DIVISION OF
FACILITIES CONSTRUCTION &
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General Information Regarding Nonstructural Components

- Section 1613.1 of the 2015 IBC states: "Every structure, and portion thereof, including **nonstructural components** that are permanently attached to structures and their supports and attachments, shall be designed and constructed to resist the effects of earthquake motions in accordance with ASCE 7."

- **What are "nonstructural components"?**
  - Nonstructural components consist of architectural, mechanical, and electrical components that are permanently attached to, or supported by the primary structure.
  - Table 13.5-1 of ASCE 7 provides the following examples of "Architectural" components – *interior nonstructural walls and partitions, cantilevered elements such as parapets and chimneys, exterior wall panels and glazing elements, veneer, penthouses, ceilings, cabinets, access floors, appendages & ornamentations, signs and billboards, and other rigid and flexible components.*
  - Table 13.6-1 of ASCE 7 provides the following examples of "MEP" components – *HVAC, fans, AC units, cabinet heaters, air distribution boxes, boilers, furnaces, tanks, chillers, water heaters, heat exchangers, evaporators, air separators, MFR & processing equipment, engines, turbines, pumps, compressors, pressure vessels, elevators, escalators, generators, batteries, inverters, motors, transformers, motor control centers, panel boards, switch gear, instrumentation cabinets, communication equipment, computers, instrumentation & controls, stacks, electrical towers, lighting fixtures, vibration isolated components, piping & conduit systems, ductwork, conveyors, and cable trays.*

- **Why is nonstructural seismic restraint important?**
  - Nonstructural damage has historically accounted for 25-50% of the damage observed in recent earthquake events within the United States.
  - Even for small earthquakes, nonstructural damage may represent a life safety hazard.
  - The cost of nonstructural components within a building is often greater than the cost of the primary structure itself.

- **What is meant by seismic restraint?**
  - "Seismic restraint" refers to the anchorage or bracing of nonstructural components in an effort to minimize the displacement of the component during an earthquake event.

- **Are all nonstructural components required to be seismically restrained?**
  - There are several instances where seismic restraint is not required. Below is a listing of exceptions included within the IBC and ASCE 7.
  - Section 1613.1 of the 2015 IBC
    - Detached one- and two-family dwellings where S_S<0.4g (i.e. Seismic Design Category A, B, C).
    - Wood-framed buildings meeting conventional construction requirements (IBC 2308).

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- Agricultural storage structures.
- Structures that require special consideration and are not addressed in the IBC or ASCE 7 (i.e. bridges, transmission towers, etc.).

❑ Section 13.1.4 of ASCE 7

- Nonstructural components located within Seismic Design Category 'B or less'.
- Nonstructural MEP components located within Seismic Design Category 'C' and having an importance factor (I_P) equal to 1.0.
- Nonstructural MEP components located within Seismic Design Category 'D or above' and…
  - ♦ … flexible connections are provided between components and associated ductwork, piping, and conduit are provided, and…
  - ♦ … components weigh less than 400lbs and are mounted no more than 4-ft above the floor level, and…
  - ♦ … components weigh less than 20lbs and are attached to ceilings or walls, and…
  - ♦ … components consist of distribution systems weighing 5lbs/ft or less.

➢ **What are some examples of seismic restraint?**

❑ The Federal Emergency Management Agency (FEMA) has developed several guides for the installation of seismic restraints for mechanical equipment (FEMA 412), electrical equipment (FEMA 413), and for ductwork and piping systems (FEMA 414). Free copies of these publications can be downloaded from the following website: http://www.fema.gov/help/publications.shtm. The figures shown below represent examples of seismic restraint which are shown in each of these three FEMA guidelines.

