

90 kW, Tier 2, Direct Expansion, 142.1 m², All-In-One Prefab Data Center Module – Busway or PDU



DESIGN OVERVIEW

Data Center IT Capacity
90 kW

Target Availability
Tier 2

Annualized PUE at 100% Load
1.64

Total Racks and Average Density
12 racks at 7.5 kW/rack

Data Center Overall Space
142.1 m²

Regional Voltage and Frequency
400V, 50Hz

ABOUT THIS DESIGN

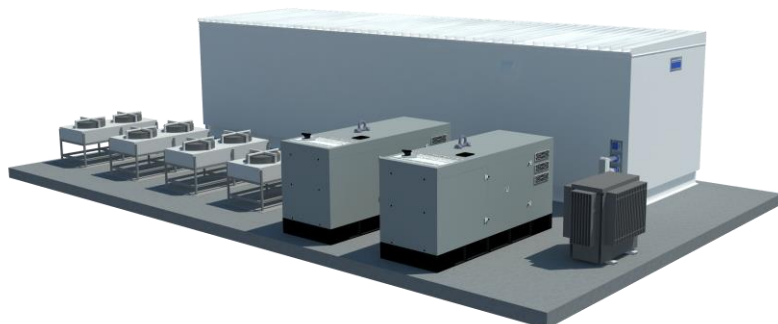
- Uptime Institute TIER-Ready II compliant
- Direct expansion, close coupled cooling architecture
- Integrated row-based air distribution
- Hot aisle containment for increased cooling efficiency
- Highly scalable and adaptable
- Modular UPS

INTRODUCTION

The planning process of most projects can be iterative and thereby expensive. Data center projects are burdened with these challenges and can benefit greatly from simplification and time savings. Schneider Electric's data center reference designs help customers optimize the planning process by providing them with validated, proven, and documented data center physical infrastructure designs. The use of these designs has a positive impact on not just the project itself, but also on the performance, reliability, and efficiency of the data center over its lifetime.

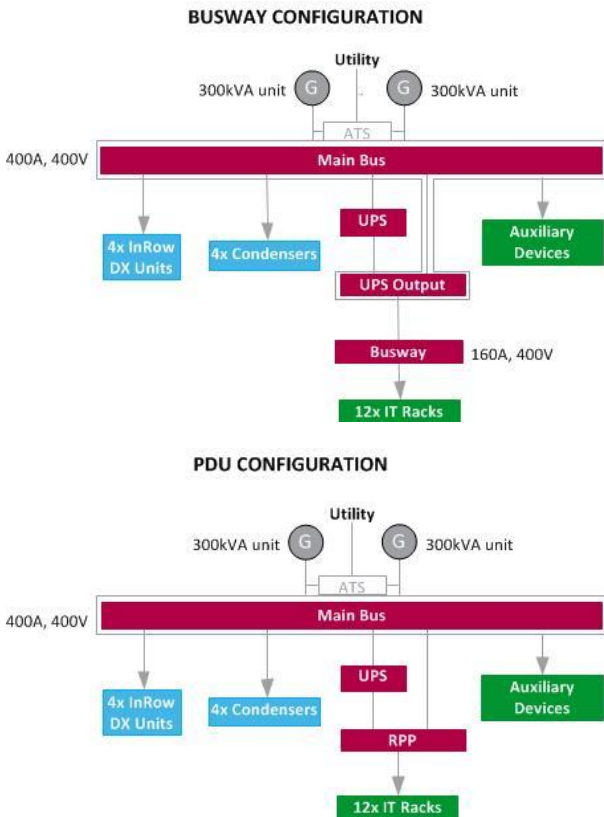
Reference Design 84 includes design information for three spaces: IT space, facility power, and facility cooling. The data center is constructed of one pre-fabricated module, comprising the integrated power, cooling, and structural systems required to meet the design's specifications published in this overview document.

This design is Uptime Institute TIER-ready II compliant. This assures the design can be deployed onsite and then quickly and cost-effectively certified by Uptime Institute for industry-standard TIER II reliability.



