Meta Open Rack Frame V3 Specification

Revision 1.1

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1.2 Acknowledgements

2. Compliance with OCP Tenets

Please describe how this Specification complies to the following OCP tenets. Compliance is required for at least three of the four tenets. The ideals behind open sourcing stipulate that everyone benefits when we share and work together. Any open source project is designed to promote sharing of design elements with peers and to help them understand and adopt those contributions. There is no purpose in sharing if all parties aren't aligned with that philosophy. The IC will look beyond the contribution for evidence that the contributor is aligned with this philosophy. The contributor actions, past and present, are evidence of alignment and conviction to all the tenets.

2.1. Openness

This specification builds on the base Open Rack and provides an example of a detailed implementation for the community to leverage and promote the building of open products. Detailed design specifications and design documentation needed to build this Meta version of the rack and accessories are incorporated into this specification.

2.2. Efficiency

The sharing of this specification will allow others to leverage and learn from the development work that Rittal & Meta have put into developing a detailed design of the frame and accessories designs.

2.3. Impact

This version of Open Rack provides a detailed design contribution that will allow others to reference in future contributions or designs. This will also allow adopters to leverage all the development work and resulting design to potentially develop and deploy solutions with quicker time to market.

2.4. Scale

The various construction and design requirements outlined were all developed to support the build at Scale of this Meta version frame. By sharing this implementation, the community will see a detailed design that can be leveraged to make the frame and related accessories at scale.

2.5. Sustainability

The frame design has application in multiple IT industry domains and, as a result, has the potential to enable more rack reuse in these different areas.

3. Revision Table

Date	Revision #	Author	Description
03/08/23	0.1	Charest	Draft shared w/ R&P
04/05/23	1.0	Charest	Misc. updates
07/09/23	1.1	Charest	Misc. updates & updates to Fig 7.4.1. 7.5.1, & 7.5.2 . other minor changes.

4. Scope

This document defines technical specifications for a specific implementation, the Meta Version, of Open Rack Frame V3 used in Open Compute Project. This document, along with the Open Rack V3 Base Specification shall comprise product's technical specification. This specification is a supplement to the Open Rack V3 Base Specification specification.

5. Overview

Open Rack is a fundamental building block for the Open Compute ecosystem. It provides the structure and power for interoperability of Open Rack based IT Systems that are contributed to the Open Compute Foundation. This frame design is an implementation of Option 1 outlined in Open Rack V3 Base specification.

Any statements using:
 SHALL must meet this requirement to comply with the specification
 SHOULD are recommended to meet this requirement but are not required
 MAY are suggested if the rack supplier is interested in meeting for interoperability
between solutions

6. Physical Specifications

This section provides a high level description of the frame size, supported weight, and capacity. More detailed information is provided in section 7.

6.1 Dimensions

6.1.1 Physical Definition:
The basic frame dimensions are defined below.

6.1.2 Height: (nominal): 2286 mm (90 inches), floor to frame top

6.1.3 Width (nominal): 600 mm (23.62 inches)

6.1.4 Depth (nominal): 1068 mm (42.05 inches)

6.2 Load Rating

Load rating shall be 1400 kgs (3080 lbs). This does NOT include the mass of the rack. Any IT shelves, doors, side panels and any other accessory items shall be included in the max load.

A cross brace 1-OpenU in height may be added to the rack assembly to meet the load rating for configurations heavier than 800kgs (1763 lbs). For racks that require the cross-brace, the recommended range for the brace locations is rack positions 18OU to 27OU, with the default location being position 23OU.

6.3 OU/RU Capacity

This frame design has the capacity to support 44 OpenU or 47 RU of IT gear. The rack design also shall have the ability to support 88 - ½ OpenU IT gear as well. The mixing of the various types is possible as the rack design has cut outs for gear support brackets for each option. Note that the spacing and support brackets designs vary and the details regarding the mixing IT gear types is not covered in this specification. Note that a ½ OpenU design guide does not exist, but the features are included in the rack to allow for design flexibility for developers.

