INSTALLATION AND
OPERATIONAL MANUAL

Godrej S.M.A.R.T.

BUSDUCT SYSTEM

IMS CERTIFIED

CPRI / ASTA TESTED

Kindly read the manual for Safe Installation and Energizing the Godrej S.M.A.R.T Busduct System
PREFACE

This manual describes the installation and inspection procedure of Godrej S.M.A.R.T. busduct systems. Refer the manual carefully before setting the installation and the maintenance of the busduct system. It is giving the proper instructions for proper handling, installation, operation and maintenance, and also helps in minimizing personal injury, equipment damage during the handling of the busduct system, and to facilitate the movement of the busduct sections.

Special care on the handling of the busduct is essential; as the product is for the usage of power distribution which itself is very costly.

However it is recommended that the installation is performed only by qualified person, who is familiar with the installation, testing / commissioning and operations of the busduct.

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Formats can be photocopied, filled up and filed for future reference

SAFETY FIRST: - READ THESE SIMPLE GUIDELINES FOR COMPLETE INFORMATION. NOT FOLLOWING THEM MAY BE DANGEROUS.
1. **GENERAL**

1.1. Since construction sites are usually of poor conditions, proper planning and coordination between all the Utilities, HVAC contractors, Plumbing contractors and Electrical contractors are important for a good busduct installation.

1.2. The successful operation and performance of busduct is dependent upon proper handling, installation, operation and maintenance. Neglecting certain fundamental installation and maintenance requirements may lead to personal injury and damage to electrical equipment or other property.

1.3. Installation, operation and maintenance of busduct should be conducted only by Competent personal.

1.4. For purpose of these guidelines, a competent person is one who is familiar with the installation, construction, and operation of the equipment and the hazards involved. In addition, the person should be:

   1.4.1 Trained and authorized to test, energize, clear, ground, tag and lockout circuits and equipment in accordance with established safety practices.

   1.4.2 Trained in proper care and use of personal protective equipment such as rubber gloves, hard hat, safety glasses or face shields, and flash resistant clothing in accordance with established safety practices.

   1.4.3 Trained in rendering the first aid.

**WARNING:** HAZARDOUS VOLTAGES IN ELECTRICAL EQUIPMENT CAN CAUSE SEVERE PERSONAL INJURY. ENSURE POWER HAS BEEN TURNED OFF, DISCONNECTED AND ELECTRICALLY ISOLATED SO THAT NO ACCIDENTAL CONTACT CAN BE MADE WITH ENERGIZED PARTS. FOLLOW ALL MANUFACTURER’S WARNING AND INSTRUCTIONS.

**WARNING:** OPERATION OF BUSWAY WHICH HAS BEEN WATER OR MOISTURE DAMAGED CAN CAUSE PROPERTY DAMAGE, SEVERE PERSONAL INJURY. OBSERVE THE PRECAUTIONS IN SECTION 6 AND 7 TO ASSURE ADEQUATE INSULATION.

2. **UNPACKING**

2.1. Care must be taken while unpacking. Strip cutters should be used on all metal strips securing the package.

2.2. Nail pullers should be used for unpacking wooden crates to avoid damage.

2.3. Remove any support blocks which may have been used for shipping.

2.4. **DO NOT REMOVE THE PLASTIC WRAPPING ON THE BUSDUCT AT THE LOAD AND SUPPLY ENDS TILL THE BUSDUCT IT TAKEN UP FOR INSTALLATION, AS DUST, MOISTURE AND ANY OTHER CONTAMINATION CAN OCCUR WHICH MAY RESULT IN THE FAILURE OF THE BUSDUCT AFTER INSTALLATION.** (see Fig No-4)

2.5. Check the material received as against the packing list of the package.

3. **HANDLING**

These guidelines are provided to help avoid personal injury, and equipment damage during handling and to facilitate moving the busduct sections and fittings at the job site.

3.1. Handle busduct with care to avoid damage to internal components and the enclosure or its finish.

   Avoid subjecting busduct to twisting, denting, and impact and in general, rough handling.

3.2. Do not use busduct ends for lifting busduct sections or fittings.

3.3. When the busduct is received, unpack it sufficiently to inspect it for concealed damage and to determine that the shipment is complete and correct.
3.4. If busduct is to be stored prior to installation, restore the packing for protection during that period (see section 4.). When conditions permit, leave the packing intact until the section or fittings are at their final installation location.