FACILITY POWER BLOCK DIAGRAM

Facility Power



The facility power system supplies power to the critical and non-critical components within the data center. The electrical architecture used in this data center design is a single path with UPS. The utility and generator feed in parallel to a 400 amp Prisma panelboard in the electrical room, which then feeds the data center cooling equipment and a 96 kW Symmetra PX UPS that provides critical power to the IT room with 6.5 minutes of battery runtime. In the busway configuration, the UPS feeds a 160 amp Canalis KN busway, which feeds the IT racks. In the PDU configuration, the UPS feeds a 277kVA Remote Power Panel (RPP), which feeds the IT racks. The Symmetra PX has N+1 redundancy through an additional 16 kW power module for a total of seven 16 kW power modules. It also has N+1 redundancy in the battery strings for a total of 9 battery strings.

The facility power system is designed to support additional peripheral devices like fire panels, access control systems, and environmental monitoring and control devices. Power meters in the electrical path monitor power quality and allow for predictive maintenance & diagnostics of the system. These meters also integrate with StruxureWare Power Monitoring Expert.

Every component in this design is built and tested to the applicable IEC standards.

Further design details and schematics are available in the engineering package.

DESIGN OPTIONS

This reference design can be modified as follows without a significant effect on the design’s performance attributes:

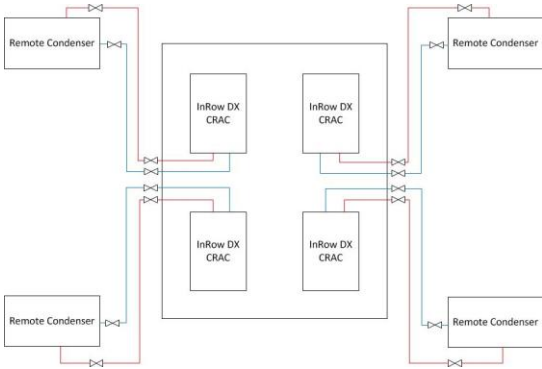
- Add StruxureWare Power Monitoring Expert
- Provision for load bank
- Change UPS batteries
- Add/change standby generator options:
 - Location
 - Tank size
 - Fuel type

FACILITY POWER ATTRIBUTES

Name	Value	Unit
Total amps (main bus)	400	A
Input voltage (main bus)	400	V
Panelboard kAIC	36	kA
Power path	Single	
Generator redundancy	N+1	
IT space UPS capacity	96	kW
IT space UPS redundancy	N+1	
IT space UPS runtime @ full IT load	6.5	minutes
IT space UPS output voltage	400/230	V
Facility cooling UPS capacity	None	
Facility cooling UPS redundancy	None	
Facility cooling UPS runtime @ full load	None	

Facility Cooling

FACILITY COOLING BLOCK DIAGRAM



The mechanical design utilizes direct expansion as the primary system for heat dissipation. The architecture consists of four InRow DX units and four remote air-cooled condensers in an N+1 configuration. A direct expansion system can effectively cool this small facility environment, since the refrigerant has only a short distance to travel from CRAC to condenser.

The predictable performance of the row-based cooling architecture makes it well-suited for this medium density application. Furthermore, a hot aisle containment system minimizes the mixing of hot and cold air streams, increasing the cooling efficiency and performance.

This design is instrumented to work with StruxureWare Cooling Monitoring Expert.

Further design details such as dimensions, equipment placement, temperature set points, pipe sizing, flow rates, and pressure drops are available in the engineering package.

DESIGN OPTIONS

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- Add StruxureWare Cooling Monitoring Expert

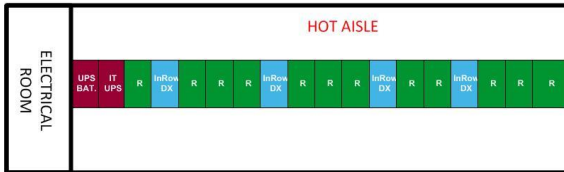
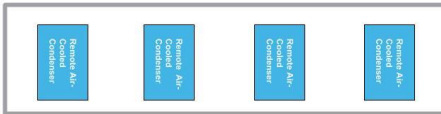
FACILITY COOLING ATTRIBUTES

Nam	Value	Unit
Total net cooling capacity (N)	101.9	kW
Input voltage	400	V
Heat rejection medium	R-410A	
Mechanical redundancy	N+1	
Outdoor heat exchange	Remote air-cooled condensers	
Refrigerant supply temperature	20	°C
Refrigerant return temperature	36.7	°C
Storage tank size	None	
Ride-through time	None	
Economizer type	None	

