



Public Overview of the EMerge Alliance Data/Telecom Center Standard Version 1.0

**A standard defining low voltage dc power distribution system requirements for use
in data centers and telecom central offices**

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EMerge Alliance Data/Telecom Center Standard Version 1.0
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FOREWORD:

The EMerge Alliance Data/Telecom Center Standard Version 1.0 is a practical guide for the hybrid use of DC power in commercial data centers and telephony central offices and allows the buildings of today to adapt to the needs of tomorrow. Data Centers and Telephony Central Offices are huge and growing energy users in nearly every building the energy efficiencies that can come from DC power distribution can be significant. But power efficiency is not the only advantage to a data center operator. Higher reliability, smaller equipment footprints, lower capital outlay and lower operating costs including maintenance can be equally compelling reasons to use DC power distribution. With double digit grow still being projected for data and telephony, the time to consider DC power integration is now.

The Standard offers unprecedented design and space flexibility and provides new opportunities to reduce energy usage while improving reliability, reducing system complexity and cost, and improving sustainability. The Standard calls for the conversion of existing AC power sources to DC power at the distribution level rather than at the rack or within individual servers and other IT devices. This upstream conversion also facilitates optional connections to on-site alternative power generation or storage sources, including solar panels, micro-turbines, fuel cells, and other alternate sources that naturally supply DC power. The option to use native DC power sources for DC loads improves the ROI from on-site renewable investments, reduces energy costs and improves a building's environmental footprint.

Having direct access to safe, DC power is the next logical step for commercial buildings. The number of DC powered devices (computers, lights, sensors, etc.) in workplaces of all types is high and is expected to skyrocket with the introduction of new superefficient solid-state lighting and continued growth in information technology applications. By eliminating the inefficiency of numerous AC to DC power conversions, the energy efficiency of building can be improved. Beyond efficiency, the use of DC has the potential to eliminate future landfill waste, and reduce product shipping weights and overall product costs by eliminating unnecessary electronic content used just to accommodate the exclusive use of AC power.

1. INTRODUCTION

1.1. Motivation

This direct current-power distribution system (DC-PDS), EMerge Alliance Data/Telecom Center Standard [the STANDARD], is intended to assist in addressing a number of growing challenges in designing, building and operating data and/or telecom centers in commercial buildings. These challenges include the increasing need to improve power consumption efficiency and system reliability, the need to constantly adapt to fast-changing device technologies and increasing equipment load densities used in these spaces without incurring large upgrading costs, and the need to facilitate the increasing desire to efficiently integrate renewable energy sources into the power sourcing for a building. The purpose of the STANDARD is to help bridge the gap between commercial building designs meant to accommodate uses that may not change for 30 years or more and ones that need to accommodate dramatic life-cycle changes that occur as often as once every one to three years typical of data/telecom centers. The EMerge DC-PDS DTC STANDARD defines a convenient and safe system of voltages and electrical interfaces between the electrical power feed infrastructure specific to the Data/telecom center and the load devices that use and control power within that space.

Specifically, the STANDARD defines a nominal 380VDC-PDS infrastructure that interconnects sources of power to devices in the data/telecom center which draw the power.

1.2. The primary goals of an EMerge Standardized system are as follows:

- 1.2.1. Allow fast installation time as compared to installation times in a typical commercial building data and/or telecom center,
- 1.2.2. Simplify and allow more flexible reconfiguration capability as compared to the reconfiguration capability in a typical commercial data and/or telecom centers
- 1.2.3. Provide for the use of safe power levels, as defined by the 2011 NFPA® National Electric Code® (see Related Documents Section 2.).
- 1.2.4. Allow competitive first-cost in modular / building blocks as compared to typical first cost for a commercial building data and/or telecom centers with similar functionality,
- 1.2.5. Allow the use of direct current (dc) electric power distribution that facilitates the reduction of energy loss and improves system reliability as compared with the alternating current (ac) electric power distribution used in typical commercial data and/or telecom centers,
- 1.2.6. Facilitate the integration of renewable and other dc energy sources such as solar photovoltaic panels, wind, fuel cell, batteries and other native dc power sources including building-wide dc power distribution.

