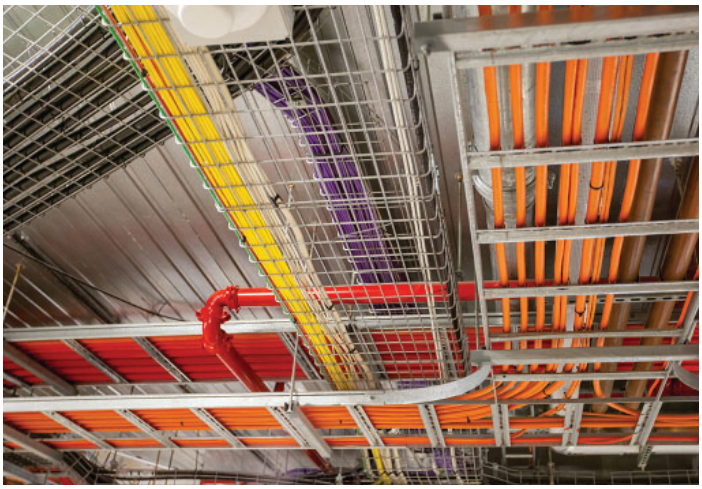
Cable Pathway Systems for Modern Data Centers, Industrial Installations and General Enterprise Projects

Modern data centers and industrial installations require cable pathway systems capable of supporting unprecedented cable densities while maintaining performance, safety, scalability, and compliance with industry standards. Traditional steel cable runway systems, while historically common, no longer represent best practice for high-density data center environments due to their limited vertical containment and reduced cable support. This white paper evaluates contemporary cable tray solutions, with emphasis on hybrid wire basket systems, and outlines design considerations aligned with construction specifications and CSI methodology.

The exponential growth of data traffic has resulted in significant increases in both power and low-voltage cabling within data centers. Cable management systems must now address:

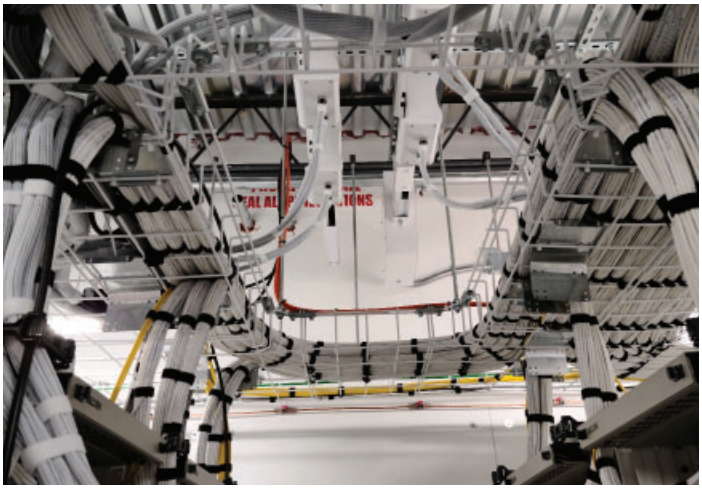
- High cable volume within constrained building footprints
- Compliance with cable bend radius and manufacturer specifications
- Support for future expansion and reconfiguration
- Integration with cooling strategies (hot aisle/cold aisle)
- Consistent appearance and constructability



Traditional ladder-style cable runway systems are linear, two-dimensional solutions that lack vertical containment. As a result, cables must be bundled and mechanically secured to adjacent structures, increasing labor costs and reducing adaptability.

Basket-style cable tray systems provide an essential vertical containment component, allowing higher cable density within the same horizontal footprint. These systems are suitable for both power and data cabling and may serve as an Equipment Grounding Conductor (EGC) where permitted by code.

Basket tray systems typically feature wire grid spacing not exceeding 4 inches, providing continuous support along the cable length. By comparison, traditional ladder runway systems often use rung spacing of 9 to 12 inches, resulting in reduced support and increased risk of cable deformation or performance degradation.



Maintaining cable continuity and integrity at pathway entry and exit points is critical. Cable dropouts or waterfalls shall be used to ensure smooth cable egress and to prevent abrasion or excessive stress. Acceptable configurations include:

- Side-mounted dropouts
- Inline transitions
- Over-the-rail waterfalls

All directional changes shall utilize sweeping-radius transitions. Butt-style turns, tees, and crosses without adequate radius are not acceptable for high-density cable pathways, as they can violate minimum bend radius requirements and compromise cable performance.

The 801 Series Mega Snake is a hybrid cable tray system combining the flexibility of wire basket tray with the structural strength and installation efficiency of ladder tray. The system is designed to maintain cable integrity while simplifying installation and ensuring consistency.

Factory-engineered waterfalls and cable dropouts are available for side, over-rail and bottom egress. These components provide continuous cable support and maintain manufacturer-required bend radii as cables transition from tray to racks or cabinets.

Data center pathways frequently require tray size reductions in areas of lower cable density. The 801 Series Mega Snake provides factory-built horizontal and vertical reducing transitions, eliminating the need for field fabrication.

Generic wire basket systems often require field-fabricated transitions, resulting in:

- Increased labor costs (up to one hour per transition)
- Inconsistent electrical bonding
- Irregular appearance
- Sharp edges requiring additional grinding to meet code

Factory-built Mega Snake transitions are consistent, fully bonded, free of sharp edges, and compliant with applicable electrical and safety standards. Consistency in infrastructure design is a critical consideration, particularly in co-location and multi-tenant data centers. A uniform, professional appearance contributes to tenant confidence and perceived facility quality. Factory-configured systems provide a repeatable, code-compliant solution that supports both operational and aesthetic objectives. Cable pathways typically follow a grid-based “street and avenue” layout to route cables efficiently from origin to destination. This methodology applies to both overhead and underfloor installations.