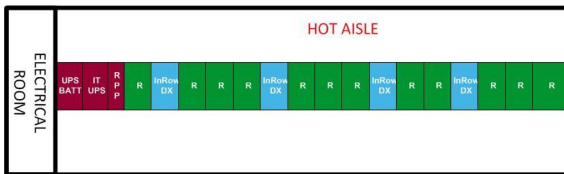
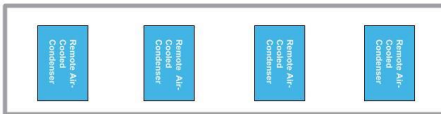
IT Space

IT SPACE FLOOR LAYOUT

BUSWAY CONFIGURATION



PDU CONFIGURATION



DESIGN OPTIONS

This reference design can be modified as follows without a significant effect on the design's performance attributes:

- Add environmental and security management
- Change rack options (tall, wide, deep)
- Change power distribution options (Rack PDU type: basic, switched)
- Add StruxureWare Data Center Expert

The IT capacity of this single-pod design is 90 kW. For deployments that require a small footprint, this design is ideal. Rather than require additional IT racks or pods, the rack density can be scaled up to 7.5 kW per rack as computing demands increase to drive efficiency and defer capital expenditure until needed

The IT space design specifies all the physical infrastructure systems and respective spacing arrangements required to meet the overall design's performance attributes. This includes racks, PDUs, rack power distribution, cooling units, and the hot-aisle containment system.

The pod supports power densities up to 7.5 kW per rack, and the 96kW Symmetra PX UPS supplies server-level voltage to the racks either through a 160 A busway or an integrated PDU. Each rack is configured with a metered rack-mount PDU to enable remote monitoring of the units for efficiency and capacity management.

InRow RD & RP units control the removal of heat by monitoring the temperature in the room and the pressure in the contained hot aisle.

The security of the room is maintained at multiple points. At the rack level, access is controlled by a door lock and sensor. At the room level, security cameras are utilized for monitoring.

IT ROOM ATTRIBUTES

Name	Value	Unit
IT load	90	kW
Input voltage	400	V
Supply voltage to IT	230	V
Average density	7.5	kW/rack
Number of racks	12	racks
IT floor space	33	m ²
Single or dual cord	Dual	
Heat rejection medium	R-410A	
CRAC/CRAH type	Row-based DX CRACs	
CRAC/CRAH redundancy	N+1	
Containment type	Hot aisle	

Design Attributes

Overview	Value	
Annualized PUE at 100% load	1.64	
Data center overall space	142.1 m ²	
Facility Power	Value	Unit
Generator Redundancy	N+1	
Total amps (main bus)	400	A
Input voltage (main bus)	400	V
Panelboard kAIC	36	kA
Power path	Single	
IT space UPS capacity	96	kW
IT space UPS redundancy	N+1	
IT space UPS runtime @ rated load	6.5	minutes
Facility cooling UPS capacity	None	kW
Facility cooling UPS redundancy	None	
Facility cooling UPS runtime @ rated load	None	minutes
Facility cooling		
Total cooling capacity	101.9	kW
Input voltage	400	V
Heat rejection medium	R-410A	
Mechanical redundancy	N+1	
Outdoor heat exchange	Remote air-cooled condensers	
Coolant supply temperature	20	°C
Coolant return temperature	35	°C
Storage tank size per cooling system	None	gallons
Ride through time	None	mins
Economizer type	None	
IT Space		
IT load	90	kW
Input voltage	400	V
Supply voltage to IT	400	V
Average density	7.5	kW/rack
Number of IT racks	12	racks
IT floor space	32.7	m ²
Single or dual cord	Single	
Heat rejection medium	R-410A	
CRAC/CRAH type	Row-based DX CRACs	
CRAC/CRAH redundancy	N+1	
Containment type	Hot Aisle	

