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Centeris Data Center

Rack Data Processing and Networking Equipment Installation Guidelines

Centeris Data Center provides a robust power distribution system diversified and spread across three redundant Generator Paralleling Switchgear (GPS). GPS and UPS redundancy is taken all the way to the dual corded server level.

Centeris Data Center cooling is energy wise designed on minimal carbon footprint provided by 100% outside air with evaporative cooling function on demand. For this reason IT equipment operates within a POD/Containment System that requires strict adherence to cooling airflow management standards.

The implementation of the installation requirements is mandatory for the proper functioning of data processing and networking equipment. The guidelines and best practices that are explained in this module help improve operations by minimizing the risk of failure, eliminate safety hazards, ensure rack security and air flow and power distribution quality.

Centeris Data center standard rack is APC SX 48u. Each rack has locked side panels and doors with stock locks. Racks are seismically anchored and braced to the subfloor structure in accordance with engineered design. They are grounded to the building ground bars; doors are bonded to the rack frame. Centeris POD is either Schnedier Electric EcoAisle or HyperPOD with temperature sensitive (135 deg.) dropout ceiling for fire protection.

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Ensure proper Network Equipment Building System (NEBS) standards grounding

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Use permanent or metallic wrist straps to prevent ESD damage

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Unpacking and repacking is done exclusively in the de-crating/staging room, cardboard is prohibited inside the Data Hall.

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Equipment Placement

Racks' vertical mounting rails are factory installed and adjustable for IT equipments depth. Consider equipment placement planning and make these depth adjustement prior to any installation.

Ensure heavier IT equipment placed on the lower half of the rack;

Consider factors such as cable management when deciding where to install equipment in the rack. For applications that require high-density cabling, you may need 1U of horizontal cable management and/or air flow control brush strips for every 1U of patch panels or switches.

Different Data Center standards suggest different installation topologies for the networking gear. Whether at the top of each rack or in a dedicated rack, its installation poses the challenges of cabling orientation.

Unless the cabling is routed through horizontal/vertical cable managers, install network gear with cabling ports towards the hot aisle and the opposite side flush with cold aisle vertical mounting rails to eliminate cooling air bypass openings.

If used with horizontal cable managers adjust the cold aisle vertical mounting rails to provide sufficient clearance for the door to close without placing pressure on the cable managers or cables and for proper installation of blanking panels and elimination of any cooling air bypass openings.

The location of equipment in the rack is vital to the proper operation of servers and other equipment, to maximize the space inside the rack and to permit easy service. You should develop a detailed plan for equipment placement before you install it, including plans for future expansion. Naturally, you need to make sure each rack has enough rack spaces to accommodate all the equipment you plan to install. The weight of your equipment must not exceed the rack's load rating. Always place the heaviest equipment toward the bottom of the rack.

You should also consider spreading blade servers and other high-density, high-wattage loads among multiple racks to prevent problematic hot spots.

Airflow Management

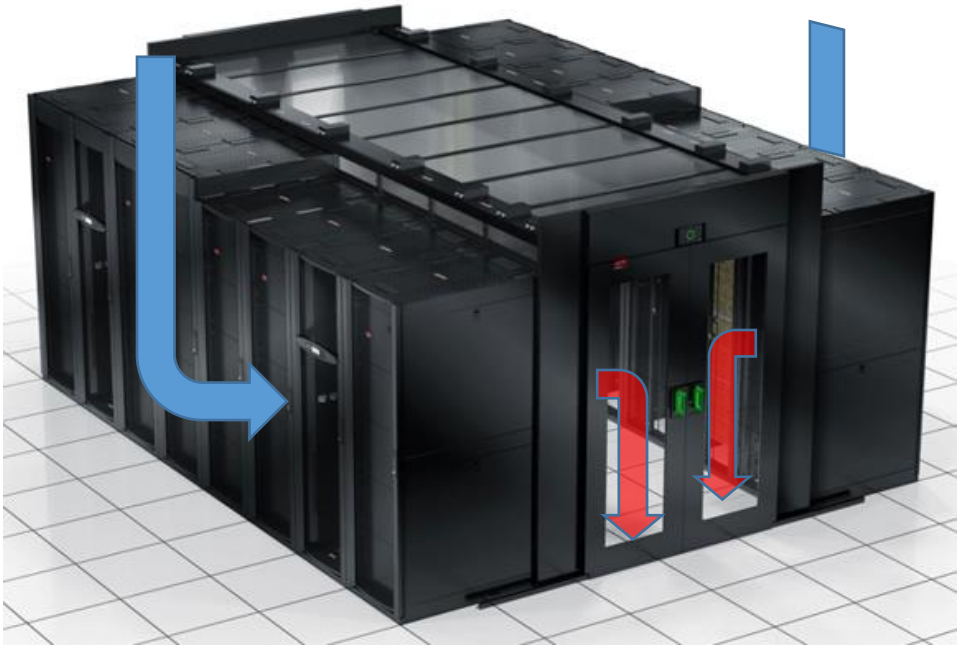
Centeris Data center operates in a Hot Aisle Containment arrangement and thus server and networking equipment needs to be placed in a manner that does not produce cooling air turbulence or counter flow. Installed equipment should have their respective cooling fans moving hot server air towards the hot aisle.

