



OPEN

Compute Project

Open Rack Design Guide v1.0

Author: Steve Mills



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2 Introduction

2.1 Goal

This design guide provides the engineering details required for IT equipment suppliers to build systems compatible with the V1 Open Rack platform.

The Open Rack is focused on fulfilling the Open Compute Project goal of maximizing operational efficiency of large scale deployments by adhering to the following the principles:

- Installation and service operations are located in the cold aisle
- Data cables are located on the front of the rack to improve technician access
- Component faults are identifiable from the front
- Routine service does not require the use of tools
- Non-recyclable components are minimized
- Designs are vanity free
- Racks are integrated directly into the data center air containment solutions

2.2 Reference Documents

The following specification is available on the [OCP website](#):

- Open Rack Engineering Files which describe the engineering details needed to create the rack
 - CAD
 - Specification
 - 2D Inspection Print
- Open Rack Design guide CAD files – reference files for IT gear makers

3 Overview of Facebook's Open Rack Implementation

The Open Rack is divided into 48mm tall sections, each called an OpenU. The current version of the Open Rack has three 13xOpenU zones plus one 2xOpenU zone for network switches. The three 13xOpenU zones are further broken into a 3xOpenU power zone and a 10xOpenU *innovation zone* for the IT equipment.

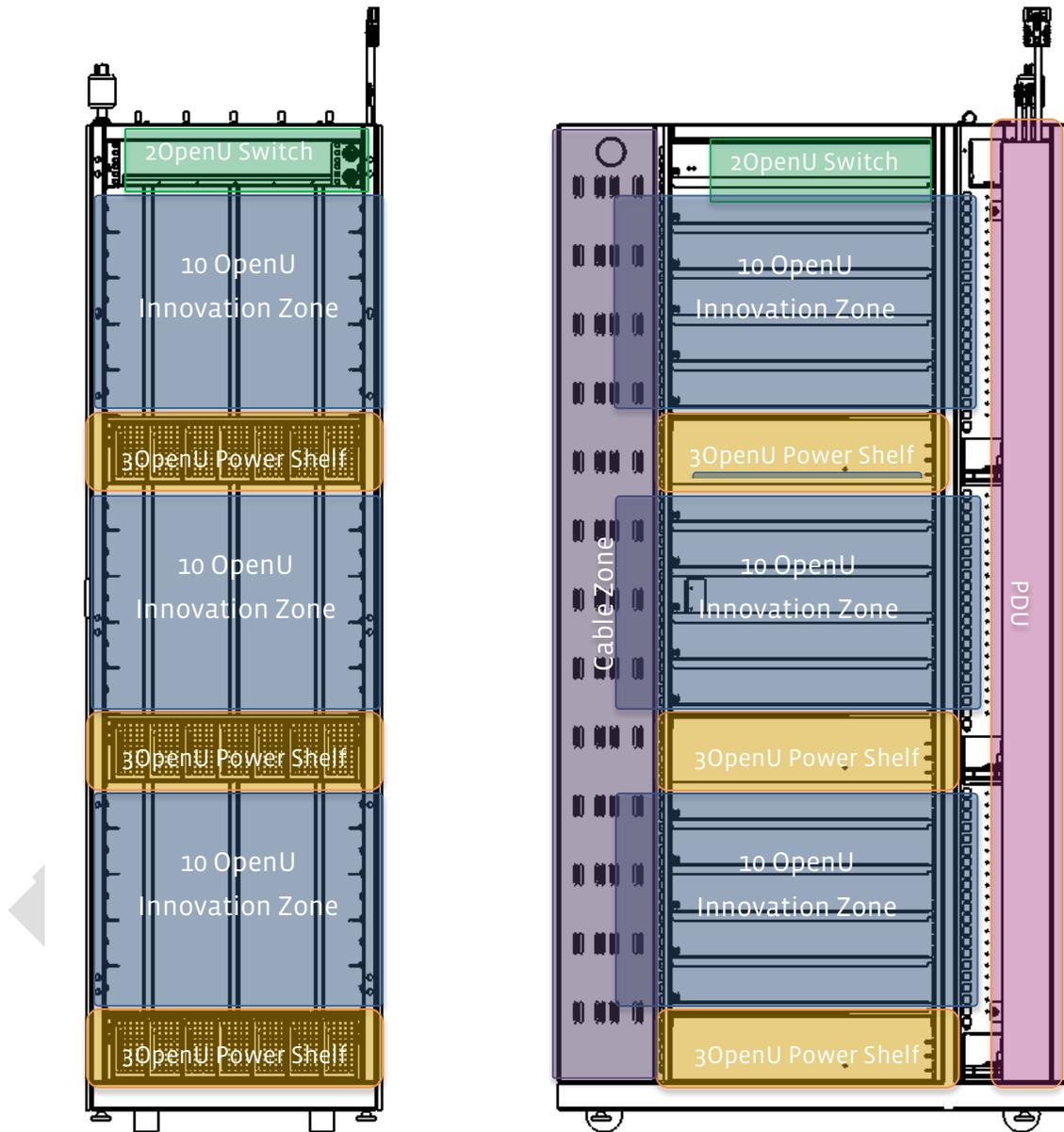


Figure 1 Overall Layout of Open Rack

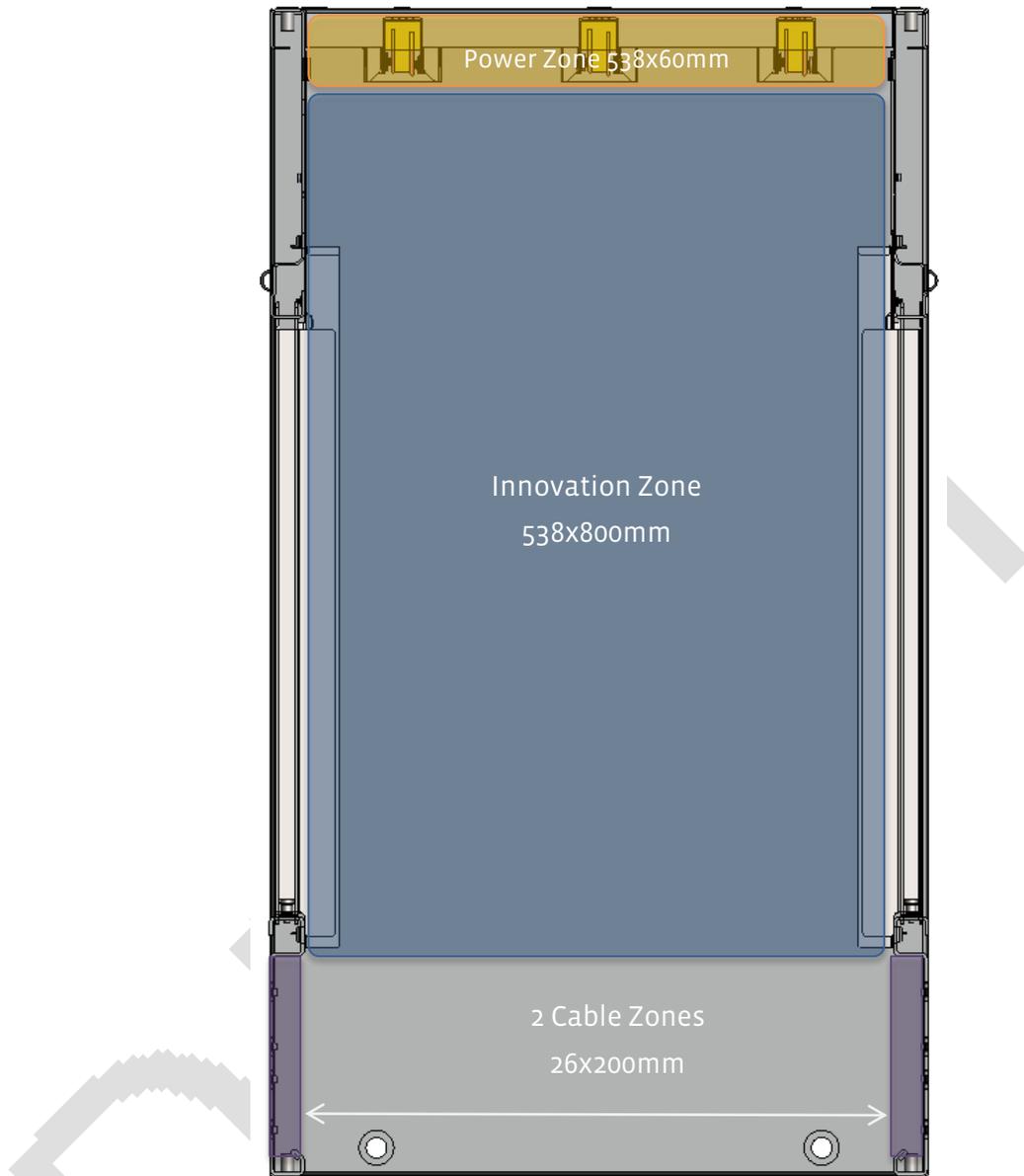


Figure 2 Top View of the Open Rack

The power zone receives power provided by the data center into an AC and a DC PDU. The PDUs distribute the power to each of the 3 OpenU power shelves. The power shelves consist of 7 hot-swap power supplies that are serviceable from the cold aisle. The power exits the power shelf and is distributed along three 12V bus bars to the Innovation zone above.

