2024
ELECTRIC DISTRIBUTION DESIGN MANUAL
FIELD MAINTENANCE ONLY

Historical Record: 1/1/2024
External Version

SDGE™

ATTENTION:

- The contents held within this book are for field maintenance only. Every effort should be made, when possible, to upgrade to current standards.

IF YOU HAVE ANY QUESTIONS REGARDING THE CONTENT OF THESE MANUALS, PLEASE EMAIL CONSTRUCTIONSTANDARDSADMINISTRATORS@SEMPRAUTILITIES.COM OR CONTACT:

REV. 09/04/2024

MAIN TABLE OF CONTENTS

SUMMARY OF CHANGES

DATE	STANDARD PAGES	QTY	FILE NAME
09/20/24	NEW RELEASE, 6101, 6114, 6201, 6222	5	DMFMO2024v0920.pdf

MAIN TABLE OF CONTENTS

ARCHIVED BOOKS AVAILABLE ON THE INTERNAL VERSION

5000
GENERAL
INFORMATION

5000
GENERAL
INFORMATION

5000 - No FMO standards for this section.

MAIN TABLE OF CONTENTS

5100
OVERHEAD LAYOUT SYSTEMS

5100
OVERHEAD LAYOUT SYSTEMS

5100 - No FMO standards for this section.

MAIN TABLE OF CONTENTS

5200
UNDERGROUND
LAYOUT SYSTEMS

5200
UNDERGROUND
LAYOUT SYSTEMS

5200 - No FMO standards for this section.

MAIN TABLE OF CONTENTS

5300
DEMAND
ESTIMATING

5300
DEMAND
ESTIMATING

5300 - No FMO standards for this section.

MAIN TABLE OF CONTENTS

5400
VOLTAGE DROP

5400
VOLTAGE DROP

5400 - No FMO standards for this section.

MAIN TABLE OF CONTENTS

5500
CONDUCTOR
AMPACITIES

5500
CONDUCTOR
AMPACITIES

5500 - No FMO standards for this section.

MAIN TABLE OF CONTENTS

5600 - No FMO standards for this section.

MAIN TABLE OF CONTENTS

5700
PADS & SUBSTRUCTURES

5700
PADS & SUBSTRUCTURES

5700 - No FMO standards for this section.

MAIN TABLE OF CONTENTS

5800
CAPACITORS

5800
CAPACITORS

5800 - No FMO standards for this section.

MAIN TABLE OF CONTENTS

5900
WIRE & SUPPORTS

5900
WIRE & SUPPORTS

5900 - No FMO standards for this section.

MAIN TABLE OF CONTENTS

6000
SUBSTATION
LOAD FORCASTING

6000
SUBSTATION
LOAD FORCASTING

6000 - No FMO standards for this section.

MAIN TABLE OF CONTENTS

6100
SECTIONALIZING
& PROTECTION

6100
SECTIONALIZING
& PROTECTION

PAGE	SUBJECT
6114	UNDERGROUND SERVICE RESTORER

MAIN TABLE OF CONTENTS

REV	CHANGE	DR	BY	DSN	APV	DATE	REV	CHANGE	DR	BY	DSN	APV	DATE
C							F						
B							E						
A	6114 MOVED TO FMO	JIK	MAK	FRC	KRG	09/16/2024	D						

	Indicates Latest Revision		Completely Revised	X	New Page		Information Removed

DM6114 FIELD MAINTENANCE ONLY

ALL VERSIONS LISTED IN FMO ARE SUPERSEDED BY THEIR CURRENT VERSION FOUND INSIDE THE ELECTRIC DISTRIBUTION DESIGN MANUAL.

REVISION HISTORY:

09/16/2024: MOVED TO FMO

TABLE OF CONTENTS

REV	CHANGE	DR	BY	DSN	APV	DATE	REV	CHANGE	DR	BY	DSN	APV	DATE
C							F						
B							E						
A	6114 MOVED TO FMO	JIK	MAK	FRC	KRG	09/16/2024	D						

	Indicates Latest Revision		Completely Revised	X	New Page		Information Removed

TABLE OF CONTENTS

SCOPE

This document provides criteria for the selection and application of 12KV feeder sectionalizing devices on selected high–risk circuits.