Data Center Infrastructure Management (DCIM) System



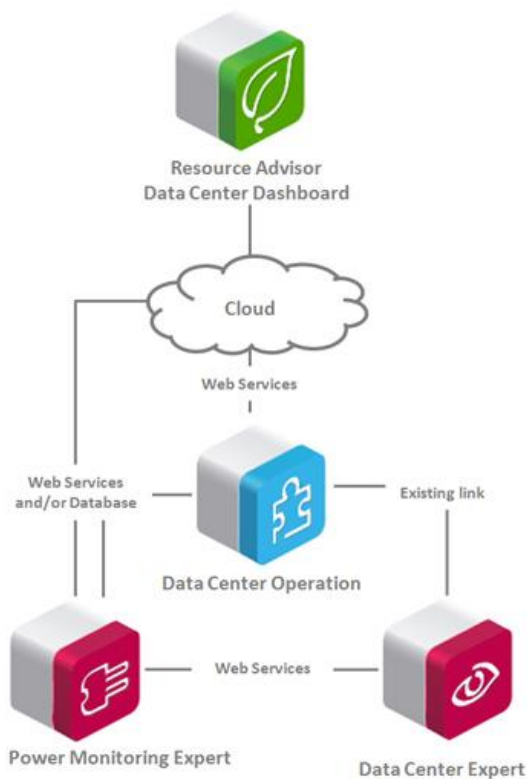
Good design and quality construction alone do not ensure a highly available & efficient data center. DCIM provides on-going monitoring and control to ensure the facility lives up to its design intent. StruxureWare for Data Centers is a software management suite designed to collect and manage data about a data center's assets, resource use, and operational status throughout the life cycle of the facility. This information is then distributed, integrated, and applied in ways that help managers optimize the data center's performance and meet IT, business, and service-oriented goals. From IT assets to racks, rows, rooms and buildings, StruxureWare for Data Centers delivers the right information to the right users at the right time.

Control level: Experts, on site or remotely, can control process performance and ensure business continuity in real time, while tracking energy consumption in a highly critical and secure environment.

Operations level: Functional managers can optimize operations, energy, and assets through smart analytical tools, often spanning multiple sites.

Enterprise level: C-level executives can drive their sustainability strategy efficiently, choosing the best scenario that meets their business objective to conserve enterprise-wide resources.

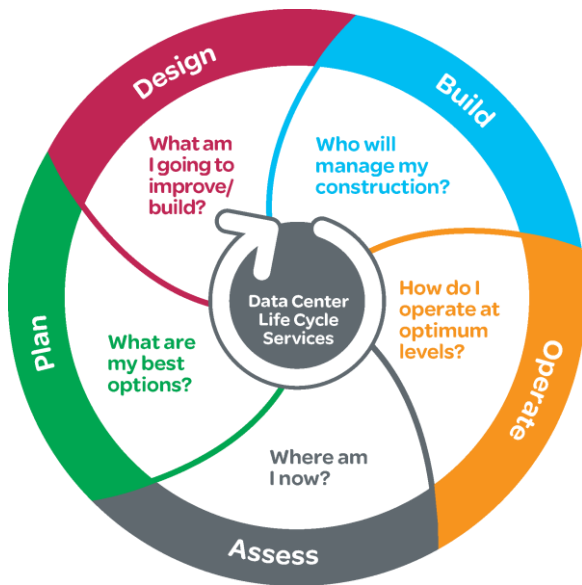
StruxureWare for Data Centers allows for flexibility when requirements and implementation strategies change over time. StruxureWare software applications and suites simplify integration time, improve reliability, enhance visibility to energy information, and streamline operational efficiency.



➤

Demo:
 Visit www.apc.com/software to learn more about **StruxureWare for Data Centers!**

Schneider Electric Life-Cycle Services



1

Team of over 7,000 trained specialists covering every phase and system in the data center

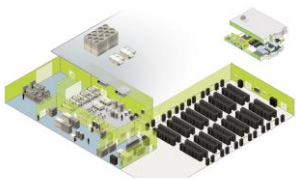
2

Standardized, documented, and validated methodology leveraging automation tools and repeatable processes developed over 45 years

3

Complete portfolio of services to solve your technical or business challenge, simplify your life, and reduce costs

Get more information for this design:



3D spatial views



Floor layouts

Engineering Package

Every reference design is built with technical documentation for engineers and project managers. This includes engineering schematics (CAD, PDF), floor layouts, equipment lists containing all the components used in the design and 3D images showing real world illustrations of our reference designs.