Proper airflow through the data networking equipment helps maintain effective operating temperatures and prevents the premature end of life of the equipment. Improper airflow due to no or limited space between the chassis air vents and the adjacent walls leads to equipment overheating. The usage of incorrect racks prevents proper airflow and ventilation.

Blanking panels force cold air through your equipment and prevent hot air from recirculating through open spaces. Snap-in 1U blanking panels save significant installation time compared to screw-in models, and the 1U size always fills empty rack spaces evenly. You can also install brush strips, gaskets and grommets to block air leaks around cable channels and other gaps. If you have devices that use side-to-side airflow (common with network switches and routers because of their cabling requirements), you can install internal gaskets to accommodate them.

When installed IT equipment has a setback from the front vertical mounting rails plane, the tenant shall install duct blanking or gaskets to prevent cooling air bypass.

Centeris Facility Operations team is ready to assist you with solutions.



If installation is performed in a colocation POD, the hot aisle doors must be kept closed to prevent cooling air bypass.

Power Distribution

The equipment in your rack usually requires many power outlets, especially since most IT equipment has more than one cord and power supply. Centeris' rack is equipped with 2 ea. zero u 5kW 208V/30A single phase redundant rack mount power distributions units (rPDUs). They're like industrial-strength power strips that provide the reliability required for high-availability IT applications. Rack PDUs are installed in a designated space on one side of the rack while the data cabling is to be routed on the other side to maintain ample separation between power and data cabling. They can also provide features like real-time remote monitoring of connected loads and automated alerts. User-defined alarm thresholds mitigate risk with real-time local and remote alerts to warn of potential circuit overloads. Users can access and configure Metered Rack PDUs through secure Web, SNMP or Telnet Interfaces.

Rack PDUs must be color labeled in accordance with the receptacles they are to be plugged into.

IT Load is balanced across all phases. (Subject to Facility Operations verification).

Typical Centeris power distribution is overhead receptacles. Rack PDU cords (installed by Centeris personnel) are to be routed through the rack roof openings (typically blanked with brush strips or light magnetic blanking panels), over and across the copper cable trough on top of the rack, zip tied to the underside of the cabling ladder above and coiled in the power cable trough on the top of the rack on the cold aisle side. Actual plug connection and RPP power on is to be provided by Centeris upon request.

Extreme care must be exercised when connecting the IT load, to insure even load on all phases. IT equipment should be plugged into redundant power sources and maintaining a phase balance (equal loads on the A-B vs A-C vs B-C phase on the RPP). This balanced installation is subject to Centeris verification under load.

Security

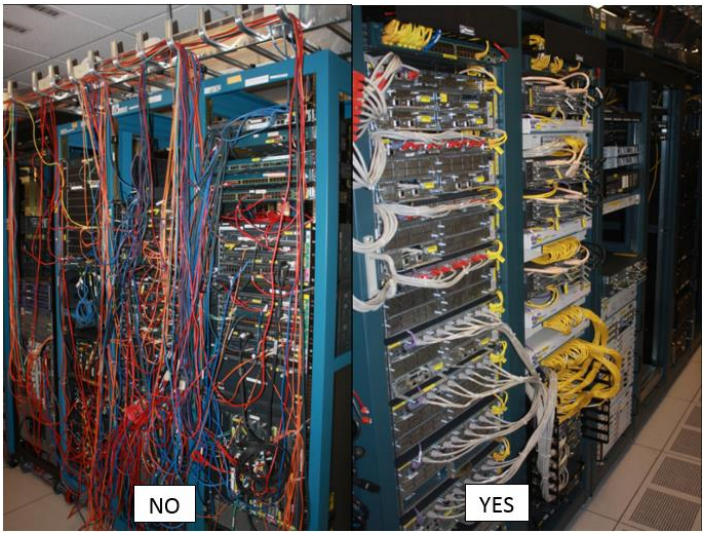
Upon request Centeris Facility Management will provide you with unique rack keys.