3.5. Verify that the weights of any busduct sections or fittings are within the rated capacity of the handling equipment to be used.

3.6. A fork lift truck may offer a more convenient method of handling busduct and has the added advantage of permitting it to be hoisted between levels. Balance the load carefully. Fig. 1

3.7. Platform lifts or elevators, either manually or power operated, can be used advantageously in moving loads of busduct between elevations. Fig. 2

4. STORAGE

4.1. Busduct sections and fittings which are not to be installed and energized immediately should be stored in a heated building having adequate air circulation and protection from dirt, fumes, water, and physical damage.

4.2. It is recommended that busduct should not be stored outdoors. Protect busduct from dust and water by covering with the waterproof sheet. (Fig. 3)

4.3. If it must be stored outdoors, cover it securely to provide protection from weather and dirt. Temporary electrical heating should be installed beneath the cover to prevent condensation.

4.4. Outdoor busduct is not weather resistant until completely and properly installed and should be treated exactly the same as indoor busduct until after it is installed.

4.5. Bus duct should always be placed on the floor horizontally and, wooden battens or forms are placed underneath the busduct. (Fig. 3 & Fig. 4)
Wrong Method of Storing of the Busducts.

Correct Method of Storing of the Busducts.

Fig. 4

5. OPERATION

5.1. Provide sufficient horizontal and vertical clearance from walls and ceilings to provide easy access to joints, both for the original installation and possible removal of a section when required.

<table>
<thead>
<tr>
<th>Copper Size &amp; Weight</th>
<th>Aluminum Size &amp; weight</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rating in Amps</strong></td>
<td><strong>Busduct</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Height mm</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Fig. 1</strong></td>
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<td>400</td>
<td>115</td>
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<td>2000</td>
<td>240</td>
</tr>
<tr>
<td>2500</td>
<td>305</td>
</tr>
<tr>
<td>3200</td>
<td>405</td>
</tr>
</tbody>
</table>

DO NOT REMOVE THE PLASTIC WRAPPING UNTIL TAKEN FOR ASSEMBLY
Table 1

5.2. Table 1 shows the approximate weight of busduct. However, the weight of special busduct (e.g. flanged end, expansion joint and etc.) should be considered during transporting the units as it is heavier than the weight calculated.

5.3. Avoid subjecting busduct not only to twisting, denting, and impact and, in general, rough handling. Especially busduct ends are not to be hit against the structures or equipment and also not allowed to stand busduct against the wall or other structures.

5.4. Suitable and certified hoisting wire should be used to hoist the busduct for easy installation and also to avoid damage to the housing.

5.5. Ensure that proper distribution of the busduct weight is applied and careful approach is a must to avoid any damage to the housing that could pinch the busduct insulation and result in a failure.

5.6. No direct fixing of hoisting wire to the joint cover hole on the housing for of the busduct, but instead, use lifting jig for both horizontal and vertical busduct installation. (Fig. 5)

5.7. The joint hole should not be used for hoisting as it cannot withstand the weight of the busduct, which result break on the wielding parts or any damages.

5.8. Do not drag the busduct across the floor.

5.9. When installing vertical riser, it is easier to lower the busduct from the floor above where it will be installed. Vertical sections are often stored on the floor above their final location to facilitate lowering them into position.

5.10. While hoisting any feeder ensure that the opposite side of the feeder being hoisted should be rested on a support in order to prevent any damage to the joint.

5.11. Hang one busduct unit with two hangers in principle.

5.12. Depending on the site condition, preferably flanged end, flange end box, cable feed box shall be installed first, followed by the sub-sequent unit numbers. (Fig 6)

5.13. While installing the busduct each unit of the busduct to be individually checked for IR value.

5.14. Also the IR to be checked during the various stages of installation.
Using the lifting fixture the busduct is raised. It is lowered after proper alignment with the load and supply of the corresponding busduct. Perfectly meshed busduct.

6. PROTECTION AGAINST INGRESS OF DUST AND WATER

The ingress of dust and water into the busduct will decrease electrical and physical properties and cause dielectric damage.