7. Mechanical
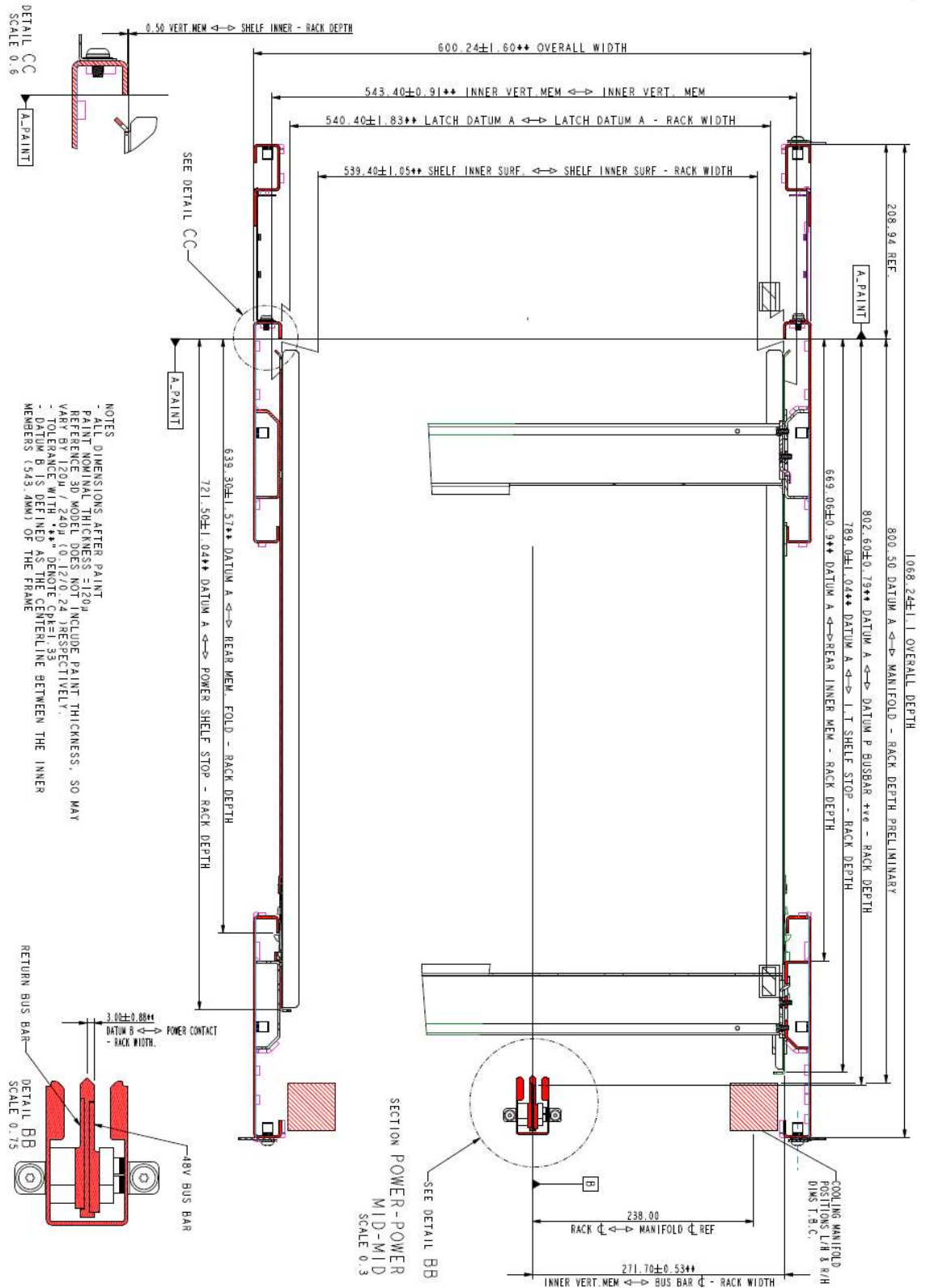
7.4 Frame X-Section:

Figure 7.4.1 Frame Cross Section

7.5 Frame Mounting Points

Mounting point locations on the front and rear of the rack are outlined below. These locations can be used for mounting doors or other accessories. There are also mounting points in the sides of the rack. There are threaded inserts in these locations and the details on the thread type can be determined from bill of materials in the top level drawing C30001.

7.5.1 The fasteners shall be M8 fasteners shall be M8 x 1.25p - 6H

7.5.2 The fasteners shall be M8 fasteners shall be M12 x 1.75p - 6H

7.5.3 The minimum torque out for the M8 rack fasteners is 20N-m.

7.5.4 The minimum torque out for the M12 rack fasteners is 20N-m.

7.5.5 The fasteners shall not protrude above of the frame installed surface

7.5.6 The distance from the frame face to the start of the threads on the M8 fastener shall be 6mm maximum and on the M12 fastener shall be 8mm maximum