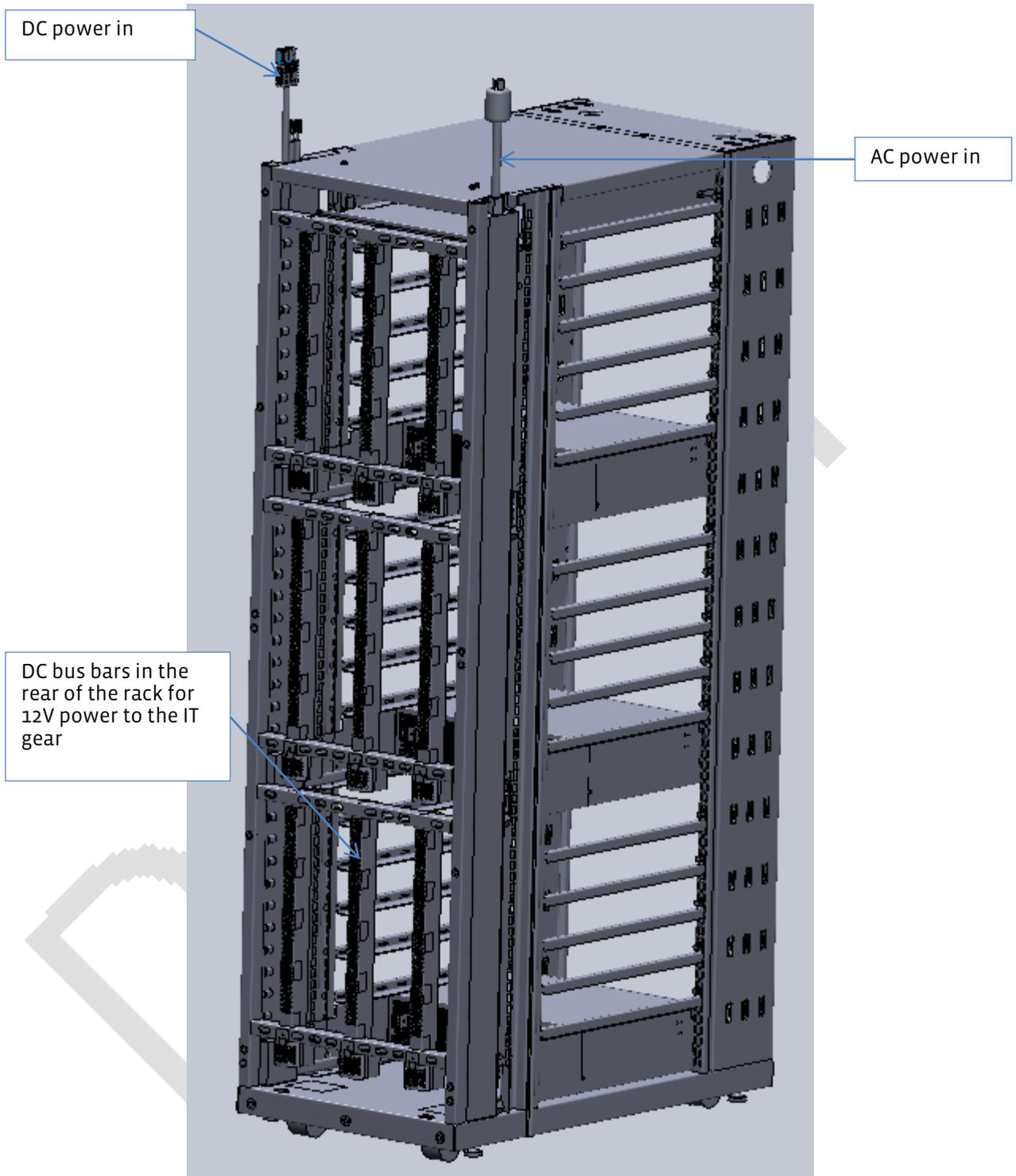


Figure 3 Power Inputs and Bus Bars

The innovation zone is an area available to IT equipment suppliers. Due to the power bus bar in the back, the IT equipment is easy to install and service from the cold aisle. A simple set of brackets extends from the sides of the rack to provide a shelf for the gear to sit on when it is installed in the rack.

