

PPE Requirement

- + Safety shoe
- + Safety goggles
- + Safety helmet
- + rubber gloves

Entrance of Electrical Room | Fire Indicator Lamp

- Isolate the CO2 system before entering the room, from ON -> ISOLATE position.
- If RED lamp lit up, DO NOT enter the room. CO2 is discharge, wait.
- If GREEN lamp lit up, safe to enter the room, CO2 is not in-operation.
- Switch back from ISOLATE -> ON.

Electrical Room Requirement

- Rubber mat (5mm x 600mm x MSB Length) in front of MSB.
- Single line/schematic diagram MSB.
- First Aid Treatment & CPR sign.
- Sufficient lighting inside the room.
- At least 2 point socket for maintenance.
- Exhaust fan in working operation.
- Door entrance open outwards.
- Room shall not used as store any item.

Fault 1 | Earth fault (EFR)

- Look at OCR red light appear.
 - Look at outgoing MCCBs for any breaker trip or OFF position.
- To further action:
- Perform insulation test on MSB busbar, this is to verified MSB internal is NO FAULT.

Fault 2 | Over-current Relay fault (OCR)

- Look at OCR red light appear.
 - Look at outgoing MCCBs for any breaker trip position.
- To further action:
- Perform insulation test on MSB busbar, this is to verified MSB internal is NO FAULT.
 - RACK out ACB and check abnormal conditions on busbar (burning marks).

CASE SCENERIO 1:

Management contacted you about power outage at building/factory, ask to restore back power.

Step 1: Verify MSB is having fault.

- Confirm MSB trip by looking at supply indicator.
- Look at main isolator confirm OFF position.
- Look at EFR/OCR any RED light indication.

Step 2: Signage & Shutdown

- Place DANGER signs on ACB.
- Place DANGER signs on faulty MCCBs.
- Perform shutting down all MCCBs with ON position.

Step 3: Restore back power

- Press RESET button on EFR/OCR first.
- Perform spring charge, then switch ON main isolator (ACB/MCCB)
- Check voltage conditions, each phase and R-Y-B by operating the voltage selector switch.

Step 4: Switch ON outgoing

- Switch ON all MCCBs starting from smallest amps to largest amps. To avoid in-rush current to nearby circuits .
- Wait about 1-2 minute, then switch ON next MCCB.
- Lastly, switch ON capacitor bank.

Step 5: Job done / Ending

- Write/record all faults into MSB's log book.
- Wait at least 30min in-case of second time MSB trip again.
- Inform management/boss.
- Remove any signage placed earlier on ACB.
- Switch off room lights and lock door.

CASE SCENERIO 2: PART1

Management contacted you about maintenance work by SESCO and required to shutdown the MSB (Incomer 1). You are required to perform power transfer using coupler switch and transfer supply from incomer 2 to incomer 1.

Step 1: Shutdown Incomer 1

- Inform all to shutdown all equipments at subDB. Ensure all subDB have switched OFF first.
- Switch OFF MCCBs at MSB panel.
- Switch OFF capacitor bank isolator.
- Switch OFF main isolator (ACB/MCCB).
- Place DANGER signs on ACB, to avoid anyone from switching ON the ACB incomer 1.
- Wait for SESCO supply has OFF supply.

Step 2: Transfer Power from incomer 2 to 1

- Check position all MCCBs at incomer 1 is OFF position.
- Unlock the coupler switch, then switch ON.

Note:

Any fault detected will cause trip at incomer 2 protection device (EFR/OCR)

Step 3: Restore back power (Incomer 1)

- Look at incoming supply indicator lamp.
- Check voltage conditions, each phase and R-Y-B by operating the voltage selector switch.

Step 4: Switch ON outgoing (Incomer 1)

- Switch ON all MCCBs starting from smallest amps to largest amps. To avoid in-rush current to nearby circuits .
- Wait about 1-2 minute, then switch ON next MCCB.
- Lastly, switch ON capacitor bank.
- Inform management, supply is back.

CASE SCENERIO 2: PART2

After few hours later, SESCO informed that their maintenance work is almost done and will turn ON power supply at this time. You will need to switch OFF the coupler switch and restore power on incomer 1.

Step 5: Shutdown again

- Repeat Step 1 shutdown sequence.
- Switch OFF the coupler switch and lock.
- Wait for SESCO supply has switch ON supply for Incomer 1. (Look at OCR/EFR power lamp)

Step 6: Restore back power again

- Go to step 3.
- Go to step 4.

Step 7: Job done / Ending

- Write/record all faults into MSB's log book.
- Wait at least 30min in-case of second time MSB trip again.
- Inform management/boss.
- Remove any signage placed earlier on ACB.
- Switch off room lights and lock door.

CASE SCENERIO 3:

New site/building, your management ask you to energized the supply power for first time.

