

METHOD STATEMENT FOR INSTALLATION OF ACCESS CONTROL SYSTEM

1.0 Scope

This method statement details the method of installation of Access Control System.

Note

A separate Method Statement Ref. ETA/MS/E- 038 shall be submitted for testing and commissioning of the Door Entry System (CCTV System, Access Control System, Audio Intercom, Video Intercom)

2.0 Material

- 2.1 All materials shall be as per approved material submittals.
- 2.2 Type of cable shall be as per approved shop drawings / system manufacturer's recommendation.
- 2.3 Type and location of Card readers, Door contacts, Magnetic locks, Exit Push button shall be as per approved shop drawing.

3.0 Applicable Location

- 3.1 Tower E1, E2, E3, W1, W2, W3 (Entry to the Building from the Podium Areas upto Level 2)

4.0 Method**4.1 Storage**

- 4.1.1 All materials received at site shall be inspected and ensured against approved material submittal.
- 4.1.2 Any discrepancies, damages etc. shall be notified immediately for further action.
- 4.1.3 Material found not suitable for the project are to be removed from site immediately.
- 4.1.4 Cables shall be stored with the factory packing on the flat surface.
- 4.1.5 Materials shall be stacked properly as per manufacturer's recommendation and covered to prevent dust and water / moisture.
- 4.1.6 Access Control System Equipment to be stored as per manufacturer's recommendation mentioned / marked in the packing.
- 4.1.8 Ambient condition of the storage place to be as per manufacturer's recommendation.

4.2 Installation

4.2.1 Control Cable

- 4.2.1.1 Ensure the relevant current / approved shop drawings are available with installation team.
- 4.2.1.2 Transfer the cable to the work place with the help manpower..
- 4.2.1.3 Check the cable drum for any external damage during transportation and ensure the type of cable against area of usage / application.
- 4.2.1.4 Type and size of the cable is as per approved shop drawings.
- 4.2.1.5 In concealed application pull cables manually through conduit installed as per approved shop drawings and approved method statements.
- 4.2.1.6 Leave enough length of cable at both ends of panel and devices for termination.
- 4.2.1.7 No through joints is allowed without the sanction of the Consultants.

4.2.2 Access Control Equipments.

- 4.2.2.1 Ensure the relevant current / approved shop drawings are available with installation team.
- 4.2.2.2 Transfer the equipment to the work place with the help of manpower.
- 4.2.2.3 Location of the panel to be as per approved shop drawing after coordinating with other services.
- 4.2.2.4 Fixing holes will be marked properly keeping back box of the panel in place.
- 4.2.2.5 Fix back box properly and fix remaining panel accessories.

4.2.3 Card Readers

- 4.2.3.1 Ensure the relevant current / approved shop drawings are available with installation team.

| METHOD STATEMENT | ELECTRICAL | ACCESS CONTROL SYSTEM |
|------------------|--|-----------------------|
| 4.2.3.2 | Exact location of the Card Readers to be as per approved Shop drawing. | |
| 4.2.3.3 | For the Card readers, which needs to be fixed on the wall, fix appropriate G.I.back box. | |
| 4.2.3.4 | Install the Card readers and terminate the cable properly. | |
| 4.2.4 | <u>Door Contacts</u> | |
| 4.2.4.1 | Ensure the relevant current / approved shop drawings are available with installation team. | |
| 4.2.4.2 | Exact location of the Door Contacts to be as per approved Shop drawing. | |
| 4.2.4.4 | Type of Door Contacts to be as per the location and type of door i.e., either recessed or surface mounted | |
| 4.2.4.5 | For the Door Contacts, which needs to be fixed on the door, door supplier to provide appropriate provisions. | |
| 4.2.5.6 | Install the Door Contacts and terminate the cable Properly. | |
| 4.2.5 | <u>Locks</u> | |
| 4.2.5.1 | Ensure the relevant current / approved shop drawings are available with installation team. | |
| 4.2.5.2 | Exact location of the Locks to be as per approved Shop drawing. | |
| 4.2.5.3 | Type of Locks Contacts to be as per the location and type of door i.e., either recessed or surface mounted | |
| 4.2.5.4 | For the Locks, which needs to be fixed on the door, door supplier to provide appropriate provisions. | |
| 4.2.5.5 | Install the locks and terminate the cable Properly. | |
| 4.2.6 | <u>Exit Push Button</u> | |
| 4.2.6.1 | Ensure the relevant current / approved shop drawings are available with installation team. | |
| 4.2.6.2 | Exact location of the Push Button to be as per approved Shop drawing. | |

4.2.6.3 For the Push Buttons, which needs to be fixed on the wall, fix appropriate G.I.back box.

4.2.6.4 Install the Push Buttons and terminate the cable properly.

5.0 Records

5.1 QC Installation Check List

5.2 Inspection request duly signed-off by NMX and Consultant.

6.0 Attachment

6.1 QC installation checklist of Access Control System.

**METHOD STATEMENT FOR
INSTALLATION OF BUS DUCT
SYSTEM**

1.0 Scope

1.1 This method statement details the method of installation of Enclosed Bus Assemblies (Plug-in Busways – Indoor and associated accessories required to complete the busway system) according to the Specification Section 16450.

Note: A separate Method Statement ref. ETA/MS/E-32 shall be submitted for Testing & Commissioning.

2.0 Material

2.1 All materials shall be as per approved material submittals, shop drawing and single line diagram.

- 2.1.1 2000A Bus Bar and accessories
- 2.1.2 1600A Bus Bar and accessories
- 2.1.3 1200A Bus Bar and accessories.
- 2.1.4 1000A Bus Bar and accessories.

3.0 Applicable Location

3.1 Tower E1,E2,E3 & W1,W2,W3.

4.0 Method

4.1 Storage

- 4.1.1 Busways and accessories received at stores are verified to determine the consignment is correct and complete.
- 4.1.2 Repack the busbars and store at advised by the manufacture

4.2 Installation

- 4.2.1 Ensure approved documents like shop drawing, electrical layout drawings, DEWA approval, Manufacturer's drawing and single line diagram are available with the installation team.
- 4.2.2 Check the alignment of busway route in the electrical shaft and on the route from the electrical room to the electrical shaft with plumb bob and spirit level. Do necessary modification for clear straight shaft.
- 4.2.3 Co-ordinate with other services and building structure and make sure that busbar is away from water service.

- 4.2.4 Mark the slab supports in the electrical shaft and horizontal supports as per the route from electrical room to the electrical shaft.
- 4.2.5 Fix the supports as marked on slab. Make sure that slab can take the weight of the busbar.
- 4.2.6 Hoist the busbar segment to the position with suitable pulley / chain block arrangement
- 4.2.7 Support the busway with suitable hangers in it's position. Hangers & Supports will be supplied by the manufacturer.
- 4.2.8 The same way the other pieces are erected and the joints are made with the specially made joint bolts using calibrated torque wrench.
- 4.2.9 Check the continuity and the insulation test for each and every joints, and record the results on the approved format.
- 4.2.10 Fix the tap-off boxes in the provision available in the busway and label the phase sequence.
- 4.2.11 Cover the entire installed busway and the tap-off units to protect it from dust and contaminations.
- 4.2.12 Upon completion of installation, manufacturer's engineer will inspect and certify the installation.
- 4.2.13 Inspection request shall be submitted for Consultant's inspection and agree prior to DEWA inspection.

5.0 List of Equipments

- 5.1 Chain pulley block
- 5.2 Torque wrench.
- 5.3 Continuity and Insulation tester.
- 5.4 Sprit Level.
- 5.5 Tool box with standard spanners.

7.0 Records

- 7.1 QC Inspection Check List.
- 7.2 Inspection request duly signed-off by NMX and Consultant.
- 7.3 Installation certificate from manufacturer.

8.0 **Attachment**

8.1 Inspection Check List for Installation of Enclosed Bus Assemblies

8.2 Enclosed Bus Duct Continuity and Insulation Test Report

METHOD STATEMENT FOR T&C OF BUS DUCT SYSTEM

1.0 Scope

1.1 This method statement details the Testing and Commissioning of Bus Duct System in accordance to the specification section 16450.

2.0 Material

2.1 All the materials shall be as per approved material submittals.

2.2 Size and number of Bus Duct as per approved shop drawing .

2.3 Identifications and labels.

3.0 Applicable Location

3.1 L.V. room & Electrical Closet in E1,E2,E3 & W1,W2,W3 Towers.

4.0 Instruments.

4.1 Insulation Resistance tester (Megger) with variable Voltage selection.

4.2 Micro Ohm meter.

4.3 Torque tightness.

4.4 Phase sequence meter.

Note: The instruments used for testing and commissioning shall be checked and ensured that they are calibrated and the current valid calibration reports are filed for record.

5.0 Inspection Procedure : (Refer Enclosed Test Format.)

5.1 Visual, Mechanical and Operational checks as per the format enclosed.

6.0 Test Procedure : (Refer Enclosed Test Format.)

6.1 Insulation Resistance Test using 500V Megger:

- 6.1.1 Check the tightness of connections.
- 6.1.2 Clean all the supporting insulators.
- 6.1.3 Isolate the cables on incoming and outgoing side.
- 6.1.4 Apply a megger voltage of 500Volts DC between Phase 'R' to earth for 1 min with Phase 'Y', 'B' & 'N' shorted and earthed and record the values.
- 6.1.5 Similarly continue the test and record the values for the other phases.

6.2 Contact Resistance Test:

- 6.2.1 Connect the test leads of Micro ohmmeter as instructed below.
- 6.2.2 Connect the voltage leads across the contacts where contact resistance is to be measured.
- 6.2.3 Connect the current cable on either side of the contacts where contact resistance is to be measured. (The current leads must be connected after the voltage leads.)
- 6.2.4 Switch on the power supply to the Micro ohmmeter.
- 6.2.5 Select the current range of 100A D.C. in the Micro ohmmeter. Vary/Adjust the variac, so that 100A D.C. is displayed in the Micro ohmmeter.
- 6.2.6 Press/Switch on the Resistance measuring button in the Micro ohmmeter.
- 6.2.7 The value for which the contact resistance measured will be displayed in Micro ohms.
- 6.2.8 Tabulate the test results.

7.0 Safety :

- 7.1 Only experienced and skilled personnel shall be engaged for testing.
- 7.2 Safety guards shall be in place and secured prior to start-up.
- 7.3 Warning signs and tapes shall be placed during start-up and commissioning as required.
- 7.4 All safety procedures shall be followed in accordance with the project health and safety plan.
- 7.5 Safety officer shall check and ensure all safety precautions as followed.

8.0 Records:

- 8.1 Inspection request duly signed-off by Consultant.
- 8.2 Calibration certificates of testing instruments.

9.0 **Reference :**

9.1 Specification Section 16450.

9.2 Approved Drawings.

METHOD STATEMENT FOR INSTALLATION OF CABLE TRAYS & LADDERS

1.0 Scope

1.1 This method statement details the method of installation of cable trays and ladders.

2.0 Material

2.1 Cable trays and ladders and accessories shall be as per approved material submittal.

3.0 Applicable Location

3.1 Tower E1, E2, E3, W1, W2, W3 and Podium – Electrical closet, ELV closet and Mechanical rooms.

4.0 Method**4.1 Storage**

4.1.1 All materials received at site shall be inspected and ensured that the materials are as per approved material submittal.

4.1.2 Any discrepancies, damages etc. shall be notified and reported for future action.

4.1.3 Material found not suitable for the project are removed from site immediately.

4.1.4 Cable trays and ladders are stored horizontal position on flat surface with timber support at each meter and covered to protect from moisture and direct sunlight.

4.2 Installation

4.2.1 After the civil clearance to proceed with MEP installations, ensure the area is clean and ready to start the works.

4.2.2 Ensure all the relevant current / approved shop drawings are available with the installation team.

4.2.3 Required quantity of standard length of trays and ladders and accessories are shifted from site stores to the work place with help of cranes and wheel barrow, clean the material for dust from storage and transportation.

4.2.4 Mark the trays and ladders routes as per approved shop drawing, ensure these are of horizontal and vertical runs only.

- 4.2.5 Coordinate the routes, levels and ensure there are no clashes with other services.
- 4.2.6. Maintain enough clearance for cable pulling and any access for future maintenance.
- 4.2.7 Mark the support, fix the supports with appropriate metal plugs, threaded rods and nuts (or) 'L' angles/Slotted 'C' channels and nuts. A maximum of 1.2 mtr. distance is maintained between the supports to avoid sagging of trays and ladders. Provide adequate supports at 150mm for bends, branches and offsets.
- 4.2.8 Cut the standard length of tray / ladder to required length with appropriate cutting tools and fixing holes with drilling machines. And fixed with the necessary accessories. Use mushroom head screws on the cable route to avoid the cable insulation damage during pulling.
- 4.2.9 All the fittings shall be from manufacturer.
- 4.2.10 Expansion provision shall be provided at all the building expansion joints.
- 4.2.11 Manufacturer's instruction for installation shall be followed.
- 4.2.12 Approved fire sealant shall be provided wherever the installation crosses the fire rated walls.
- 4.2.13 Sleeves shall be provided at all the wall crossing.
- 4.2.14 Copper earth links shall be installed at every joints to maintain continuity throughout the installation
- 4.2.15 Ensure the installations of tray/ladder are neat, in straight line for good aesthetic look. Trim the extra projected supports.
- 4.2.16 All sharp edges and burrs shall be cleaned for pulling of cables.
- 4.2.17 Treat the cut and drilled part with zinc rich paint immediately after cutting and before installation.
- 4.2.18 Provide identification labels as specified to identify the service.
- 4.2.19 Inspection shall be offered for QC verification.
- 4.2.20 All the installed cable trays to be protected from damages.

5.0 Records

- 5.1 Inspection request duly signed-off by Consultant.