6.1. Some common sources of such contaminants are:

6.1.1. **During construction** – Indoor busduct must be protected from moisture during and after installation. Special attention should be given to riser busduct during construction to protect them from moisture from uncompleted roofs, walls, etc. **Outdoor busduct is not weather resistant, until completely and properly installed and should be treated exactly the same as indoor busduct until it is completely installed.**

6.1.2. **Floor level liquids** – Minimum curbs of four inches should be installed around all floor openings for riser busduct to prevent floor level liquids (water / oil spills) from entering the openings.

6.1.3. **Leaking roof** – protect indoor busduct with a temporary sheet metal shield or other protective cover to prevent water from falling onto the busduct until the roof is repaired.

6.1.4. **Pipes** – protect indoor busduct with a temporary sheet metal shield or other protective cover to prevent water from falling onto the busduct until the pipes are repaired. Where pipes (especially cold water pipes) pass directly above indoor busduct, the busduct should be protected from dripping condensate by insulating the pipe or permanently shielding the busduct with sheet metal or plastic.

6.1.5. **Sprinklers** – protect indoor busduct from direct or indirect spray of sprinklers.

6.2. To prevent this, take precaution against the ingress of dust water during storage and installation.

6.2.1. Install busduct after the general construction works are completed.

6.2.2. Install busduct when possible leaking roof is sealed.

6.2.3. Install extra cover at the busduct end.
7. SUMMARY
7.1. Review erection drawing very carefully.
7.2. Check the bill of material.
7.3. Check description and identification of each piece before installation it.
7.4. Follow instruction on each piece for torque requirement.
7.5. Follow manufacturer's joint assembly instruction drawing for both indoor and outdoor procedure.
7.6. Conduct an insulation resistance test on each section of busduct before it is installed.
7.7. Conduct an insulation resistance test on the portion of each run already installed on a daily basis.
7.8. Check for possible source of water that may fall on indoor busduct and take corrective action to prevent this.

8. JOINT ASSEMBLY

The joint section is heart of the busduct during its operation, so proper tightening of the joint bolt is important to ensure its continuous and satisfactory operation.

8.1. Ensure all contact surfaces are clean and free of contaminants by using dry cloth.
8.2. Align the busduct ends of adjoining sections, verifying proper phase alignment, and slide the sections together as illustrated in Fig. 7. It is done by inserting jointing tool inside the joining holes.

8.3. For easier connection of “supply” and “load” and less impact on the download of the busduct weight, certain interval has to be kept. Use joint cover by screwing bolt on the lower part of the joint cover then follow by the upper part of the joint cover this would enable easy jointing and accurate jointing interval. (Fig. 8.1, 8.2)
**IP54 JOINT INSTALLATION PROCEDURE**

**STEP 1**
Align the busduct joint sections.

**STEP 2**
Attach the two busduct joint sections.

**STEP 3**
Install the joint support with joint bolt, Belleville washer and MF.

**STEP 4**
Install the bottom cover. Make sure all the side and bottom covers are properly tightened.

**STEP 5**
Install the top cover. Tighten the MF nut using the torque wrench.

Fig. 8.1
IP55 to IP65 JOINT INSTALLATION PROCEDURE

STEP 1
ALIGN THE BUSDUCT JOINT SECTIONS.

STEP 2
ATTACH THE TWO BUSDUCT JOINT SECTIONS.

STEP 3
INSTALL THE JOINT SUPPORT WITH JOINT BOLT, BELLEVILLE WASHER AND NP NUT. TIGHTEN WITH TORQUE WRENCH.

STEP 4
INSTALL THE IP SIDE COVERS AT BOTH SIDES OF THE BUSDUCT JOINT SECTION.

STEP 5
INSTALL THE BOTTOM COVER. MAKE SURE ALL THE SIDE AND BOTTOM COVERS ARE PROPERLY TIGHTEN.

STEP 6
INSTALL THE TOP COVER.

STEP 7
APPLY SEALANT AROUND THE ENTIRE JOINT EDGES.