Overhead cable tray systems benefit from open, free-air environments, allowing for direct routing with minimal impact on cooling.

Advantages include:

- Simplified routing and modifications
- Improved accessibility for maintenance
- Reduced installation constraints

Tray width selection in overhead systems is primarily driven by cable capacity rather than accessibility limitations.

Underfloor cable management must conform to a 2 ft x 2 ft raised floor grid and preserve plenum airflow for cooling. Design considerations include:

- Maintaining hot aisle/cold aisle airflow
- Avoiding obstruction of cold air delivery
- Managing high cable density in stacked configurations

Stacked trays in hot aisles should be designed with narrower trays at upper elevations and wider trays below to improve accessibility and capacity.

The 301 Series Snake Canyon is a modular 2 ft x 2 ft tray system designed specifically for raised-floor environments.

Key features include:
- Compatibility with standard floor grid layouts
- Multiple elevation options
- Full-width and half-width tray configurations
- Maximum cable capacity due to absence of horizontal braces

The modular design supports rapid installation, simplified modifications, and deployment in both new and existing facilities.

Overhead systems generally offer superior accessibility and easier maintenance, while underfloor systems provide enhanced security and a cleaner visual environment. Both approaches are acceptable when designed in accordance with best practices and project requirements.

REFERENCE STANDARDS AND CODES

The design, materials, installation, and performance of cable pathway systems shall comply with the latest adopted editions of the following codes and standards, as applicable:

National Electrical Code (NEC)

- NFPA 70 – National Electrical Code (NEC)
  - ◊ Article 300 – General Requirements for Wiring Methods
  - ◊ Article 392 – Cable Trays
  - ◊ Article 645 – Information Technology Equipment
  - ◊ Article 250 – Grounding and Bonding

Cable tray systems shall be listed and installed in accordance with NEC requirements, including provisions for cable support, grounding, bonding, and allowable cable types.

Telecommunications Infrastructure Standards

- **ANSI/TIA-942 – Telecommunications Infrastructure Standard for Data Centers**
  Cable pathway systems shall support the spatial, capacity, and redundancy requirements defined for data center environments, including compliance with bend radius, separation, and routing guidelines for both power and telecommunications cabling.
- **ANSI/TIA-569 – Telecommunications Pathways and Spaces**
  Pathway systems shall be designed to accommodate present and future cabling requirements while maintaining accessibility and compliance with fill ratios.

BICSI Standards and Guidelines

- **ANSI/BICSI 002 – Data Center Design and Implementation Best Practices**
  Cable management systems shall align with BICSI recommendations for scalability, maintainability, airflow management, and pathway redundancy.
- **ANSI/BICSI 005 – Electronic Safety and Security (ESS) Design and Implementation Best Practices** (where applicable)
  Pathway systems shall support physical security, segregation, and controlled access requirements.

Underwriters Laboratories (UL)

- **UL 568 – Cable Tray Systems**
  Cable tray assemblies shall be UL Classified or Listed for the intended application.
- **UL 467 – Grounding and Bonding Equipment**
  Metallic cable tray systems used as an Equipment Grounding Conductor (EGC) shall comply with applicable UL grounding and bonding requirements.

National Electrical Manufacturers Association (NEMA)

- **NEMA VE 1 – Metal Cable Tray Systems**
  Cable tray materials, dimensions, load ratings, and finish requirements shall conform to NEMA VE 1.
- **NEMA VE 2 – Cable Tray Installation Guidelines**
  Installation practices shall follow NEMA-recommended methods for support spacing, fastening, bonding, and grounding.

Local Codes and Authorities Having Jurisdiction (AHJ)

All work shall comply with applicable state, regional, and local codes, ordinances, and amendments as enforced by the Authority Having Jurisdiction (AHJ). Where conflicts occur, the most stringent requirement shall govern.

Manufacturer Requirements

Cable tray systems shall be installed in accordance with the manufacturer's published instructions, including requirements for loading, support spacing, transitions, bonding, and accessories. Where manufacturer requirements exceed minimum code requirements, the manufacturer's requirements shall apply.

CONCLUSION

The intent of the 801 Series Mega Snake design is to provide a robust, scalable, and code-compliant cable pathway infrastructure that supports current and future cabling requirements while preserving cable performance, maintaining proper airflow management, and facilitating safe installation and maintenance. The cable tray systems are designed to accommodate high-density environments, minimize field fabrication, ensure consistent grounding and bonding, and integrate seamlessly with both overhead and raised-floor configurations without compromising operational efficiency or aesthetic standards.

Modern data centers, large-scale industrial facilities, and enterprise installations require cable pathway systems that support high-density cabling while maintaining cable performance, code compliance, and long-term operational reliability. Hybrid wire basket tray systems, including the 801 Series Mega Snake, and modular raised-floor solutions such as the 301 Series Snake Canyon, have been evaluated and identified as compliant with applicable industry standards and design criteria.

When properly designed, specified, and installed in accordance with project requirements and governing codes, both overhead and underfloor cable tray systems provide scalable, maintainable, and visually consistent infrastructure solutions capable of meeting the technical, aesthetic, and operational demands of contemporary data center environments.

Contact us to configure Mega Snake for your next project.
Our manufacturing company is proud to be fully compliant with the Build America, Buy America Act (BABA). We ensure that all products manufactured and materials used in our operations meet the stringent requirements set forth under BABA guidelines. This includes sourcing components domestically, maintaining traceability of materials, and upholding rigorous quality and documentation standards.