METHOD STATEMENT FOR INSTALLATION OF CABLES & WIRES

1.0 Scope

1.1 This method statement details the method of installation of power cables and associated accessories.

Note:

1) Refer method statement Ref. No ETA/MS/E-005 for installation of cable trays and ladders.

2.0 Material

2.1 XLPE/SWA/PVC Cables.

2.2 PVC insulated SWA/PVC sheathed cable.

3.0 Applicable Location

3.1 Tower E1, E2, E3, W1, W2, W3, Podium and Villas.

4.0 Method**4.1 Storage**

4.1.1 All materials received at site shall be inspected and ensured that the materials are as per approved material submittal.

4.1.2 Any discrepancies, damages etc. shall be notified and reported for further action.

4.1.3 Material found not suitable for the project are removed from site immediately.

4.1.4 Cables are stored with the factory packing on the flat surface with stoppers to prevent drums rolling, as demonstrated on the attachment.

4.1.5 Protection shall be provided from direct sunlight.

4.2 Installation

4.2.1 Ensure the relevant current/approved shop drawings are available with the installation team.

4.2.2 Handle the cable drums as instructed by the manufacturer (see attachment sheets demonstrating the cable drum handling)

4.2.3 Check the cable drum for any damage for transportation and test the cable for continuity and insulation resistance before installation.

- 4.2.4 Check and ensure the cable route is completed and free from damage or sharp edges.
- 4.2.5 Raise the cable drum above the ground level with cable jack to unwind the cables to the pulling direction.
- 4.2.6 Pull the cable manually from one feeder end to the other end.
- 4.2.7 Ensure no undue stress is applied on the cable which may damage the cable and its functionality.
- 4.2.8 Leave enough length of cables at both the ends for termination.
- 4.2.9 After pulling the cable check for mechanical damage, if any major damage found replace the cable with new one.
- 4.2.10 Dress the cable with necessary cable ties and no overlap of cables shall be allowed.
- 4.2.11 In case of single core 630 Sq.mm cable, trefoil arrangement with cable touching along their entire length is adopted.
- 4.2.12 Provide identification as per specification and approval material submittals.
- 4.2.13 Installation shall be offered for QC verification and inspection consultant.

5.0 Records

- 5.1 Inspection request duly signed-off by Consultant.

6.0 Attachment

- 6.1 Cut sheet demonstrating handling the cable drums.

METHOD STATEMENT FOR TESTING OF LV CABLES/WIRES

1.0 Scope

- 1.1 Testing of LV Cables / Wires installed in Tower according to the requirement of the Project Specification.

2.0 Material

- 2.1 XLPE / SWA / PVC cables,
2.2 PVC Insulated Cables and Flexible wires.

3.0 Testing Equipment

- 3.1 Continuity Tester
3.2 Insulation resistance tester. (Megger)

Note: The Calibration certificates of testing instruments shall be verified to have current certificate, prior to usage.

4.0 Testing and Commissioning Method**4.1 Physical Checks**

- 4.1.1 Physical checks will be conducted as follow, prior to testing:

4.1.1.1 Check the cables are layed properly with proper and adequate support arrangement (i.e. supported in cable trays, trunking, ladder etc.) properly layed, dressed and cleated/tied with cable cleats/ties.

4.1.1.2 Check the cable support arrangements are fixed to the building structure rigidly.

4.1.1.3 Check the Identifications and labeling are provided according to the specification and DEWA requirement.

4.1.1.4 Check the glanding and gland earthing termination is correct.

4.1.1.5 Check if there are any physical damages. Replace as required if any major damages are noticed.

4.2 Insulation Resistance Test

- 4.2.1 Insulation resistance test will be done by applying 0.5kV for the below mentioned points with suitable insulation resistance tester (Megger).
- a) Phase to Phase.
 - b) Phase to Neutral.
 - c) Phases to Earth.

- 4.2.2 Record all results and details as per attached format. The readings to be verified with permissible limits.
- 4.2.3 Phase rotation test shall be conducted after energisation.
- 4.2.4 Check if there is any over heating of cables after a 2 hours of energisation.
- 4.2.5 Suitable corrective action shall be taken if any discrepancies are found.
- 4.2.6 Inspection requests shall be raised for consultant to witness the testing (random test).

5.0 Records

- 5.1 Inspection request duly signed-off by Consultant.

6.0 Attachment

- 6.1 Cable continuity and Insulation test report.

METHOD STATEMENT FOR INSTALLATION OF CAPACITOR BANKS

1.0 Scope

- 1.1 This method statement details the method of Installation of Capacitor Banks according to the Specification Section 16410.

2.0 Material

- 2.1 All materials shall be as per approved material submittals, shop drawing and single line diagram.
- 2.1.1 Capacitor Banks.
 - 2.1.2 Cable glands and lugs.
 - 2.1.3 Identification labels and tags.

3.0 Applicable Location

- 3.1 For Tower - E1, E2, E3 & W1,W2,W3 L.V. rooms.

4.0 Method

4.1 Storage

- 4.1.1 Capacitor banks shall be inspected upon receipt at site for damages and compliance with the approved submittals and Single line Diagram.
- 4.1.2 Upon completion of receiving inspection, the Capacitor bank shall be positioned at the respective substation locations with suitable crane arrangements.
- 4.1.3 Capacitor bank found with transportation damages shall be recorded and notified to the concern party for further action.
- 4.1.4 Capacitor bank shall be covered with polythene sheets to protect from dust and moisture.

4.2 Installation

- 4.2.1 Ensure approved documents like shop drawing and electrical room layouts are available with the installation team.
- 4.2.2 Place channels in correct locations and anchor them securely.

- 4.2.3 Carefully shift the capacitor bank panel and place it on the anchored channels.
- 4.2.4 Anchor the panel as required and ensure it is fixed securely to the channel.
- 4.2.5 Check the label/markings to ensure that it is the right panel and check the position according to the shop drawing.
- 4.2.6 Check the provision for cable termination.
- 4.2.7 Terminate the cable as per single line diagram using proper tools.
- 4.2.8 Clean the terminations with blower to clean the dust and small metal pieces fallen during cable cutting and terminating process.
- 4.2.9 Ensure the entire panel are free from dust and damage.
- 4.2.10 Provide identification for the panel and all the cable terminations as per specification requirement.
- 4.2.11 Organize the cables neatly with cable ties.
- 4.2.12 Double check the connections by tightening the terminations.
- 4.2.13 Inspection shall be offered for QC Verification before DEWA inspection.

5.0 Safety

- 5.1 Safety Officer shall ensure that the technicians have undergone safety induction program, and all safety procedures are followed.
- 5.2 Only experienced technicians shall be engaged for this specialized job.
- 5.3 Workmen shall be given proper training to use PPE and shall be monitored to avoid any violation of the same.
- 5.4 Electric tools will be checked and certified by Safety Officer and earthing of the same shall be ensured.
- 5.5 All other safety precautions shall be followed as per established safety plan and procedures.

6.0 Records

- 6.1 QC Inspection Check List.
- 6.2 Inspection request duly signed-off by Consultant.

7.0 **Attachment**

- 7.1 Inspection Check List for Capacitor Banks .
- 7.2 Insulation Resistance Test Report Format.

METHOD STATEMENT FOR INSTALLATION OF CCTV SYSTEM

1.0 Scope

This method statement details the method of installation of CCTV System.

Note

A separate Method Statement Ref. ETA/MS/E- 0 shall be submitted for testing and commissioning of the Fire Alarm System.

2.0 Material

- 2.1 All materials shall be as per approved material submittals.
- 2.2 Type of cable shall be as per approved shop drawings / system manufacturer's recommendation.
- 2.3 Type of Cameras shall be as per approved shop drawing.

3.0 Applicable Location

- 3.1 Tower E1, E2, E3, W1, W2, W3(Entrance Floor)

4.0 Method

4.1 Storage

- 4.1.1 All materials received at site shall be inspected and ensured against approved material submittal.
- 4.1.2 Any discrepancies, damages etc. shall be notified immediately for further action.
- 4.1.3 Material found not suitable for the project are to be removed from site immediately.
- 4.1.4 Co axial cables shall be stored with the factory packing on the flat surface.
- 4.1.5 Materials shall be stacked properly as per manufacturer's recommendation and covered to prevent dust and water / moisture.
- 4.1.6 CCTV Equipment to be stored as per manufactures recommendation mentioned / marked in the packing.
- 4.1.8 Ambient condition of the storage place to be as per manufacturer's recommendation.

4.2 Installation

4.2.1 Co axial Cable

- 4.2.1.1 Ensure the relevant current / approved shop drawings are available with installation team.
- 4.2.1.2 Transfer the cable to the work place with the help manpower..
- 4.2.1.3 Check the cable drum for any external damage during transportation and ensure the type of cable against area of usage / application.
- 4.2.1.4 Type of the cable is as per approved shop drawings.
- 4.2.1.5 In concealed application pull coaxial cable manually through conduit installed as per approved shop drawings and approved method statements.
- 4.2.1.6 Leave enough length of cable at both ends of panel and devices for termination.
- 4.2.1.7 No through joints is allowed without the sanction of the Consultants.

4.2.2 CCTV EQUIPMENTS

- 4.2.2.1 Ensure the relevant current / approved shop drawings are available with installation team.
- 4.2.2.2 Transfer the equipment to the work place with the help of manpower.
- 4.2.2.3 Location of the panel to be as per approved shop drawing after coordinating with other services.
- 4.2.2.4 Fixing holes will be marked properly keeping back box of the panel in place.
- 4.2.2.5 Fix back box properly and fix remaining panel accessories.

4.2.3 CCTV CAMERAS

- 4.2.3.1 Ensure the relevant current / approved shop drawings are available with installation team.
- 4.2.3.2 Exact location of the device to be as per approved reflected ceiling plan for surface / recessed installation

4.2.3.3 For the Camera, which needs to be fixed on the false ceiling, fix junction box of the camera above false ceiling.

4.2.3.4 Install the Camera and terminate the cable properly.

5.0 Records

5.1 QC Installation Check List

5.2 Inspection request duly signed-off by NMX and Consultant.

6.0 Attachment

6.1 QC installation check list formats for the following.

a) Installation of CCTV System

**METHOD STATEMENT FOR
TESTING & COMMISSIONING OF
DOOR ENTRY SYSTEM**

1.0 Scope

This method statement details the method of Testing and commissioning of Door Entry System.

Note

- 1) A separate Method Statement Ref. ETA/MS/E- 019 shall be submitted for Installation of the CCTV System.
- 2) A separate Method Statement Ref. ETA/MS/E- 020 shall be submitted for Installation of the Access Control System.
- 3) A separate Method Statement Ref. ETA/MS/E- 021 shall be submitted for Installation of the Audio Intercom/Video Intercom System

2.0 Material

- 2.1 All materials shall be as per approved material submittals.
- 2.2 Type and Sizes of cable shall be as per approved shop drawings / system manufacturer's recommendation.
- 2.3 Type of Equipments/Devices shall be as per approved shop drawing.

3.0 Applicable Location

- 3.1 CCTV SYSTEM - Tower E1, E2, E3, W1, W2, W3 (Entrance Floor).
- 3.2 ACCESS CONTROL SYSTEM - Tower E1, E2, E3, W1, W2, W3 (Entry to the Building from the Podium Areas upto Level 2)
- 3.3 AUDIO INTERCOM - Tower E1, E2, E3, W1, W2, W3 (All Suites)
- 3.4 VIDEO INTERCOM – Villas (29nos)

4.0 Method

Find attached the manufacturer representative's detailed method statement and test formats for testing and commissioning of Door Entry System covering the mechanical checks, switching ON the unit. Programming and testing

The whole system will be commissioned and certified by the manufacturer's representative before handing over.

5.0 Records

6.1 Commissioning procedure with test results in attached format.

6.2 Inspection request duly signed-off by NMX and Consultant.

6.3 Certification of installation by SIBCA

6.0 Attachment

6.1 Manufacturer's representative method statement detailing the pre-commissioning and commissioning procedures, including test formats

6.1.1 CCTV System

6.1.2 Access Control System

6.1.3 Audio Intercom/Video Intercom System

**METHOD STATEMENT FOR
INSTALLATION OF CO DETECTION &
ALARM SYSTEM**

1.0 Scope

This method statement details the method of installation of CO detection and alarm system.

NOTE: 1. Testing and Commissioning of CO Detection and Alarm system will be submitted separately under Ref. ETA/MS/E-007.

2.0 Material

2.1 Multitronic 592 – Standard 6 channel Monitoring & Control panel.

2.2 ADOS 592 TOX CO gas sensor with chemical (CO gas) test head.

2.3 2 x 2C Shielded cable

3.0 Applicable Location

3.1 East and West Podium (basement, Lower ground Floor, Ground Floor and First Floor)

4.0 Method

4.1 Storage

4.1.1 All materials received at site shall be inspected and ensured that the materials are as per approved material submittal.

4.1.2 Any discrepancies, damages etc. shall be notified to stores for further action.

4.1.3 Material found not suitable for the project is to be removed from site immediately.

4.1.4 Cables shall be stored with the factory packing on the flat surface.

4.1.5 CO detection and alarm system panels and devices are stored in a dry and ventilated closed space.

4.2 Installation

4.2.1 Installation of Containment

4.2.1.1 The main cables from the panels to each detector through the concealed/G.I.Conduit

4.2.2 Pulling cables

4.2.2.1 The main cables from the panels are pulled through the containment.

4.2.2.2 Cable type and size are as per approved shop drawing.

4.2.3 Installation of Detectors

4.2.3.1 ADOS 592 TOX gas detectors are installed on the G.I. back box on the designated columns as per approved shop drawing.