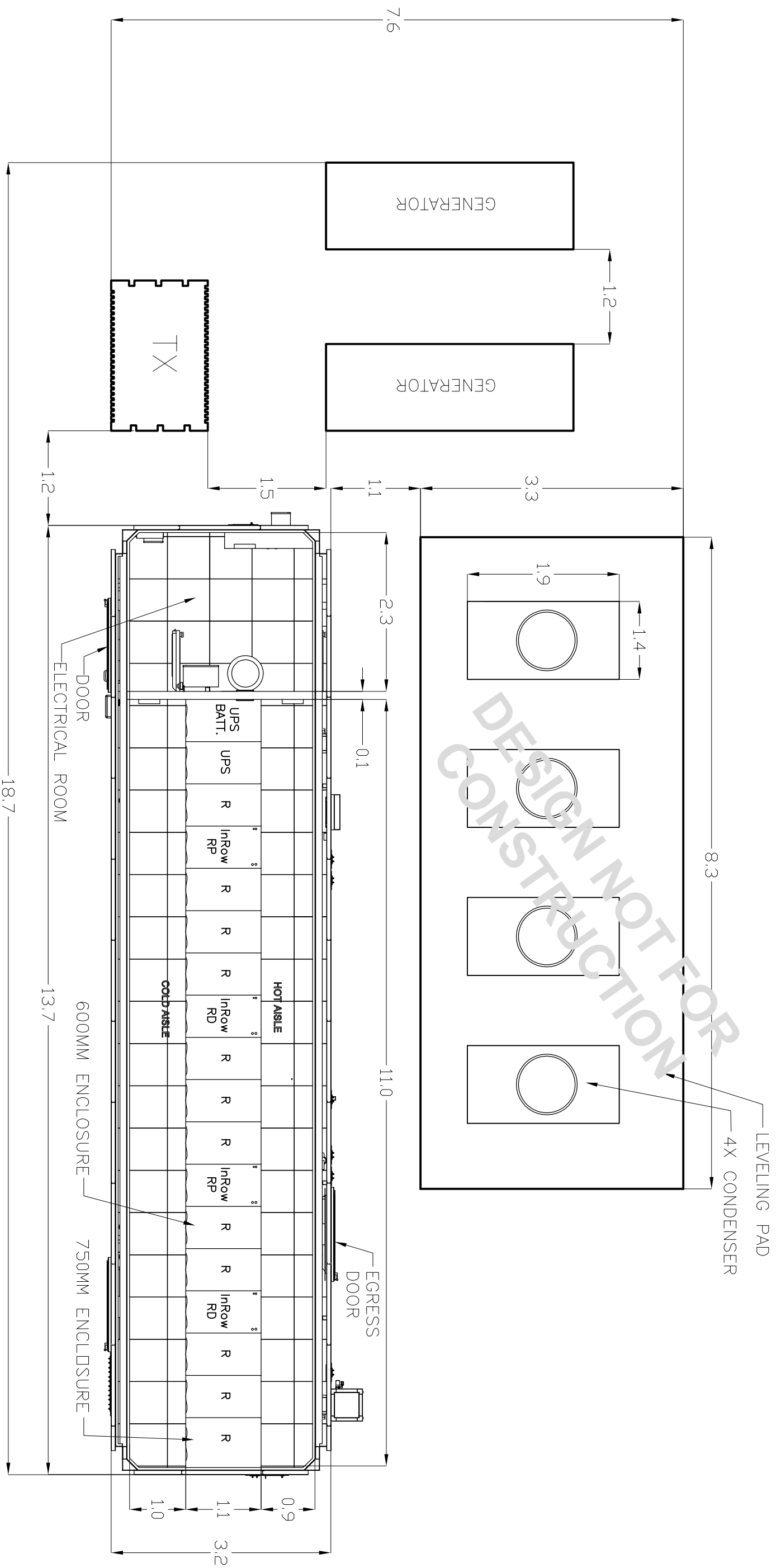
One-line schematics



Bill of materials

Documentation is available in multiple formats to suit the needs of both engineers and managers working on data center projects.