7.5.7 The M8 fastener shall have a minimum 7 x full threads.
The M12 fastener shall have a minimum 9 x full threads.
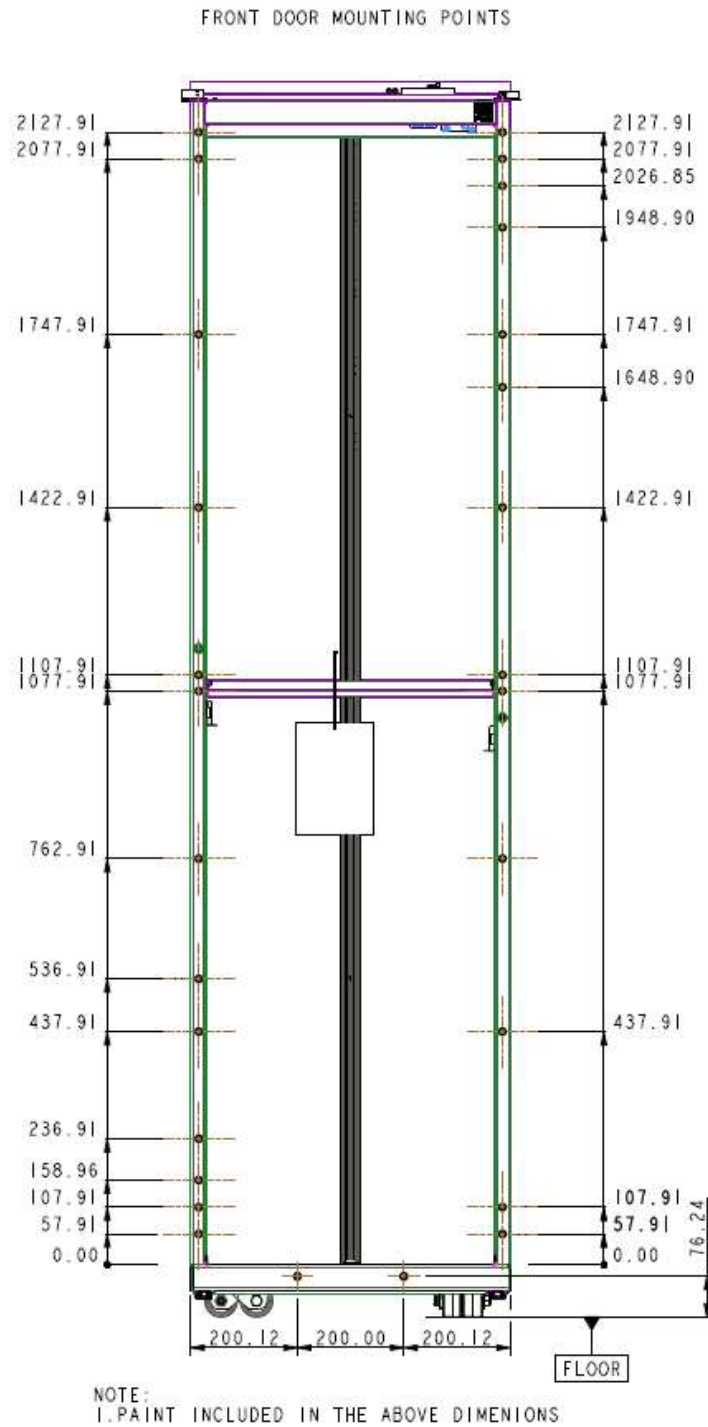
7.5.1 Front Mounting points

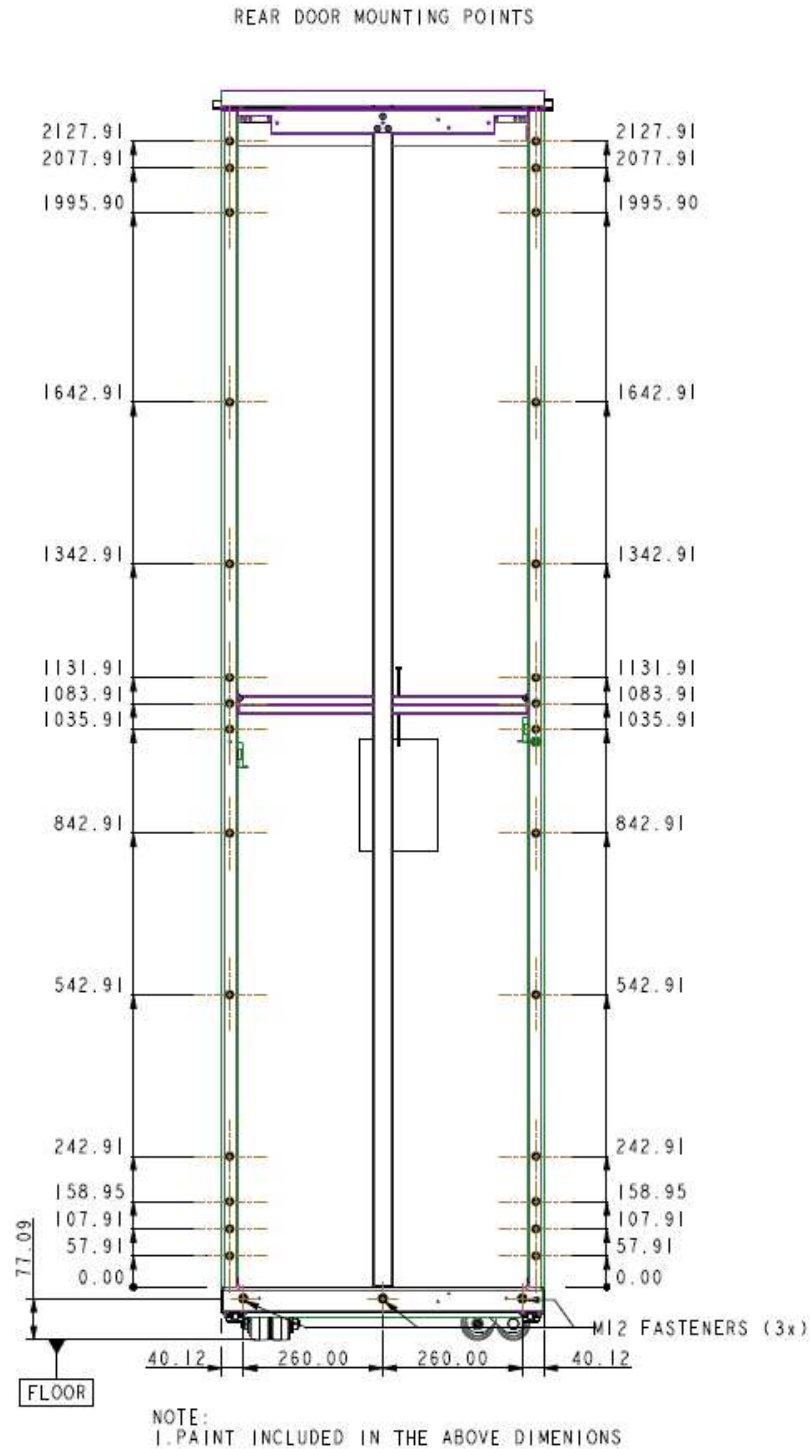FIgure 7.5.1 Front Frame Mounting Points - All M8