4.2.3.2 The height of the detectors shall be as per approved shop drawing – 1200mm top of box from FFL.

4.2.3.3 Terminate the wires to the detectors.

4.2.4 Installation of Main panels

4.2.4.1 The unit will be checked before installation for any mechanical damage during transportation.

4.2.4.2 The nameplate will be checked against approved equipment data sheet.

4.2.4.3 The panels are fixed at the designated BMS Room.

4.2.4.4 The mounting height of the panel is 1800mm TOP from FFL.

4.2.4.5 The 50mm x 50mm GI Trunking to be connected to the panel to take the cabling for detectors.

4.2.4.6 Terminate the cable outgoing for detectors.

4.2.4.7 Connection of power supply is fed from the DB as mentioned in the approved shop drawing.

4.2.4.8 Provisions shall be made available for BMS connections

5.0 Records

6.1 Signed off QC installation Check List

6.2 Inspection request duly signed-off by Consultant.

6.0 Attachment

7.1 Operating Instruction of ADOS Multitronic 592. – 13pages.

METHOD STATEMENT FOR INSTALLATION OF DISTRIBUTION BOARDS (DB'')

1.0 Scope

- 1.1 This method statement details the method of installation of Distribution Boards (DBs).

2.0 Material

- 2.1 Distribution Boards.
2.2 Cable glands and lugs,
2.3 P.V.C. wires,
2.4 Identifications.

3.0 Applicable Location

- 3.1 Respective electrical rooms, LV rooms and Apartments in E1,E2,E3 & W1,W2,W3 Towers, Podium and Villas.

4.0 Method

4.1 Storage

- 4.1.1 DB's shall be inspected upon receipt at site for damages and compliance with the approved submittals.
- 4.1.2 Upon completion of receiving and inspection, the DB's shall be repacked.
- 4.1.3 Material found not suitable for the project is removed from site immediately.
- 4.1.4 Distribution boards shall be stored in a covered and ventilated store.
- 4.1.5 Distribution Boards are stacked in an array with manufacturer packing and avoid over stacking as per manufacturer's recommendations.

4.2 Installation

- 4.2.1 Ensure current/approved documents like shop drawing, electrical room layout and load schedules are available with the installation team.
- 4.2.2 Shift the particular Distribution Boards and associated accessories to the work place with proper manpower.

- 4.2.3 Check the label/markings to ensure the right board before installation.
- 4.2.4 Mark the fixing position of the D.B. as per shop drawing, coordinate with other equipment and services.
- 4.2.5 Fix the frame of the DB with proper metal plugs and bolts. Ensure the installation is straight and leveled.
- 4.2.6 Suitable knock-out at the top of the DB's shall be used for Incoming cable entry.
- 4.2.7 File the knock-out to suit the cable glands and lugs for rigid terminations.
- 4.2.8 In case of DB's installed in apartments, make a provision on the gland plate at the top of the DB.
- 4.2.9 Cut the gland plate to suit the trunking size to carry all the incoming and outgoing cables and wires.
- 4.2.10 Ensure the busbars and interconnecting terminals are free from damage.
- 4.2.11 Fix the appropriate breakers as per approved load schedule.
- 4.2.12 Terminate all the circuits to its respective breakers with proper ferrule identification.
- 4.2.13 Organize the wires neatly with cable ties.
- 4.2.14 Clean the DB after dressing with blower to blow out all the small particles and dust after the termination works.
- 4.2.15 Provide identification labels as per specification / approved submittals.
- 4.2.16 Fix the doors.
- 4.2.17 Place the approved load schedule copy inside the DB's door.
- 4.2.18 Inspection shall be offered to QC Verification.

5.0 Safety

- 5.1 All safety precautions shall be followed as per established project safety plan and procedure.

6.0 Records

- 6.1 Inspection request duly signed-off by Consultant.

| | |
|---|----------------------------------|
| | |
| Pre - Commissioning Check List For Final Distribution Board. | MEP Contractor (1804) |

| <u>Locatio / Area :</u> <u>Feeder SMP Ref :</u> | | Verification Sign-off | |
|--|---|-----------------------|-----|
| S.No. | Activities / Items to be Inspected | Engineer | QCI |
| 1 | Verify the Installed DB's have approved submittals. | | |
| 2 | Ensure the drawings used for installation are correct and approved. | | |
| 3 | Check and ensure the DB's new and undamaged. | | |
| 4 | Check the DB's as per approved load schedule and drawings. | | |
| 5 | Check the Nameplate and identification labels as per Load schedule and approved sumittals. | | |
| 6 | Check the DB's have rigid support. | | |
| 7 | Ensure location of DB's is as per approved drawing. | | |
| 8 | Check the termination and dressing of cables and wires completed neatly. | | |
| 9 | All cables and wires including grounding are terminated and identified. | | |
| 10 | Ensure all terminals are tightened as required. | | |
| 11 | Ensure DB's interiors are cleaned and free from dust. | | |
| 12 | Check the grounding has been provided as per approved drawing including the body of the DB's. | | |
| 13 | Identification provided as specified / required. | | |

| | | |
|--|-----------------------|--|
| <u>Comments / Remarks, if any</u> | | |
| | | |
| | | |
| | QA/QC Engineer | |
| Signature : | | |
| Name : | | |
| Date : | | |

METHOD STATEMENT FOR T&C OF FINAL DISTRIBUTION BOARDS

1.0 Scope

1.1 This method statement details the Testing and Commissioning of Final Distribution board (DBs) according to the specification section 16415.

2.0 Material

2.1 All the materials shall be as per approved material submittals.

2.2 Size and number of way of the DB shall be as per approved shop drawing and load schedule.

2.3 Identifications and labels.

3.0 Applicable Location

3.1 Respective electrical rooms, LV rooms and Apartments in E1,E2,E3 & W1,W2,W3 Towers, Podium and Villas.

4.0 Instruments.

4.1 Insulation tester.

4.2 ELCB tester.

4.4 Multimeter.

Note: The instruments used for testing and commissioning shall be checked and ensured that they are calibrated and the current valid calibration reports are filed for record.

5.0 Method

5.1 **Physical check** – Conduct A thorough visual check is conducted to ensure the components and the connections are made correctly, and recorded on the checklist as attached.

5.2 **Polarity check** – Conduct polarity check to ensure the switch and the screw lamp connections are correct and record on the attached format.

- 5.3 **Continuity check** – With the help of a Multimeter, the continuity of all the circuits are checked and ensured the resistance value is under the permissible limit.
- 5.4 **Insulation check** – Use a insulation tester to check is there any break down of insulation between conductors, if any replace it immediately. Also record the insulation resistance value of all the circuit in the attached format.
- 5.5 **ELCB and Polarity Test** – With the help of ELCB tester check the function of the earth leakage circuit breaker at rated current.

7.0 **Records**

- 7.1 Commissioning check list and test format at attached.
- 7.2 Inspection request duly signed-off by Consultant.

8.0 **Attachment**

- 8.1 Check list and test format.

METHOD STATEMENT FOR INSTALLATION OF EARTHING SYSTEM

1.0 Scope

1.1 This method statement details the method of installation of Earthing System as per specification section 16060.

2.0 Material

2.1 Material used for the system is as per BS : 7671 and BS : 7430.

3.0 Applicable Locations

3.1 Basement, Ground level, roof, Mechanical, Electrical rooms at all levels. All mechanical services exposed will be bonded to the earthing system, all extraneous metal below 2.5 Mtrs shall be bonded. Ceiling grids and other such metals & systems shall be measured to assess whether bonding maybe required.

4.0 Method

4.1 Storage

4.1.1 All materials received at site shall be inspected by QA Engineer and ensured that the materials are as per approved material submittal.

4.1.2 Any discrepancies, damages etc. shall be notified and reported for further action.

4.1.3 Material found not suitable for the project to be removed from site immediately.

4.1.4 Earthing material shall be stored in a covered/dry place at all the time to avoid corrosion.

4.2 Installation of LV Earthing System

4.2.1 As per approved shop drawings identify location of earth pits.

4.2.2 Co-ordinate with Main Contractor for installation of earth pits with approved fixing details.

- 4.2.3 The copper earth rod will be driven manually in earth. After achieving a minimum depth of approximately 3 meters, the earth resistance will be measured. If the earth resistance value is not satisfactory, the process of adding further earth electrodes shall be continued till expected resistance value of less than 1 ohm is achieved.
- 4.2.4 Adjacent earth electrodes shall be spread to atleast 1 length of one of the driven electrodes (6 mtrs) to achieve result of less than 1 ohm. Work Inspection Request (WIR) to be issued.
- 4.2.5 The earth pit shall be installed after completion of installation of earth rods and a clear gap of 50 mm shall be maintained between top of earth electrode and earth pit cover. The top of earth pit shall be in level with the finished floor level in the area. Earth rods (electrode) connection to be protected with Denso tape.
- 4.2.6 The PVC sheathed single core earthing cables of specified sized as per shop drawings shall be laid between the earth pit and the earth bar inside the building and terminated with proper type lugs/clamps.
- 4.2.7 The interconnection of earth pit shall be as per approved shop drawing.
- 4.2.8 All earthing connections shall be made after cleaning the surfaces thoroughly and tightness checks for each connection shall be performed.
- 4.2.9 Continuity of earth connections shall be checked for every link in the network by ETA QA Engineer. Issue WIR. All joints to rods to have shrink-wrap protection applied.
- 4.2.10 The down-stream earthing connections from earth bars shall be made to the panel boards, frames and other equipment as per approved shop drawings.
- 4.2.11 Along with all power cables on earth cable of size as per approved shop drawings shall be laid and it shall be terminated to the earth bar of the panel/equipment, which it feeds to, in addition with local earthing from earth bar.
- 4.2.12 On completion of total earthing system and testing, WIR will be submitted for approval to Design Consultant.
- 4.2.13 The extent of bonding requirements to be identified and agreed between R&P and MACE in line with project specifications, DEWA standards, statutory requirements & clause 3.0 above.

5.0 Installation of Equipotential Bonding

- 5.1 The metallic frame of all electrical equipments shall be connected to the nearest earth bar with a specified size of earth cable.
- 5.2 The earthing continuity of cable trays and trunking shall be maintained with earth links on each joints of cable trays and trunking shall be connected to earth bar with specified size of earth cable.
- 5.3 Flexible earth cable spiral shall be used for the earthing connections when there is possibility of expansion/contraction and also where vibrating equipment is installed.
- 5.4 The metallic water lines shall be bonded by an earthing cable of size not less than 6mm^2
- 5.5 All bonding connections shall be checked for correct tightness and cleanliness.
- 5.6 WIR will be issued for signature to Consultant.

6.0 Safety

- 6.1 All safety precautions shall be followed as per established project safety plan and procedure.

7.0 Records

- 7.1 Inspection request duly signed-off by Consultant.

METHOD STATEMENT FOR TESTING OF EARTHING SYSTEM

1.0 Scope

1.1 Testing of Earthing system for the Tower E1, E2, E3, W1, W2, W3 & Podium including earth continuity tests in accordance with the requirements of Specification 16060.

1.2 The below listed LV Systems are covered.

- a. Feeders and branch circuits.
- b. Lighting circuits.
- c. Single phase motor and appliance branch circuits.
- d. Three phase motor and appliance branch circuits.
- e. Containment System.
- f. Armoured and metal clad cable runs.

2.0 Material

2.1 Earth pit and earth rod.

2.2 Earth cables / wires.

3.0 Method**3.1 Testing equipment**

4.1.1 Earth tester.

4.1.2 Multimeter.

The calibration certificates of testing instruments will be verified for validity prior to use.

3.2 Inspections

3.2.1 Physical Checks: Physical checks will be conducted to ensure the following as per specification.

- a. Electrode connection in the earth pit.
- b. Protective conductors from earth pit to LV Panels.
- c. Earthing conductors and its sizes.
- d. All links and junctions.

3.2.2 Earth electrode resistance check

- a. Earth electrode will be tested with earth tester by 3 point test method.

- b. All the earth pit values shall be tabulated and submit for consultants review.

3.2.3 Continuity Test

- a. Check the continuity of earth cables from MDB to Distribution Board and to the end of all equipments.
- b. All the readings are recorded and submitted to consultant's review as per the attached test formats.

3.3 Corrective Actions

If the measured resistance is found to be higher than the standards / specification the Engineer will be notified and recommendations will be agreed to lower the resistance.

Tighten loose joints if any.

Values specified by Local Authority (DEWA)

The main earth resistance shall not exceed 1 ohms, for each incoming DEWA supply / MDB.

4.0 Records

- 4.1 Test results as attached format.
- 4.2 Inspection request raised for consultant to witness testing.
- 4.3 Remedial action, if any.

METHOD STATEMENT FOR INSTALLATION OF EMERGENCY LIGHTING SYSTEM

1.0 Scope

This method statement details the method of installation of Emergency Lighting System, as per Project Specification 16536

Note

A separate Method Statement Ref. ETA/MS/E- 034 shall be submitted for testing and commissioning of the Emergency Lighting System.

2.0 Material

- 2.1 All materials shall be as per approved material submittals (schedule of materials attached herewith).
- 2.2 Sizes of FP200 cable shall be as per approved shop drawings / system manufacturer's recommendation.
- 2.3 Type of emergency / exit luminaire shall be as per approved shop drawings.
- 2.4 Direction sign of Exit luminaries shall be as per approved shop drawings.

3.0 Applicable Location

- 3.1 Tower E1, E2, E3, W1, W2, W3 Podium Area.

4.0 Method**4.1 Storage**

- 4.1.1 All materials received at site shall be inspected and ensured against approved material submittal.
- 4.1.2 Any discrepancies, damages etc. shall be notified immediately for further action.
- 4.1.3 Material found not suitable for the project are to be removed from site immediately.
- 4.1.4 FP200 cables shall be stored with the factory packing on the flat surface.
- 4.1.5 Materials shall be stacked properly as per manufacturer's recommendation and covered to prevent dust and water / moisture.
- 4.1.6 Central emergency lighting panels battery banks and luminaries to be stored as per manufactures recommendation mentioned / marked in the packing.

