - .1 Identify requirement for bypass starters
 - .5 Variable Frequency Drives
 - .1 Identify requirement for bypass starters
- .9 Motors
 - .1 Discuss types of motors required and protection requirements
- .10 Power System Monitoring
 - .1 Identify requirements for power metering, voltage detection, etc.
 - .2 Identify requirements for HMI / SCADA Monitoring
- .11 Protection
 - .1 Identify requirements for system protective equipment.
 - .2 Identify ground fault detection requirements.
- .12 Standby Generation
 - .1 Discuss the requirements for standby generation, which could either be permanent or temporary.
 - .2 Discuss sizing and typical loads.
 - .3 Discuss means of connection for temporary generators.
- .13 Uninterruptible Power Supplies
 - .1 Identify the power source requirements.
 - .2 Identify bypass requirements.
 - .3 Identify minimum specs.
- .14 Hazardous Locations
 - .1 Discuss specific requirements for hazardous locations.
- .15 Arc Flash
 - .1 Identify requirements for arc flash analysis and stickers.
- .16 Grounding
 - .1 Identify minimum grounding requirements.
 - .2 Identify where additional grounding studies are required.

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- .17 Power Factor Correction
 - .1 Identify where power factor correction should be installed and typical application methods.
- .18 Medium Voltage Systems
 - .1 Discuss general medium voltage distribution requirements
 - .2 Note that the topic of medium voltage distribution is significant, and given that MV distribution is currently limited to the NEWPCC and Deacon/WTP facilities, it is deemed that a detailed design guide for this topic is not required at this time.
- .19 Fire Alarm System
 - .1 Identify requirements regarding fire alarm systems.
- .20 Electrical Room Requirements
 - .1 Identify general ventilation requirements.
- .21 Design Responsibility
 - .1 Identify responsibility for design calculations.
 - .2 Identify responsibility for creation of drawings
 - .3 Identify responsibility for short circuit study, coordination study, arc flash study.
 - .4 Identify when harmonic study is required, and who is responsible.
 - .5 Identify drawing requirements for some typical projects / facilities.
- .22 Sample Drawings
 - .1 Provide sample drawings for the following:
 - .1 Single Line Diagram
 - .2 Motor Starter Schematic

Note: Specific notes will be made in the document regarding specific standards and details required at specific facilities. For example, the SEWPCC facility has a standard of utilizing a minimum of 21mm conduit.

1.2.3 Review Meeting and Finalization

- .1 A meeting with the City and SLI will be held to review the content in the Electrical Design Guide.
- .2 After the review meeting, SLI will modify the document as required and finalize.

1.2.4 Ongoing Support

- .1 Provide an allowance of 20 hours to address subsequent questions and clarification requested that may occur over the next six – nine (6-9) months after the Electrical Design Guide is finalized.

Exclusions:

- Discussion of automation, networking, and PA systems are outside the scope of this design guide.
- The Electrical Design Guide document will not include write-up regarding the rationale for the specific items specified. For example, it will specify that 1000V wire is to be utilized for 600V systems, but not present the reason for the higher voltage selection.