6.5.2 Rear Frame Mounting points

Figure 7.5.2 Rear Frame Mounting Points- All M8, unless otherwise stated
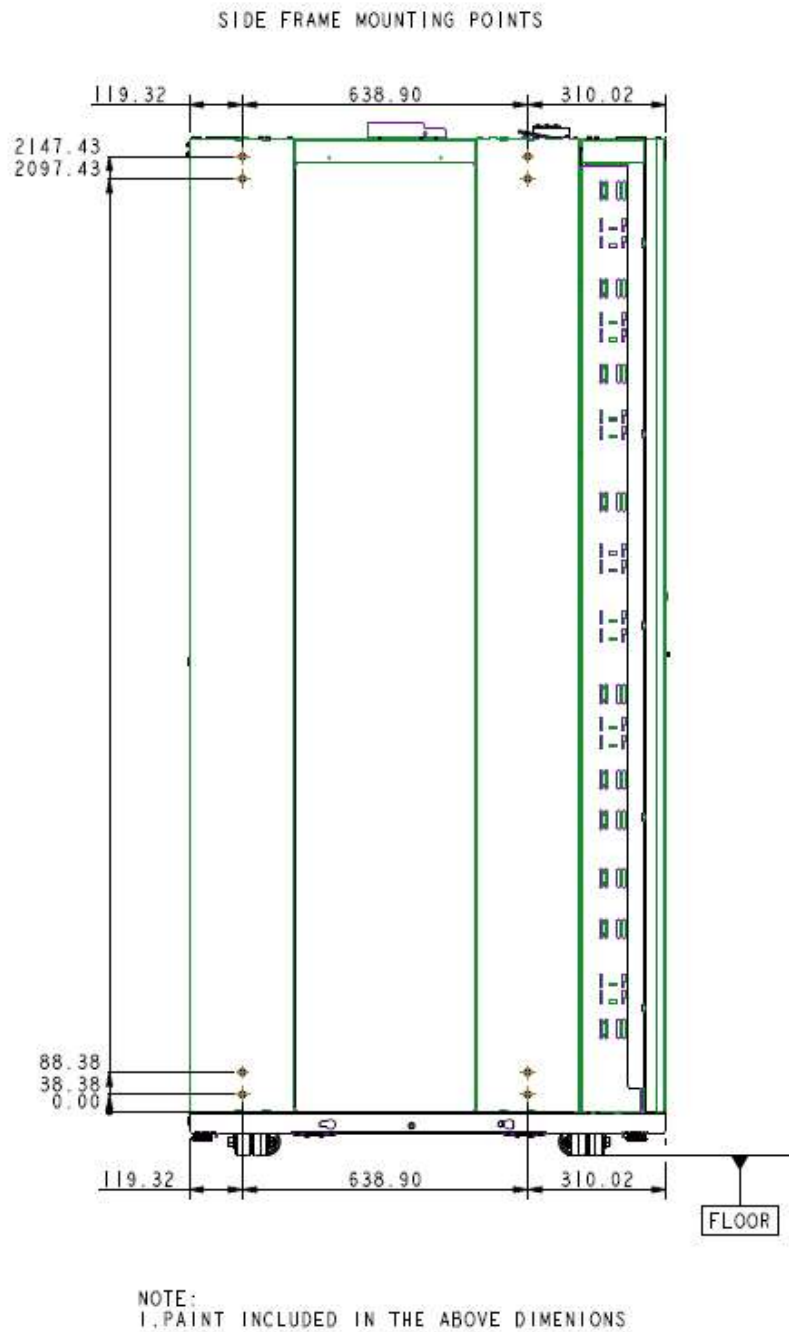
SIDE FRAME MOUNTING POINTS

Figure 7.5.3 Side Frame Mounting Points - All M8

7.6   Air Flow

The rack is designed with front to back airflow. 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.

7.7 Cabling -

7.7.1   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.

7.7.2   To prevent cable damage, sharp edges and burrs must be removed around cable routing areas. For areas where sharp edges cannot be removed, proper protection or guides must be put in place to ensure cables do not make contact with the sharp edges.

7.7.3   Cables can be added and removed from the cable management system without

tools.

7.7.4   Provides a cable pass through the top and the bottom of the rack frame for four power cables. Max dimensions of power cable connector housing is 68mm x 24mm.