> Email ReferenceDesigns@Schneider-Electric.com to receive the engineering package for this design



REFERENCE DESIGN CONCEPT

DESIGN NOT FOR CONSTRUCTION

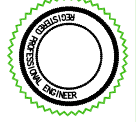
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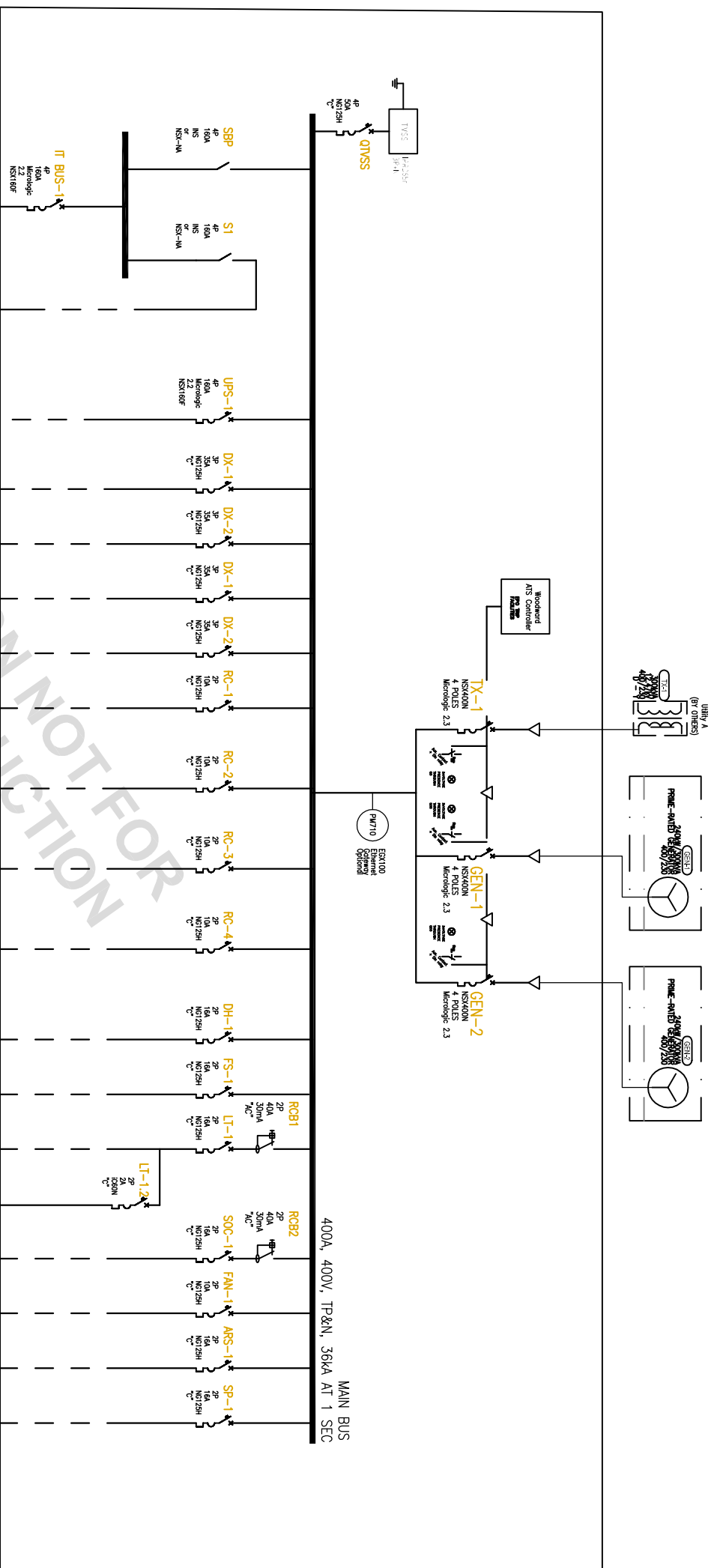
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**PREFABRICATED DATA CENTER
REFERENCE DESIGN #84
FACILITY SITE LAYOUT - BUSWAY**

Date	Description	Rev.	Date	Rev.	Description

Drawing No: RDB4_1.1.1
 Facility: Site Layout_EN 80
 Project Title: PREFABRICATED DATA CENTER FACILITY SITE LAYOUT - BUSWAY
 Checked By: []
 Design By: []
 Date: []



