

# Samcon Industrial Controls P.Ltd

Office-112, Krishna Building, Laxmi Industrial Estate, Vartak Nagar, Thane 400606, Tel-022-25856701

## Method for Installation of DB or Panel-(Part-1)

### **General Equipment & Tools:**

- The equipment that will be engaged for Installation of Panel ,D.B will be
- Tool Box with Screwdriver, Pliers, Spanner , Hammer
- Drilling Machine with various Bits , Grinding & Cutting Machine
- Electrical Tester , Continuity Tester ,Multi Meter , Earth Tester , IR Tester
- Wire Cutter , Blower ,Crimping Tools
- Knockout punch and Flat File
- Marker, Measuring tape, Level gauge / Spirit level.
- Ladder / Scaffolding / Mobile scaffold
- Chain Block and Pipe Wrench
- Portable Lights
- Removable Barricades

### **Storage & Material Handling:.**

- Suitable lockable storage shall be made on Site.
- The storage area must be free from dust and Water leakages / seepages.
- The DB, Panel and Accessories shall be unloaded with care in designated area of the Store to avoid any damages and against the effects of weather or any construction activities of Site.
- The Material will be stacked / unload in the site store on a proper stand on wooden loft on a flat surface at a sufficient height from Ground.
- Materials shall be stored in a place free of water and adequately covered to avoid any kind of damages.
- Proper protection should be given to the material by means of covering the material with Tarpaulin sheet etc.
- If they are dispatch in packs or pallets, each pack of pallet shall be lifted individually with suitable lifting equipment.
- The material shall be transported / Shifted in their original packing to Site location.

### **Inspection of Materials:**

- **Inspection of Materials:**
- Check the reference of delivered material against approved submittal and purchase order.
- Check The Material according to its Type, Size, Make
- **Physical Damages Inspection:**
- In case of any damages observed during inspection, the concern report will be issued and Material shall be returned to the supplier for replacement.

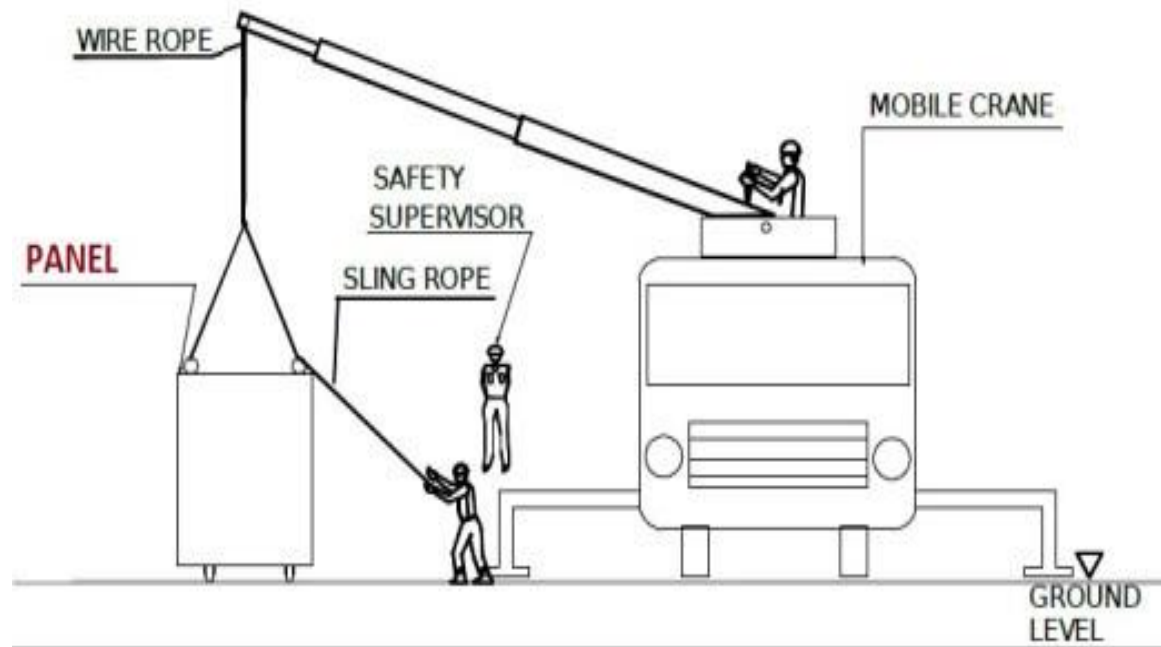
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## Sequence of Installation Works:

### (1) Shifting of Panel on Site

- Prior to commencement of Panel installation works, areas and access shall be checked and confirmed by safety officer, that they are in a suitable Condition for installation works.
- Decide appropriate Size of Crain / Hydra according to weight of Panel.
- Panel shall be carefully unloaded or shifted to the site by using Crane/Hydra or by sufficient manpower and moved to a defined installation location.
- Remove the packing and ensure that the panel is free from transportation damages
- Check The shop drawings, Material submittals, Method statement, ITP & HIRA are approved,
- Ensure all contents are available inside the panel.
- Ensure control wiring identification shall be correctly done.
- Megger shall be used having a valid calibration certificate.

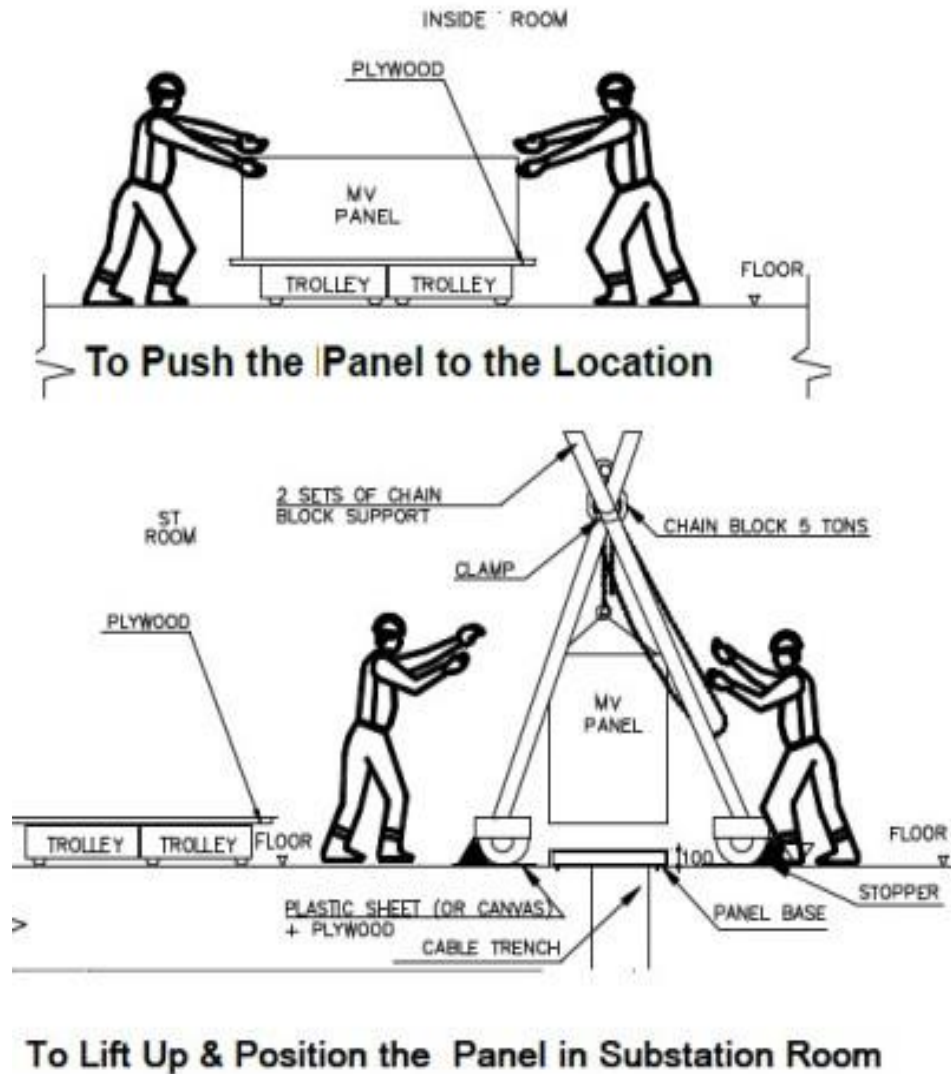


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## (2) Installation of Panel:

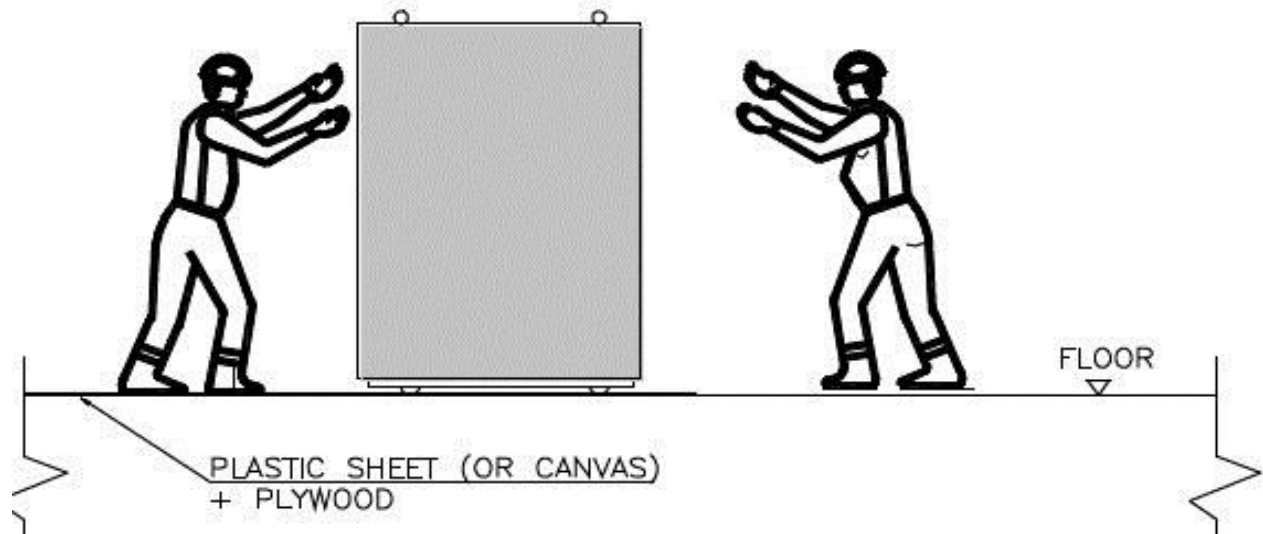
- **Marking of Panel Position:**
- For floor mounted panel, the exact location of the panel and fixing holes to be marked on the concrete plinth for the installation.



- Remove the Factory packing and ensure that the LT panel is free from transportation damages