Fig. 8.2
8.4. Assembly
8.4.1. Ensure load and supply sides are aligned correctly by placing inserting tool.
8.4.2. Joint the two sections until the joint edge to edge distance is 300mm or to have adequate contact surfaces of each phase to phase.
8.4.3. Insert joint bolt with the joint support through the joint hole and tighten it with plate spring and MF nut with the tool.
8.4.4. For IP 65 and IP67, install side cover with gasket and then fix with bolts (M8x16) on both sides.
8.4.5. Install the joint cover with gasket on the top and bottom of the jointing section.
8.4.6. After side cover and joint cover are fixed, apply sealant around the covers to ensure its protection against water and dust.

8.5. Ensure that all busduct installation is in straight alignment, either in horizontally or vertically in order to have proper jointing system. Then only tighten the Maintenance Free twin nut to the required torque (14-15 Kg.m)

9. HORIZONTAL HANGER INSTALLATION
9.1. Fix Horizontal hanger to the hanger rod M12 fully threaded rod, and adjust it for correct elevation of the busduct as per site condition.
9.2. Lay the busduct on the horizontal hanger.
9.3. Ensure the busduct is aligned in straight line.
9.4. Install the hanger clamp on both side of the busduct for fixture.
9.5. Additional horizontal hangers shall be placed on elbows, such as vertical / horizontal elbow, offset elbow, combination elbow and etc.
9.6. Supporting interval of horizontal hanger shall not exceed 1.5 meters for straight length. However each elbows / bends must be supported separately

Fig. 12
### Dimensions for Horizontal Hanger (Fig. 12)

<table>
<thead>
<tr>
<th>Copper Conductor Ampere Rating</th>
<th>Height “W”</th>
<th>Width “A”</th>
<th>Aluminum Conductor Ampere Rating</th>
<th>Height “W”</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>115</td>
<td>105</td>
<td>400</td>
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<td>710</td>
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<td>5000</td>
<td>905</td>
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<tr>
<td>6300</td>
<td>740</td>
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</tbody>
</table>

**Note:** Horizontal Support Hangers should not be over a Joint Section.

**Support Hanger Load**

<table>
<thead>
<tr>
<th>Ampere Rating</th>
<th>Steel Angle Size (mm)</th>
<th>Screw Threading on Rod in mm</th>
<th>Weight (kg/m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>400 – 1250A</td>
<td>50 x 50 x 5 (Thick)</td>
<td>M 12</td>
<td>3.0</td>
</tr>
<tr>
<td>1600 – 2500A</td>
<td>50 x 50 x 5 (Thick)</td>
<td>M 12</td>
<td></td>
</tr>
<tr>
<td>2500 – 6300A</td>
<td>50 x 50 x 5 (Thick)</td>
<td>M 12</td>
<td></td>
</tr>
</tbody>
</table>

10. **VERTICAL FIX HANGER INSTALLATION**

Vertical Fix hanger shall be installed to fix the first feeder unit, on the first floor, for firm hold of the busduct.

10.1. Temporarily support the busduct section in place. Fit the C-Channel (customer’s scope) onto the Floor Flange. Fix on the bolts (customer’s scope) onto the slab in order to hold the C-Channel firmly to the slab.

10.2. Drill the C-Channel with opening hole of 14mm dia. To accommodate the fixed support rod. Locate the hole in line with the centerline of the side of the busduct housing. The distance in between these two holes from center is 65mm. Then, drill the busduct housing with opening hole of 12mm dia. With the height around 85mm from the
top of the C-Channel for installing the L-Channel Bracket by using M10 bolts supplied. The distance in between these two holes from center to center is 60mm.

10.3. Fix the rod to the top of the C-Channel together with the nuts as show. Try to adjust the Top Nut on both sides until the height from the top of the C-Channel to the base of the “L” Channel is around 50mm and it is aligned with the opening hole of 12mm dia. On the busduct housing.

10.4. Then fix the “L” Channel together with the nuts as shown (Fig. 13).

10.5. The process of fixing the Vertical fixed hanger is completed.

Vertical Fixed Hanger

Vertical Fixed Hanger (400A – 1000A)

Vertical Fixed Hanger (1250A – 3200A)


11. VERTICAL SPRING HANGER INSTALLATION

For Vertical Spring Hanger, they are used on subsequent floors to absorb any expansion occurrence from busduct. Moreover, immediately support shall be provided if the floor-to-floor distance exceeds 4 meters.

The following instructions are for fitting of vertical fixed Hanger for Busduct systems.