7.7.5   Rack shall have openings at the top of the rack for cable pass through as shown in figure(s) below.
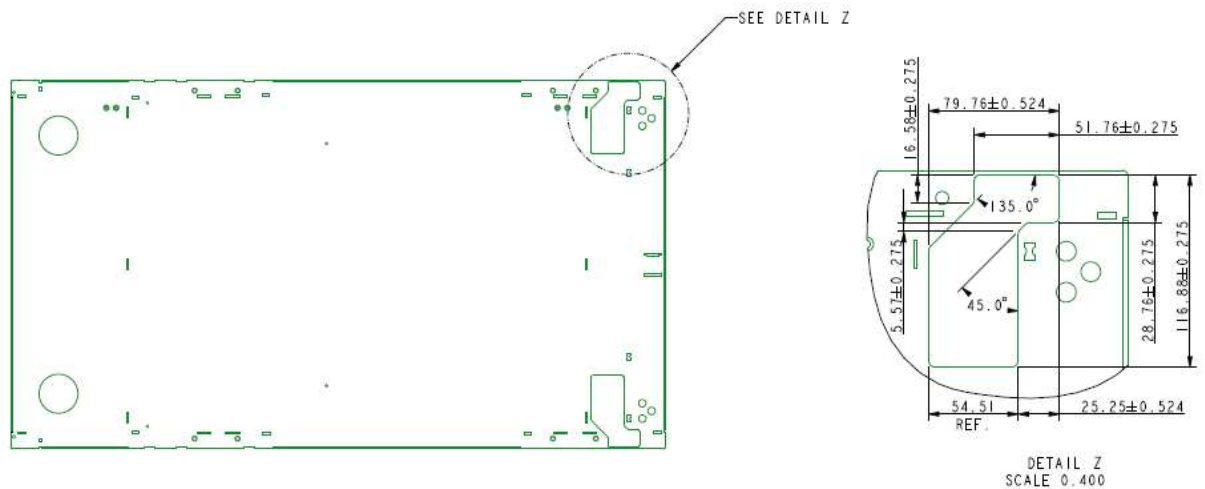
Figure 7.7.5.1 Top of rack cable openings WITHOUT plastic grommets installed
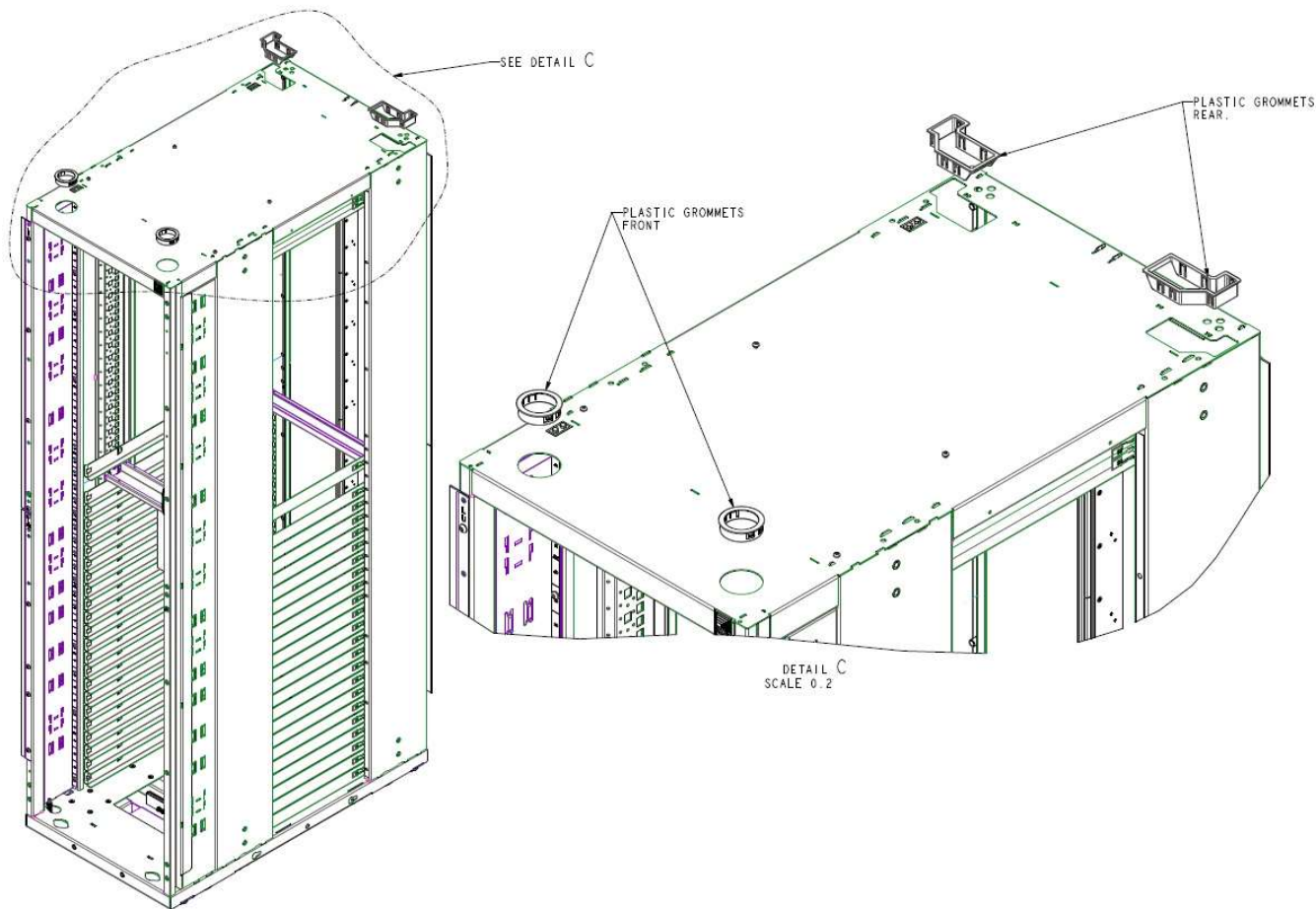
Figure 7.7.5.2 Top of rack cable openings showing where rear plastic grommets install