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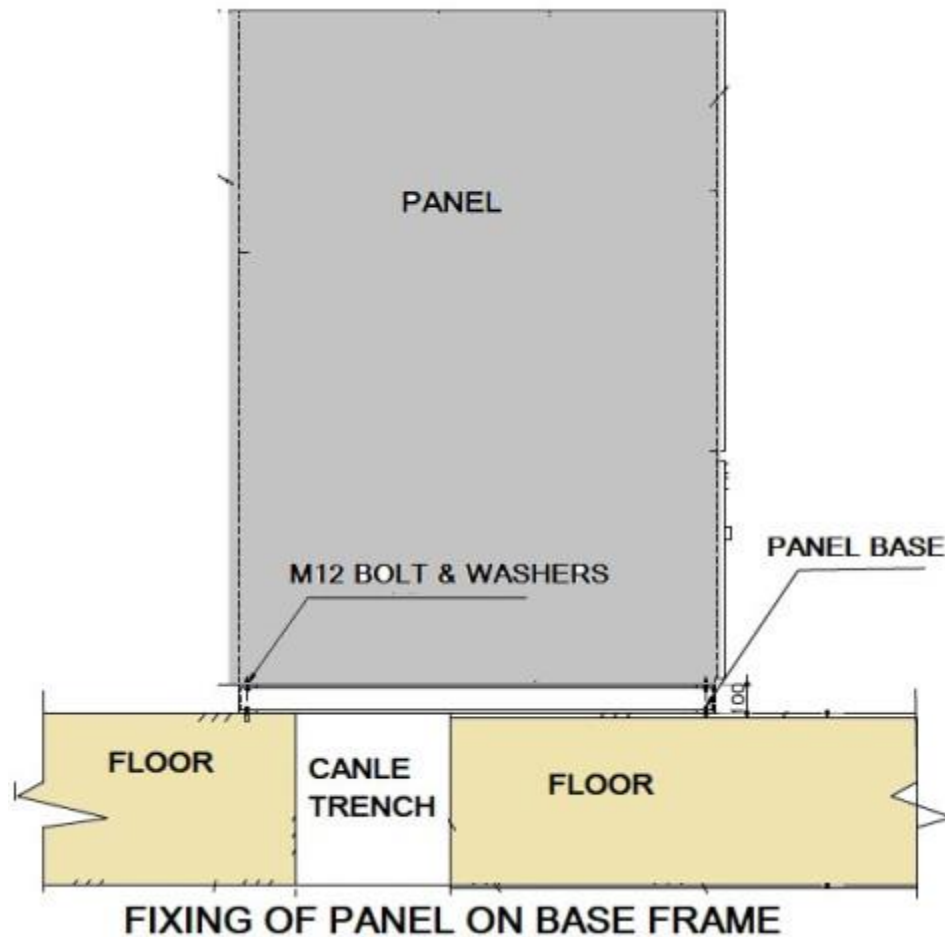
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- **Install the panel in proper alignment and fix properly.**

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- To secure panel base to the floor using M12 anchor bolts.
- Access around the panel to be checked for future maintenance as per regulations.
- Ensure the services contains water is away from the panel or properly protected against any accidental leakages.
- Incoming and outgoing cables shall be marked/identified as per approved shop drawing.
- Mark the fixing position of the DB's support as per approved shop drawing and coordinate with other equipment and services.
- After marking are then drilled according to the selected sizes of anchor bolts to appropriate depth as per approved shop drawing.
- Locknuts on the anchor bolts will ensure a permanent fixing of the DB support to the wall/slab.
- After installation of DB supports, installing position of the DB as per approved shop drawing.
- Ensure that painting of the wall is completed prior to marking and mounting of DB.
- All DBs wall mounting and floor mounted arrangement will be in accordance with approved shop drawings and the approved material submittal.

