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# Open Rack Frame V3 Specification

Revision: 0.1

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# Scope

This document defines a specific instantiation of Open Rack that complies with the OCP Open Rack specification revision 2.1. This version of Open Rack is optimized to meet the needs of large cloud deployments.

# Reference Documents

## OCP [Open Rack Specification 2.1](http://files.opencompute.org/oc/public.php?service=files&t=580920558fc6c1d7b79bb1b6208c9c6d)

## [Open Rack Stand-alone Busbar Specification](http://files.opencompute.org/oc/public.php?service=files&t=07cc2ae0b7f992176872780e4463bb37&download)

## <<TBD>> Liquid Cooling Manifold specification

## <<TBD>> Door Specification

## <<TBD>> Pluggable Network Cable specification

## <<TBD>> Rack Frame Mechanical Drawings

## Facebook 18-000233 Specification, Telco Ground lug, Facebook, Data Center

## Facebook 18-000142 Specification, Materials of Concern Standard

# Mechanical Requirements

The frame dimensions and tolerances will be defined in the Rack Frame Mechanical Drawings

## Frame Geometry

### Nominal Height: 48RU or <<XX OpenU>> 2295 mm from floor to top of the rack frame

### Nominal Height: 42RU or <<XX OpenU>> 2013 mm from floor to top of the rack frame

### Nominal Width: 600 mm

### Nominal Depth: 1068 mm

## Support Features

### Shall provide method of toolless mounting slides directly to the rack frame

### Shall provide features to mount “zero U” EIA PDUs along the side of the frame <<not necessarily need by MS>>

### Shall provide features to mount a “zero U” management appliance

### Shall provide a pluggable network interface connection as defined in << Pluggable Network Cable specification>>

## Load Ratings

### Load rating shall be 1600 kgs (3500 lbs). This does NOT include the mass of the rack.

### An ½ OpenU cross brace may be added to the rack assembly to meet the load rating for configurations heavier than 800kgs (1500lbs)

## Environmental

### Operating Temperature: 10C – 60C

### Long-term Storage: -40C to 50C and 5-95% RH <<timeframe>>

### Short-term Storage: -20C to 65C and 10-80% RH

### Operating Humidity: 85%max, 5C dew point minimum

## Color and Marking

### Text font is MS Reference with a minimum size of 4mm.

### All “U” markings shall be marked in a permanent and legible manner using a high contrast color with the lowest location marked as “1”

## Casters

### All 4 casters swivel.

### Casters must always remain within the rack envelope.

### Rack shall have an entry angle of 15 degrees minimum

### Rack shall have an exit angle of 10 degrees minimum

### Must be replaceable without requiring equipment to lift the rack off the floor. Tools may be used for service.

## Levelers

### Shall have a swivel foot at least 45 mm in diameter

### Can raise the rack casters a minimum of 15mm off the floor

### Shall support the fully loaded rack under seismic test

### Must be operable with 8mm electric hex driver and have a secondary method of operation using a hand wrench

### Max torque to raise or lower while fully loaded is 4N-m

### Must stay within the rack foot print when deployed

### Must ship and stay in the raised condition during all non-seismic tests

### Must be replaceable without requiring equipment to lift the rack off the floor. Tools may be used for service.

## Air Flow

### The rack shall seal against the IT gear or blanking panels within the rack to prevent bypass of air a pressure of 5mm of water

### Under normal operating conditions, no openings in the rack sides, top, or bottom are allowed where hot air can recirculate to the cold aisle of the data center

## Cabling

### Rack shall provide an exit hole in the bottom of the rack 25mm x15mm minimum in size under each cable zone in the front of the rack to allow for a data cable under the floor to pass to the cable zone

### To prevent cable damage, sharp edges and burrs must be removed around cable routing areas

### Cables can be added and removed from the cable management system without tools.

### Provides a cable pass through the top and the bottom of the rack frame for four power cables <<TBD XXxXXmm >> in size.

### The cable tray area must be at least 4500mm2 per side of usable area for cables.

## Rack Mover

<<Any mechanical interfaces to rack-level equipment movers need to be defined, both geometry and max accelerations allowed. Follow FB requirements>>

# Electrical Grounding

## Telco Ground Lug

### Provide M5X0.8 nut features as an electrical ground to mate with Data Center Telco Ground Lug as defined in FB PN: 18-000233.

### Conductivity of the ground path shall be protected from rust and corrosion over the life of the product. All ground points shall pass rust grade 6 per ASTM D610-01 after 48 hours of salt spray per ASTMB117-07.

### Green ground screws shall be provided with the rack and have a hex head 8mm across the flats.

### Ground points shall be located per 3D CAD on the top surface of the rack for overhead grounding and the rear base surface to support underfloor grounding.

## IT Gear Ground Path

### Rack shall provide an electrically conductive path from the IT equipment in the rack to the rack grounding lug on the top of the rack.

### This path shall not pass through any surfaces that are not protected from rust and corrosion such as un-plated surfaces.

### All rack ground paths shall pass rust grade 6 per ASTM D610-01 after 48 hours of salt spray per ASTMB117-07.

## Ground Strap Connection

### Rack shall provide a location along the front of the rack that does not interfere with the removal of IT service gear

### Ground point will have a contrasting color to help visually identify the location

# Optional Kits

Each kit below shall be a required component included in the scope of the work for the rack supplier. Each Kit shall have an interface specification that defines all the information necessary to ensure the kit is intermateable across suppliers.

## General Requirements applying to all SKUs

### All hardware used to retain FRUs must have 2 different methods of driving the hardware for installation and removal in case the hardware is stripped. For example, a screw could have both a philips drive and a hex drive to meet this requirement.