7.8 Rack Mover Related Requirements

The frame shall follow the frame profile and design as outlined in the drawings and 3D CAD as the interfaces for the rack mover require them to constrain and move the rack.

Frame Pull Test: Restrain rack at rear using the bottom most Qty. 4 - M8 screws, 2 per side, in the rear verticals of the frame. Attach two pull straps with hooks to the rack, one each to the front left and front right members with the hook grabbing the outer slots, locate the straps 582mm off the floor. Connect the 2 straps at the end opposite the rack and apply a total minimum load of 900N to the frame through both straps at the same time (450N per strap) and release. Verify no permanent damage or deformation. See Figure 7.8.1 below for reference.

Figure 7.8.1: Image showing 2 straps with hooks attached to rack during test.

7.9 Blind Mate Liquid Cooling Requirements

OCP ORv3 blind mate liquid cooling is currently under development and the detailed requirements for the frame and interfaces will be provided when the design is finalized. This section is a placeholder. Preliminary reference dimensions to the manifold are provided in Figure 7.4.1.

8.0 Prescribed Materials

All critical frame & accessory materials are called out in detail within the respective documentation provided with this specification (in separate drawings).

9.0 Environmental Requirements

9.1 Operating Temperature: 10°C to 60°C

9.2 Long-term Storage: -40°C to 50°C and 5-95% RH

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

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

10.0 Color & Markings

10.1   Color

All painted metal components to be black and applied at a thickness of 0.12mm +/-10%.

10.2   U Markings

All "U" markings shall be marked per requirements in the frame base specification. The locations for the markings are outlined in the rack label drawings provided.

11.0 Electrical Grounding

11.1   Telco Ground Lug:

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

11.1.2   Conductivity of the ground path shall be protected from rust and corrosion over the life of the product.

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

11.1.4   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.

11.2 IT Gear Ground Path

11.2.1   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. For the Meta implementation of ORv3, the ground path goes from the busbar → the frame → the ground lug.

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

11.2.3   Conductivity of the ground path shall be protected from rust and corrosion over the life of the product.

11.3 Ground Strap Connection

11.3.1   Ground Strap Connection (Banana plug) located at the front of the rack.

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

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

12.0 Optional Accessories & Kits:

General Requirements applying to all SKUs: all interfaces between the frame and components listed below shall be adequately defined to ensure proper fitment and/or performance.

12.1 Caster FRU:

12.1.1   The FRU will contain a single caster assembly and hardware.

12.2 Leveler FRU

12.2.1   The FRU will contain a single leveling foot assembly and hardware.

12.3 Side Panels for Air Flow Containment

12.3.1   Shall stay installed during the rolling movement test

12.3.2   Shall require only 1 person to install and remove

12.3.3   Shall be designed with hardware that features T30 Torx heads

12.4 Cable Management tray

12.4.1   Shall be designed as a removable kit.
12.4.2   May be installed using tools.
12.4.3   Shall provide 3090 mm^2 of cross-sectional area per side.

12.5 Busbar assembly

12.5.1   Complies with OCP ORv3 Meta Busbar Specification.

12.6 Air Containment Filler Blanks

This accessory is not a Rittal provided design, CAD & drawing are provided for reference.

12.6.1   OpenU Air Filler Blanks are to be used to block any unused OpenU positions within the rack to prevent airflow bypass.
12.6.2   Design of OpenU Air Filler Blanks (various sizes) shall feature tool-less installation and may utilize the IT gear shelves for mounting.

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

12.7.1   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.

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

12.7.3   Frame shall provide 25mm of flat space on top of the rack canopy on the cold aisle side for mounting a cold-aisle containment panel.

12.8 IT Support Bracket

The IT gear will optionally sit on a set of brackets that form a shelf. CAD & drawing included in specification zip file for reference.

12.8.1   Shall provide a method of toolless mounting IT support brackets directly to the rack frame.

12.8.2   Shall be no more than 1-OpenU tall and serviceable without removing or interfering with other IT support brackets or nearby IT chassis.

12.8.3   Must be able to install or remove from inside the rack frame.

12.8.4   Shall support 80 kg per set under dynamic loads without taking any permanent deformation. Shorter versions of the bracket can be rated at a lower weight (like brackets for the shorter depth power shelf).

12.8.5   Static Load at end: Support 50 kg static load applied over 25mm of leading edge of a pair of the support brackets installed in the rack without taking any permanent deformation.