4.1.7 Ambient condition of the storage place to be as per manufacturer's recommendation.

4.2 Installation

4.2.1 FP 200 Cable

- 4.2.1.1 Ensure the relevant current / approved shop drawings are available with installation team.
- 4.2.1.2 Check the cable drum for any external damage during transportation and ensure the type of cable against area of usage / application.
- 4.2.1.4 Check the colour and size of the cable is as per approved shop drawings.
- 4.2.1.5 Install the FP200 cable in the using clips for exposed area installation. Maintain clipping distance of 60cm
- 4.2.1.6 The cable shall be adequately supported depending on the type of installation as recommended by the manufacturer.
- 4.2.1.7 In concealed application pull FP200 cable manually through conduit installed as per approved shop drawings and approved method statements.
- 4.2.1.8 Check and ensure the cable route is proper and free from damage or sharp edges.
- 4.2.1.9 Leave enough length of cable at both ends for termination.
- 4.2.1.10 Proper glanding to be done at the Light Fitting enclosure.
- 4.2.1.11 Provide identification in the panel for the circuits as per approved shop drawings.

4.2.2 Emergency Lighting Panel and Battery Compartments

- 4.2.2.1 Ensure the relevant current / approved shop drawings are available with installation team.
- 4.2.2.2 Transfer the panel / battery bank to the work place with the help of forklift. Enough manpower shall be deployed to avoid any transportation damages.

- 4.2.2.3 Exact location of the panel to be marked based on service shop drawings after coordinating with other services.
- 4.2.2.4 Ensure the adequate access availability for future maintenance.
- 4.2.2.5 Fixing holes will be marked properly, keeping back box of the panel in place, for wall mounted panels.
- 4.2.2.6 Fix back box properly and fix remaining panel accessories.
- 4.2.2.7 For floor mounted / free standing panels location will be marked on the floor.
- 4.2.2.8 Panel / battery banks to be identified properly as per specification and approved shop drawings.
- 4.2.2.8 Proper glanding to be done on top as per manufacturer's recommendations and the wires to be terminated after ferruling.
- 4.2.2.9 Remove the cable sheath after the cable enters the panel and dress the wires.
- 4.2.2.10 The lines wires are connected to circuit changeover modules, and the earth wire to the earthing provision on the panel.
- 4.2.2.11 Panel and the Circuits to be identified properly as per the approved shop drawings.

4.2.3 Emergency / Exit Luminaires

- 4.2.3.1 Ensure the relevant current / approved shop drawings are available with installation team.
- 4.2.3.2 Transfer the luminaires to the work place manually after checking the type of luminaire against relevant current / approved shop drawing.
- 4.2.3.3 Exact location of the luminaire to be marked on the reflected ceiling layout with exact dimension for ceiling installation.
- 4.2.3.4 Exact location and mounting height to be as per approved shop drawing for wall-mounted installations.

- 4.2.3.5 Install the luminaire and terminate the cable properly.
- 4.2.3.6 Ensure the proper protection from damages during construction work.
- 4.2.3.7 Address the luminaire as per addressing given in the approved shop drawing
- 4.2.3.8 Check the directional signs of the Exit luminaire against approved shop drawings

5.0 Records

- 6.1 Signed-off installation Check List
- 6.2 Inspection request duly signed-off by Consultant.
- 6.3 Certification of installation by CEAG.

6.0 Attachment

- 7.1 Emergency Lighting System devices – Installation check list
- 7.2 Schedule of material

METHOD STATEMENT FOR TESTING & COMMISSIONING OF EMERGENCY LIGHTING SYSTEM

1.0 Scope

This method statement details the Testing and Commissioning of Emergency Lighting System, as per Project Specification 16536

Note

A separate Method Statement Ref. ETA/MS/E- 014 shall be submitted for Installation of the Emergency Lighting System.

2.0 Material

- 2.1 All materials shall be as per approved material submittals
- 2.2 Sizes of FP200 cable shall be as per approved shop drawings / system manufacturers recommendation.
- 2.3 Type of emergency / exit luminaire shall be as per approved shop drawings.
- 2.4 Direction sign of Exit luminaries shall be as per approved shop drawings.

3.0 Applicable Location

- 3.1 Tower E1, E2, E3, W1, W2, W3 and Podium Areas.

4.0 Method

Find attached the manufacturer representative's detailed method statement and test formats for testing and commissioning of Emergency Lighting system covering the mechanical checks, insulation resistance measurement, switching ON the unit. Programming and testing

The whole system will be commissioned and certified by the manufacturer's representative before handing over.

5.0 Safety

- 5.1 Safety Officer shall ensure that the technicians have undergone safety induction programme.
- 5.2 Only experienced technicians shall be engaged for this specialized job.
- 5.3 Workmen shall be given proper training to use PPE and to be monitored to avoid any violation on the same.
- 5.4 Electric tools to be checked and certified by Safety Officer and earthing of the same shall be ensured.
- 5.5 All other safety precautions shall be followed as per established safety plan and procedures.

6.0 Records

- 6.1 Commissioning procedure with test results in attached format.
- 6.2 Inspection request duly signed-off by Consultant.
- 6.3 Certification of installation by CEAG.

7.0 Attachment

- 7.1 Manufacturer's representative method statement detailing the pre-commissioning and commissioning procedures, including test formats

METHOD STATEMENT FOR INSTALLATION OF FIRE ALARM SYSTEM

1.0 Scope

This method statement details the method of installation of Fire Alarm System, as per Project Specification 16721

Note

A separate Method Statement Ref. ETA/MS/E- 033 shall be submitted for testing and commissioning of the Fire Alarm System.

2.0 Material

2.1 All materials shall be as per approved material submittals.

2.2 Sizes of FP200 cable shall be as per approved shop drawings / system manufacturers recommendation.

2.3 Type of FA device shall be as per approved shop drawing.

3.0 Applicable Location

3.1 Tower E1, E2, E3, W1, W2, W3, Villas and Podium Areas.

4.0 Method**4.1 Storage**

4.1.1 All materials received at site shall be inspected and ensured against approved material submittal.

4.1.2 Any discrepancies, damages etc. shall be notified immediately for further action.

4.1.3 Material found not suitable for the project are to be removed from site immediately.

4.1.4 FP200 cables shall be stored with the factory packing on the flat surface.

4.1.5 Materials shall be stacked properly as per manufacturer's recommendation and covered to prevent dust and water / moisture.

4.1.6 Ambient condition of the storage place to be as per manufacturer's recommendation. (0 °C to 49 °C)

4.2 Installation**4.2.1 FP 200 Cable**

- 4.2.1.1 Ensure the relevant current / approved shop drawings are available with installation team.
- 4.2.1.2 Transfer the cable to the work place with the help manpower. Enough manpower shall be deployed to avoid any transportation damages.
- 4.2.1.3 Check the colour and size of the cable is as per approved shop drawings.
- 4.2.1.4 Install the FP200 cable in the using clips for exposed area installation. Maintain clipping distance of 60cm
- 4.2.1.5 The cable shall be adequately supported depending on the type of installation as recommended by the manufacturer.
- 4.2.1.6 In concealed application pull FP200 cable manually through conduit installed as per approved shop drawings and approved method statements.
- 4.2.1.7 Leave enough length of cable at both ends for termination.
- 4.2.1.8 Leave enough length of cable at both ends of panel and devices for termination.
- 4.2.1.9 No through joints is allowed without the sanction of the Consultants.

4.2.2 **Fire Alarm Panels**

- 4.2.2.1 Ensure the relevant current / approved shop drawings are available with installation team.
- 4.2.2.2 Transfer the panels to the work place with the help manpower. Enough manpower shall be deployed to avoid any transportation damages.
- 4.2.2.3 Location of the panel to be as per approved shop drawing after coordinating with other services.
- 4.2.2.4 Fixing holes will be marked properly keeping back box of the panel in place.
- 4.2.2.5 Fix back box properly and fix remaining panel accessories.

4.2.3 **Fire Alarm Outstations**

4.2.3.1 Ensure the relevant current / approved shop drawings are available with installation team.

4.2.3.2 Type of device shall be as per approved shop drawings from Consultant as well as Local Authority (Civil Defence)

4.2.3.3 **Fire Alarm Detectors**

4.2.3.3.1 Exact location of the device to be as per approved reflected ceiling plan for surface / recessed installation.

4.2.3.3.2 For surface installation of fire alarm detectors fix suitable G.I. Junction box.

4.2.3.3.3 For the detector, which needs to be fixed on the false ceiling, fix junction box above false ceiling.

4.2.3.3.4 Install the detectors base and terminate the cable properly.

4.2.3.3.5 Install the detectors on the base with dust cover to prevent dust and contamination. This cover shall not be removed until all other construction activities are completed.

4.2.3.3.6 Address the detector as per addressing given in the approved shop drawings.

4.2.3.4 **Manual call points and sounders**

4.2.3.4.1 Exact location and mounting height shall be marked as per approved shop drawing from Consultants as well as Local Authority (Civil Defence).

4.2.3.4.2 Fix 3" x 3" G.I. Junction box

4.2.3.4.3 Fix the device and terminate properly.

4.2.3.4.4 Address the device as per addressing given in the approved shop drawings.

4.2.3.7 **Interfacing Units (CM / MM)**

4.2.3.7.1 Exact location of the CM/MM shall as per approved shop drawings from Consultant as well as Local Authority (Civil Defence) and to be coordinated at site to ensure easy access for maintenance in future.

4.2.3.7.2 Fix the CM/MM in a G.I.Junction box.

4.2.3.7.3 Fix the Junction box above the ceiling in accessible location.

4.2.3.7.4 FP 200 cable to be glanded on Junction box, terminate the cable properly.

4.2.3.7.5 Access panel to be provided when this device is located above false ceiling.

4.2.3.7.6 Address to be made as per addressing given in the approved shop drawings.

5.0 Records

5.1 QC Installation Check List

5.2 Inspection request duly signed-off by Consultant.

6.0 Attachment

6.1 QC installation check list formats for the following.

a) Installation of Fire Alarm system

**METHOD STATEMENT FOR
TESTING & COMMISSIONING OF
FIRE ALARM SYSTEM**

1.0 Scope

This method statement details the method of Testing and commissioning of Fire Alarm System, as per Project Specification 16721

Note

A separate Method Statement Ref. ETA/MS/E- 018 shall be submitted for Installation of the Fire Alarm System.

2.0 Material

2.1 All materials shall be as per approved material submittals.

2.2 Sizes of FP200 cable shall be as per approved shop drawings / system manufacturer's recommendation.

2.3 Type of FA device shall be as per approved shop drawing.

3.0 Applicable Location

3.1 Tower E1, E2, E3, W1, W2, W3, Villas and Podium Areas.

4.0 Method

Find attached the manufacturer representative's detailed method statement and test formats for testing and commissioning of Fire Alarm System covering the mechanical checks, insulation resistance measurement, switching ON the unit. Programming and testing

The whole system will be commissioned and certified by the manufacturer's representative before handing over.

5.0 Records

5.1 Commissioning procedure with test results in attached format.

5.2 Inspection request duly signed-off by NMX and Consultant.

5.3 Certification of installation by SIBCA

6.0 Attachment

6.1 Manufacturer's representative method statement detailing the pre-commissioning and commissioning procedures, including test formats

METHOD STATEMENT FOR INSTALLATION OF G.I. & PVC CONDUITING ON SURFACE

1.0 Scope:

- 1.1 This method statement details the method of installation of G.I. Conduit and PVC Conduit on surface.

2.0 Material:

- 2.1 All materials shall be as per approved material submittals.
- 2.2 Sizes of Conduits to be used are 20mm dia to 50mm dia.

3.0 Applicable Location:

- 3.1 Tower E1, E2, E3, W1, W2, W3, Podium and Villas
- 3.2 G.I. Conduits are used particularly in all exposed to view area, such as plant room, lift motor rooms, sub-stations and outside buildings, partially open ceilings, any place which is likely to be damp or exposed to outside ambient temperature.
- 3.3 PVC Conduits are used only false ceiling areas.

4.0 Method:

4.1 Storage:

- 4.1.1 Conduit shall be lowered not dropped to the ground.
- 4.1.2 Conduit shall be given proper support at all the times and shall be stacked on flat surface. Manufacturer's instructions shall be followed as applicable.
- 4.1.3 Timber supports shall be placed at an interval of one metre.
- 4.1.4 Conduits shall be protected from direct sunlight and moisture to avoid deterioration.
- 4.1.5 Conduits shall be stored with proper end caps.
- 4.1.6 Conduits shall be stacked size wise.

4.2 Installation:

- 4.2.1 Shifting of materials shall be done by tower crane or sufficient manpower shall be deployed. All necessary safety precautions as per established procedure shall be implemented during shifting and installation.

- 4.2.2 The routes for the surface Conduits will be marked based on the approved shop drawings and coordinated with other services at site.
- 4.2.3 Prior to erection, all burrs and sharp edges shall be removed from the conduit with reamer together with any dirt, oil or paint, which may be present.
- 4.2.4 Standard length of conduits shall be cut to the required length.
- 4.2.5 For G.I. Conduits threading shall be done using a threading machine and correct size die-set. Threads will be kept to a minimum when showing from couplings and boxes.
- 4.2.6 Cold Galvanizing paint is applied to the thread part of G.I. Conduit just before fixing.
- 4.2.7 Where required conduits of size 20mm and 25mm shall be bent to the required radius using manual bending machines. Manufactured bends are used for conduits size 32 mm and 50mm.
- 4.2.8 Conduits are fixed to the building fabric by means of distance bars saddle with appropriate metal screws and plugs. A space of 3mm minimum shall be maintained between conduit and the building surface.
- Check all mechanical connections are internally smooth for pulling wiring in no burrs or sharp edge will be allowed.
- 4.2.9 The route of this steel conduits are restricted to horizontal and vertical runs except for the areas where approved to follow the line of an architecture.
- 4.2.10 Spacer bars are fixed in regular interval not exceeding 1.2m and the distance from either side of any box or bend to the nearest spacer bar shall not be more than 150mm.
- 4.2.11 Ensure the Conduit installations are in straight line.
- 4.2.12 Conduits shall be fixed so that no water enters, if it is not practicable a 3mm hole is drilled at the lowest point of the conduit to drain the water out.
- 4.2.13 All terminal boxes are marked on the appropriate location (i.e. wall or ceiling) as per approved shop drawing and fixed with metal screws and plugs. Suitable braze bushes are used where conduit enters the boxes to avoid any damage to the wires.
- 4.2.14 Wherever necessary draw wires shall be pulled into conduit runs and kept at pull boxes for future use.
- 4.2.15 Any rusting of steel conduits occurred during construction shall be removed.
- 4.2.16 Inspection shall be offered for ETA QA verification.