PURPOSE

Application of automatic sectionalizing devices for underground circuits (pad–mounted service restorer and PME3 with SCADA) can be beneficial in reducing the number of customers affected by service interruptions. These devices are also helpful in reducing the projected SAIDI by minimzing the impact of a failure of the unfused high molecular polyethylene (HMWPE or PECN in GFMS or unjacketed cross–linked polyethylene (XLPE) cable.

CRITERIA

A. Circuits chosen for study should meet one or more of the following:

1. A high amount of unfused type HMWPE of XLPE cable as defined by
   a. Total cable length exceeding one mile or
   b. Exceeding 20 percent of the total underground cable length
2. Underground outage history exceeding three feeder outages over the last three years regardless of cause.

B. In addition to the above, the application must be prioritized based on the cost–to–benefit (C/B) ratio analysis in Design Manual section 6145. The projected value (the inverse of the C/B ratio) must be greater than one to justify the additional sectionalizing devices. Alternate methods of project methods of project justification may be allowed by Electric Distribution Planning.

APPLICATION

The circuit under consideration must be examined to ensure that it will meet the switching provisions of Design Manual section 6111 after modification. Service restorers are the preferred device because of the automatic operation and the fact that they can immediately reduce the number of customers affected by an outage. If a service restorer is already in use on a circuit, the PME3 with SCADA should be used where substation SCADA is available or will be available within two years. In cases where the frequency is not as critical, the PME3 with SCADA may be the most economical choice.

1. 600A Padmounted Service Restorer

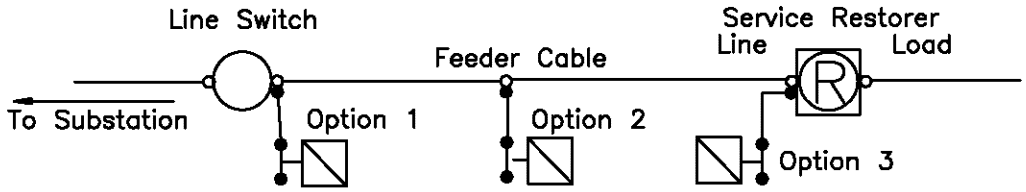
a. Consideration must be made regarding the location and length of the un–fused cable segments when locating the service restorer. As a general guide, locate the service to maximize the amount of load on the line side of the device and to maximize the circuit length on load side. The service restorer should be located to protect at least one half of the circuit load. If this is not practical, locate to maximize the isolation of the unfused cable sections.

b. A line switch is required immediately ahead of the service restorer for maintenance. This may be an overhead gang operated or hookstick switch, a padmount switch, a handhole switch (On–Off),or a manhole switch (group/On–Off). Manhole switches are acceptable for this application but they are not preferred.

FOR FIELD MAINTENANCE ONLY

APPLICATION (continued)

c. No load should be connected between the service restorer and the line switch immediately ahead. An exception to this rule would be the placement of a single phase transformer that would only provide secondary service for the actuator device within the service restorer. This single phase transformer may tap the feeder at either the switch, the service restorer or in between. Following is an illustrative one-line diagram for the three optional hookups.



Special Note: DM 6121.3.d.1 requires that a fuse request be submitted and approved prior to installation of un-fused transformer stations.

d. If the service restorer is located so as to protect a purely underground section it shall be set for one test reclosing 5 seconds after the fault, then lockout. Distribution Planning will determine the number of test reclosings for circuits with overhead spans on the load side of the service restorer.

e. Distribution Planning must be contacted to obtain settings for all protective devices on the circuit.

2. PME3 with SCADA or SCADA Overhead Switch

The PME3 with SCADA should be applied in cases where: 1) A feeder has an existing service restorer and protection (fuse) coordination is not possible. 2) The less expensive SCADA switch will provide adequate protection for the circuit being studied.

a. If existing subsurface or padmount switchgear is strategically placed for service restoration contact Electric Distribution Standards about SCADA actuator retro-fit. This option can be more economical than other options.

b. Install SCADA type switches at the midpoint, one-quarter and three-quarter points on the feeder in that order of preference. These may be the new PME3 SCADA switch, SCADA overhead switch, or an existing underground switch retro-fitted with SCADA.

c. SCADA operated devices may be installed on feeders from current non-SCADA substations where SCADA is not planned within two years. Substations where SCADA is not planned within two years will limit options to automatic protection devices.

d. Consideration should be given to converting strong tie switches to SCADA.

