Electrical Start-Up Procedure

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FEMC
NSF

Raytheon Polar Services Company
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Purpose

Electrical start up procedure and tests are generally performed as a quality control measure to ensure manufacturer and project specifications were met during installation and start up of the equipment and/or system prior to bringing the equipment online.

Scope/Applicability

These procedures standardize the RPSC FEMC start up testing while incorporating industry standards. This assures the equipment and associated systems are in working order and are in compliance with the design.

In this procedure, the below equipment/system start up procedures are discussed:

- Building Wire and Cable
- Wiring Devices
- Grounding and Bonding
- Automatic Paralleling Switchgear
- Power Conditioning Equipment
- Enclosed Switches
- Dry Type Transformers
- Feeder Plug-in Busway
- Panelboards
- Transfer Switches
- Uninterruptible Power Supplies
- Packaged Engine Generator Systems
- Power Monitoring and Control System
Terms and Definitions

Amps
Amperes

AC
Alternate Current

DC
Direct Current

gpm
Gallons per minute

Kw
Kilowatt

MCC
Motor Control Center

psi
Pounds per square inch

TVSS
Transient Voltage Surge Suppressors

V
Volt

Responsibilities

FEMC

Field Engineer/Project Engineer or Designee

- Coordinates the Final Inspection with appropriate parties.
• Oversees/Participates in the Start Up, Test, and Inspection Process to ensure the Specifications and Procedures are followed.

NSF

*Title II Inspector or other NSF Designee*

Independent Inspector for the NSF, who witnesses the testing and conducts the required inspections for the NSF.

**Electrical Start Up Discussion**

Prior to engaging any system, it is important to verify that all connections and associated apparatus are installed properly to assure the system performs correctly, efficiently, and safely. Remove all packing and protective materials from the system before testing.

**General Preparation for All Start Up Test Procedures**

Before starting, obtain the latest revision of the plans, specifications, and the approved shop drawings of the complete system and its associated equipment. Compare installed equipment and materials to construction drawings and compare the installation for compliance to the design and completeness including all terminations being made; proper voltage at the power source; hangers and seismic protection installed; and connection to the controls. Obtain the manufactures’ recommended procedure for testing the equipment where appropriate.

**Equipment Check**

Check to see that all packing materials have been removed.
Building Wire and Cable

All building wire and cable shall be installed per the plans and specifications. Deviations from these standards must be documented per the RFI/CR process and the as-built process, as appropriate. Landing lugs, torquing bolted connections, and meggering shall be performed per the applicable codes, specifications, and manufacturer’s recommendations, and documented on the Wire Continuity and Termination Testing form (EN-MPS-725h).

Equipotential Grounding Test Procedure

All grounding and bonding shall be installed per the plans and specifications. Deviations from these standards must be documented per the RFI/CR process and the as-built process, as appropriate.

A ground resistance test shall be conducted to determine compliance of the grounding system with the specifications. Determine test measurements (resistance) in ohms from up to twelve points, or quantity as required by the specifications, selected in the field, as measured in reference to the equipotential reference. All measurement shall be taken from the main area grounding point or telecommunications ground bar of the building being tested. Before beginning the test, establish the resistance values. Document the results on Equipotential Reference Grounding Point Testing form (EN-MPS-725c).

Automatic Paralleling Switchgear Procedure

All switchgear shall be installed per the plans and specifications. Deviations from these standards must be documented per the RFI/CR process and the as-built process, as appropriate. Start-up the switchgear per manufacturer’s recommendation, instructions, and the specifications. Document the start-up utilizing the Switchboard Testing form (EN-MPS-725g).
Power Conditioning Equipment (TVSS) Procedure

All power conditioning equipment (TVSS) shall be installed per the plans and specifications. Deviations from these standards must be documented per the RFI/CR process and the as-built process, as appropriate. Start-up per manufacturer’s recommendation, instructions, and the specifications.