1.3. Objective of the STANDARD, Limitations of this First Release

- 1.3.1. This first generation STANDARD for a system platform and its components is designed to support basic data center and/or telecom center equipment and systems. In any case, the standardized DC-PDS platform is intended to be highly flexible, allowing for quick and minimally disruptive installation, reconfiguration, relocation, upgrading and/or replacement of system equipment and other components by licensed trade and/or professional data/telecom center maintenance personnel.
- 1.3.2. In addition, with the rapid development of new dc power electronic systems and devices, this document will periodically be updated in the area of circuit protection, power systems control and arc flash protection on a regular basis. Lastly, with the rapid development of new control protocols, this document has reserved future consideration of this topic. Participating members of the EMerge Alliance are expected to stay advised of industry developments in all effect areas of this domain and/or volunteer to assist on the EMerge DTC Technical Standards Committee to accomplish these continuing goals.
- 1.3.3. Governing Body: EMerge Alliance: The EMerge Alliance is a non-profit (501c corporation) industry organization representing corporate, government and academic entities who share a common interest in the design, execution and use of the system in new and existing commercial buildings as may be governed by the corporation's bylaws (the BYLAWS).

1.4. EMerge Alliance Purpose:

- 1.4.1. To define reasonable, practical and otherwise necessary standards for essential physical and functional aspects of the system, including critical Component interfaces and minimum and/or maximum operational performance requirements of said components or combinations of said components as may be further defined herein;
- 1.4.2. To assist in providing the means to evaluate products and services for their usefulness in the aforementioned STANDARD's compliant system platform; and lastly
- 1.4.3. To educate, publicize or otherwise promote the value of design, construction and use of the dc platform and/or the system platform STANDARD.
- 1.4.4. EMerge Alliance BYLAWS: The EMerge Alliance is non-discriminatory in accepting eligible membership as described in its BYLAWS. The Alliance is unbiased in its promotion of the STANDARD and/or its generic standardized system platform components. The Alliance may, from time-to-time, promote individual companies and /or their product on a non-discriminatory fee basis as may also be provided for in its BYLAWS. In any case, when a conflict of

requirements or their interpretation is deemed to exist between this document and the BYLAWS, the BYLAWS will take legal precedence.

- 1.4.5. EMerge Alliance Product Registration: The EMerge Alliance requires manufacturers to submit their products for Registration and Evaluation before such products, related literature and publications may bear the appropriate Alliance approved logos and other markings. Refer to the EMerge Alliance website's (www.EMergeAlliance.org) "Members section" for further information.

1.5. Intent of this Document

- 1.5.1. This document is intended to standardize, to the extent practical, the application of a safe, reliable and energy efficient dc electrical systems to power ICT equipment used in data centers, telecommunications central offices and other similar installations.
- 1.5.2. It will not be used as a substitute for NFPA 70: National Electrical Code in the US, any other national electrical regulatory codes or applicable building codes as required by the AHJ.
- 1.5.3. Design Goals: Adherence to the STANDARD should allow manufacturers to design products with reasonable confidence that such conforming products interoperate with other registered EMerge Alliance products.
- 1.5.4. Conformance to the STANDARD: **CONFORMANCE WITH THIS OR ANY OTHER STANDARD, CODE OR LEGAL REQUIREMENT AS MAY BE IN PART OR IN WHOLE REPRESENTED IN SUCH EMERGE REGISTRATION, IN ANY CASE, SHALL ALWAYS BE THE EXCLUSIVE RESPONSIBILITY OF THE PRODUCT MANUFACTURER.**
- 1.5.5. SCOPE: While the STANDARD intends to evolve into a global STANDARD, at this release most references are to US (and Canadian, where harmonized) based standards such as the National Electric Code (NEC), Underwriters Laboratories (UL). If used in other regions, recognized EMerge approved equivalent standards shall be substituted after making written application and receiving written authorization of the EMerge Alliance.
- 1.5.6. Electrical systems or components complying with the requirements of the STANDARD should be installed in accordance with current edition relevant codes such as the ELECTRICAL AND BUILDING CODES, the Canadian Electrical Code (CEC), the International Building Code and the International Mechanical Code and other recognized AHJ requirements.
- 1.5.7. Fire Resistance of systems or components complying with the STANDARD is beyond the scope of the STANDARD.
- 1.5.8. Components or systems that contain features, characteristics, devices, materials, different from those covered by the requirements in the STANDARD that may

involve a risk of fire or of electric shock or injury to persons shall be, in any case, subject to the requirements of the AHJ.

- 1.5.9. Revision of requirements shall be proposed and adopted in conformance with the methods employed for development, revision, and implementation of this document and as further defined in the BYLAWS and/or by the procedures established by the EMerge Alliance Board of Directors as allowed by provisions of said BYLAWS.

Remaining content of this section is available to EMerge Alliance members only.