11.1. Temporarily support the busduct section in place. Fit the C-Channel (customer’s scope) onto the Floor Flange. Fix on the bolts (customer’s scope) onto the slab in order to hold the C-Channel firmly to the slab.

11.2. Drill the C-Channel with opening hole of 14mm dia. To accommodate the fixed support rod. Locate the hole in line with the centerline of the side of the busduct housing. The distance between these two holes from center is 65mm. Then, drill the busduct housing with opening hole of 12mm dia. with the height around 190mm from the top of the C-Channel for installing the L-Channel Bracket by using M10 bolts supplied. The distance in between these two holes from center to center is 60mm.

11.3. Fix the rod to the top of the C – Channel together with the nuts.

11.4. Try to adjust the top nut on both sides until the height from the top of the C – Channel to the base of the L – Channel is around 155mm, while the height from the bottom of L – channel to the bracket of the vertical spring hanger is 100mm. Then, fix the L – Channel together with the nuts as shown in Fig. 15.

11.5. Unscrew the top nut, 15mm above the top of the L – channel. The process of installing the vertical spring hanger is completed.
12. **INSPECTION OF JOINT BOLT**

Godrej S.M.A.R.T. Busduct System use MF (Maintenance Free) nut at the jointing section which ensures the proper tightening of the bolt.

12.1. Tighten the MF nut using either a ratchet wrench or, a torque wrench (set to 1400kg-cm / 14kg-m).

12.2. Ensure the tightness of the MF nut until the neck of the MF nut is broken. If the MF nut is not tightened properly, an over-heating of the busduct may occur.

12.3. The torque values of tightening of the nuts are as shown below. Table 2

<table>
<thead>
<tr>
<th>NUT SIZE</th>
<th>M8</th>
<th>M10</th>
<th>M14</th>
</tr>
</thead>
<tbody>
<tr>
<td>TORQUE VALUE (kg – cm)</td>
<td>90 – 110</td>
<td>180 – 230</td>
<td>1400 – 1500</td>
</tr>
<tr>
<td>TORQUE VALUE (kg – m)</td>
<td>0.9 – 1.10</td>
<td>1.80 – 2.30</td>
<td>14 – 15</td>
</tr>
</tbody>
</table>

Table 2
13. **FIXING TAP-OFF-BOX**

<table>
<thead>
<tr>
<th>13.1.</th>
<th>This work shall only be carried out by competent and suitably qualified persons.</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.2.</td>
<td>Ensure that one end of the cable is terminated to the plug-in box isolator and the other end is terminated and isolated in the equipment to be connected.</td>
</tr>
<tr>
<td>13.3.</td>
<td>Remove the plug-in hole cover.</td>
</tr>
<tr>
<td>13.4.</td>
<td>Do not remove the plug-in hole insulation plate as removal could expose live busbars.</td>
</tr>
<tr>
<td>13.5.</td>
<td>The orientation of the plug-in hole base plate can be verified by visual inspection.</td>
</tr>
<tr>
<td>13.6.</td>
<td>Ensure that the Tap-Off-Box isolator is switched off.</td>
</tr>
<tr>
<td>13.7.</td>
<td>Align the Tap-Off-Box connection stabs with the plug-in hole plate and push in fully.</td>
</tr>
<tr>
<td>13.8.</td>
<td>Secure the Tap-Off-Box in position with the four fixing clamps located on the back of the box. Note that incoming side of the isolator may be live and care should be taken not to displace any internal screens or shrouds.</td>
</tr>
<tr>
<td>13.9.</td>
<td>When the box is secured in place, verify the phasing of the plug-in box before energizing equipment.</td>
</tr>
</tbody>
</table>
14. **ENERGIZING**

**Before Energizing**

14.1. Recheck all joint connections for tightness by following on the recommended torque value given as section 13.3. Table 2. Ensure that outer head of MF nut is broken. If not, then retighten the nut until it is broken, before installing side cover.

