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CITY OF SIOUX FALLS
PUBLIC WORKS

ENGINEERING DIVISION
POLICY LETTER

Policy Number: 2020-01

Title: Minimizing Arc Flash Hazards

Purpose: This policy establishes minimum specifications to minimize arc flash hazards for new, low voltage (less than 1000V) electrical equipment purchased for installation on projects owned and operated by the City of Sioux Falls. Some Medium voltage guidance is also included.

Effective Date: July 1, 2020

Expiration Date: N.A.

Policy Division: Design and Construction

Supersedes Policy Numbers or New Policy: New

Approved:

Chad J. Huwe

Chad J. Huwe, P.E., City Engineer

On: 7/1/2020

MINIMIZING ARC FLASH HAZARDS

This policy establishes minimum specifications to minimize arc flash hazards for new, low voltage (less than 1000V) electrical equipment purchased for installation on projects owned and operated by the City of Sioux Falls. Some Medium voltage guidance is also included.

The City Engineering Division's policy on minimizing arc flash hazards shall be as described in the attached eleven page document entitled "MINIMUM SPECIFICATIONS FOR NEW EQUIPMENT INSTALLATIONS FOR MINIMIZING ARC FLASH HAZARDS", Revision A, dated May 19, 2020 authored by Brandon Moore from Interstates.

Questions regarding this Policy Letter should be directed to the City of Sioux Falls Light and Power Superintendent.

END OF POLICY LETTER

CITY OF SIOUX FALLS

MINIMUM SPECIFICATIONS FOR NEW EQUIPMENT INSTALLATIONS FOR MINIMIZING ARC FLASH HAZARDS

Rev A – 5/19/2020

INTRODUCTION

1. **Purpose:**
   The purpose of this document is to provide the City of Sioux Falls with general guidelines to help facilitate the design, purchase and installation of equipment to minimize Arc Flash Hazards.

2. **Scope:**
   The following guidance covers new, low voltage (less than 1000V) electrical equipment purchased for installations on projects owned and operated by the City of Sioux Falls. Some Medium voltage guidance is also included.

3. **Safety Concerns:**
   Follow all City of Sioux Falls and industry standard safety practices and policies as well as local regulatory requirements. Follow City of Sioux Falls and industry accepted electrical system modeling and analysis methods.

4. **Requirements:**
   Full details of the requirements and guidelines are listed in section 4.

5. **Links, References and Attachments:**
   Full details about the attachments and other references are listed in section 5.

Authored By	Title	DD-MTH-CCYY
Brandon Moore	Electrical Engineer (Interstates)	05/19/2020

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1.0 Purpose:

Electrical power system designs play an important role in the safety, reliability, and maintainability of City of Sioux Falls facilities. The purpose of this document is to provide City of Sioux Falls colleagues and contractors with general guidelines to help facilitate the design, purchase, and installation of electrical equipment. In order to address inherent hazards and complexities associated with electrical power systems, as well as to facilitate future expansion, it is essential that proper guidelines for the minimum specifications for new equipment be followed.

The intent of this document is to facilitate a clear understanding of the minimum specifications for new installations and alleviate additional costs associated with replacement due to non-conformance or lack of future expansion capacity.

2.0 Scope:

The following guidance covers new low voltage (less than 1000V) electrical equipment purchased for installations in City of Sioux Falls owned and operated facilities in the United States.

3.0 Safety Concerns:

All colleagues need to ensure that they are familiar with and adhere to all City of Sioux Falls Electrical Safety-Related Work Practices as well as any local regulatory requirements. Colleagues should also familiarize themselves with any applicable industry safety practices and adhere to those accordingly. In cases where policies and/or practices conflict, or the colleague is not clear, then they should immediately check with their supervisor for clarification. Do not proceed if you don't understand, are unclear, or are unsure of any safety practice or policy.