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- If there is more than one DB to be installed at the same location, they shall be installed side by side and clearance shall be maintained as per approved shop drawing.
- The height of Distribution Board shall be maintained as per approved shop drawing so that easy access for termination of cables and other maintenance work can be carried out.
- Check the position according to the approved shop drawings.
- Check & ensure adequate space is available for maintenance
- After installation, the panel shall be properly cleaned and protected to prevent dust & contamination.
- Before beginning installation in any area, examine all adjoining works in that area should be completed. Installation shall not proceed in that area until such conditions are corrected by the contractor.
- Fix all equipment independently of wiring system. Use cadmium or zinc electroplated bolts, nuts, washers and screw.
- Mount single DB at 1800mm from finish floor level to top of equipment, unless shown otherwise on drawing / schedules.
- Ensures that clearance in front of switchgear is not less than 1m, or as indicated.
- For flush installation, DB's all conductors shall terminate behind the board in an adaptable box.
- For surface mounting, trunking shall be fixed between the board and ceiling or floor level, or conduit run directly into Trunking which prevent correct installation of the Trunking lid.
- The panel with plywood will be pushed towards the trolleys inside substation Room
- When the panel reaches on the trolleys inside the substation room. Push the panel to the location where need to install .
- To set up the chain block support to fix the chain block.
- When the panel reaches the actual installed location, lifting-up of panel by using of chain block. Lift the panel on the panel base
- **If Panel is in section wise**
- Position the first section panel on the fixing channel & check the leveling by using the level bar & adjusting with liners.
- To secure panel to the panel base using M12 anchor bolts.
- To rack in the correct breaker & PT to the correct panel.
- Proceed in the same manner for the second sections.
- Position the second section next to the first panel.
- Secure the second section to the panel base using two M12 anchor bolts
- Interconnect & fasten the two section units together.
- Proceed in the same manner for the other sections.

## **(3) Non Electrical checks before Charging Panel:**

### **(a) General Checking of Panel:**

- Confirm label/markings to ensure that the Panel is correct according to the approved shop drawings.
- All components (Circuit Breakers, Relays, Voltmeter and Ammeter) of the panel shall be verified against the approved panel / Technical drawing as per correct in Numbers, rating & size.

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- Ensure all contents are available inside DB.
- Check that it is not possible to come into contact with energized equipment when working on the system.
- If there are any Correction or modification than Check All internal connections/modification will be carried out by the Manufacturer.
- Check the main bus bar and auxiliary circuits (control, monitoring, alarm, and fault) for continuity.
- All breakers (incoming/outgoing) shall be in "OFF" position and to be locked to prevent mishandling

## **(b) Visual Checking of Panel:**

- Ensure the absence of all foreign bodies inside the switchboard.
- Identifications labels of approved engraved type nameplate shall be fixed on DB.
- Check the compliance with the protection index (leak tightness of the functional units, various sealing points, etc.).
- Check the Continuity of grounding bus bar to the main earthing system.
- Check that the panel hinged doors are connected to the frame by earthing braids.
- Adequate earth continuity shall be made between the various components.
- Check the door locks for correct operation
- Check the connections for conformity with the reference drawings.
- Check Continuity of Main, Auxiliary, Eathing and Neutral Busbar with respect to incomer and outgoing Circuits.
- Check the connections for conformity with the reference drawings and their tightness.
- Number terminals, cables and component parts to correspond with manufacturer have certified drawings.
- Ensure that vents are clear and filters are in place. Screens covering ventilation openings should be in place to prevent entry of rodents or small animals.
- Check the outer appearance (absence of any traces of shocks, peeling paint) -carry out any touch-ups if needed.

## **(c) Mechanical Checking of C.B:**

- Check for correct racking in and Out for circuit breaker and check :
- That it is impossible to rack in a circuit breaker in the closed position.
- That it is impossible to close a circuit breaker not correctly racked in.
- That it is impossible to rack out a circuit breaker is in ON condition.

## **(d) Tightness of all Connection of Switchgear.**

- Fully tight all Bolted electrical connections of Electrical Switch gear of Panel.
- Loose bolted electrical connections can lead to higher energy consumption and eventual equipment failure if not properly addressed.
- Loose control, Power wires can lead to spark, over heat which turns in to catastrophic failure.
- Check that all wiring connections are tight and that wiring is secure to prevent damage during routine operation of moving parts, especially when removing draw-out circuit breakers or opening and closing cubicle doors.
- Gently tug on control wires to ensure a tight connection or use a screwdriver to gently verify torque on the connection. Infrared scans are also very effective for finding loose wires in control circuits.
- Tighten all the connections as required

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## **(d) General Wiring Checks for Switchgear**

- Wire inserted in the Panel will be cross-checked for existing circuit number done and final ferruling shall be done as approved shop drawing.
- Wire in Panel shall be used cable tie and dress with bunching of the phase-neutral and earth and lugged to the respective MCBs and Bus bar as per approved shop drawing.
- Bunching shall be done as per phase separation respectively R, Y and B.