5.0 Safety:

All safety precautions shall be followed as per established project safety plan and procedure.

6.0 Records:

- 6.1 Work Inspection Request (WIR) duly signed-off by Consultant.

**METHOD STATEMENT FOR
INSTALLATION OF GENERATOR &
ATS**

1.0 Scope

1.1 This method statement details the method of installation of Generator and ATS according to the Specification Section 16402.

Note: A separate Method Statement Ref.: ETA/MS/E-039 shall be submitted for Testing & Commissioning of Generator and ATS.

2.0 Material

2.1 All materials shall be as per approved material submittals, shop drawing and single line diagram.

2.1.1 Generator & ATS.

2.1.2 Cable glands and lugs.

2.1.3 Identification labels and tags.

3.0 Applicable Location

3.1 Generator: East & West Podium – Ground floor.

3.2 ATS: Tower E1, E2, E3 & W1, W2, W3 - LV Rooms.

4.0 Method

4.1 Storage

4.1.1 Generator & ATS shall be inspected upon receipt at site for damages and compliance with the approved schematic.

4.1.2 Upon completion of receiving inspection, the Generator & ATS shall be positioned at the correct locations with suitable crane arrangements.

4.1.3 Generator & ATS found with transportation damages shall be recorded and notified to the concern party for further action.

4.1.4 Generator & ATS shall be covered with polythene sheets to protect from dust and moisture.

4.2 Installation

4.2.1 **Generator:**

4.2.1.1 **Installation Procedure:**

- Specification sheets will be checked for the dimension & weight of the generator sets and mounting points.
- DG set of both ratings will be mounted on a concrete plinth.
- Installation locations will be as per approved shop drawings.

4.2.1.2 Engine Exhaust System:

- Flexible exhaust tubing will be connected to the engine to take up thermal expansion and generator set movement and vibration.
- Exhaust silencer shall be mounted so that the engine does not support the weight of the silencer.
- Flexible tubing will not be used to form bends or to compensate for misalignment of piping.
- Mufflers and piping will be supported by Non-combustible hangers or supports.
- Precaution shall be taken to rule out any possibility of combustible material coming in contact, close to the exhaust piping. Approved non-combustible material shall be used where exhaust piping passes through combustible walls or ceiling etc.
- Horizontal runs of exhaust piping will be sloped downwards away from the engine to out of doors to avoid condensate water entering engine.
- Installation will be as per approved shop drawings.
- Exhaust pipe opening outside the building shall be arranged to avoid entry of rainwater and shall be fitted with bird guard.
- On confirmation of the routing of the exhaust pipe, the number of bends & length will be communicated to the manufacturers & suitable diameter of exhaust pipe will be selected for minimum back pressure.

4.2.1.3 Air Intake and Radiator Exhaust

- Intake and exhaust air louvers will be sized and located to provide sufficient intake air for engine combustion and to provide required airflow through the radiator.
- Duct work with flexible connecting section will be sized and located to provide sufficient intake air for engine combustion and to provide required airflow through the radiator.
- The allowable pressure drop will be checked with the manufacturer after confirming the layout and will be informed to the louver supplier / manufacturer, for co-ordination purposes.

4.2.1.4 Access for Installation

- Access opening for installing the Generator will be indicated on shop drawings.

4.2.2 ATS :

- Ensure approved documents like shop drawing, electrical room layout are available with the installation team.
- Check the label/markings to ensure that it is the right panel and check the position according to the shop drawing.

- Terminate the incoming and outgoing cable as per single line diagram using proper tools.
- Megger the panels after connecting the compartments.
- Megger the cables before terminating.
- Megger the panel after termination.
- Clean the termination and ATS panel with vacuum cleaner and hand brush to clean the dust and small metal pieces fallen during cable cutting and terminating process.
- Provide identification for all the cable termination as per specification requirement.
- Dress the cables neatly with cable ties / cable cleat.
- Double check the connections by tightening the terminations.
- Inspection shall be offered for QC Verification.

5.0 Records

- 5.1 QC Inspection Check List.
- 5.2 Inspection request duly signed-off by Consultant.

6.0 Attachment

- 6.1 Inspection Check List for Generator & ATS.

METHOD STATEMENT FOR T&C OF GENERATOR & ATS

1.0 Scope

1.1 This method statement details the Testing and Commissioning of Generator and ATS according to the specification section 16402.

Note: A separate method statement is submitted for installation of Generator and ATS. (Ref. ETA /MS/E-022)

2.0 Material

2.1 All the materials shall be as per approved material submittals.

2.2 Size and number of Generator and ATS shall be as per approved shop drawing and load schedule.

2.3 Identifications and labels.

3.0 Applicable Location

3.1 Generator : East & West Podium – Ground floor.

3.2 ATS : Tower E1,E2,E3 & W1,W2,W3 - LV Rooms.

4.0 Instruments.

4.1.1 Generator :

- Resistive Load bank – UPF.
- Controller for the Load bank.

4.1.2 ATS :

- Insulation Resistance tester (Megger) with Variable Voltage selections.
- Phase Sequence meter.
- Multimeter.

Note: The calibration certificates of testing instruments shall be verified prior to usage and copies shall be included in the test reports.

4.2 Installation

4.2.1 Testing & Commissioning procedure for Generator :

4.2.1.1 Overall Inspection:

- Batteries, fuel & auxiliary power must be isolated before carrying out initial inspection.
- Ensure that the control switch is in the OFF position and emergency switched is pressed.
- Ensure that the panel has the correct fascia and labels.
- All round check of the genset to ensure that no loose items e.g. nuts, bolts, washers etc are lying in, or around the equipment. Such items are to be removed as they pose a hazard to safety.
- A careful check of the interior of the alternator terminal box to ensure that no loose objects are lying within.
- Ensure the load circuit breaker is in open position (if fitted)
- A careful check of the interior of the control panel to confirm that wiring termination is correct and that no loose clippings, cable lengths, nuts etc remain in the control panel from manufacturer.
- A careful check of the engine exhaust manifold to ensure that no unplugged apparatuses exist.
- Ensure the lubricating oil to the full mark on the dipstick.
- Fill the engine with required coolant mixture i.e. anti freeze, rust inhibitor. Ensure all coolant systems are properly bled during filling.
- Check engine air intake and exhaust system for blockage.
- Ensure that sufficient unrestricted air circulation is available in the genset room without recirculation.
- Ensure that sufficient space is available around the genset for easy maintenance of the genset and easy access of the control switches and control panel reading.
- Fuel piping shall be with minimum bends so that the suction head shall be within the manufacturers recommended limit.
- Check for lube oil level, coolant and fuel.

- Position of wiring loom relative to any moving part or hot surfaces, especially exhaust.
- Carry out a random check on control wiring connections both on the engine and within the control panel for tightness and suitability.
- Ensure all defects/damages found are logged.
- Fill up the Commissioning sheet supplied with operation and maintenance manual, and ensure that the rating matches with the specification.

4.2.1.2 Genset Functional Test :

- Check that load cables are suitably rated for the calculated full load current.
- If required megger the alternator winding and load cable for insulation testing.

- Ensure that all control and low voltage devices are disconnected while insulation test.
- Connect the load cables, neutral to the load bank.
- Set the load to correct voltage, frequency and power factor.
- Connect the genset to the earth with sufficiently rated earth cable.
- Ensure that all the equipments are earthed satisfactorily.
- Check for earth resistance and ensure that the resistance is well within the limit.
- Remove the alternator terminal box top plate and check terminal for tightness.
- Remove the AVR cover and securely attach to the genset.
- Check the link is set at correct frequency.
- Ensure all units are rated for operating voltage of genset both AC and DC.
- Manually close and open the circuit breaker to ensure smooth operation.
- Check all electrical connection and tightness.
- Calculate the full load current of the generator and calculate current rating at 110%, 100%, 75%, 50%, 25% and 0%.
- Fuel lines are now to be connected.
- Check any leakage in the fuel Line.
- Ensure that control switch is in 'OFF' mode, emergency switch is pressed and the circuit breaker is in open position.
- Connect the battery to the starter motor with correct polarity (negative of the battery shall be connected to last)
- Check all electrical connections.
- Power-up the Access 4000 series control panel.

4.2.1.3 Start-up Tests :

Note : The genset shall not be started unless it is cleaned from dirt.

- Test results should be in accordance with the values stated in the operating manual. Test results should be recorded into the test format.
- Ensure that breaker is in open position.
- Release the emergency push button.
- Star engine using the RUN position on the control switch.
- Check operation of emergency stop button .
- Re-start generator set by clearing emergency stop fault and control switch in RUN position..
- Check RPM reading on the screen with the value on the rating plate.
- Adjust output voltage at AVR to specified voltage.
- Verify operation of the volts raise/lower switches if applicable.
- Verify operation of the speed raise/lower switches if applicable.
- Check the phase sequence and ensure correct phase sequence.
- Close the circuit breaker.
- Apply a small load (approx 25%) to the generating set.
- Check CT polarity by observing current readouts in the screen.

- Release the load.
- Ensure all protection devices are installed are the correct type/setting and are operating satisfactorily.
- Check operation of all shutdowns and alarms.
- Where fitted check the operation of all auxiliary chargers, heaters, pumps etc. The control cabling protection circuits and equipment for all auxiliary items should be of correct size and rating.
- Turn control switch to OFF.
- Verify that the generator set shuts down correctly.
- Fit the AVR cover.
- Open the circuit breaker.
- To ensure auto start of genset, link the control terminals for auto start in the control panel.
- Turn the control switch to AUTO mode.
- After a while switch off the genset.

4.2.1.4 Genset Load Test :

Note: Genset do not leave unattended until satisfactory testing.

Load test on the genset is not recommended if start up test is not satisfactory.

- Start the genset.
- Once the genset is reached to rated speed and voltage close the circuit breaker.
- Load up generator set smoothly as per site load testing specified.
- Observe and tabulate all necessary reading for every interval as specified in the specification.
- Observe for any leakage, undue noise or vibration.
- After completion of the test, remove load smoothly and allow the genset to run for cool down.
- After cool down time (approx 10 minutes) switch off the genset using control switch to OFF position.

4.2.1.5 Post Test Checks :

Note: Press the Emergency button before doing any inspection on the genset.

- On completion of all the test rewiring and re cabling the genset is to be properly swept clean of all loose debris e.g nuts, bolts, washers and cable clipping etc.
- Ensure generator set are left in a clean and fit condition, and ready for use.
- Check for leak in fuel, oil and coolant system.
- Check for oil level, coolant level and fuel level, top up if necessary.
- Check for any damage.
- Remove the load cable to the ATS and ensure bolts are fastened to securely to bus bars.

- Ensure that the ATS panel is set for proper voltage and suitable timings are programmed.
- Connect all the auxiliary power supply for the heater etc if applicable.
- Ensure that control switch is in 'OFF' mode.
- Connect the auto start signal cable to genset control to genset control panel from the ATS.
- Release the emergency push button.
- Turn the control switch to auto mode.

4.2.2 Procedure for Auto Transfer Switch (ATS) :

4.2.2.1 Insulation Resistance Test using 500V Megger:

- Check the tightness of connections.
- Clean all the supporting insulators.
- Isolate the cables on incoming and outgoing side.
- Apply a megger voltage of 500Volts DC between Phase 'R' to earth for 1 min with Phase 'Y', 'B' & 'N' shorted and earthed and record the values.
- Similarly continue the test and record the values for the other phases.

4.2.2.2 Operational Checks:

- Connect the required control supply as per the schematic.
- Check the operation of the switchgear i.e. closing / tripping of switchgear from local and control points.
- Check the operation of protective relays.
- Check the operation of interlocks, alarms and indications circuits as per the approved schematic

5.0 Safety :

- Only experienced and skilled personnel shall be engaged for testing.
- Safety guards shall be in place and secured prior to start-up.
- Warning signs and tapes shall be placed during start-up and commissioning as required.
- All safety procedures shall be followed in accordance with the project health and safety plan.
- Safety officer shall check and ensure all safety precautions as followed.

6.0 Records

- Site Test Reports.
- Calibration certificates of testing instruments

7.0 **Attachment**

- Inspection Check List for ATS .
- Insulation Resistance Test for ATS.
- Generator Load Test Sheet.

METHOD STATEMENT FOR INSTALLATION OF ISOLATORS & SWITCHING ACCESSORIES

1.0 Scope

- 1.1 This method statement details the method of installation of Isolators & Switching accessories.

2.0 Material

- 2.1 Isolators,
2.2 Switching accessories,
2.3 Cable glands and lugs,
2.4 P.V.C. wires,
2.5 Identifications.

3.0 Applicable Location

- 3.1 Isolators in Plantrooms, Lift-M/C room, Fan-rooms in E1, E2, E3 & W1,W2,W3 Towers and Plantroom in Podium areas.
3.2 Switching accessories in all Towers & Podium areas.

4.0 Method

4.1 Storage

- 4.1.1 Isolators & Switching accessories shall be inspected upon receipt at site for damages and compliance with the approved submittals.
4.1.2 Upon completion of receiving and inspection, the Isolators & Switching shall be stored in a covered and ventilated store.
4.1.3 Material found not suitable for the project is removed from site immediately.