14.2. Ensure that upper nuts are of the spring hangers are unscrewed 15mm above the upper part of spring hanger.

14.3. Isolate the busduct run by disconnecting all connections to transformers, switchboards, meters and so forth.

14.4. Conduct an insulation resistance test on the whole busduct connection after installation. The insulation resistance value cannot be specified due to the length of the route and the environmental factors. In a dried atmosphere, it would give a value of approximately 5 MΩ, it has to be checked due to some factors that can reduce the insulation and the other factors can be as follows;

14.4.1. Whether the busduct is damaged.
14.4.2. Whether the connecting parts are fixed precisely.
14.4.3. Whether the bolts for connecting the equipment are securely fastened.
14.4.4. Whether the hangers are supporting the busduct securely.
14.4.5. Whether the vertical spring hanger is properly.
14.4.6. Busduct kept idle without charging for a very long period of time in humid atmosphere / conditions.

**After energizing**

When the equipment is energized for the first time, competent and qualified electrical personal should be present. If short circuits and ground faults caused by damage or poor installation practices have not been detected in the check-out procedure, serious damage can result when the power is turned on.

14.5. There should be no electrical load on the busduct when it is energized. Since busduct typically extends through several rooms and floor levels, care should be taken to see that all devices fed from the busduct are in the “OFF” position.

14.6. The equipment should be energized in sequence by starting at the source end of the system and working towards the load end. In other words, energize the main devices, then the feeder devices and then the branch-circuit devices. Turn the devices to the “ON” position with a firm positive motion.

14.7. After all over-current devices have been turned on, loads such as lighting circuits, contractors, heaters, and motors may be turned “ON”.

14.8. Busduct, when operating properly, will have a moderate hum. Excessive noise may be an indication of hardware that has not been tightened or of metal parts that have been improperly assembled.

14.9. Occurrence of sparking at any point along the busduct is not a normal condition. The busduct must be de-energized immediately, and remain de-energized until the sparking condition has been corrected.

15. **CARE AND MAINTENANCE**

15.1. **OUTDOOR BUSDUCT**

15.1.1. Inspect busduct once each year or after any severe electrical short circuit or ground fault.

15.1.2. Perform an infra-red temperature scan on all electrical connections and busduct enclosure while busduct is energized and operating under maximum load conditions. A permanent record should be kept. If readings change with time, deterioration may be taking place and must be corrected.

15.1.3. Turn off power to the busduct.

15.1.4. If there is appreciable accumulation of dust and dirt, clean it off by using a brush, vacuum cleaner, or clean lint-free rags. In order to avoid blowing dust into busduct joint, circuit breakers, or other equipment, do not use a blower or compressed air. Ensure that all drain holes are operating properly.

15.1.5. Check the insulation resistance prior to re-energizing the busduct. A permanent record should be kept of resistance readings. If readings decrease appreciably with time, deterioration is taking place and must be corrected (contact the manufacturer).
15.2. INDOOR BUSDUCT

15.2.1. Inspect busduct once each year or after any severe electrical short circuit or ground fault.

15.2.2. Perform an infra-red temperature scan on all electrical connections and busduct enclosure while busduct is energized and operating under maximum load conditions. A permanent record should be kept. If readings change with time, deterioration that may be taking place and must be corrected.

15.2.3. Turn off power to busduct.

15.2.4. Look for any moisture or signs of previous wetness or dripping onto the busduct or onto connection boxes from leaky roofs, pipes, sprinklers or other sources moisture. Look for any recent changes in sprinklers or other plumbing that might now be a source of trouble to busduct.

15.2.5. Seal off any cracks or openings which have allowed moisture to enter the busduct or its connection boxes. Eliminate source of any dripping onto the busduct and any other sources of moisture see SECTION 6 or more details on preventing liquid from getting onto the busduct.

15.2.6. Replace or thoroughly dry and clean any insulating material which is damp or wet or shows accumulation of deposited material from previous wettings.

15.2.7. If there is appreciable accumulation of dust, clean it off by using a brush, vacuum cleaner, or clean lint-free rags. In order to avoid blowing dust in the busduct joints, circuit breakers, or other equipment, do not use a blower or compressed air.

15.2.8. Carefully inspect all visible electrical joints and terminals.

15.2.9. Visually check connections to be certain that they are clean and secure. Loose and/or contaminated connections increase electrical resistance which can cause overheating. Such overheating is indicated by discoloration or flaking of insulation and/or metal parts. Pitting or melting of connecting surfaces is a sign of arcing due to a loose or otherwise poor connection. Parts which shows evidence of overheating or looseness should be cleaned or replaced if damaged, contact manufacturer before opening joint bolts.