The cable zones are located in the front of the rack to so that technicians can service the cables without having to enter the hot aisle. The cables are recessed into protected areas on the sides of the racks so that the IT gear will not damage the cables when it is added or removed.

Please consult the [Open Rack hardware specification](#) for a more complete definition of all Open Rack components.

3.1 Open Rack Design Details

The equipment is supported on L-shaped brackets that snap into the sides of the rack. These brackets can be populated in any ½OpenU (24mm) location in order to support IT equipment of different heights. This adjustability allows a single rack to support different types of equipment over many generations.

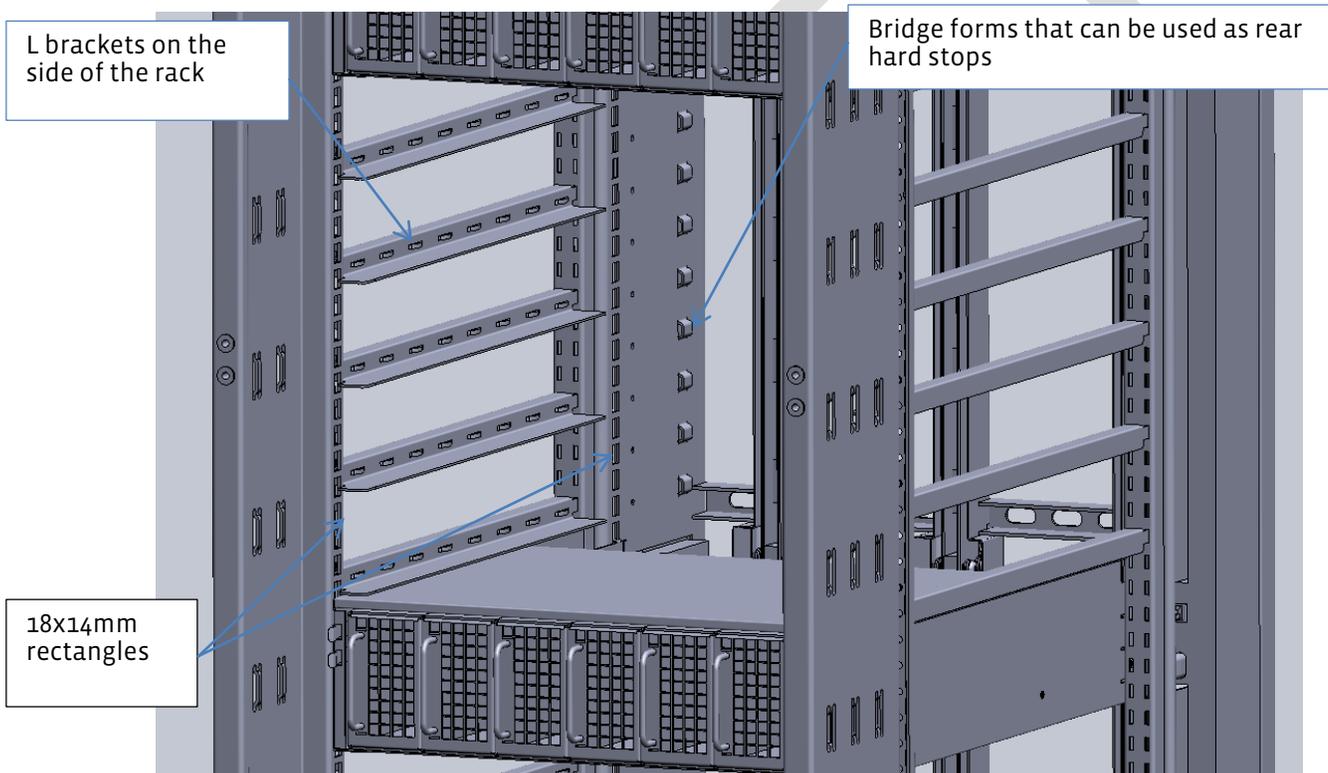


Figure 4 Detail of Knife Brackets

There is a series of 18x14mm rectangles that repeat in a 24mm pattern along both front and back vertical rails. These slots can be used to latch systems into the rack or to hang adapter brackets that can be customized to support different types of equipment.

A bridge form in the back of the rack at every OpenU can be used as a stopping surface to prevent rearward motion of the IT equipment in the rack.