4.2 Installation

- 4.2.1 Ensure current/approved documents like shop drawing are available with the installation team and to be installed after the details given in the approved drawing and specification.
4.2.2 Shift the particular Isolators & Switching accessories to the work place.

- 4.2.3 Check the label/markings to ensure before installation.
- 4.2.4 Mark the fixing position of the Isolators & Switching as per shop drawing, coordinate with other equipment and services.
- 4.2.5 Suitable knock-out at the top of the Isolators shall be used for Incoming cable entry.
- 4.2.6 File the knock-out to suit the cable glands and lugs for rigid terminations. Insulation will be fitted around the knock out to protect cable insulation passing through, where cable gland are not used.
- 4.2.7 Clean the Isolators after dressing with blower to blow out all the small particles and dust after the termination works.
- 4.2.8 Provide identification labels as per specification / approved submittals.
- 4.2.9 Inspection shall be offered to QC Verification.

5.0 **Records**

- 5.1 Inspection request duly signed-off by Consultant.

METHOD STATEMENT FOR T&C OF ISOLATORS & SWITCHING ACCESSORIES

1.0 Scope

1.1 This method statement details the Testing and Commissioning of Isolators and Switching accessories according to the specification section 16415.

2.0 Material

2.1 All the materials shall be as per approved material submittals.

2.2 Size and number of way of the Isolators and Switching accessories as per approved shop drawing .

2.3 Identifications and labels.

3.0 Applicable Location

3.1 Isolators in Plantrooms, Lift-M/C room, Fan-rooms in E1, E2, E3 & W1,W2,W3 Towers and Plantrooms in Podium areas.

3.2 Switching accessories in all Towers & Podium areas.

4.0 Instruments.

4.1 Insulation tester.

4.2 Multimeter (Continuity test)

Note: The instruments used for testing and commissioning shall be checked and ensured that they are calibrated and the current valid calibration reports are filed for record.

5.0 Method

5.1 **Physical check** – Conduct a through visual check is conducted to ensure the components and the connections are made correctly, and recorded on the checklist as attached.

5.2 **Polarity check** – Conduct polarity check to ensure the switch and the screw lamp connections are correct and record on the attached format.

- 5.3 **Continuity check** – With the help of a Multimeter the continuity of the circuits are checked and ensured the resistance value is under the permissible limit.
- 5.4 **Insulation check** – Use a insulation tester to check is there any break down of insulation between conductors, if any replace it immediately. Also record the insulation resistance value of all the circuit in the attached format.
- 5.5 Functional test of Isolators.

6.0 **Records**

- 6.1 Inspection request duly signed-off by Consultant.

7.0 **Attachment**

- 7.1 Test format.

METHOD STATEMENT FOR INSTALLATION OF LIGHTING FIXTURES

1.0 Scope

This method statement details the method of installation of Lighting Fixtures as per Project Specification 16505.

Note

A separate Method Statement Ref. ETA/MS/E-40 shall be submitted for testing and commissioning of the Lighting Fixtures.

2.0 Material

- 2.1 All materials shall be as per approved material submittals (schedule of materials attached herewith).
- 2.2 Sizes of the wires shall be as per approved shop drawings / system manufacturer's recommendation.
- 2.3 Type of luminaires shall be as per approved shop drawings.

3.0 Applicable Location

- 3.1 Tower E1, E2, E3 & W1,W2,W3, Podium areas and Villas.

4.0 Method

4.1 Storage

- 4.1.1 All materials received at site shall be inspected and ensured against approved material submittal.
- 4.1.2 Any discrepancies, damages etc. shall be notified immediately for further action.
- 4.1.3 Material found not suitable for the project are to be removed from site immediately.
- 4.1.6 Materials shall be stacked properly as per manufacturer's recommendation and covered to prevent dust and water / moisture.

- 4.1.7 Manufacturer's packing should not be removed till the time of installation.
- 4.1.9 Ambient condition of the storage place to be as per manufacturer's recommendation.

4.2 Installation

4.2.1 Wiring to Light Fixtures. :

- 4.2.1.1 Ensure the relevant current / approved shop drawings are available with installation team.
- 4.2.1.2 Transfer the wire coils to the work place manually with the help of proper man power.
- 4.2.1.3 Check the colour and size of the wire is as per approved shop drawings.
- 4.2.1.4 Pull the wires manually through conduit installed as per approved shop drawings.

4.2.3 Lighting Fixtures. :

- 4.2.3.1 Ensure the relevant current / approved shop drawings are available with installation team.
- 4.2.3.2 Transfer the luminaries to the work place manually after checking the type of luminaire against relevant current / approved shop drawing.
- 4.2.3.3 Exact location of the luminaire to be marked at site as per approved reflected ceiling plan for ceiling (surface / recessed) installation.
- 4.2.3.4 Exact location and mounting height to be marked at site as per approved shop drawing for wall mounted installations.
- 4.2.3.5 For the luminaries which needs to be fixed on the false ceiling to be marked with exact dimension to make provision by false ceiling contractor.
- 4.2.3.6 Install the luminaire and terminate the wires properly.
- 4.2.3.7 Ensure the proper protection from damages during construction work.

4.2.5 Inspection request shall be raised for QC Verification and inspection of Consultant.

5.0 Records. :

5.1 Inspection request duly signed-off by Consultant.

METHOD STATEMENT FOR T&C OF LIGHTING FIXTURES

1.0 Scope

1.1 This method statement details the Testing and Commissioning of Light fixtures according to the specification section 16505.

Note: A separate method statement is submitted for installation of Light fixture.
(Ref. ETA /MS/E-023)

2.0 Material

2.1 All the materials shall be as per approved material submittals.

2.2 Sizes of PVC wires shall be as per approved shop drawings / system manufacturer's recommendation.

2.3 Type of Luminaire shall be as per approved shop drawings.

3.0 Applicable Location

3.1 Tower E1, E2, E3 & W1, W2, W3, Podium areas and Villas.

4.0 Instruments.

4.1 Insulation Resistance tester (Megger) with Variable Voltage selections.

4.3 Multimeter.

5.0 Test Procedure :

5.1 **Physical check :**

5.1.1 Check the electrical components such as Light fixtures are connected to the final circuit of the distribution board.

5.1.2 Check the installation of Light fixture.

5.2 **Insulation Resistance Test using 500V Megger:**

5.2.1 Check the tightness of connections.

5.2.2 Apply a megger voltage of 500Volts DC between Phase 'R' to earth for 1 min with Phase 'Y','B' & 'N' shorted and earthed and record the values.

5.2.3 Similarly continue the test and record the values for the other phases.

5.3 **Lux level checked by lux meter.**

6.0 **Safety :**

6.1 Only experienced and skilled personnel shall be engaged for testing.

6.2 Safety guards shall be in place and secured prior to start-up.

6.3 Warning signs and tapes shall be placed during start-up and commissioning as required.

6.4 All safety procedures shall be followed in accordance with the project health and safety plan.

6.5 Safety officer shall check and ensure all safety precautions as followed.

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7.0 **Records:**

7.1 Site Test Reports.

7.2 Calibration certificates of testing instruments.

9.0 **Reference :**

9.1 Specification Section 16505.

9.2 Approved Drawings.

METHOD STATEMENT FOR INSTALLATION OF LIGHTNING PROTECTION SYSTEM

1.0 Scope:

1.1 This method statement details the method for installation of lightning protection system.

2.0 Material:

Material used for the system is as per BS 6651 : 1992.

3.0 Applicable locations:

Roof, Basement, and ground level network.

4.0 Method:**4.1 Storage:**

Material shall be stored in a covered/dry space at all the time to avoid corrosion.

4.2 Preparation:

4.2.1 As per approved shop drawing/s identify location of rebars / dedicated rods to be installed as down conductors. Co-ordinate with Main Contractor for installation of dedicated rods and rebar clamps before shuttering for the columns / wall is in place.

4.2.2 Clean the area of clamp to be fixed with wire brush / emery paper to remove rust on rebar, if any.

4.3 Installation:

4.3.1 The following method shall be followed at all locations, identified as per shop drawing.

4.3.2 The dedicated rebar is selected from the pile cap and the cable is clamped with the rebar by CR730 clamp and connected to the dedicated rebar of the selected column as per approved shop drawing.

4.3.3 Fix G.I. Box 160 x 80 x 35 at 500mm from SSL (for testing purpose) on the column. The box shall be tied with reinforcement rod and the box cover will be flush with the finish wall.

4.3.4 The dedicated rebars of the column as per shop drawing shall be connected to a 70sq.mm PVC cable using CR 705 Furse clamp for the extension till it reaches the roof.

4.3.5 Expanded polystyrene shall be applied to seal the hole within the concealed disconnect link box and tied with steel binding wire to prevent concrete / cement entering into the box.

4.3.6 Prior to concreting, earth continuity between reinforcement rods and dedicated rods shall be checked with a d.c. ohm meter. Also torque setting shall be checked at 40Nm.

4.3.7 In each tower E1, E2, E3, W1, W2 & W3 final test sheet shall be offered to Consultant for witness and sign-off.

- 4.3.8 Once rebar has reached upto the height as shown in the drawing for bonding, the work shall be co-ordinated with Main Contractor. This is applicable in locations as shown in design drawings.
- 4.3.9 At roof G.I. box 160 x 80 x 35mm shall be fixed at 500mm from SSL with fixing of PC116 furse earth point with pre-welded joint. The box shall be tied with reinforcement rod and box cover shall be flush with finish wall 25 x 3 copper tape run on roof perimeter as shown in shop drawing bonded with non ferrous bonding point. All mechanical i.e. AHU's, pole structure, petal structure etc. shall be bonded with 25 x 3 copper tape.
- 4.3.10 25 x 3 copper tape shall be fixed on top of parapet wall at 1m centres as shown in shop draw2ing with Non-ferrous bonding point.
- 4.3.11 Connection between down conductor and earth pits
- a. Blinding, water proofing and 50mm (min) protective screed needs to be provided by Civil contractor.
 - b. Refer attached sketch showing sectional view of the earth connection and its assembly.
- 4.3.12. Inspection shall be offered for QC verification in stages.
- 4.3.13 Inspection request shall be raised at least 24 hours in advance for Consultant's inspection, prior to concrete pour / cover-up work.
- 4.3.14 Final inspection shall be carried out collecting all the data from previous inspection requests and finally verified for the anticipated results.

5.0 Records :

- 5.1 Inspection request duly signed-off by Consultant.

6.0 Attachments :

- 6.1 Typical installation details – Detail A – Sheet 1
Detail B – Sheet 2

METHOD STATEMENT FOR TESTING OF LIGHTNING PROTECTION SYSTEM

1.0 Scope

- 1.1 Testing of Lightning protection system in accordance with the requirements of Specification 16950.

2.0 Material

- 2.1 Copper tapes and accessories.
- 2.2 PVC Insulated cables (between down conductors)

3.0 Method**3.1 Testing equipment**

- 4.1.1 Earth tester.
- 4.1.2 Continuity tester.

The calibration certificates of testing instruments will be verified for validity prior to use.

3.2 Inspections

3.2.1 Physical Checks: Physical checks will be conducted to ensure the following as per specification.

- a. Check the proper jointing of copper tapes and its connection with the down conductor.
- b. Check the proper jointing of cable installed to link down conductors and earth electrode.
- c. Clean and tighten all the joints.

3.2.2 Earth electrode resistance check

- a. Remove the lightning protection system continuity conductor connection from the earth electrode and measure the earth electrode resistance by using earth tester.
- b. All the earth values will be tabulated and submitted for consultants review.

3.2.3 Continuity Test

- a. Continuity test will be carried out to ensure the continuity between lightning protection conductor at the selected points and the earth electrode by using a multimeter.

- b. Values of the above tests will be tabulated and submitted for consultants review.

3.3 **Corrective Actions**

If the measured resistance is found to be higher than the specified value (i.e. <10 ohms) the Engineer will be notified and recommendations will be agreed to lower the resistance.

4.0 **Records**

- 4.1 Test results in the attached format.
- 4.2 Inspection request raised for consultant to witness testing.

5.0 **Attachments**

- 5.1 Earth electrode testing format
- 5.2 Pre-commissioning check list

METHOD STATEMENT FOR INSTALLATION OF LOW VOLTAGE PANELS (LVP's)

1.0 Scope

- 1.1 This method statement details the method of installation of L.V main Panels (LVPs) according to the Specification Section 16402.

Note: A separate Method Statement ref. ETA/MS/E-29 shall be submitted for Testing & Commissioning.

2.0 Material

- 2.1 All materials shall be as per approved material submittals, shop drawing and single line diagram.
- 2.1.1 L.V. Main Panels.
 - 2.1.2 Cable glands and lugs.
 - 2.1.3 Identification labels and tags.

3.0 Applicable Location

- 3.1 L.V. rooms for E1,E2,E3 & W1,W2,W3 Towers Located in Podium areas.

4.0 Method

4.1 Storage

Note: L.V. Panels will be offered for factory inspection/witness by Design Consultant prior to material dispatch

- 4.1.1 LVP's shall be inspected upon receipt at site for damages and compliance with the approved submittals and Single line Diagram.
- 4.1.2 Upon completion of receiving inspection, the LVP's shall be positioned at the respective substation locations with suitable crane arrangements.
- 4.1.3 LVPs found with transportation damages shall be recorded and notified to the concern party for further action.

- 4.1.4 LVP's shall be covered with polythene sheets to protect from dust and moisture.