Cable Management

The key requirement of cabling installation is that it should be quick and easy, fully organized and accurate in its outcomes. A well-managed installation process will be conducted by specialist contractors who are aware of the physical limitations of cabling such as bend stress and who will avoid over bundling or crushing cables as well as being fully updated on local space, access and air flow requirements. The installation process should also account for future cabling installations and also avoid installation of cables in hot areas or close to power cabling. Data cabling should be labeled, organized to prevent air flow blockage, run through horizontal/vertical managers, over the top in dedicated trough for rack to rack on the same row and in dedicated basket tray for cross hot aisle connections.

No power or data cabling installation below the raised floor.

Unmanaged cabling blocks airflow, preventing efficient cold air distribution and trapping heat inside enclosures. Centeris Data Center provides overhead cable managers (ladders and/or trays) that connect to racks. Inside enclosures, use horizontal and vertical cable managers to organize patch cables and power cords. Centeris' APC SX rack is 48u high x 48" deep to accommodate a high-density network installation.



Based on Customer/Tenant requirements Centeris Data Center provides tested and certified Single Mode LC fiber that runs between the tenants' designated network rack to MMR (Meet me Room) via nearest IDF (Intermediate Distribution Frame).
Centeris Facility Operations team can assist as needed.

Cabling

Centeris POD, about half way its length provides a basket tray for copper cabling that crosses the hot aisle. For rack to rack copper cabling route through the rack roof openings (typically blanked with brush strips or light magnetic blanking panels) and along the copper cabling trough on top of the rack on the hot aisle side, or on the basket tray on the lower cantilever arm.

Rack to rack fiber should be routed through the dedicated split innerduct and Panduit (yellow) tray system.

Ensure that the cables are not installed in front of the air ventilation grids (as shown in Figure 2-1) as it leads to improper ventilation, overheating of the equipment, and dust accumulation

Guidelines

The following guidelines are highly recommended during the installation of cables:

- Avoid placing multiple cable bundles over each other, or over bundling the cables, as it leads to performance degradation of the cables below.

- Use cables that are resistive to bend loss if excessive bending of cables cannot be prevented due to installation constraints.
- Avoid mounting the cabling components in places that block accessibility to other equipment (such as a power strip or fans) in and out of the racks.
- Maintain extra cables for contingency needs as spares for the backbone and horizontal runs.
- Avoid the following actions that can stress the cable:
    - Applying extra twists.
    - Pulling or stretching beyond the specified pulling load rate.
    - Bending it beyond the specified bend radius, and not beyond 90º.
    - Creating tension in the suspension runs.
    - Stapling or applying pressure with the cable ties.
- Avoid routing the cables through holes and pipes, as this can limit the addition of cable runs in the future.
- Label the cables with their destination at each and every termination point (to ensure that both the ends of the cable are labeled for identification and traceability).
- If there is customer network failure in the data center and it is not possible to quickly identify and access what needs to be replaced, then additional time and effort will be required to do this. If the cabling is not readily accessible because of poor installation then adjacent sections of the data center will need to be shut down while staff or contractors go hunting for the rogue link or connection.
- Test every cable during installation and termination. If a problem occurs, tag the malfunctioning cables and separate them out.
- Avoid exposing cables to areas of condensation and direct light.
- Remove the abandoned cables, as they restrict the airflow, and contribute to the possible increase in the operational temperatures, which can affect the durability of the system.
- Avoid routing the cables over equipment and other patch panel ports. Instead, route the cables below or above, and into the horizontal cable manager. Use dedicated wire baskets when cabling needs to cross the hot aisle.
- The NEC (NFPA 70), Article 800.133 (2005 NEC) indicates the separation requirements. This section of the NEC specifies the following:
  Communication wires and cables shall be separated at least 50 mm (2 inches) from conductors of any electric power, Class 1 non-power limited fire alarm, or medium-power network-powered broadband communication circuits.

Best Practices

The following best practices are recommended during the installation of cables:

• Do not leave loose cables on the floor, as this could constitute as a major safety hazard. Instead, use the vertical, horizontal, or overhead cable managers.

• Use the patch cable of exact length, and leave some slack at each end for end device movements.

• Use vertical and horizontal cable guides for routing cables within and between the racks.

• Use cable spool devices in the cable managers to prevent kinks and sharp bends in the cable.

• Bundle the related cables together in groups, as this eases management and troubleshooting.

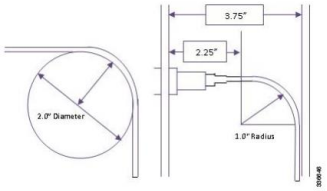
• Use the Velcro-based ties every 1 to 2 meters for bundling or securing the cables, and avoid using the zip ties as they apply pressure on the cables.