Step 1: Inspection Requirement

- Refer to page 5 on switchboard room requirement.
- Open all panels on MSB and perform visual inspection inside MSB.
- Remove any tools, foreign objects, pest and if dusty perform cleaning work first.
- Ensure all circuit wiring is secure and nothing is missing or abnormal.
- Ensure all cabling works is done from MSB to SDB cables is secured and no cables are left hanging.
- Secure all bolts-nuts at busbar and MCCB terminals.
- Ensure all earth conductor are check and secured to the main earth terminal (MET).

Step 2: Testing Requirement

- Before perform tests, ensure all circuit breakers are switched OFF, fuse is removed.
- Continuity test on MSB's busbar.
- Polarity test on MSB's busbar.
- Insulation test on MSB's busbar.
- Perform functional test of main isolator (ACB/MCCB).
- Ensure testing result value is acceptable and recorded into log book.

Step 3: Finalize before energizing the MSB

- Ensure all panels open earlier are closed and secured.
- Check if incoming supply is present by looking at power light of EFR/OCR.
- Inform management/boss that you are going to energize the MSB. (For insurances purposes.)
- Inform anyone near MSB to step back and not touching the MSB panel.

Step 4: Energizing the MSB first time

- Ensure all outgoing MCCBs is OFF position.
- Look at main isolator confirm OFF position.
- Confirm SESCO supply is present.
- Press RESET button on EFR/OCR to ensure no fault.
- Begin energizing the MSB by perform spring charge on main isolator if it is ACB type, then switch ON .
- Check voltage conditions, each phase and R-Y-B by operating the voltage selector switch.
- Wait at least 30min in-case of any fault detected.

Step 5: Switch ON outgoing MCCB to SDB.

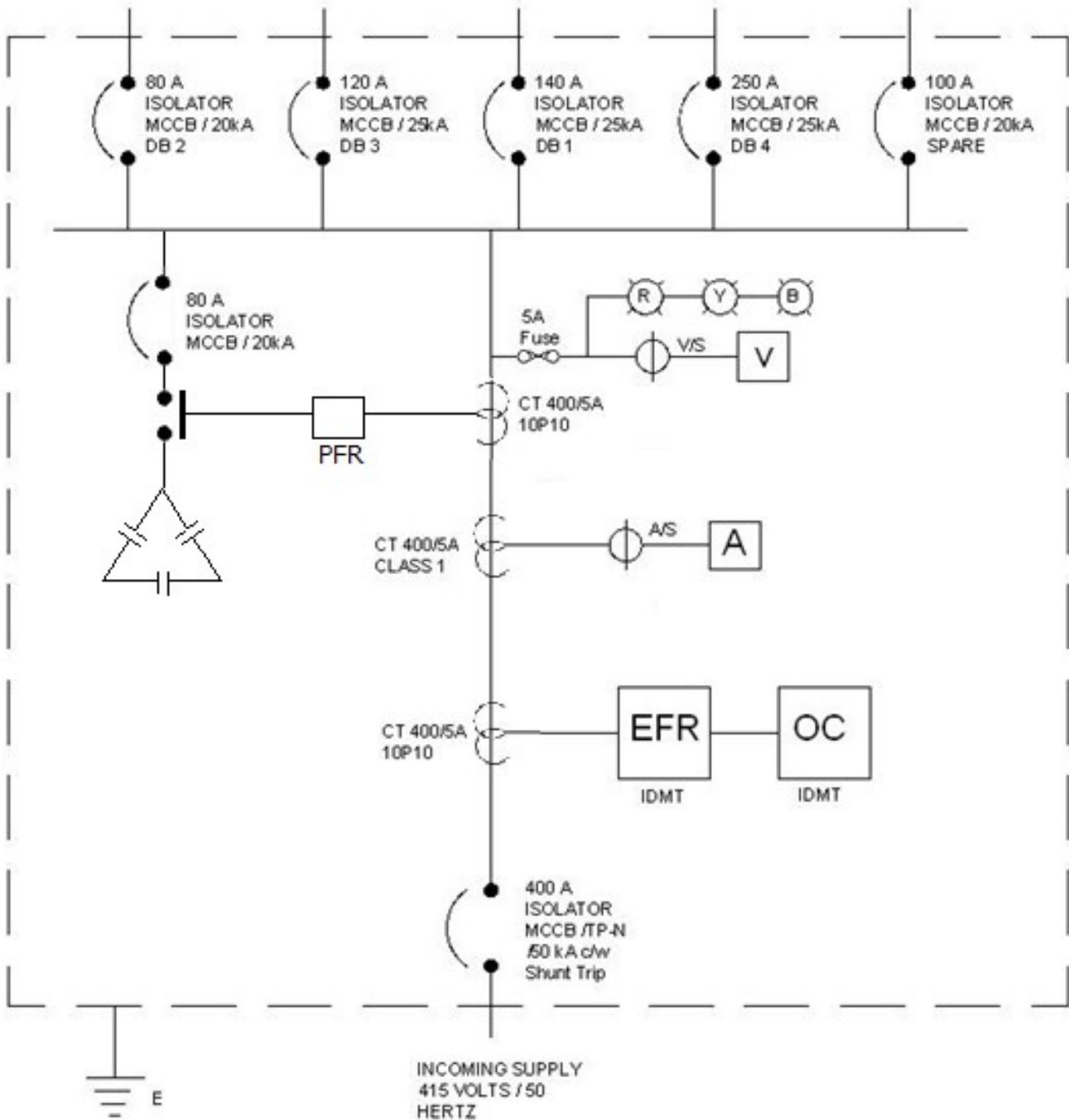
- Check and verified on MCCB and SDB is correct according to layout/schematics. Ensure cabling works is secure and supported along the route from MSB to SDB.
- SDB main isolator is switched OFF.
- Perform Insulation Tests on outgoing cables on MCCB at MSB. Ensure test value is OK.
- Switch ON the MCCB of SDB, have some to verify supply is present at SDB on same labeled MCCB.
- Verify supply at SDB main isolator.
- Continue switch ON MCCB SDB, if some SDB cabling work is NOT YET DONE, place Tag or notice on MCCB SDB labeled.
- Switch ON capacitor bank system.