4. OVERVIEW

- 4.1. The STANDARD defines a DC Power Distribution System that physically functions in a traditional commercial building power system infrastructure to specifically provide dc power distribution within a data center and/or telecom center located within that building. In addition, as shown in Figure 4.1, the Infrastructure incorporates electrically active busway and/or wiring components to distribute power to Peripherals (loads), such as rack mounted computers/servers, storage devices, networking devices, telecom devices/systems as well as room mounted lighting, motors, cooling and similar equipment and any newly invented devices. Power devices deliver 380Vdc through the Infrastructure via busway systems and/or Power Cable Assemblies (PCAs) that are also part of the Infrastructure. Controls allow active components of the system to perform basic on/off, level, monitoring and metering functions involving the power to and/or from those devices.

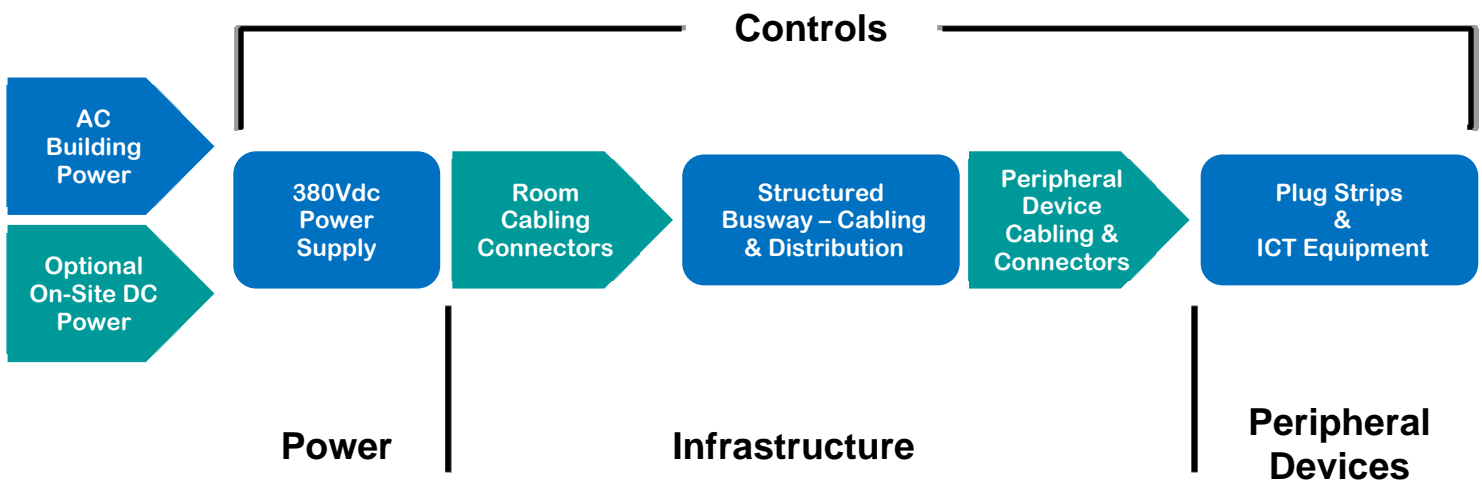


Figure 4.1 Compositional Overview of the EMerge Alliance Data/Telecom Center Standard

- 4.2. Figure 4.2 shows a pictogram of a typical conforming DC-PDS that includes examples of various Power, Infrastructure, Controls and Peripherals that can be employed therein. A system conforming to the STANDARD is intended to be highly flexible, allowing for quick and easy reconfiguration, relocation, upgrading and/or replacement of its Peripherals by licensed trade or professional building maintenance and operating personnel.