## **(e) Moving Parts and Interlock Checks for Switchgear**

- Confirm the correct operation and sequencing of electrical and mechanical interlock systems. Attempt closure on locked-open devices and attempt to open locked-closed devices.

## **(f) Lubrication of Switchgear and Switchboards**

- Check for appropriate lubrication on moving current-carrying parts and moving/sliding surfaces to keep everything operating smoothly. This includes hinges, locks, and latches.

## **(g) Insulators and Barrier Checks for Switchgear**

- Tracking is an electrical discharge phenomenon caused by electrical stress on insulation. This stress can occur phase-to-phase or phase-to-ground. Although tracking can occur internally in certain insulating materials, these materials as a rule are not used in medium- or high-voltage switchgear insulation. Tracking, when it occurs in switchgear assemblies, normally is found on insulation surfaces.
- Electrical insulators should be inspected for evidence of physical damage or contaminated surfaces. Damage caused by electrical distress is normally evident on the surface of insulating members in the form of corona erosion or markings or tracking paths.
- Inspect barrier and shutter assemblies for proper installation and operation. All active components should be exercised, mechanical indicating devices should be inspected for correct operation.

## **(h) Moisture and Corona Inspections for Switchgear and Switchboards**

- If corona occurs in switchgear assemblies, it is usually localized in thin air gaps that exist between a high-voltage bus bar and its adjacent insulation or between two adjacent insulating members. Corona might also form around bolt heads or other sharp projections that are not properly insulated or shielded. Corona in low-voltage switchgear is practically nonexistent.
- Inspect for evidence of moisture or corona when performing maintenance inspections. On outdoor assemblies, roof or wall seams should be checked for evidence of leakage, and any leaking seams should be sealed with weatherproof caulk.



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## ELECTRICAL CHECKS BEFORE CHARGING THE PANEL

- **TESTING CONTINUITY BETWEEN ALL METAL PARTS AND GROUND**
- For performing this test, it is generally recommended to use a milliohm meter for continuity measurement.
- **INSULATION RESISTANCE TESTS For SWITCHGEAR**
- It is recommended to perform these tests before connection starting so all isolating devices will be closed.
- If cables are already connected, open the isolating devices before any test.
- Disconnect the ground sensing device and the control cables.
- Using a 1000 V DC megohmmeter, measure the insulation resistance after a one minute Electrification time between :
  - 1) Phase to Phase
  - 2) Phase to Neutral
  - 3) Phase to Ground
  - 4) Ground to Earth
- Using a 500 V DC megohmmeter, measure the insulation resistance after a one minute electrification time between:
  - 1) Auxiliary circuit and ground.
  - Reconnect the cables after testing.
- **Control Wiring Electrical Tests for Switchgear and Switchboards**
- Perform insulation-resistance tests on control wiring with respect to ground. Apply 500 volts dc for 300-volt rated cable and 1000 volts dc for 600-volt rated cable for one minute each.
- Important: Units with solid-state components could be damaged if not properly isolated (via removal of plugs and/or fuses) before applying test voltage. Be sure to follow all manufacturers' recommendations when performing dielectric tests on solid state components
- Minimum insulation-resistance values of control wiring should be comparable to previously obtained results but not less than two megohms.