Step 6: Job done / Ending

- Write/record all testing values or any faults into MSB's log book.
- Wait at least 30min in-case of second time MSB trip again.
- Inform management/boss.
- Switch off room lights and lock the switchboard room.
- Any defects spotted in electrical switchboard room must inform management.

Identify Basic MSB component

Note: Trainer will ask question on the diagram



Knowledge Assessment questions

1. What is the width of rubber mat?
 - (a) 200 mm
 - (b) 600 mm
 - (c) 900 mm
2. What is the safety requirement to wear upon entering MSB room?
 - (a) safety helmet
 - (b) safety shoe
 - (c) hand glove
3. Before entering MSB room, this system must be temporary switch OFF/Isolated.
 - (a) CO2 system
 - (b) motor
 - (c) capacitor bank
4. Power factor is located at where?
 - (a) ACB or MCCB
 - (b) supply indicator
 - (c) capacitor section
5. What is the purpose of heater switch?
 - (a) to heat the msb cable
 - (b) to ensure no vapor inside msb
 - (c) prevent cable from cold
6. What is the standard setting for EFR?
 - (a) 4%
 - (b) 10%
 - (c) 15%
7. Which of the followings is used to measure current?
 - (a) EFR
 - (b) ACB
 - (c) CT
8. What is the ideal value of power factor according to requirement?
 - (a) < 0.65 or smaller
 - (b) > 0.75 or greater
 - (c) > 0.85 or greater
9. What is the maximum MCCB as main isolator in sub DB?
 - (a) 500 A
 - (b) 800 A
 - (c) > 1000 A
10. When do you operate the coupler switch?
 - (a) when one of two incomer is shutdown
 - (b) when one of the 3phase line no supply
 - (c) when power failure
11. Heater switch is best used by control method, except.
 - (a) timer clock
 - (b) temperature control
 - (c) using energy from sunlight
12. Incoming current is 1000 A, earth relay set 10%, what is the expected I_p ?
 - (a) 0.5 A
 - (b) 1000 A
 - (c) 100 A
13. What is the possible cause of EFR to triggered?
 - (a) short between R-Y
 - (b) short between Y-N
 - (c) short between B-E
14. Current transformer for EFR using this size conductor .
 - (a) 1.0 mm.sq
 - (b) 1.5 mm.sq
 - (c) 4.0 mm.sq
15. When MSB length is more than 3 meter, what is the correct length rubber mat to placed on MSB.
 - (a) no rubber mat is required
 - (b) follow the entire length of MSB
 - (c) the length of the rubber mat shall be 2 meter
16. When OCR trigger a fault, the first priority is to?
 - (a) OFF ACB, rack out ACB, perform checking
 - (b) rack out ACB, perform checking
 - (c) ON ACB, reset OCR
17. MSB door entrance RED light indicator is ON, why?
 - (a) the door is hot, do not enter
 - (b) the room is hot, do not enter
 - (c) CO2 has activated, do not enter
18. When perform meggar on msb, the expected result should be?
 - (a) $< 1\Omega$
 - (b) $< 10 \Omega$
 - (c) $> 1M\Omega$
19. This test is required when msb triggers faults?
 - (a) insulation test
 - (b) continuity test
 - (c) insulation and continuity test
20. New MSB site required to visual inspection before energized.
 - (a) ensure no foreign object inside panel
 - (b) ensure terminal are label
 - (c) all fuse or CB is correct rating