4.2 Installation

- 4.2.1 Ensure approved documents like shop drawing, SLD, electrical room layout and load schedules are available with the installation team.
- 4.2.2 Check the label/markings to ensure that it is the right panel and check the position according to the shop drawing.
- 4.2.3 Check the breaker rating and the provision for cable / bus bar termination.
- 4.2.4 Set the breaker current rating as per approved shop drawing.
- 4.2.5 Terminate the incoming and outgoing cable as per single line diagram using proper tools.
- 4.2.6 Megger the panels after connecting the compartments.
- 4.2.7 Megger the cables before terminating.
- 4.2.8 Megger the panel after termination, when I/C open and O/G closed.
- 4.2.9 Check working of motorized breakers.
- 4.2.10 Clean the termination and breaker cubicles with vacuum cleaner and hand brush to clean the dust and small metal pieces fallen during cable cutting and terminating process.
- 4.2.11 Ensure the busbars and interconnecting terminals are free from dust and damage.
- 4.2.12 Provide identification for all the cable termination as per specification requirement and SLD.
- 4.2.13 Dress the cables neatly with cable ties / cable cleat.
- 4.2.14 Double check the connections by tightening the terminations.
- 4.2.15 Keep the approved single line diagram near the LVP's (photo framed), wall mounted inside the substation.
- 4.2.16 Inspection shall be offered for QC Verification before DEWA inspection.

5.0 Records

5.1 QC Inspection Check List.

5.2 Inspection request duly signed-off by Consultant.

6.0 Attachment

6.1 Inspection Check List for L.V. Panels.

METHOD STATEMENT FOR T&C OF LV SWITCH BOARDS/PANELS

1.0 Scope

1.1 This method statement details the Testing and Commissioning of LV Switch boards / Panels according to the specification section 16402.

Note: A separate method statement is submitted for installation of L.V. Switch boards / Panels. (Ref. ETA /MS/E-009)

2.0 Material

2.1 All the materials shall be as per approved material submittals.

2.2 Size and number of LV Switch boards / Panels shall be as per approved shop drawing and load schedule.

2.3 Identifications and labels.

3.0 Applicable Location

3.1 L.V. rooms for E1,E2,E3 & W1,W2,W3 Towers Located in Podium areas.

4.0 Instruments.

4.1 Insulation Resistance tester (Megger) with Variable Voltage selections.

4.2 Phase Sequence meter.

4.3 Multimeter.

Note: The callibration certificates of testing instruments shall be verified prior to usage and copies shall be included in the test reports

5.0 Inspection Procedure :

5.1 Visual, Mechanical and Operational checks as per the format enclosed.

6.0 Test Procedure :

6.1 **Insulation Resistance Test using 500V Megger:**

- 6.1.1 Check the tightness of connections.
- 6.1.2 Clean all the supporting insulators.
- 6.1.3 Isolate the cables on incoming and outgoing side.
- 6.1.4 Apply a megger voltage of 500Volts DC between Phase 'R' to earth for 1 min with Phase 'Y','B' & 'N' shorted and earthed and record the values.
- 6.1.5 Similarly continue the test and record the values for the other phases.

6.2 **Operational Checks:**

- 6.2.1 Connect the required control supply as per the schematic.
- 6.2.2 Check the operation of the switchgear i.e. closing / tripping of switchgear from local and control points.
- 6.2.3 Check the operation of protective relays.
- 6.2.4 Check the operation of interlocks, alarms and indications circuits as per the approved schematic

7.0 **Safety :**

- 7.1 Only experienced and skilled personnel shall be engaged for testing.
- 7.2 Safety guards shall be in place and secured prior to start-up.
- 7.3 Warning signs and tapes shall be placed during start-up and commissioning as required.
- 7.4 All safety procedures shall be followed in accordance with the project health and safety plan.
- 7.5 Safety officer shall check and ensure all safety precautions as followed.

8.0 **Records:**

- 8.1 Site Test Reports.
- 8.2 Callibration certificates of testing instruments.

9.0 **Reference :**

- 9.1 Specification Section 16402.
- 9.2 Approved Drawings.

10.0 **Enclosures :** Test Report for LV Switch board.

METHOD STATEMENT FOR INSTALLATION OF MOTOR CONTROL CENTRE (MCC's) & VARIABLE FREQUENCY DRIVES (VFD's)

1.0 Scope

This method statement details the method of installation of Motor Control Centres and Variable Frequency Drives, as per project Specification Sections 16472 and 15725.

Note: A separate Method Statements shall be submitted for testing and commissioning.

1.1 MCC's (Ref : ETA / MS / E – 30)

1.2 VFD's (Ref : ETA / MS / E –31)

2.0 Material

2.1 All panels / materials / components shall be as per approved material submittals.

2.2 Panel dimension, arrangement and control sequencing shall be as per approved drawings.

2.3 Ensure the panel is factory tested and verify test reports.

3.0 Applicable Location

3.1 MCC's at Tower E1,E2,E3 & W1,W2,W3 Plant Rooms.

3.2 MCC's & VFD's at East & West Podium Heat Exchanger Room.

4.0 Method

4.1 Storage

4.1.1 All components / materials received at site shall be inspected and ensured against approved material submittal.

4.1.2 Any discrepancies, damages etc. shall be notified immediately for further action.

- 4.1.3 MCC Panel / VFD's shall be carefully unloaded from the vehicle using Crane / Fork lift and moved to suitable place for storage.
- 4.1.4 Items found not suitable for the project shall be removed from site immediately.
- 4.1.5 MCC Panel / VFD's shall be stored in a covered place separately as per manufacturer recommended ambient condition.
- 4.1.7 MCC Panel / VFD's shall be covered properly to prevent dust and contamination.

4.2 Installation

- 4.2.1 Shift the panel from stores to the installation spot using fork lift.
- 4.2.2 For floor mounted panels, the exact location of the panel and fixing holes to be marked on the concrete plinth provided by others for the installation.
- 4.2.3 Remove the packing and ensure that the panel is free from transportation damages.
- 4.2.4 For wall mounted panels, the exact location of the panel and fixing holes to be marked based on approved shop drawing keeping panel in place and will be fixed in an approved manner.
- 4.2.5 Position the panel on the plinth and align properly.
- 4.2.6 Anchor the panel as required and ensure it is fixed securely to the plinth, as per approved drawings.
- 4.2.7 Terminate the incoming and outgoing power and earthing cable as per approved single line diagram (SLD) using proper tools.
- 4.2.8 Conduct insulation tests to ensure the healthiness of the panels.
- 4.2.9 Provide proper access around the panel for future maintenance.
- 4.2.10 Ensure the services containing water are away from the panel.
- 4.2.11 Identification of panel and outgoing breaker shall be verified against approved shop drawings.
- 4.2.12 Incoming and outgoing cables shall be marked / identified as per approved shop drawings.

- 4.2.13 All components of the panel such as MCCB, MCB, Relays, Fuses, Meters, CT's, Contactors, Terminals, etc. shall be verified against the approved panel internal drawing for correct rating and size.
- 4.2.14 Any internal connections / modifications will be carried out by the Manufacturer's representative.
- 4.2.15 All breakers (incoming / outgoing) shall be in "OFF" position and to be locked to prevent mishandling.
- 4.2.16 Check and ensure adequate space is available for maintenance.
- 4.2.17 After installation panel shall be properly cleaned and protected with plastic covers to prevent from dust and contamination until commissioning time.
- 4.2.18 Inspection request shall be raised for Consultant's inspection.

5.0 Records

- 5.1 Signed-off Installation Check List will be attached to final inspection request.
- 5.2 Inspection request duly signed-off by Consultant.
- 5.3 Callibration certificates of Megger.

6.0 Attachment

- 6.1 Installation check list format for MCC's and VCD's.

METHOD STATEMENT FOR T&C OF VFD's

1.0 Scope

1.1 This method statement details the Testing and Commissioning of VFD's according to the specification section 15725.

Note: A separate method statement is submitted for installation of MCC's and VFD's. (Ref. ETA /MS/E-012)

2.0 Material

2.1 All the materials shall be as per approved material submittals.

2.2 Size and number of VFD's shall be as per approved shop drawing and load schedule.

2.3 Identifications and labels.

3.0 Applicable Location

3.1 VFD's at East & West Podium Heat Exchanger Room.

4.0 Instruments.

4.1 Insulation Resistance tester (Megger) with Variable Voltage selections.

4.2 Phase Sequence meter.

4.3 Multimeter.

Note: The calibration certificates of testing instruments shall be verified prior to usage and copies shall be included in the test reports.

5.0 Test Procedure:

5.1 **Power Connection :**

5.1.1 Megger the incoming and outgoing power cable & connections for Insulation check & short circuit. Please note that the power cables in the VFD's terminals must be disconnected during this test or it may damage the VFD's.

5.1.2 Reconnect the cables and all power terminals shall be checked for tightness.

5.1.3 All the power cables shall be supported well so that the stress is not on the terminals.

5.1.4 All fuses and overloads shall be checked for correct sizes.

5.2 Control Connection:

5.2.1 All control connection terminals shall be checked for tightness and continuity.

5.2.2 The screens of the screened cables shall be checked for proper earthing.

5.2.3 All terminations shall be cross checked with the drawing.

5.3 Insulation Resistance Test using 500V Megger:

5.3.1 Check the tightness of connections.

5.3.2 Clean all the supporting insulators.

5.3.3 Isolate the cables on incoming and outgoing side.

5.3.4 Apply a megger voltage of 500Volts DC between Phases 'R' to earth for 1 min with Phase 'Y', 'B' & 'N' shorted and earthed and record the values.

5.3.5 Similarly continue the test and record the values for the other phases.

5.4 Pre-commissioning Test:

5.4.1 Check the incoming voltage & phase sequence before switching 'ON' the incomer.

5.4.2 Check control supply and stop lock provision and operation.

5.4.3 Check bypass starter operation with the motor disconnected.

- 5.4.4 Check VFD's operation with the motor disconnected, from the control keypad.
- 5.4.5 Set parameters as required and record the parameters.
- 5.4.6 Check VFD's operations from keypad after connecting the motor, also check motor's direction or rotation.
- 5.4.7 Check bypass starter operation with the motor connected, also check motor's direction or rotation.
- 5.4.8 Check external (remote) control of the VFD's.

6.0 Safety:

- 6.1 Only experienced and skilled personnel shall be engaged for testing.
- 6.2 Safety guards shall be in place and secured prior to start-up.
- 6.3 Warning signs and tapes shall be placed during start-up and commissioning as required.
- 6.4 All safety procedures shall be followed in accordance with the project health and safety plan.
- 6.5 Safety officer shall check and ensure all safety precautions as followed.

7.0 Records:

- 7.1 Site Test Reports.
- 7.2 Calibration certificates of testing instruments.

9.0 Reference:

- 9.1 Specification Section 15725.
- 9.2 Approved Drawings.

10.0 Enclosures:

- 10.1 Site Commissioning Report for VFD's.

**METHOD STATEMENT FOR
INSTALLATION OF PUBLIC ADDRESS
SYSTEM**

1.0 Scope

This method statement details the method of installation of Public Address System.

Note

A separate Method Statement Ref. ETA/MS/E- 0 shall be submitted for testing and commissioning of the Public Address System.

2.0 Material

- 2.1 All materials shall be as per approved material submittals.
- 2.2 Type of cable shall be as per approved shop drawings / system manufacturer's recommendation.
- 2.3 Type of Speakers shall be as per approved shop drawing.

3.0 Applicable Location

- 3.1 Tower E1, E2, E3, W1, W2, W3 (Public Areas)

4.0 Method**4.1 Storage**

- 4.1.1 All materials received at site shall be inspected and ensured against approved material submittal.
- 4.1.2 Any discrepancies, damages etc. shall be notified immediately for further action.
- 4.1.3 Material found not suitable for the project are to be removed from site immediately.
- 4.1.4 Speaker cables shall be stored with the factory packing on the flat surface.
- 4.1.5 Materials shall be stacked properly as per manufacturer's recommendation and covered to prevent dust and water / moisture.
- 4.1.6 Public Address Equipment to be stored as per manufactures recommendation mentioned / marked in the packing.
- 4.1.8 Ambient condition of the storage place to be as per manufacturer's recommendation.

4.2 Installation

4.2.1 Speaker Cable

- 4.2.1.1 Ensure the relevant current / approved shop drawings are available with installation team.
- 4.2.1.2 Transfer the cable to the work place with the help manpower..
- 4.2.1.3 Check the cable drum for any external damage during transportation and ensure the type of cable against area of usage / application.
- 4.2.1.4 Type of the cable is as per approved shop drawings.
- 4.2.1.5 In concealed application pull Speaker cable manually through conduit installed as per approved shop drawings and approved method statements.
- 4.2.1.6 Leave enough length of cable at both ends of panel and devices for termination.
- 4.2.1.7 No through joints is allowed without the sanction of the Consultants.

4.2.2 Public Address Equipments

- 4.2.2.1 Ensure the relevant current / approved shop drawings are available with installation team.
- 4.2.2.2 Transfer the equipment to the work place with the help of manpower.
- 4.2.2.3 Location of the panel to be as per approved shop drawing after coordinating with other services.
- 4.2.2.4 Fixing holes will be marked properly keeping back box of the panel in place.
- 4.2.2.5 Fix back box properly and fix remaining panel accessories.

4.2.3 SPEAKERS

- 4.2.3.1 Ensure the relevant current / approved shop drawings are available with installation team.

- 4.2.3.2 Exact location of the device to be as per approved reflected ceiling plan for surface / recessed installation
- 4.2.3.3 For the Speakers, which needs to be fixed on the false ceiling, fix junction box of the camera above false ceiling.
- 4.2.3.4 Install the Speakers and terminate the cable properly.

5.0 Records

- 5.1 QC Installation Check List
- 5.2 Inspection request duly signed-off by Consultant.

6.0 Attachment

- 6.1 QC installation check list of Public Address System

METHOD STATEMENT FOR T&C OF PUBLIC ADDRESS SYSTEM

1.0 Scope

This method statement details the method of Testing and commissioning of Public Address System.