### Charging & Testing of Panel:

- **Cable Terminations:**

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- Identify cable to be laid and Cut the cable to required length.
- Put temporary marker onto the cable.
- Carefully pull (using suitable method) and lay the cable to its route
- Make appropriate opening (Cut-out) in DB /PANEL for inserting the cable with a rubber gasket so that there will be no sharp edges and secure the wire insulation from damage.
- Gland the cables using appropriate cable glands size.
- Terminate cables inside enclosure by securing cables to switchboards with gland bracket; and enclosure with glanding plates or fabricated steel extension boxes.
- Slice the cable and identify cores to be used. Installed the ferrule number and cable lug
- Dressing the cable inside the panel and Secure the cables (if necessary) with cable ties or other suitable method
- Install cable marker / tag as specified
- Terminate the cable properly & as per termination schedule
- Earth the glands to the equipment earth grid
- After complete termination of wire/cable same DB compartment shall be cleaned and fixed door.
- **Earthing Connections:**
- The Panel Main earthing bar is to connected to earth electrode or earthing Grid by Suitable size of 2 No's of Eathing Strip or Earthing Wire via testing joints.
- **Energize the Panel**
- Switch off All Switchgear of Panel.
- Connect the incoming cables of Panel to the Power Supply Source.
- Check healthy ness of Power Supply at incoming of Panel.
- **NO LOAD:**
- Measure input Voltage of Power Supply between Phase to Phase, between Phase and Neutral and between Neutral and Ground.
- If measured incoming Voltage is within limit than Switch ON the Main Breaker of Panel.
- Measure Voltage on Bus bar between Phase to Phase, between Phase and Neutral and between Neutral and Ground.
- If measured Bus bar Voltage is within limit than Panel should operate on NO LOAD Condition for 5 minutes to observe any heating, sparking and performance of accessories of Panel.
- After 5 minute, one by one Switch ON the all Circuit Breaker of Panel.
- **ON LOAD:**
- Measure Voltage on each outgoing feeder of panel between Phase to Phase, between

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Phase and Neutral and between Neutral and Ground.

- If measured Voltage of outgoing feeders are in within limit than Panel should Energize for 2 hours and verify complete performance. Check for any unusual temperature rise in cables, terminals and protective devices.
- **Correct Phasing:**
- Check Phase Sequence of Power Supply at Outgoing Circuit of Panel.
- If there is not correct phase sequence for three phase power supply, reverse one phase at incoming side of Panel.
- **Indicators**
- Check all Power Supply ON /OFF / TRIP indicator works properly.
- If any associated converters check the indications to the corresponding output terminal block.
- **Under/Overvoltage Protection**
- Check the relay operation and adjust to the desired rating.
- The protection information reports shall be checked up to the distribution board output terminal block.
- **Automatic Transfer Switches**
- Check mechanical and / or electrical interlocks.
- With the both available supplies (Main Power & D.G Power) confirm the functional checks by presence of voltage, loss of supply, restoration of supply in manual and in automatic mode.
- The both incoming supplies are readiness in the distribution board
- **Record The Test Data:**

## Floor Marking Near Electrical Panels:

- Keep Space in Front of Electrical Panels Clear
- The area in front of electrical panels must be kept clear and marking with effective floor marking taps.
- While specific colors of floor marking tape are not required, it's often recommended that employers select colors that indicate a hazard is present. Striped black and yellow floor marking tape often serves this purpose, as black and yellow are regularly used for hazard markings.
- When the nominal voltage to ground for a piece of electrical equipment is 600 volts or less, the minimum depth of clear working space in front of the equipment must be 3 feet (in some circumstances, it must be larger). This distance applies to some situations

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involving voltages up to 2500 volts as well.

## Codes and Standards:

- Panel shall comply with the latest Relevant Indian Standards and Electricity Rule and Regulations and shall be as per IS-13947-1993.
- The general construction shall confirm to IS-8623-1977 (Part-1) for factory built assembled switchgear & control gear for voltage up to and including 1100 V AC.