15.2.10. Check the insulation resistance prior to re-energizing the busduct. A permanent record should be kept of resistance readings. If readings decrease appreciably with time, deterioration is taking place and must be corrected also, refer to section 14.4

---

**Verification of Insulation Resistance (Refer IEC 60439 – 1:1999, page # 72)**

For PTTA (Partially Type Tested Assemblies) which have not been subjected to a dielectric test according to 8.2.2 or 8.3.2 (clause numbers 8.2.2 page # 61 or 8.3.2 page # 71 of IEC 60439 – 1), an insulation measurement using an insulation measuring device at a voltage of at least 500V shall be carried out.

In this case, the test is deemed satisfactory if the insulation resistance between circuits and exposed conductive parts is at least $1000\Omega/V$ per circuit referred to the nominal voltage to earth of these circuits.

By exception, items which, according to their specific requirements, are current-consuming apparatus (e.g. windings, measuring instruments) at the application of the test voltage or are not designed for the full test voltage shall be disconnected as appropriate.

- Study the Busduct Layout drawing.
- Proceed with the marking and the drilling of the supports as per drawing.
- Fix the Horizontal / Vertical supports as per drawing.
- Starting from one end of the equipment or panel and, start connecting from the flanged end in Sequential order.
- Check for Vertical Plumb / Horizontal Level of the busduct during installation.
- Check IR value of the connected busducts before the start and at the end of the shift during the installation process on a daily basis. Also cover the end portion of the busduct to prevent any water or dust seepage or contamination.
- Shear the Maintenance Free Nuts at 14kg-m torque with a torque wrench.
- Carry out the final Inspection as per the checklist in this manual.
- Do the IR Test of the whole installed system.
- Energize the Busduct System

Not OK

OK
## 17. Appendix

### Pre Installation Checklist

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Inspection Check</th>
<th>Location / Line No.</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Check Electrical Shaft size as per drawing.</td>
<td>Ok</td>
<td>Not Ok</td>
</tr>
<tr>
<td>2</td>
<td>Wet riser and sprinkler should not be in the same shaft.</td>
<td>Ok</td>
<td>Not Ok</td>
</tr>
<tr>
<td>3</td>
<td>Electrical Shaft Clearance for no Water seepage. Proper plastering / white wash / tiling to avoid any seepage of Paint / Cement on the busduct.</td>
<td>Ok</td>
<td>Not Ok</td>
</tr>
<tr>
<td>4</td>
<td>Installed supports are as per approved drawing and the supports are not at jointing section.</td>
<td>Ok</td>
<td>Not Ok</td>
</tr>
<tr>
<td>5</td>
<td>Check whether all electrical equipment like transformer /DG /Panels are positioned and as per approved drawing.</td>
<td>Ok</td>
<td>Not Ok</td>
</tr>
<tr>
<td>6</td>
<td>Check the Detailed packing list with part number(s) received, along with consignment and verify, the same with approved drawing whether all the bus duct sections are received. And all busduct, and its accessories are received as per approved drawing and there is no shortfall on accessories and hardware.</td>
<td>Ok</td>
<td>Not Ok</td>
</tr>
<tr>
<td>7</td>
<td>If any shortfall of accessories or hardware are reported the same is inform to manufacturer/supplier on the same day.</td>
<td>Ok</td>
<td>Not Ok</td>
</tr>
<tr>
<td>8</td>
<td>Busduct consignment to be stored in dry place and covered with proper plastic. (Do not remove the plastic wrapped on the load / supply ends of the busduct till taken for installation)</td>
<td>Ok</td>
<td>Not Ok</td>
</tr>
<tr>
<td>9</td>
<td>Check whether all required tools and tackles mentioned in the installation manual are available before starting the installation.</td>
<td>Ok</td>
<td>Not Ok</td>
</tr>
<tr>
<td>10</td>
<td>IR value check for every bus duct feeder before Installation</td>
<td>Ok</td>
<td>Not Ok</td>
</tr>
<tr>
<td>11</td>
<td>Client's Competent Personnel should take training on the method of installation of the bus duct / Rising main / Lighting Trunking from Godrej before start of installation.</td>
<td>Ok</td>
<td>Not Ok</td>
</tr>
<tr>
<td>12</td>
<td>Outdoor busduct is not weather resistant, until completely and properly installed. Should be treated exactly the same as indoor busduct, until it is installed.</td>
<td>Ok</td>
<td>Not Ok</td>
</tr>
</tbody>
</table>

Note: - To put the Check mark for compliance.