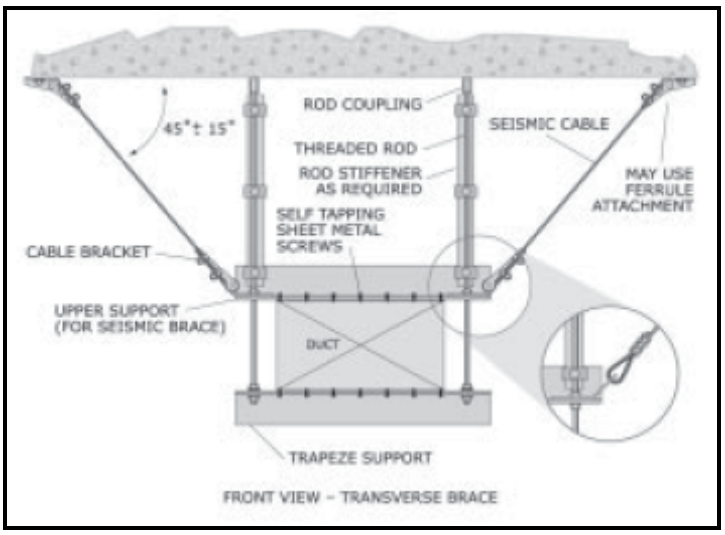

Figure 1. Cable bracing of rectangular duct.

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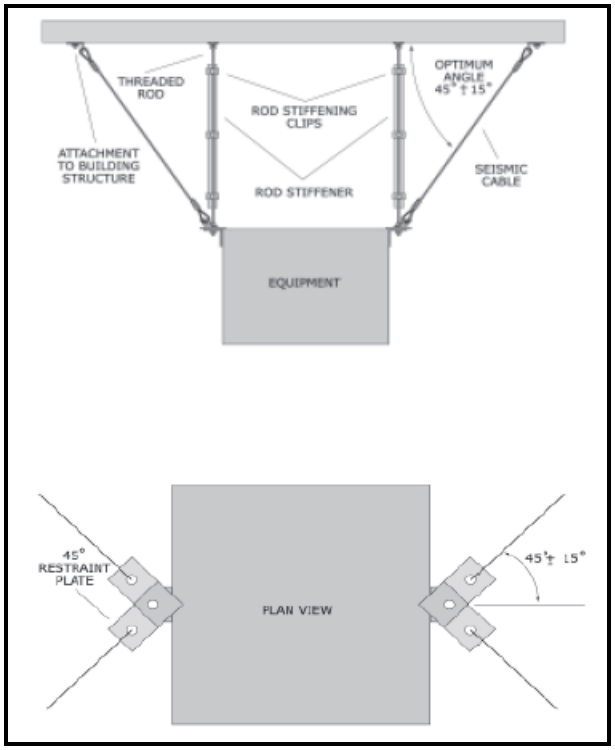

Figure 2. Double-rod support of mechanical equipment.

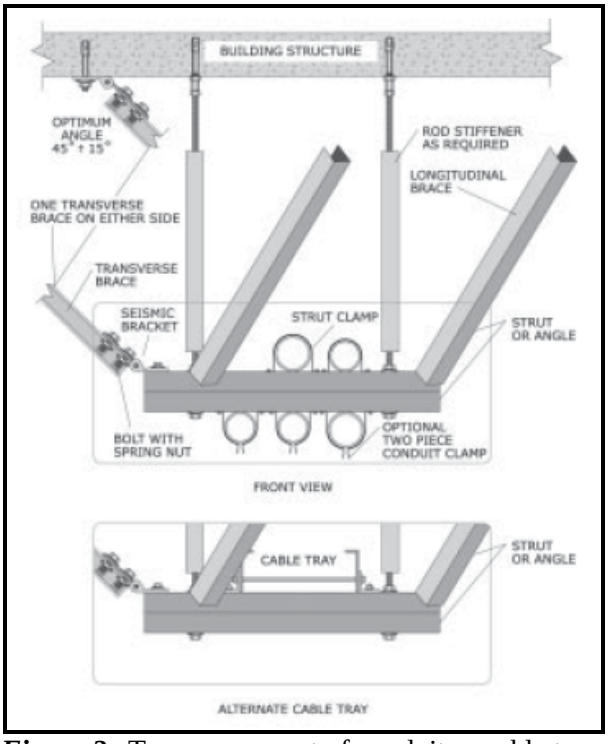

Figure 3. Trapeze support of conduit or cable tray.