## Caster FRU

### The FRU will contain a single caster assembly and hardware

## Leveler FRU

### The FRU will contain a single leveler assembly and hardware

## Side panels for Security

### Must stay installed during the rolling movement test

### Requires only 1 person to install and remove

### <<<TBD MS Security Requirements>>>

## Side panels for Air Flow

### Must stay installed during the rolling movement test

### Requires only 1 person to install and remove

### May use an M8 hex driver for installation

## Cable Management tray

### Must be designed as a removable kit

### May be installed using tools

### Shall provide 4500mm2 of cross-sectional area per side

## Busbar assembly

### Survives 100 cycles of the IT gear clip while meeting voltage loss requirements

### Complies with [OCP stand-alone busbar specification](http://files.opencompute.org/oc/public.php?service=files&t=07cc2ae0b7f992176872780e4463bb37&download) as defined in Section 4.0

## Air Containment

### OpenU Air Filler Blank

#### Shall have tool-less installation

#### Shall prevent air recirculation at a pressure of 5mm of water.

### Air Containment from Rack Frame to Facility Hot-Aisle Containment

#### Shall provide a method to extend the height of the rack to meet the data center containment at a height of 2413mm (95”) from the floor

#### Shall ensure that air cannot pass under the bottom of the rack under normal conditions

### Air Containment from Rack Frame to Facility Cold-Aisle Containment

#### Shall ensure that air cannot pass under the bottom of the rack under normal conditions

## IT Support Bracket

The IT gear will optionally sit on a bracket that forms a shelf.

### support 70kg per set under dynamic loads without taking any permanent deformation.

### support 50kg static load applied to the leading 25mm of the support brackets without taking any permanent deformation.

### Must be serviceable from inside the rack frame

### Shall be no more than 1OpenU tall and serviceable without removing other IT support brackets

## Seismic Kits

### GR63 Zone 2 support

### GR63 Zone 4 support

## Rack Cross Brace

## The rack may include a ½ Open U cross brace for configurations heavier than 800 kgs (1750 lbs).

### Cross-brace kit shall include all hardware required for installation

### A M8 hex driver may be used for installation

### IT gear may be removed from the rack to install or remove the cross-bracing

### Cross brace shall only be ½ OpenU in height

## Front and Rear Door <<per MS Requirements should this be a separate specification as stated in section 4.0??? >>

### The design shall enable both a front and rear door. Rear door shall be split

### The door could be EMI, security, or heat exchanger and is out of the scope of this document.

### Max door weight is <<XX As set by the need for heat exchanger doors>>

### Door mounts (such as hinges) shall support the door weight under dynamic loads

### Swing angle must be >90 degrees without extending outside the width of the rack frame

### Any optional doors are not included in the rack depth limits defined in Section 5.

# Testing

Unless otherwise stated, any tests require to be performed in a fully loaded configuration shall assume that the weight is evenly distributed throughout the volume of the rack.

## Rolling Movement

### Roll over a 5x6mm vertical step with each caster independently at 0.5m/s

### Transition 5x25mm wide gap in the floor at 0.5m/s

### Transition a 5-degree ramp both up and down

### Roll 800m on a concrete floor at 0.8m/s

### After completing the four tests above, the force (kgw) required to push the rack from a non-moving position along a smooth, flat cement floor shall be less than 5% the total combined weight (kgw) of the rack and IT Gear.

## Unpackaged Tests

### The enclosure system shall be tilted to an angle of 10 degrees from its normal upright position and held in this position for a period of 1 minute. The test shall be repeated for all four positions (front, back, side1, side2)

### Leveling feet shall be raised and lowered 3 cycles without physical or plating damage to the foot or rack. Each foot will be raised/lowered to its maximum/minimum height before operating the next foot.

### While in its normal position on a flat surface, with casters rotated towards the surface, a force equal to 20 percent of the weight of the fully loaded enclosure system, but not more than 250 N (56.2 lbf), is applied in any direction except upwards, at a height not exceeding 2 m (78.74 in) from the floor. The force is applied to the front, back and each side of the system, each for a period of 1 minute.

### <<Rack mover testing – Any testing required for these features should be documented here>>

## Paint and Corrosion Resistance

### Salt spray test (DIN EN ISO 9227 NSS), Test duration 168 h.

### Condensation test (DIN EN ISO 6270-2 CH), Test duration 500 h.

### Exceeds condensation alternating atmosphere (DIN EN ISO 6270-2 AHT), Test duration 20 cycles.

### Adhesion tests in accordance with DIN EN ISO 2409

### Hardness tests in accordance with DIN EN ISO 2815.

### Cupping tests in accordance with Erichsen to DIN EN ISO 1520.

### Mandrel bending testing in accordance with DIN EN ISO 1519.

### Impact tested according to ASTM D 2794.

### Paint shall be resistant to mineral oils, vegetable oils, emulsion for cutting, diesel fuel, detergents, weak acid and alkaline solutions (NAOH pH9, HCL pH5). Resistance to solvents in accordance with DIN EN ISO 2812-1 and -2.

### Weather resistance Test in accordance with DIN EN ISO 11507, lamps type 1 (UV-B (313), procedure A.

# Regulatory

## Latest revision of UL/IEC/EN 62368-1

## UL/CB certified

## RoHS

## EU Directive

## REACH

## WEE

## Conflict Minerals

## All plastic materials will be 94V-0 or better from a UL recognized suppliers.

# Revision History

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| --- | --- | --- |
| **Rev**  **Date** | **Author** | **Changes** |
| 0.1  18 DEC 18 | Steve Mills | Initial Release for Review |
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