**Checked at site by:-**

Name

Signature

Date

**Verified by Client's site engineer:-**

Name

Signature

Date
## Insulation Resistance Test

<table>
<thead>
<tr>
<th>Reference</th>
<th>Between</th>
<th>Before shearing</th>
<th>After shearing</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>R Phase - Neutral</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Y Phase - Neutral</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>B Phase - Neutral</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>R Phase - Earth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Y Phase - Earth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>B Phase - Earth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Neutral - Earth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>R Phase - Y Phase</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>R Phase - B Phase</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>B Phase - Y Phase</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Instruction / Check list for Pre-Commissioning of the Busduct System

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Description</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Client's Competent Personnel should take training on the method of installation of the bus duct / Rising main / lighting Trunking from Godrej before start of installation.</td>
<td>Ok</td>
</tr>
<tr>
<td>2</td>
<td>All the bus duct lines are aligned in plumb in case of riser &amp; at zero level in case of horizontal run of busduct.</td>
<td>Ok</td>
</tr>
<tr>
<td>3</td>
<td>Check whether all the joint bolts are sheared @14-15 kg-m. and tightening of joint bolt is 100% responsibility of installation contractor / Clients.</td>
<td>Ok</td>
</tr>
</tbody>
</table>
| 4       | Take insulation resistance at 1000V. Check the IR before and after Shearing of joint Bolts. As per IEC 60439-1, clause 8.3.4 insulation resistance should be at least 1000 Ω/V i.e. 0.5 M Ω.  
***(To maintain stringent quality standards Godrej recommends 1M Ω)*** | Ok     |
| 5       | Check whether all the spring Hangers top Nuts are loosen and spring should be loaded in case of Riser as per installation manual.                                                                        | Ok     |
| 6       | Check whether earthing run along with Bus duct is physically connected to both the ends of the busduct flanged & equipment.                                                                              | Ok     |
| 7       | Check whether all the bolts at Flanged end are tightened.                                                                                                                                                  | Ok     |
| 8       | Check tightening of all the bolts of flexible links to equipment side like Panel, Transformer, DG                                                                                                         | Ok     |
| 9       | Check whether all the supports to the risers and bus duct line are installed properly to carry the required weight of Busduct                                                                               | Ok     |
| 10      | Check whether all the holding clips on the horizontal supports are tighten                                                                                                                                 | Ok     |
| 11      | Check whether all the holding clips on Tap off box are tighten                                                                                                                                              | Ok     |
| 12      | Relay Setting of all the MCCB / ACB.                                                                                                                                                                        | Ok     |
| 13      | Check for chance of water seepage on Busduct / Rising Main from other utilities                                                                                                                          | Ok     |
| 14      | Wet Riser & Sprinkler should not be in same shaft.                                                                                                                                                         | Ok     |
| 15      | Check whether the entire name plates on Tap Off Box & panels indicating outgoing location of supply.                                                                                                        | Ok     |
| 16      | Check whether caution / danger stickers displayed on all the Tap Off Boxes and Electrical Panels.                                                                                                        | Ok     |
| 17      | Check whether earthing wire is connected to Tap Off Box door & bus duct housing.                                                                                                                              | Ok     |
| 18      | Check Phase sequence of Rising Main (R, Y, B, and N) in line with Tap off box incoming and outgoing.                                                                                                        | Ok     |
| 19      | Check Whether Outdoor installation Bus duct is properly filled up with sealant/compound at the joints in case of IP/65/68                                                                                     | Ok     |
| 20      | Bus Duct / Rising Mains should not be energized without checking of all above instructions and installation Contractor / Client to ensure all above points                                                  | Ok     |

**Note:** To put the Check mark for compliance.

**Checked at site by:-**

Name               Signature                Date

**Verified by Client's site engineer:-**

Name               Signature                Date
Should you have any queries on installation, you may contact us on any of the below contacts.

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