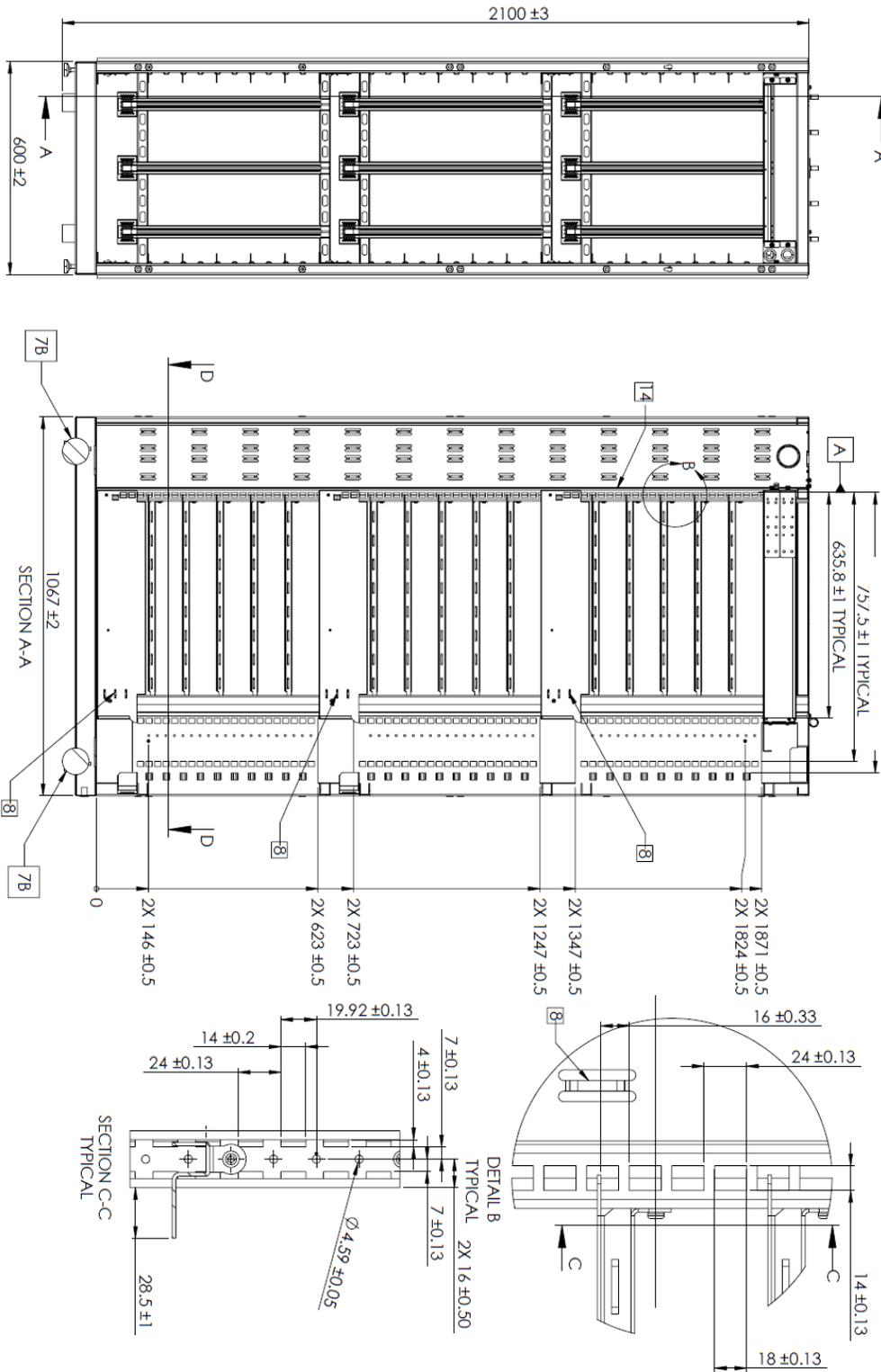


Figure 5 Open Rack Cabinet, Detailing How the Knife and L Brackets Attach

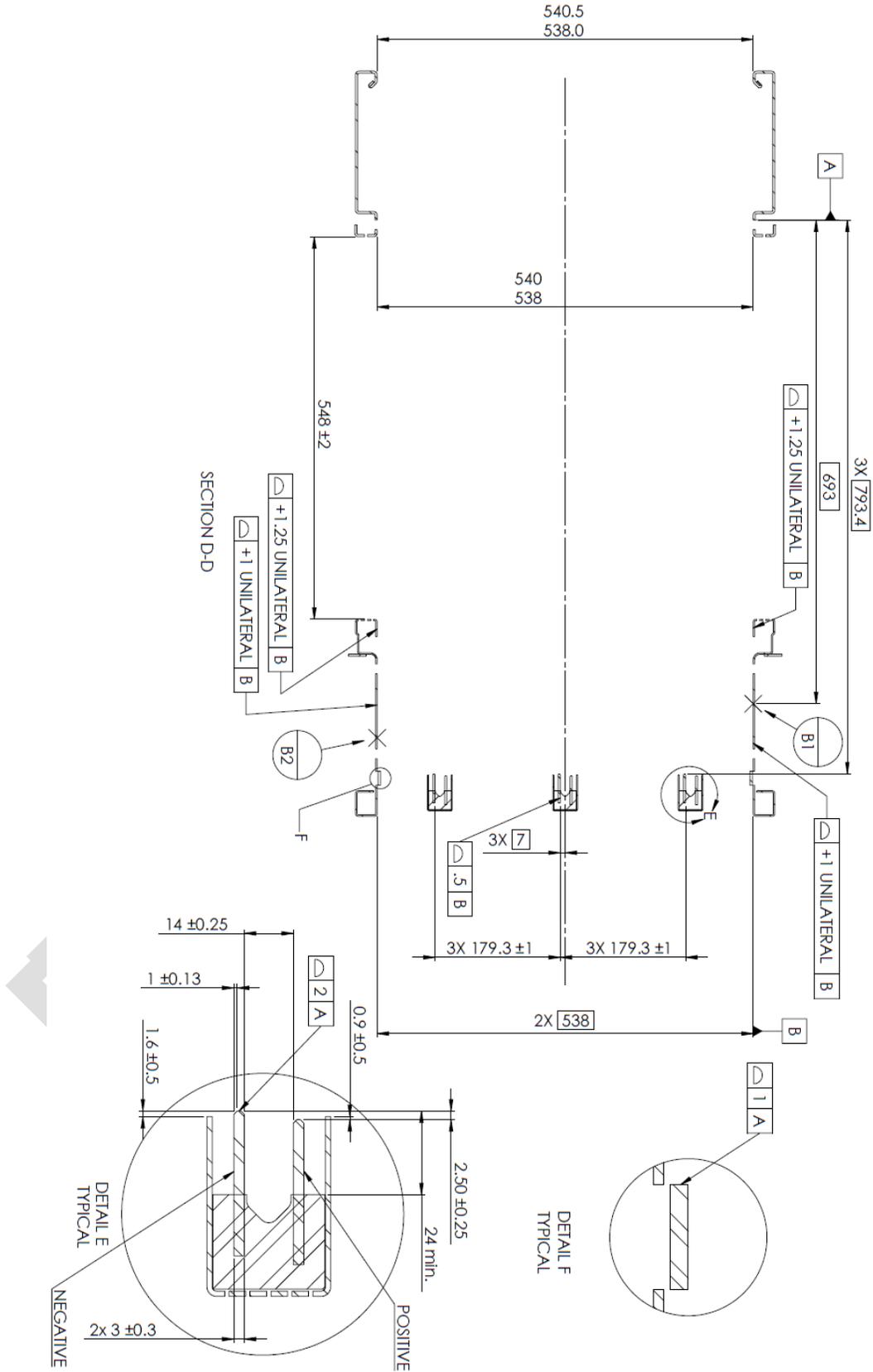


Figure 6 Top View Cross Section of the Open Rack Showing Bus Bars and Rack Openings

4 Reference Chassis Design

The reference design uses latches that snap into the rectangular holes in the front of the rack. The latches provide a stop to prevent forward motion of the IT equipment in the rack. This is just one example of how the rectangles might be used. The chassis could also have cams that use the rectangles to push against the rack to make sure that the chassis is always forced against the hard stop in the back of the rack.

The 12V bus bar connector location is controlled to make sure that it will contact the bus bar since it is a blind-mate connection. The reference design assumes that the 12V bus bar clip referenced in section 5.1 is included in the design. Any equipment that uses a different clip or method of attaching to the bus bar is free to deviate from the specification as the designer accepts the responsibility of ensuring that the equipment always mates with the bus bar and the rack.

The chassis height must be a minimum of 1xOpenU tall, but can grow in height by $\frac{1}{2}$ xOpenU increments of 24mm. The chassis height should be no greater than $(48\text{mm} * \text{OpenU}) - 2.5\text{mm}$. The 2.5mm provides room for the L bracket that the chassis rests on and clearance in the rack to make sure that it does not rub the L bracket above.

