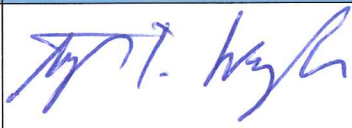
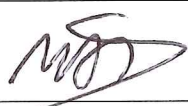






Standard Operating Procedure
Replacement of Motor Control Center Starters

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Approval

<i>Approving Authority</i>	<i>Name</i>	<i>Signature</i>	<i>Date</i>
Quality Assurance Manager	Steve Washington		12 JUN 2019
EVP Process & Controls	Michael Delgado		13 JUN 2019
Professional Engineer	Steve Rusconi	SR	13 June 2019
EVP Service & Safety	Mike Fisher		13 June 2019
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Revision History

<i>Revision #</i>	<i>Description of Change</i>	<i>Effective Date</i>	<i>DCR#</i>
0	New Procedure Document	14 JUN 2019	17011



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- 1 Purpose
 - 1.1 To establish procedures for removal and replacement of 'bucket-type' Motor Control Center (MCC) motor starters.
- 2 Scope
 - 2.1 Coordination of all operations with general contractor or owner.
 - 2.2 Safety Review and Arc Flash hazard work area delineations.
 - 2.3 Disconnection, removal and replacement of existing Motor Control Center (MCC) 'bucket-type' motor starters.
- 3 Responsibilities
 - 3.1 The Therma Project Manager shall coordinate scheduling for all electrical shutdown and replacement work with the owner or owner's agent.
 - 3.2 The Therma Electrical Foreman shall coordinate with the Therma Project Manager for scheduling shutdowns.
 - 3.3 The Therma Electrical Foreman is responsible for ensuring the crew follows all established safety and electrical standard procedures.
 - 3.4 The Therma Electrical Foreman shall assign work to electricians according to their training and experience.
 - 3.5 The Electrician shall review with the Foreman all Safety and Personal Protective Equipment (PPE) issues, schedules, plans and component information prior to the start of work.
- 4 References
 - 4.1 Therma Safety Manual, Policy Section 53 Lockout / Tagout Program
 - 4.2 Therma Safety Manual, Policy Section 54 Electrical Safety Program (NFPA 70)
- 5 Special Materials and Tools
 - 5.1 Arc Flash Personal Protective Equipment (PPE)
 - 5.2 Voltmeter- AC



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- 5.3 Safety Delineators, barriers
- 5.4 Lock Out / Tag Out Supplies
- 6 Procedures
 - 6.1 Prepare the work site for shut down and replacement of electric motor 'bucket-type' starters.
 - 6.2 Review all safety procedures including Therma Safety Manual, Policy Section 53 Lockout / Tagout Program and Section 54 Electrical Safety Program (NFPA 70) which include instructions for the following:
 - 6.2.1 Safety cordon area with barriers and signage. etc.
 - 6.2.2 Establish safety area by cordoning off minimum six (6) feet radius around the MCC to be replaced.
 - 6.2.3 Two Electricians shall gear-up/dress in their 'Arc Flash Personal Protective Equipment(PPE) including: Coveralls or rated clothing; Safety Glasses; Earplugs; baklava, Hard Hat with Faceshield for Arc Flash; rubber and leather gloves, etc., per Therma Arc Flash Training Procedures.
 - 6.3 Coordinate all shutdowns for each piece of equipment with the general Contractor and/or Owner prior to start of shutdown.
 - 6.3.1 Determine whether the MCC bus to be energized or de-energized during the starter replacement.
 - 6.3.2 Verify Therma's Arc Flash PPE meets the required energy rating per applicable codes and Therma Safety Procedures.
 - 6.3.3 When the MCC is to be de-energized during starter replacement, proceed to LOTO in step 6.4.
 - 6.3.4 When the MCC is to be energized during starter replacement, proceed to LOTO in step 6.5.
 - 6.4 When authorized by GC or Owner, Electrician shall De-energize Motor Control Center(MCC) bus bar system ('Line Side' or 'Power Supply' of bucket starters).



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- 6.4.1 Therma Electrician shall initiate 'Lock-Out/Tag-Out' (LOTO) for electrical power equipment to prevent accidental energizing of the 'LINE' side of the bucket starter.
- 6.4.2 Electrician shall attach a padlock and tag to the MCC Power Supply switch per Therma and site specific LOTO procedures.
- 6.4.3 Electrician shall verify power has been de-energized by checking for Voltage at LINE side of bucket starter to be replaced.
- 6.5 When authorized by GC or Owner, Electrician shall begin replacement of starter while the Motor Control Center(MCC) is energized.
 - 6.5.1 Electrician shall initiate LOTO for the Disconnect Switch(DS), Circuit Breaker(CB) or Motor Circuit Protector(MCP) within the bucket type starter to secure the "load-Side" of the switch/breaker.
- 6.6 Electrician shall verify power has been disconnected/de-energized by checking for voltage at the 'Load-Side' of the switch/breaker.
- 6.7 Electrician shall disconnect and safe-off 'LOAD' side wires from bucket and pull/route the wires to the safe side of the MCC panel.
 - 6.7.1 Electrician shall disconnect and safe-off all control wiring terminated on the panel door as required and/or remove the panel door per manufacturer's instructions.
 - 6.7.2 Pull-apart terminal blocks in the vertical wireway must be disengaged/disconnected and the wiring to other units, master terminal blocks, or to load devices must be disconnected before the unit is removed.
- 6.8 After opening and/or removing bucket cover/door, electrician shall use a screwdriver to push in on the latch at the top center of the unit and rotate ¼-turn counterclockwise. Then grasp the unit and pull it outward to remove.
 - 6.8.1 NOTE: Removing the 'bucket' from the MCC disconnects the 'LINE' side of the starter unit from the MCC bus and ground bars.
- 6.9 Electrician shall cover the opening with non-conductive materials until the starter is ready to be installed. Door panel may need to be installed to maintain arc safety rating of the MCC.



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- 6.10 Electrician shall install/replace bucket-type starter unit
 - 6.10.1 Position the mounting points on the unit frame with the mating guide rails.
 - 6.10.2 Slide the unit inward until all four mounting points are engaged, then move it inward with a quick push. This movement overcomes the compression of the stabs as they engage the vertical bus bars.
 - 6.10.3 With the unit in the correct position, the ¼-turn latch is easily engaged by pushing it inward (with screwdriver) and rotating ¼-turn clockwise.
 - 6.10.4 Note: Installing the 'bucket' into the MCC connects the 'LINE' side of the starter's CB or DS.
 - 6.10.5 Electrician shall check voltage at the 'LINE' side of the starter's CB or DS between each phase and ground to verify proper connection with the bus.
- 6.11 Electrician shall re-connect 'LOAD' wiring as required for power and controls to/from the starter bucket. Electrician shall also re-connect any control wiring to the panel door and install panel door as required.
 - 6.11.1 Electrician shall verify that all wiring is connected/terminated and marked properly.
- 6.12 Electrician shall install cover on bucket and initiate 'Lock-Out/Tag-Out' (LOTO) for electrical power equipment to prevent accidental energizing of the 'LOAD' side of the bucket starter.
 - 6.12.1 Electrician shall attach a padlock and tag per Therma and site specific LOTO procedures.
- 6.13 Electrician shall coordinate with GC/Owner for Re-Energizing the MCC panel or starter PRIOR to removing Therma LO/TO.
- 6.14 Upon approval from GC/Owner, electrician shall re-energize the MCC panel or starter.
- 6.15 Electrician shall verify voltage at applicable 'Load' side terminals of the starter.