• Regularly maintain the cabling documentation, labeling, and physical or logical cabling diagrams.

• Document and regularly update all the cabling components and their mapping.

• For new installations or re-cabling of the existing equipment, install the cable guides to reduce mechanical stress and bending of the data cables, and to enhance the maintainability. The installation and usage of cable guides should be independent of the number of cables that are installed.

Figure 2-10 Bend Radius



Grounding

Ground (earth) refers to the reference point in an electrical circuit from which other voltages are measured, or a common return path for an electric current, or a direct physical connection to the Earth.

Electrical circuits are connected to the ground (earth) for several reasons. For example, in powered equipment, the exposed metal parts are separately connected to the ground to prevent the user contact with dangerous voltage if the electrical insulation fails. Connections to the ground limit the buildup of static electricity when handling electrostatic-sensitive devices.

Centeris Data Center racks are connected to the building ground, doors bonded to the rack and racks bonded to each other.

In addition to rack grounding, many data networking devices require the installation of a NEBS compliant ground, and they have dedicated grounding points for that. This is because a system that uses only an AC third prong ground is not sufficient to fully ground the device. Electrical damage can lead to the following failures: – Damage to the component due to Electrostatic Discharge (ESD) – Data corruption – System lockup – Frequent system reboots.

Some customers claim that they do not need NEBS grounding as they rely on metal-to-metal connections between the network/server device and rack. However, this connectivity can become weak over time (for example, due to vibrations) and make the grounding ineffective. Instead, use a multi meter to verify the effectiveness of the metal-to- metal connectivity.

For example, the use of plastic screws and washers to minimize vibrations avoids effective metal-to-metal connections. Even though the multi meter confirms good connectivity, you still need NEBS as the metal-to-metal connections can get disconnected from the rack and power supply during the maintenance of the equipment and it is only the NEBS grounding that ensures that the grounding is still in place.

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Best Practices

Use a multi meter or an equivalent device to check the effectiveness of the connectivity between different parts of the installed equipment (such as, cards, chassis, and racks) to the building ground. The multi meter readings should be less than 1 Ohm for good point-to-point resistivity.

- Perform an initial test (using a calibrated multi meter) to check the effectiveness of the earth or system grounding from the rack to the pit and maintain the test records.
- Ensure that proper grounding practices are in place so that the buildings and the equipment installed in them have low-impedance connections and a low-voltage differential between the chassis.

Electrostatic Discharge (ESD)

Electrostatic Discharge (ESD) refers to the transfer of electrostatic charge between bodies at varied voltages that is caused by direct contact or induced by an electrostatic field. When you walk across a carpet and touch a metal door knob, you experience a slight shock on your fingers. If the same ESD occurs in data networking equipment, the equipment can be damaged or destroyed.

Best Practices

The following best practices are recommended to prevent ESD damage:

- Use permanent or metallic wrist straps instead of the disposable ones as metallic wrist straps have better connectivity to the skin of the operator, and are less prone to failure when compared to the disposable wrist straps, which are made of inexpensive and not very resistant material.
- Each time before using the wrist strap (permanent or disposable), test it using a multi meter to ensure that the resistance is less than 1 Mohm. This should be performed in addition to the periodic test of the ESD protective devices in accordance to the maintenance program of the customer or partner.
- If the installation site has ESD-protected areas, perform the following:
    - Post appropriate signage indicating the ESD-protected area, so that it is clearly visible to people entering the area.
    - Allow only those who have completed the appropriate ESD training into the protected areas. The content of the training material should follow the ANSI 20.20 certification standard.

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Environmental considerations

Cardboard is prohibited inside the technical rooms. Due to VESDA sensitivity cardboard may trigger a fire alarm, may clog VESDA filtering system and may be suctioned into the IT equipment

Unpacking and repacking is done exclusively in the de-crating room; separate cardboard / foam/ plastic before disposal and place in the appropriate containers outside for recycling/trash service pickup.

Work areas need to be cleaned up at the end of the work day with uninstalled equipment placed in racks or in storage and free of installation debris: cables, zip ties fasteners, Velcro straps etc.

Racks cannot be used for storage but you can request a dedicated locker in a storage room, subject to agreement terms.

No food or drink is permitted on the Data Floor.

Use of folding chairs in the Data Hall is permitted during performance of IT installation work but need to be removed at the end of the work day. Request Facility Operations team for chairs to borrow.

For additional Data center work rules information see Centeris Data Center Policies & Work Rules.