MAX. CALCULATED ICC: 19.4KA
160A BUSWAY

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REFERENCE DESIGN CONCEPT

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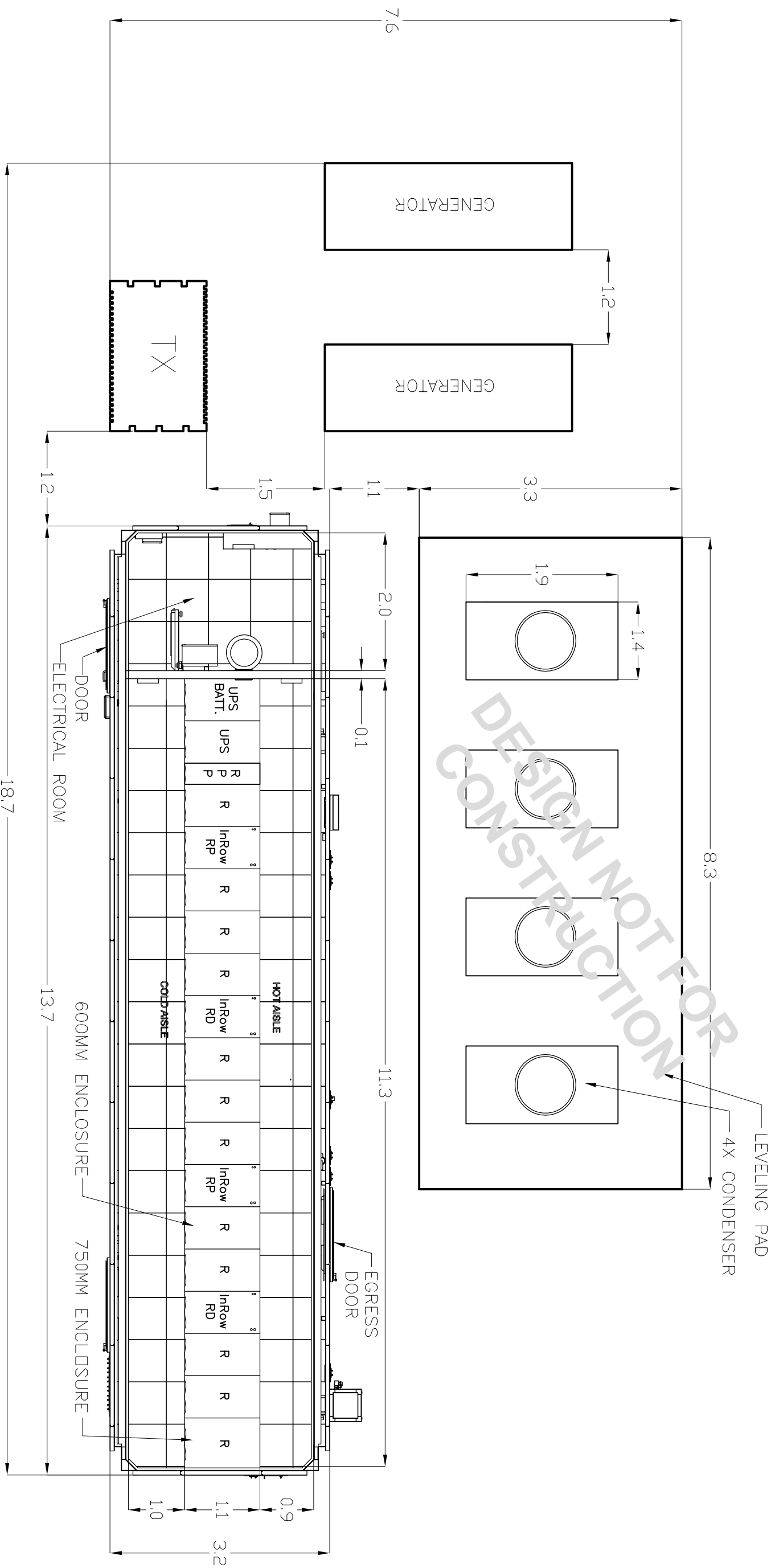
**PREFABRICATED DATA CENTER
REFERENCE DESIGN #84
ELECTRICAL ONE-LINE - BUSWAY**



Rev.	Description	Date	Rev.	Description	Date
01	Bimby Design Order	JUN-2018			

Task	Start	End
Design		
Check		
Draw		
Issue		

Rev.	Description	Date
01	Issue for Design	
02	Issue for Check	
03	Issue for Draw	
04	Issue for Issue	