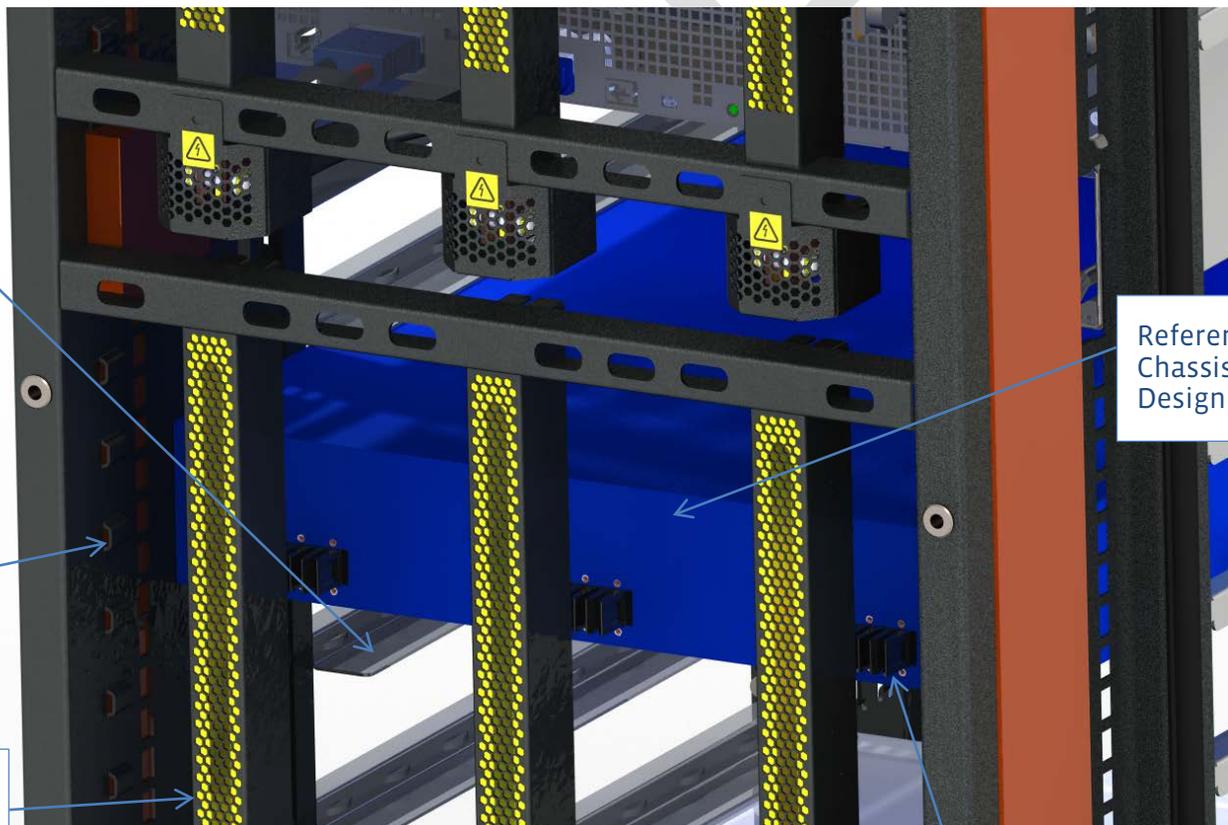


Figure 7 Reference Chassis Design

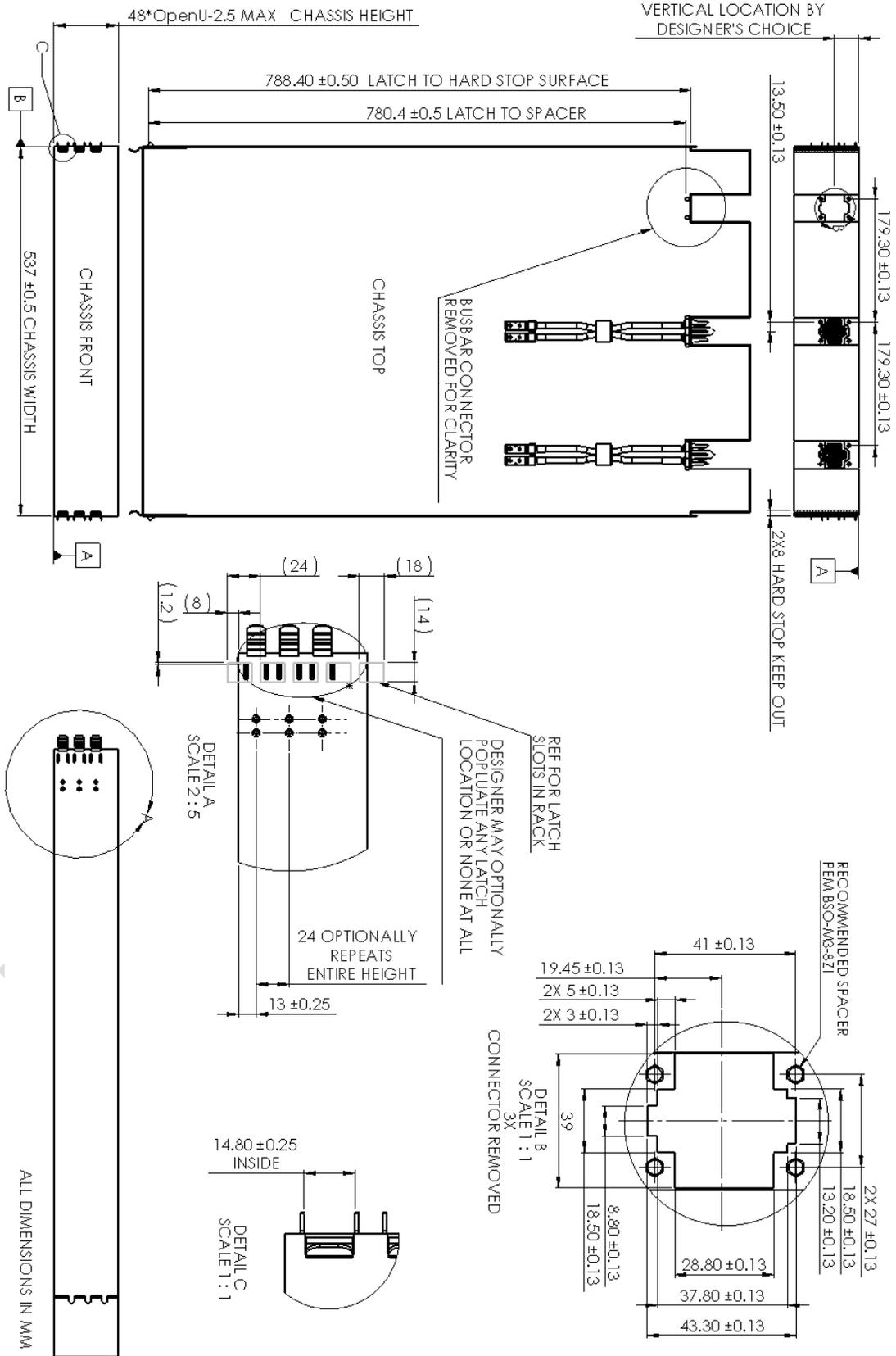


Figure 8 Reference Chassis Design for 12V DC Connector

The 539 nominal width between the front vertical posts is held +/- 1mm during manufacturing. However, this tolerance is only guaranteed under static conditions. If the rack is shipped while integrated with IT gear, the rack will be exposed to non-operation shock conditions. Just like any other component in the system, this dimension will change when exposed to non-operational shock. Changes in this dimension due to environmental shock can be minimized several different ways:

- 1> Minimize the shock to which the system is exposed by using shock pallets and air-ride trucks for transport.
- 2> Minimize the mass of the IT gear in the rack during transport.
- 3> Add a brace across the front vertical sections of the rack to maintain the 539mm spacing. The brace could be attached to the external faces of the rack, or included as part of the IT gear like EIA rack gear does. EIA IT gear traditionally has a thick front plate that connects the left and right post of an EIA rack and keeps the vertical sections stabilized during transport.

The CAD files for the reference chassis design, which includes the DC busbar clips is included with this design guide as an aid for developing IT gear for the platform. This file is only a reference and does not guarantee compliance or intermateability between the rack and the IT Gear.

The CAD files and inspection drawings including tolerances for the V1 version of the Open Rack are also available on the OCP website and are a great resource for IT gear suppliers.

5 Contact Information for Chassis Enabled Components

5.1 Bus Bar Power Interconnect

5.1.1 Methode

Hannah Han
Applications Engineer
Business Phone: 408-453-4831
hhan@methode.com

Vic Geevarghese
Field Application Engineering Manager
Business Phone: 847-222-2563
Mobile Phone: 312-912-2873
vgeevarghese@methode.com

6 Revision History

Author	Revision		Date
Steve Mills	0.5	Initial Release	24 AUG 12
Steve Mills	1.0	Section 3: Update Figure 5, 6, and 7; Section 4: Add detail on non-operational vibration; Section 5: Contacts 5.1.1	27 AUG 13

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