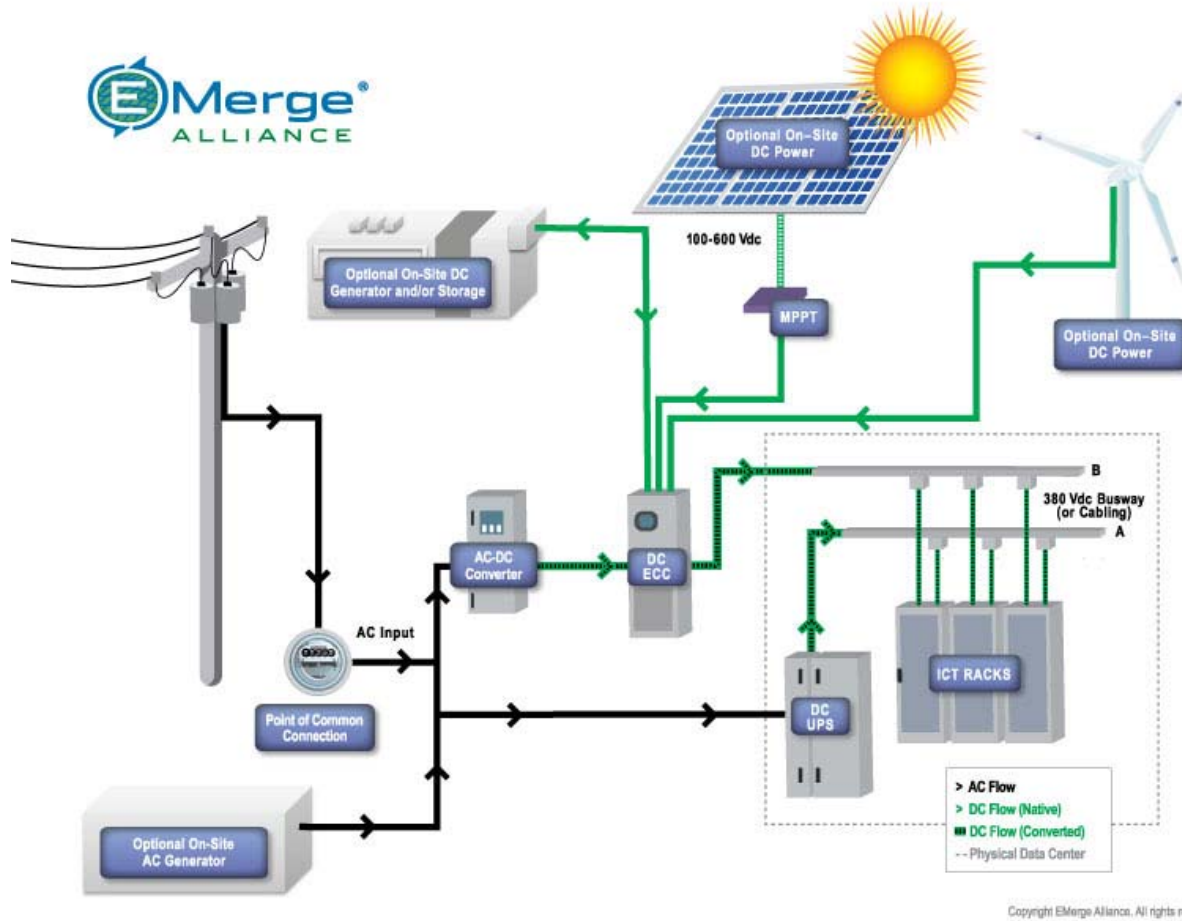


Figure 4.2 A Generic Pictogram of a 380Vdc Power Distribution System for DTC Applications

Informational note: Figure 4.2 is not intended to represent all possible configurations of a DC-PDS for DTC applications, but rather is illustrative of the basic concept of such systems.

The STANDARD focuses on the data center space domain. As such the DC-PDS is composed of systems, sub-systems and components that are UL (or by an otherwise acceptable listing service which is acceptable to the AHJ) listed for 380V DC-PDS applications. Any system, sub-system and/or device intended for use in implementing the STANDARD should be submitted for evaluation and registration by the EMerge Alliance. It is not the intent of the STANDARD to dictate how a 380V DC-PDS infrastructure is defined and assembled. It is the intent of the STANDARD to define specific application parameters, as represented by the “shall” requirements contained herein, to which designers and installers apply commercially available agency listed and labeled systems, sub-systems and components in a safe and an environmentally responsible manner which are acceptable to the code AHJ.

ACCESS THE FULL STANDARD: JOIN THE EMERGE ALLIANCE

Please visit www.emergealliance.org to join the EMerge Alliance. Governing, Participating and General Members all receive access to the complete version of the Standard, including detailed sections, like those addressing the four system product categories that were omitted from this public overview. The complete Standard contains the following topics.

TABLE OF CONTENTS

1.	INTRODUCTION.....	4
2.	RELATED DOCUMENTS.....	ERROR! BOOKMARK NOT DEFINED.
3.	TERMS AND ABBREVIATIONS.....	ERROR! BOOKMARK NOT DEFINED.
4.	OVERVIEW.....	8
5.	INFRASTRUCTURE	ERROR! BOOKMARK NOT DEFINED.
6.	POWER	ERROR! BOOKMARK NOT DEFINED.
7.	PERIPHERALS.....	ERROR! BOOKMARK NOT DEFINED.
8.	CONTROLS.....	ERROR! BOOKMARK NOT DEFINED.
9.	INSTALLATION.....	ERROR! BOOKMARK NOT DEFINED.

FIGURES

Figure 4.1	Compositional Overview of the EMerge Alliance Data/Telecom Center Standard	8
Figure 4.2	A Generic Pictogram of a 380Vdc Power Distribution System for DTC Applications.....	9
Figure 6.1	EMerge Alliance DC-PDS DTC Voltage Tolerance Curve	Error! Bookmark not defined.