12.8.6   Dynamic Load at end: 32kg dropped from 30mm height applied over 25mm of leading edge of a pair of the support brackets installed in the rack without taking any permanent deformation, 1 drop

12.8.7 Bracket Pull Out Force: rack bracket installed in rack, pull on rack towards front of rack. The retention latch shall have a 400N minimum pull out force. Test with both left and right versions as well as any rail design variations.

Pull force to be applied with following criteria (reference Figure 12.8.7.1 below):

- Perpendicular to the front face in the vertical and Horizontal direction.
- Apply force in a controlled manner, possibly using a ratchet-strap attached to a fixed structure.
- The front horizontal surface of the shelf may be drilled to attach the pulling apparatus directly to the horizontal surface flange of the bracket.

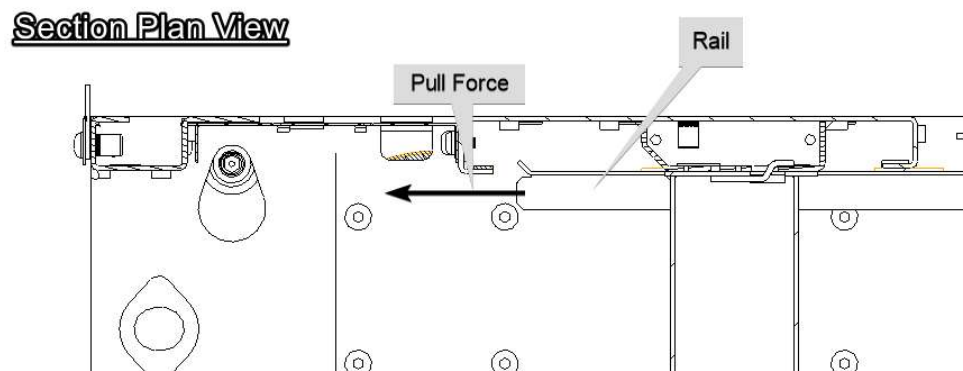See Figure 12.8.7.2 Example of Bracket pull out force testing

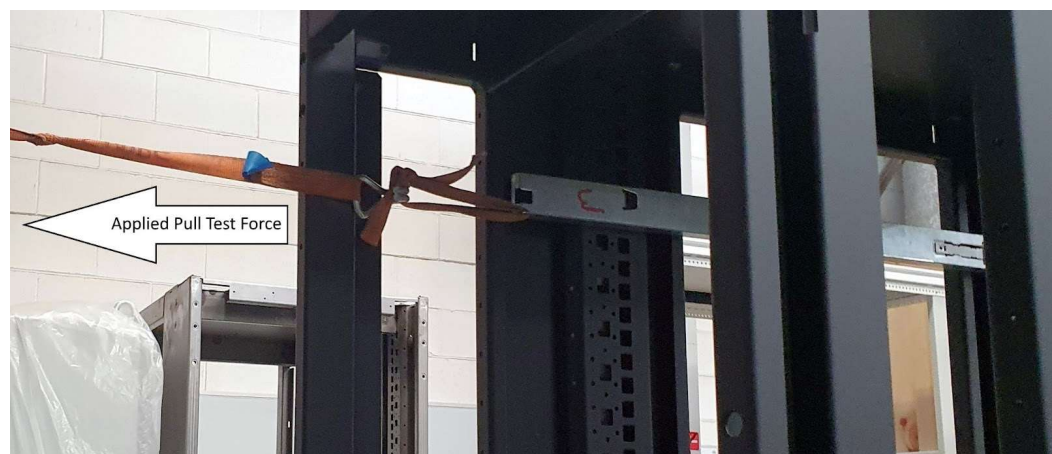Figure 12.8.7.1 Partial Top Section View of Rack

Figure 12.8.7.2 Image showing Bracket pull out force testing

12.9 Power Shelf Support Bracket

The power shelf will optionally sit on a set of brackets that form a shelf. CAD & drawing included in specification zip file for reference.

12.9.1 Shall provide a method of toolless mounting IT support brackets that mount directly to the rack frame.

12.9.2   Shall be no more than 1-OpenU tall and serviceable without removing or interfering with other IT support brackets or nearby IT chassis.

12.9.3   Must be able to install or remove from inside the rack frame.

12.9.5   Static Load at end: Support 50 kg static load applied over 25mm of leading edge of a pair of the support brackets installed in the rack without taking any permanent deformation.

12.9.6   Dynamic Load at end: 32kg dropped from 30mm height applied over 25mm of leading edge of a pair of the support brackets installed in the rack without taking any permanent deformation,, 1 drop

12.9.7 Bracket Pull Out Force: rack bracket installed in rack, pull on rack towards front of rack. The retention latch shall have a 400N minimum pull out force. Test with both left and right versions as well as any rail design variations. Refer to section 12.8.7 for details.

12.10 Cross Brace

The rack may include a cross brace for configurations. CAD & drawing included in specification zip file for reference.

12.10.1 Cross-brace kit shall include all hardware required for installation.
12.10.2 T25 Torx driver may be used for installation.
12.10.3 IT gear may be removed from the rack to install or remove the brace.
12.10.4 Cross brace shall require 1-OpenU in height maximum.
12.10.5 For configurations requiring a cross-brace, the rack shall have features to support brace locations in positions OpenU 18 to OpenU 27.

