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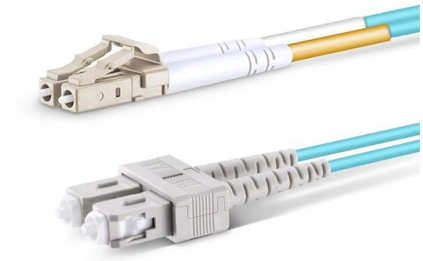
How to calculate the seismic support frame for cable trays



Overview

There are only a few cases of collapse of conduit or cable tray support systems in earthquakes or on shake tables.

Key Takeaways

Seismic support frames for cable trays are calculated by combining dead loads, seismic forces, and structural analysis to determine bracing, support spacing, and member sizing according to applicable codes.Step 1: Determine Loads
• Dead Load (D): Includes the weight of the cable trays, cables, covers, and permanently attached components ( ).

• Seismic Load (E): Calculated using the seismic coefficient (Fp) multiplied by the total weight of the supported system. For critical facilities, an importance factor may be applied (e.g., 1.5 for essential systems) ( ).

• Load Combinations: Combine dead and seismic loads according to local building codes or standards such as IEEE 344, AISC-N690, or UBC provisions ( ).
Step 2: Select Support Type and Layout
• Support Types: Options include rod hangers, trapeze frames, cantilever brackets, or proprietary steel channels ( ).

• Spacing: Determine horizontal and vertical spacing of supports based on tray width, weight, and seismic forces. Wider spacing increases seismic load on each support ( ).

• Bracing: Include diagonal bracing between layers of cable trays to resist lateral seismic forces. Bracing should be connected to rigid points such as walls, roof diaphragms, or equipment cabinets ( ).
Step 3: Calculate Seismic Forces on Supports
• Tributary Weight: Assign the portion of cable tray weight each support or bracing element carries. For multi-layer trays, distribute loads to upper and lower supports ( ).

• Lateral Force: Multiply the tributary weight by the seismic coefficient (e.g., 0.2g–0.675g depending on code and importance factor) to determine horizontal seismic forces ( ).

• Vertical Effects: If bracing is installed at an angle, calculate vertical uplift forces using trigonometry (e.g., vertical force = horizontal force / sin(angle)) ( ).
Step 4: Structural Analysis
• Member Sizing: Check bending moments, axial loads, and deflection for HSS or strut members under combined dead and seismic loads ( ).

• Connection Design: Ensure top and bottom connections of bracing elements can resist calculated reactions without yielding or buckling ( ).

• Rod Hangers: Include stiffeners if necessary to prevent buckling under combined vertical and lateral loads ( ).
Step 5: Verify Compliance
• Codes and Standards: Ensure design meets relevant standards such as AISI, AISC, IEEE 344, NEMA VE 1, or local building codes ( ).

• Walkdown and Analytical Review: Conduct in-plant inspections and limited analytical review to identify potential weak points or non-ductile connections ( ).
Step 6: Documentation
• Record all calculations, support layouts, bracing details, and load assumptions. Include any deviations or special conditions requiring further evaluation ( ). By following these steps, engineers can design seismically robust cable tray support frames that maintain electrical system integrity during earthquakes while complying with applicable codes and standards.

Article Content

How to calculate the seismic support frame for cable trays

This article will explore the importance of seismic resistance in cable trays, discuss when seismic braces are necessary, and help

simulATe — Precision Tray Analytics

Professional cable tray and containment engineering software. Standards-compliant ampacity, pulling, seismic, fire and 3D analysis

Cable Tray Load Calculation Guide | PDF | Snow | Structural Load

This document provides guidelines for determining load factors that should be considered when designing support systems for Snap

Cable Tray and Conduit System Seismic Evaluation Guidelines

There are only a few cases of collapse of conduit or cable tray support systems in earthquakes or on shake tables. One collapse

B-Line series Cable Tray Design Considerations

As an industry leader in cable tray, Eaton offers one of the widest ranges of cable management solutions available in the market

Seismic Supports for Electrical Cable Systems

Seismic Category I supports for electrical conduit and cable tray systems are described. Types of supports and their analysis, design,

Installing Seismic Restraints for Electrical Equipment

Raceways/Conduits/Cable Trays: Covers the different ways to install raceways, conduits, and cable trays. Attachment Types: Gives

Rev 4 to Procedure SAG-CP4, "Seismic Design Criteria for Cable

the various design approaches and their corresponding seismic input criteria. The following sections describe in detail the guidelines

One source for all of your seismic and cable management needs

Our cable tray, bolted framing, and seismic bracing are approved as one system through third party testing. Our team of experts can

What are the seismic design considerations for cable trays?

By carefully considering the material selection, component sizing, connection details, dynamic response, installation, and support, we

Performance-based earthquake engineering methodology for

Cable trays are long distributed structures and generally multi-span steel structures suspended from the ceiling (Fig. 1a), or mounted

Seismic fragility analysis of suspended cable trays in civil buildings

This study aims to understand the seismic fragility of typical suspended cable trays in civil buildings through full-scale

Seismic Bracing Systems for Cable Trays Catalog

Explore seismic bracing solutions for cable trays. Catalog details wire rope/cable systems, specs, design for earthquake protection.

Circuit Integrity of Cable Tray Wiring Systems During Natural Disasters

For those installations, Seismic Restrained Cable Tray Wiring Systems may be obtained by providing the proper multidirectional

6.4 Mechanical, Electrical, and Plumbing Components

ASCE/SEI 7-10 exempts electrical raceways, conduit, cable trays, and bus ducts from seismic bracing requirements in Seismic

PERFORMANCE-BASED EARTHQUAKE ENGINEERING

Thus, probabilistic seismic assessment of the building structures and cable trays is rational. Division V Performance-based

Revision 3A to, "Generic Implementation Procedure (GIP) for

The seismic review guidelines contained in this section are applicable to steel and aluminum cable tray and conduit support systems

Related Video Reference

This video was associated with the source search result. Verify technical details against current product documentation and project requirements.

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This document is for preliminary research. Verify specifications against current standards, product documentation and project requirements.