4.0 Requirements:

4.1 Codes and Standards

4.1.1 Code Compliance

The installation of electrical systems shall comply with the following codes and standards:

NEC	National Electrical Code (Latest Edition)
NESC	National Electrical Safety Code
NFPA 70E	Standard for Electrical Safety in the Workplace (Latest Edition)
OSHA	Occupational Safety and Health Administration Standards

State, federal, and local laws and ordinances

4.1.2 Equipment Approval

Electrical material and equipment shall have UL (Underwriters Laboratories) or FM (Factory Mutual), approval and label.

4.2 Permits, Inspections, and Approvals

4.2.1 Permits and Licenses

The Contractor shall obtain all permits or licenses required by the authority having jurisdiction of the electrical installation.

4.2.2 Compliance

It shall be the responsibility of the Contractor to ensure compliance of the installation with the authority having jurisdiction for inspection.

4.2.3 Contractor Skills

The Contractor shall be responsible for providing adequate skillsets needed for work performed in the City of Sioux Falls and for appropriately supervising the installation practices.

4.3 Design Requirements

Design requirements for new electrical equipment and installations are outlined in the following sections. Any deviation from these requirements must be approved by City of Sioux Falls Technical Services.

4.3.1 Power System Study

A Power System Study (fault current, load flow, coordination, equipment evaluation, and arc flash) for evaluating proposed new installations shall be performed according to the City of Sioux Falls Power System Study Spec. SKM Power Tools for Windows (latest City of Sioux Falls approved version) shall be the software used to perform the study. City of Sioux Falls or a consultant approved by the City of Sioux Falls shall perform the study. An electronic backup copy of the model and report shall be provided to the City of Sioux Falls.

4.3.2 Short Circuit Current Rating

The short circuit current rating of all new electrical equipment not specified below shall be at least 130% of the calculated available fault current.

4.3.2.1 Switchgear (Not Common)

The short circuit current rating of all switchgear equipment shall be 100kA, unless a main-tie-main arrangement is used in which case the short circuit current rating shall be 150kA.

4.3.2.2 Switchboard

The short circuit current rating of all switchboard equipment shall be 130% of the calculated available fault current or 65kA, whichever is higher.

4.3.2.3 Motor Control Centers

The short circuit current rating of all MCC equipment shall be 130% of the calculated available fault current or 65kA, whichever is higher.

4.3.2.4 Power Distribution Panels (i.e. power distribution panels downstream from main switchgear or switchboard feeder circuits.)

The short circuit current rating of all power panels shall be 130% of the calculated available fault current or 35kA, whichever is higher. Equipment shall have fully rated short circuit current ratings. Series ratings in power distribution panels will not be allowed.

4.3.2.5 Lighting Panelboards

The short circuit current rating of all lighting panelboards shall be equal to the maximum of the following:

(1) 110% of the calculated available fault current at the lighting panelboard.

(2) Maximum short circuit current rating of any other breakers in panelboards or distribution panels within the facility where the breakers are interchangeable.

4.3.3 Arc Flash Hazard

The arc flash hazard of the system shall be designed not to exceed the limitations of Hazard Risk Category 2 (8 cal/cm2) as defined in the latest edition of NFPA 70E. The line side of any protective device shall be considered and included in the arc flash calculations.

4.3.4 Transformers

4.3.4.1 Transformer Size - Secondary Voltage 300V and Below

Transformers with a secondary voltage of less than 300V shall not exceed a rating of 112.5 kVA.

4.3.4.2 Transformer Size - Secondary Voltage 300V through 600V

Transformers with a secondary voltage 300V through 600V shall not exceed a rating of 2000 kVA (1500 kVA preferred). City of Sioux Falls owned transformers with a secondary voltage of 600V or less shall not have a bonded H0 (primary) to X0 (secondary) bushing.

If a utility transformer is used, every effort should be made to acquire a configuration without a bonded H0 X0 bushing.

4.3.4.3 Enclosures

Totally enclosed primary and secondary transformer connections are preferred.