12.11 Front and Rear Door

12.11.1 The door could be EMI, security, or heat exchanger and is out of the scope of this document.
12.11.2 The frame design shall enable both a front and rear door. Rear door shall be split.
12.11.3 Rear door and/or spacer combined weight shall not exceed 150 kg as set by the requirement of the frame to support a rear door heat exchanger.
12.11.4 Door mounts (such as hinges) shall support the door weight under dynamic loads.
12.11.5 Door swing angle must be >90° without door frame extending outside the width of the rack frame (so it does not interfere with adjacent racks). It is acceptable for handles/locks to extend beyond the rack width when the door is opened.

12.11.6 Any optional doors are not included in the rack depth limits defined Section 6.1 of this specification.

12.12 Stabilizer

Some configurations of racks may require a stabilizer kit for rack stability. The stabilizer shall meet the following requirements:

12.12.1 Installation and removal without tools

12.12.2 Support the rack at the 10 degree tip test at maximum weight listed in this specification

12.12.3 Left and right stabilizers are the same design (i.e. not left/right handed)

12.12.4 Work with frame interface features defined in Open Rack V3 Base Specification

12.13 Tool less Front (Plastic) Cable Clip

This accessory is not a Rittal provided design, CAD & drawing are provided for reference. The cable clip shall meet the following requirements (detailed design information will be provided in the engineering documentation):

12.13.1 Installation into front cable manager without tools.

12.13.2 Removal from both inner and outer sides of front cable manager without tools.

12.13.2 Design so that can install forward or rearward facing.

12.13.3 Part shall meet dimensions and tolerances in the design documentation.

12.13.4 Part to be molded in green and per material outlined in drawing.

12.14 Tool less Busbar Access Cover

This accessory is not a Rittal provided design, CAD & drawing are provided for reference. The cable clip shall meet the following requirements (detailed design information will be provided in the engineering documentation):

12.14.1 Shall be a tool less design

12.14.2 Part shall grip onto the busbar in a sturdy manner and not drop from gravity.

12.14.3 Part shall meet dimensions and tolerances in the design documentation.

12.13.4 Part to be molded in green and per material outlined in drawing.

13. Environmental and Regulations

Below are requirements listed in addition to requirements listed in the Open Rack V3 Base Specification.

13.1 WEEE Directive (2012/19/EU); aims to reduce the environmental impact of EEE by restricting the use of certain substances during manufacture.

13.2 US EPA - **S**ubstances of **C**oncern **I**n articles as such or in complex objects (**P**roducts)The vendor shall provide the declaration of compliance document stating that a product doesn't contain any substances regulated by EPA 40 CFR751

14. References

[1] OCP Open Rack Specification 2.1
[2] Open Rack V3 Base Specification Rev. 1.0

"Title", publication year, publication journal/conference/standard, volume, pages, link to publication if available
[2] OCP Profiles - https://github.com/opencomputeproject/OCP-Profiles
[3] Redfish Interop Validator - https://github.com/DMTF/Redfish-Interop-Validator
[4] Redfish Service Validator - https://github.com/DMTF/Redfish-Service-Validator
[5] Redfish Service Conformance Check -
https://github.com/DMTF/Redfish-Service-Conformance-Check

Appendix A

Complete all the checklist items in the table with links to the section where it is described in this spec or an external document .

Item	Status or Details	Link to detailed explanation
Is this contribution entered into the OCP Contribution Portal?	Yes Spec, (CAD will be later)	If no, please state reason.
Was it approved in the OCP Contribution Portal?	TBD	If no, please state reason.
Is there a Supplier(s) that is building a product based on this Spec? (Supplier must be an OCP Solution Provider)	Yes	Rittal
Will Supplier(s) have the product available for	Yes	If more time is required, please state the timeline and

GENERAL AVAILABILITY within 120 days?		reason for extension request. Please have each Supplier fill out Appendix B.

Appendix B - OCP Supplier Information Company: Rittal

Contact Info: OCP@rittal.com

Product Name: Meta ORV3 Rack
Product SKU#: 7844610
Link to Product Landing Page: TBC

For OCP Accepted™
- All Suppliers must be an OCP Member. All corporate membership levels are eligible.
- Complete the OCP Accepted™ Product Recognition Checklist, which includes hardware management conformance checks, security profile and open system firmware conformance checks.
- Submit a design package meeting OCP Hardware Design Guideline Contribution Checklist (if not already submitted by the contributor). If already submitted, declare the product is 100% compliant with the design package.
- Submit a firmware package including a firmware image, build scripts, documentation, test results and a tool that verifies modifications
- Submit the BMC source code, if applicable to product type

Please complete the OCP Inspired™ Product Recognition Submission Checklist or OCP Accepted™ Product Recognition Checklist and the following table

List all the requirements in one summary table with links from the sections.

Requirements	Details	Links
Which Product recognition?	OCP Accepted™	Provide link for the appropriate Product Checklist
If OCP Accepted™, who provided the Design Package?	Rittal	Link to OCP Contribution Database - Link to come once submitted.
Where can a potential adopter purchase the product?	Rittal	Link to OCP Marketplace - Link to come in later revision.