6200
SYSTEM
ENGINEERING

6200
SYSTEM
ENGINEERING

PAGE	SUBJECT
6222	APPLICATION OF GROUNDING BANKS

MAIN TABLE OF CONTENTS

REV	CHANGE	DR	BY	DSN	APV	DATE	REV	CHANGE	DR	BY	DSN	APV	DATE
C							F						
B							E						
A	6222 MOVED TO FMO	JIK	FRC	FRC	KRG	09/16/2024	D						

DM6222 FIELD MAINTENANCE ONLY

ALL VERSIONS LISTED IN FMO ARE SUPERSEDED BY THEIR CURRENT VERSION FOUND INSIDE THE ELECTRIC DISTRIBUTION DESIGN MANUAL.

REVISION HISTORY:

09/16/2024: MOVED TO FMO

TABLE OF CONTENTS

REV	CHANGE	DR	BY	DSN	APV	DATE	REV	CHANGE	DR	BY	DSN	APV	DATE
C							F						
B							E						
A	6114 MOVED TO FMO	JIK	FRC	FRC	KRG	09/16/2024	D						

	Indicates Latest Revision		Completely Revised	X	New Page		Information Removed

TABLE OF CONTENTS

SCOPE

This criteria shall be used for the application of grounding banks. Grounding banks provide a grounded neutral source that is required by load additions which are served by 6.9kV transformers.

DEFINITIONS

A grounding bank installation consists of three–phase transformers connected grounded wye–delta and is used to provide a ground source for the primary neutral wire. The primary voltage rating of the transformers used can be 12 or 6.9kV. The secondary voltage shall be rated 480 volts or higher (see O.H. Standards page 1195).

APPLICATION OF GROUNDING BANKS

A. Why Grounding Banks?

A grounding bank may be installed to serve single–phase load additions using 6.9kV transformers when there are two or fewer grounding banks on a circuit and:

1. Extension of an existing neutral wire, beyond the proper location for a grounding bank, is double the cost of a new grounding bank installation.

2. A neutral connected to an existing grounding bank is available, but additional single–phase load will exceed the recommended kVA limit on the existing grounding bank (see paragraph B.5).

B. Design Considerations

The following lists several design considerations related to the application of grounding banks.

1. The available short–circuit current sensed by a protective device is reduced approximately 100 amps for each grounding bank between the fault location and the substation. To prevent desensitization of the substation ground relays, the number of grounding banks on a circuit is limited to three installations.

2. A grounding bank should be installed at a central location to enable future loads to take advantage of this neutral source. Since there will normally be a maximum of three grounding banks per circuit, each grounding bank should be located to cover one third of the area served by the circuit.

3. The recommended location for a grounding bank is on the unfused portion of a circuit, preferably on the feeder because the load on the grounding bank will be served by an energized neutral source except during times when the circuit is interrupted or the grounding bank has failed.

4. Neutrals established by grounding banks should only be used to serve transformers fed from the same circuit.

5. The following are approved grounding bank installations, allowable connected kVA unbalance between phases and maximum connected kVA loading.

Grounding Bank Installation	Allowable Connected kVA unbalance Between Phases	Maximum Connected kVA Loading (a)
3 – 50 kVA's	150 kVA	1500 kVA
3 – 75 kVA's	225 kVA	2250 kVA

(a) The maximum connected kVA allowed was set at 10 times the unbalance which a grounding bank may tolerate because the load unbalance on the average circuit is 10 percent.

b. For more information on overhead grounding banks, refer to O.H. Standards Page 1195.

6. Single–phase loads served from a grounding bank should be divided equally among the three phases to balance the total load as much as possible.

If the amount of unbalance cannot be kept within the limits set above, one of the following must be done:

a. Extend the neutral from the substation and remove the grounding bank. This alternative is recommended if there is significant load growth potential in the area.

b. Serve part of the load with 12kV single–phase transformers. Use enough 12kV transformers to reduce the amount of 6.9kV connected kVA below the recommended limit.

c. Extend the neutral from another grounding bank, either new or existing, and transfer some 6.9kV load to this neutral. These neutrals are not to be connected to each other.

6300
SUBSTATION
ENGINEERING

6300
SUBSTATION
ENGINEERING

6300 - No FMO standards for this section.

MAIN TABLE OF CONTENTS