4.3.4.4 Padmount Transformers

Padmount transformers owned by the City of Sioux Falls shall have the oil drain valve, sampling valve, and instrumentation accessible from outside the cable termination compartments, allowing access without having to open the doors to the termination compartments. The transformer nameplate shall be visible on the outside of the unit.

4.3.4.5 Dry Type Transformers (greater than 112.5kVA)

Dry type transformers rated more than 112.5kVA and positioned indoors shall be installed in a dedicated transformer room that has a fire rating as specified by the NEC code. The transformer room shall not be shared with any other low voltage, serviceable equipment including, but not limited to, switchgear, switchboards, fused disconnects or motor control centers. The only low voltage, serviceable equipment that may be permitted will be the transformer secondary protection (low-voltage main).

Exception: Dry type transformers rated more than 112.5kVA and positioned indoors may share a room with other electrical equipment provided that protection is installed such that the primary and secondary of the transformer have available incident energy of not more than 40 cal/cm^2.

4.3.5 High Resistance Grounding

All 480 Volt systems of greater than 800 Amps shall be derived from a Wye configuration utilizing HRG (high resistance grounding). HRG shall not be used on wye-wye configured transformers if the H0 & X0 bushings are bonded (***every effort should be made to acquire HRG***). Systems of 800 Amps or less are allowed to be solidly grounded.

4.3.6 Transformer Secondary Protection

Each transformer shall have a service main disconnect/protective device on the secondary side of the transformer in accordance with the following sections.

4.3.6.1 Services Up To 3000 Amps

An independent isolated or stand-alone main disconnect/protective device shall be used downstream of the Transformer, but in a separate enclosure than the Switchboard/MCC/Panelboard. The Switchboard/MCC/Panelboard downstream of the main disconnect/protective device shall be Main Lug Only.

4.3.6.2 Services Greater Than or Equal to 3000 Amps

The system described in 4.3.6.1 shall also be used for 480V services greater than or equal to 3000 Amps. Alternatively, with approval from the City of Sioux Falls, low voltage drawout-type switchgear can be used to house the main disconnect/protective device and feeder circuits. Any low voltage switchgear shall be reviewed and approved by City of Sioux Falls prior to purchase.

4.3.7 Switchboards

4.3.7.1 Maintenance Switches

All breakers 1200A and above shall be required to have Maintenance switches (RELT or equivalent). Engineer to decide during the design stage if they are to be located on gear or remote. (Schweitzer SEL-751 feeder protection relay and SEL-C804 are being used at one of the pump stations currently)

4.3.7.2 Section Barriers

All vertical sections shall be separated with section barriers without openings to adjacent sections.

4.3.7.3 Infrared Windows

Switchboards shall be equipped with infrared windows such that doors do not need to be opened for a thermal scan of the cable terminations.

4.3.7.4 Other Equipment Standard Options for Switchboards/MCCs

(1) Wire connections to be internal to bucket.
(2) Shutters for stabs.
(3) External overload reset.

4.3.8 Panelboard Front Covers

Panelboard bolted front covers that provide access to overcurrent protective devices and wire ways should be avoided when possible. When available from the manufacturer, all panelboards should be purchased with hinged front covers.

5.0 Links, References, and Attachments:

5.1 City of Sioux Falls Electrical Safety Related Work Practices

5.2 EC National Electrical Code
http://www.nfpa.org/aboutthecodes/AboutTheCodes.asp?DocNum=70

5.3 NESC National Electrical Safety Code
http://standards.ieee.org/about/nesc/

5.4 NFPA 70E Standard for Electrical Safety in the Workplace
http://www.nfpa.org/aboutthecodes/AboutTheCodes.asp?DocNum=70E

5.5 OSHA Occupational Safety & Health Administration
http://www.osha.gov/

5.6 UL Underwriters Laboratories
http://www.ul.com/

5.7 FM Factory Mutual
http://www.fmapprovals.com/