Enclosed Switches Procedure

All enclosed switches shall be installed per the plans and specifications. Deviations from these standards must be documented per the RFI/CR process and the as-built process, as appropriate. Start-up per manufacturer’s recommendation, instructions, and the specifications.

Dry Type Transformers Procedure

All dry type transformers shall be installed per the plans and specifications. Deviations from these standards must be documented per the RFI/CR process and the as-built process, as appropriate. Start-up per manufacturer’s recommendation, instructions, and the specifications. Document the start-up utilizing the Dry Type Transformer Test form (EN-MPS-725b).

Feeder Plug-in Busway Procedure

All feeder plug-in busway shall be installed per the plans and specifications. Deviations from these standards must be documented per the RFI/CR process and the as-built process, as appropriate. Start-up per manufacturer’s recommendation, check the grounding, voltage, and continuity. There should be no phases to ground.
Panelboards Procedure

The panelboards shall be installed per the manufacturer’s recommendation, instruction, and the specifications. Deviations from these standards must be documented per the RFI/CR process and the as-built process, as appropriate. Check panel labeling against drawings, and document the start-up utilizing the Panelboard Testing form (EN-MPS-725f).

Transfer Switch Start-up Procedure

All enclosed transfer switches (automatic and manual) shall be installed per the plans and specifications. Deviations from these standards must be documented per the RFI/CR process and the as-built process, as appropriate. Start-up per manufacturer’s recommendation, instructions, and the specifications.

Uninterruptible Power Supply (UPS) Procedure

All UPS shall be installed per the plans and specifications. Deviations from these standards must be documented per the RFI/CR process and the as-built process, as appropriate. Start-up per manufacturer’s recommendation, instructions, and the specifications.

Packaged Engine Generator System

The package engine generator shall be installed per the plans and specifications. Deviations from these standards must be documented per the RFI/CR process and the as-built process, as appropriate. Start up per manufacturer’s recommendation, instructions, and the specifications. Document the start-up utilizing the Generator Set Start-up Checklist form (EN-MPS-725d).
Power Monitoring System Procedure

The power monitoring shall be installed per the plans and specifications. Deviations from these standards must be documented per the RFI/CR process and the as-built process, as appropriate. Start-up per manufacturer’s recommendation, instructions, and the specifications.

Megger (Insulation Resistance Testing) Procedure

The megger testing shall be in accordance with the Specifications. Deviations from these standards must be documented per the RFI/CR process and the as-built process, as appropriate. Utilize report form, Megger Test Report (EN-MPS-725e).

Continuity Testing

The continuity testing shall be in accordance with the Specifications. Standard Continuity Tests include the following three.

1. Receptacles are tested by circuit tester (document on Wiring Devices form (EN-MPS-725i)).
2. Lights are tested by a visual operation test.
3. Motor Loads are tested using a voltage meter and testing the disconnect.

Utilize report form, Wire Continuity and Termination Testing (EN-MPS-725h), as appropriate.

All Call System

All Call shall be started-up in accordance with the manufacturer’s recommendations. Testing shall be conducted and documented on the All Call Testing form (EN-MPS-725a).
References

All Call Testing Form (EN-MPS-725a)
Dry Type Transformer Test (EN-MPS-725b)
Equipotential Reference Grounding Point Testing (EN-MPS-725c)
Generator Set Start-up Checklist (EN-MPS-725d)
Megger Test Report (EN-MPS-725e)
Panelboard Testing (EN-MPS-725f)
Switchboard Testing (EN-MPS-725g)
Wire Continuity and Termination Testing (EN-MPS-725h)
Wiring Devices (EN-MPS-725i)
29 CFR 1910 – Occupational Safety and Health Standards

IEEE – Institute of Electrical and Electronics Engineers, www.ieee.org
ANSI – American National Standards Institute, www.ansi.org
NEC – National Electrical Code


Records

See the above forms under the FEMC-MPS tab of the FEMC Records Management Table (EN-D-226a).