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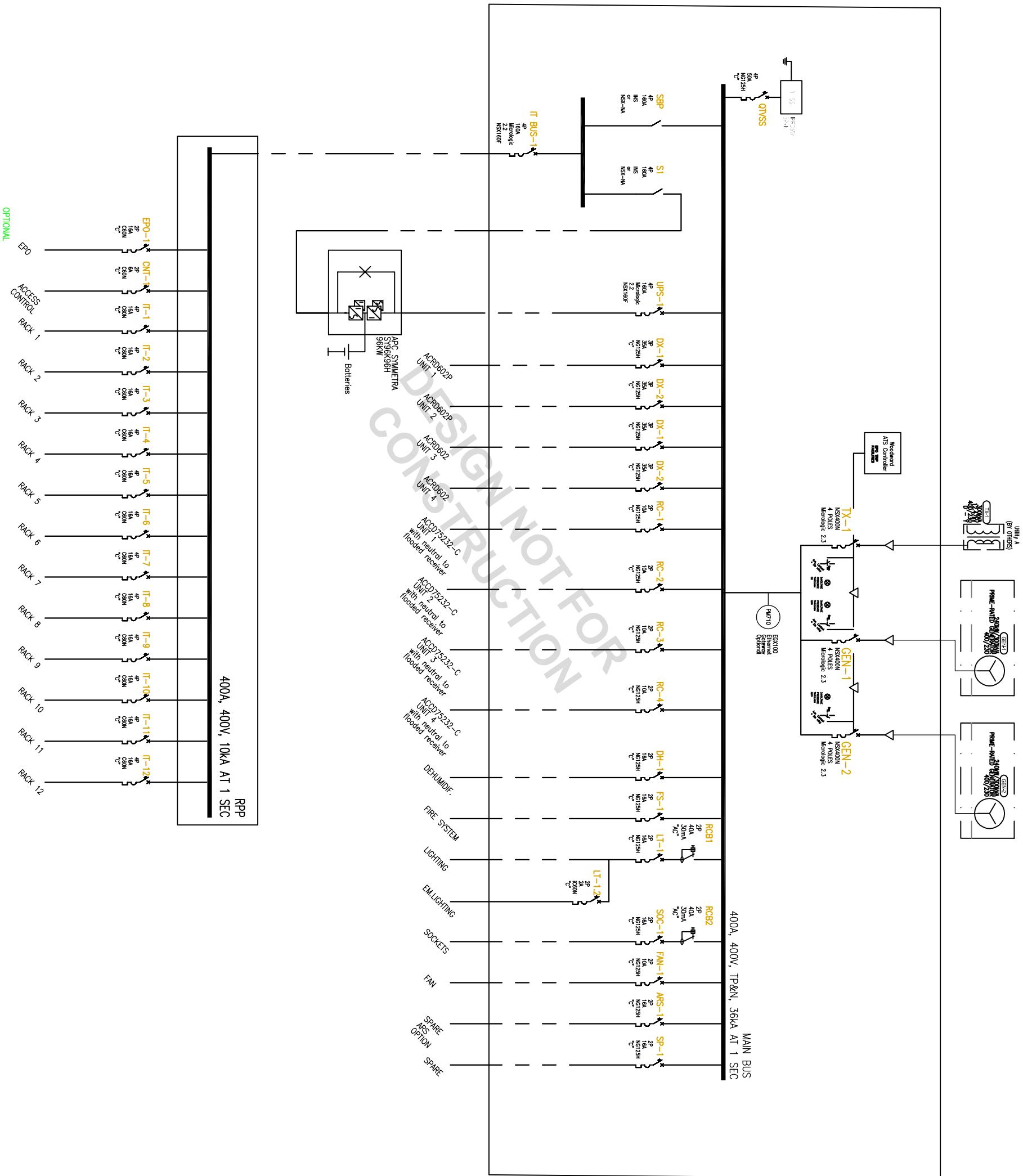
PREFABRICATED DATA CENTER
REFERENCE DESIGN #84
FACILITY SITE LAYOUT - PDU

Date	Description	Rev.	Date	Rev.	Description

Date	Description	Rev.	Date	Rev.	Description

Date	Description	Rev.	Date	Rev.	Description

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R1	Final Design Check	JUN-2018			

Drawing No. RD84 2.2.2
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