Note

A separate Method Statement Ref. ETA/MS/E- shall be submitted for Installation of the Public Address System.

2.0 Material

2.1 All materials shall be as per approved material submittals.

2.2 Size and Type of cable shall be as per approved shop drawings / system manufacturer's recommendation.

2.3 Speakers shall be as per approved shop drawing.

3.0 Applicable Location

Tower E1,E2,E3,W1,W2,W3,(Public Areas)

4.0 Method

Find attached the manufacturer representative's detailed method statement and test formats for testing and commissioning of Public Address System covering the mechanical checks, switching ON the unit. Programming and testing

The whole system will be commissioned and certified by the manufacturer's representative before handing over.

5.0 Records

5.1 Commissioning procedure with test results in attached format.

5.2 Inspection request duly signed-off by Consultant.

5.3 Certification of installation by SIBCA

6.0 Attachment

6.1 Manufacturer's representative method statement detailing the pre-commissioning and commissioning procedures, including test formats

METHOD STATEMENT FOR INSTALLATION, TESTING & COMMISSIONING OF SUB MAIN DISTRIBUTION BOARDS (SMDB's)

1.0 Scope

- 1.1 This method statement details the method of Installation, Testing & Commissioning of Sub Main Distribution Boards (SMDBs) according to the Specification Section 16442.

2.0 Material

- 2.1 All materials shall be as per approved material submittals, shop drawing and single line diagram.
- 2.1.1 Sub Main Distribution Board.
 - 2.1.2 Cable glands and lugs.
 - 2.1.3 Identification labels and tags.

3.0 Applicable Location

- 3.1 All Typical floors, Electrical Closet in E1, E2, E3 & W1, W2, W3 – Towers, L.V. rooms & Electrical Closet in Podium area.

4.0 Method

4.1 Storage

- 4.1.1 SMDB's shall be inspected upon receipt at site for damages and compliance with the approved submittals.
- 4.1.2 Upon completion of receiving inspection, the SMDB's shall be repacked.
- 4.1.3 Material found not suitable for the project is removed from site immediately.
- 4.1.4 Sub Main Distribution Boards shall be stored in a covered and ventilated store.
- 4.1.5 Sub Main Distribution Boards are stored in with packing as per manufacturer's recommendations. Packing shall be removed only prior to installation.

4.2 Installation

- 4.2.1 Ensure approved documents like shop drawing, electrical room layout and load schedules are available with the installation team.
- 4.2.2 Shift the particular Sub Main Distribution Boards and associated accessories to the work place with crane or Lift. Packing will be removed at the position of installation.
- 4.2.3 Check the label/markings to ensure the right board before installation.
- 4.2.4 Mark the fixing position of the SMDB's as per shop drawing, coordinate with other equipment and services.
- 4.2.5 Fix the SMDB's with proper metal plugs and bolts. Ensure the installation is straight and leveled.
- 4.2.6 Suitable knock-out at the top of the SMDB's shall be used for Incoming and Outgoing cable entry.
- 4.2.7 File the knock-out to suit the cable glands and lugs for rigid terminations.
- 4.2.8 Suitable equipotential earthing will be provided in accordance with DEWA requirement.
- 4.2.9 Ensure the busbars and interconnecting terminals are free from dust and damage.
- 4.2.10 Check the breakers as per approved load schedule.
- 4.2.11 Megger the panel.
- 4.2.12 Megger the cables before termination.
- 4.2.13 Terminate all the circuits to its respective breakers with proper ferrule identification.
- 4.2.14 Dress the cables neatly with cable ties/ cable cleat.
- 4.2.15 Double check the connections by tightening the terminations.
- 4.2.16 Clean the SMDB's after dressing with blower to blow out all the small particles and dust after the termination works.
- 4.2.17 Provide identification labels as per specification / approved submittals.
- 4.2.18 Place the approved load schedule copy inside the SMDB's door.

4.2.19 Inspection shall be offered to QC Verification.

5.0 **Testing & Commissioning:**

5.1 **Instruments.**

5.1.1 Insulation tester.

5.1.2 ELCB Tester.

5.1.3 Multimeter.

Note: The instruments used for testing and commissioning shall be checked and ensured that they are calibrated and the current valid calibration reports are filed for record.

5.2 **Method**

5.2.1 **Physical check** – Conduct A thorough visual check is conducted to ensure the components and the connections are made correctly, and recorded on the checklist as attached.

5.2.2 **Polarity check** – Conduct polarity check to ensure the switch and the screw lamp connections are correct and record on the attached format.

5.2.3 **Continuity check** – With the help of a Multimeter, the continuity of all the circuits are checked and ensured the resistance value is under the permissible limit.

5.2.4 **Insulation check** – Use a insulation tester to check is there any break down of insulation between conductors, if any replace it immediately. Also record the insulation resistance value of all the circuit in the attached format.

5.2.5 **ELCB and Polarity Test** - With the help of ELCB tester check the function of the earth leakage circuit breaker at rated current.

6.0 **Safety**

6.1 Safety Officer shall ensure that the technicians have undergone safety induction program.

6.2 Only experienced technicians shall be engaged for this specialized job.

6.3 Workmen shall be given proper training to use PPE and to be monitored to avoid any violation on the same.

- 6.4 Electric tools to be checked and certified by Safety Officer and earthing of the same shall be ensured.
- 6.5 All other safety precautions shall be followed as per established safety plan and procedures.

7.0 Records

- 7.1 Commissioning check list and test format at attached.
- 7.2 Inspection request duly signed-off by Consultant.

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| Pre - Commissioning Check List Sub Main Distribution Board. | MEP Contractor (1804) | |

| <u>Locatio / Area :</u> | | Verification Sign-off | |
|--------------------------------|---|------------------------------|------------|
| <u>Feeder SMP Ref :</u> | | | |
| S.No. | Activities / Items to be Inspected | Engineer | QCI |
| 1 | Verify the Installed SMDB's have approved submittals. | | |
| 2 | Ensure the drawings used for installation are correct and approved. | | |
| 3 | Check and ensure the SMDB's new and undamaged. | | |
| 4 | Check the SMDB's as per approved load schedule and drawings. | | |
| 5 | Check the Nameplate and identification labels as per Load schedule and approved sumittals. | | |
| 6 | Check the SMDB's have rigid support. | | |
| 7 | Ensure location of SMDB's is as per approved drawing. | | |
| 8 | Check the termination and dressing of cables and wires completed neatly. | | |
| 9 | All cables and wires including grounding are terminated and identified. | | |
| 10 | Ensure all terminals are tightened as required. | | |
| 11 | Ensure SMDB's interiors are cleaned and free from dust. | | |
| 12 | Check the grounding has been provided as per approved drawing including the body of the DB's. | | |
| 13 | Identification provided as specified / required. | | |

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| <u>Comments / Remarks, if any</u> | | |
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| | | |
| | | QA/QC Engineer |
| Signature : | | |
| Name : | | |
| Date : | | |

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| Installation Check List For Enclosed Bus Duct System | | MEP Contractor (1804) |

| <u>Locatio / Area :</u> | | Verification Sign-off | |
|-------------------------|---|-----------------------|-----|
| S.No. | Activities / Items to be Inspected | Engineer | QCI |
| 1 | Check the Material is as per approved submittal. | | |
| 2 | Check drawings used for installation are latest and approved. | | |
| 3 | Check all material are new and undamaged. Megger each length of busway before installation to check for possible damage of contamination during shifting and storage. | | |
| 4 | Check the layout, opening and elevations of the installed bus duct system as per approved drawings. | | |
| 5 | Check the installation complies with the manufacturer's instruction / drawings. | | |
| 6 | Check the supporting system and support spacing as the approved drawings. | | |
| 7 | Check the continuity and insulation resistance prior and after the installation. | | |
| 8 | Check all the nuts, bolts, screws etc. are tight and secure. (Torque 60-80 lbs) | | |
| 9 | Check the installation of bus duct system is coordinate with other services as required. | | |
| 10 | Check the earth bonding is provided as per approved drawings. | | |
| 11 | Check all joints are tightened with totque sensitive special bolts supplied by the manufacturer using torque wrench. | | |
| 12 | Manufacturer's representative to check and certify the installation, prior to consultant's inspection. | | |
| 13 | Identification labeling completed as per approved details and DEWA requirement. | | |

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| <u>Comments / Remarks, if any</u> | |
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| QA/QC Engineer | |
| Signature : | |
| Name : | |
| Date : | |

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| CONTACT RESISTANCE TEST FOR BUS DUCT | MEP Contractor (1804) | |

| Current Injected : 100 A DC Amb. Temp. | | | | | |
|---|--------------------------|---|----------|----------|----------------|
| S.no | Contact Reference | Contact Resistance in Micro ohms | | | Remarks |
| | | R | Y | B | |
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| Instrument Make / Name | | | |
| Instrument Serial No. | | | |
| Caliberation Date | | | |
| | ETA M&E | NMX | Consultant |
| Signature : | | | |
| Name : | | | |
| Date : | | | |
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| CONTACT RESISTANCE TEST FOR BUS DUCT | |

| Current Injected : 100 A DC Amb. Temp. | | | | | |
|---|-------------------|----------------------------------|---|---|---------|
| S.no | Contact Reference | Contact Resistance in Micro ohms | | | Remarks |
| | | R | Y | B | |
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| Instrument Make / Name : | | | |
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| | ETA M&E | NMX | Consultant |
| Signature : | | | |
| Name : | | | |
| Date : | | | |
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| Installation Check List For Generator | MEP Contractor (1804) | |

| Locatio / Area : | | Verification Sign-off | |
|-------------------------|--|------------------------------|------------|
| S.No. | Activities / Items to be Inspected | Engineer | QCI |
| 1 | Verify the installed Generator have approved submittals. | | |
| 2 | Ensure the drawings used for installation are correct and approved. | | |
| 3 | Check and ensure the Generator are new and undamaged. | | |
| 4 | Factory test reports received and verified. | | |
| 5 | Check the termination are in good condition. | | |
| 6 | Check the labelling of Panels, Cables and their identification. | | |
| 7 | Check the Earthing system for Generator. | | |
| 8 | Check Fuel level. | | |
| 9 | Check Fuel leakages. | | |
| 10 | Check Engine oil level. | | |
| 11 | Check coolant. | | |
| 12 | Check Exhaust pipe work & Muffler assembly installation. | | |
| 13 | Check Exhaust system leakage. | | |
| 14 | Check circuit breakers and its operation. | | |
| 15 | Check battery connection. | | |
| 16 | Check battery charging system. | | |
| 17 | Check to see that switchgear is in the auto position. | | |
| 18 | Simulate power failure & check the working of auto change over system. | | |

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| Comments / Remarks, if any | | |
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| | | QA/QC Engineer |
| Signature : | | |
| Name : | | |
| Date : | | |

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| Installation Check List For ATS | MEP Contractor (1804) | |

| <u>Locatio / Area :</u> | | Verification Sign-off | |
|-------------------------|---|-----------------------|-----|
| S.No. | Activities / Items to be Inspected | Engineer | QCI |
| 1 | Verify the installed ATS have approved submittals. | | |
| 2 | Ensure the drawings used for installation are correct and approved. | | |
| 3 | Check and ensure the ATS are new and undamaged. | | |
| 4 | Factory test reports received and verified. | | |
| 5 | Check the ATS as per approved drawings. | | |
| 6 | Check the Name Plate and Identification labels. | | |
| 7 | Check the mounting channels are even and free from any damage. | | |
| 8 | Check all meters, indication lamp, handles and locks are correct and undamaged. | | |
| 9 | Ensure adequate clearance available around ATS as required and as per drawings and regulations. | | |
| 10 | Check the termination and dressing of cables completed neatly. | | |
| 11 | Esure all terminals are tightened as required. | | |
| 12 | Ensure ATS are cleaned and free from dust and small metallic particles. | | |
| 13 | Check the grounding has been provided as per approved drawing including the body and door of the panel. | | |
| 14 | Check the Identification and warning signs provided as specified / required. | | |
| 15 | Submit the consultant Inspection request. | | |

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| <u>Comments / Remarks, if any</u> | |
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| | |
| | QA/QC Engineer |
| Signature : | |
| Name : | |
| Date : | |

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| Installation Check List For MCC's & VFD's. | | MEP Contractor (1804) |

| Locatio / Area : | | Verification Sign-off | |
|-------------------------|---|------------------------------|------------|
| S.No. | Activities / Items to be Inspected | Engineer | QCI |
| 1 | Check the MCC's / VFD's installed have an approved submittal. | | |
| 2 | Ensure the drawings used for installation are correct and approved. | | |
| 3 | Verify factory test reports and Consultant approved factory witness certificate. | | |
| 4 | Inspect the concrete bases for suitability as per drawings. In case of wall mounted panels, ensure the adequate supporting arrangement. | | |
| 5 | Inspect the MCC's upon receive at site and ensure that the panel free from damages. | | |
| 6 | Ensure all indication lamps, meters and other easily breakable items are undamaged. | | |
| 7 | Ensure adequate clearance around the panel as approved shop drawings. | | |
| 8 | Check the identification of the panel , incoming and outgoing breakers as against approved shop drawings. | | |
| 9 | All cables and wires are terminated and identified. | | |
| 10 | Check the tightness of all terminations. | | |
| 11 | Check the identification ferruling of internal panel wiring as against approved drawings of the manufacturer. | | |
| 12 | Check the interlock with other services are provided as per approved drawing of the manufacturer and specification. | | |
| 13 | Check the glanding and termination of the cables (Incoming and Outgoing) and ensure the same are grounded. | | |
| 14 | Ensure that the panels are protected from damages during the construction works. | | |
| 15 | Final inspection for the complete installations as per specifications / approved submittals / manufacturers instruction. Prior to DEWA (Local Authority) inspection | | |

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| Comments / Remarks, if any | |
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| | |
| QA/QC Engineer | |
| Signature : | |
| Name : | |
| Date : | |