PART 1 - GENERAL

1.01 DESCRIPTION

A. Provide all required seismic restraints and calculations in order to insure that the installation of all architectural, mechanical, and electrical equipment/components are in compliance with all applicable seismic codes, standards, and specific information listed herein.

1.02 QUALITY ASSURANCE

A. ASTM standards

B. 2019 California Building Code, Title 24 (CBC)

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for each type of material listed in this Section.

B. Submit special seismic certification (OSP) for mechanical and electrical equipment/components as noted on CBC 1705A.13.3.1. Contractor shall bear all costs associated with any and all tests, engineering calculations and documentation required to obtain OSHPD approval in accordance with this section in a timely manner if the Contractor chooses to select equipment that does not already have special seismic certification as noted on the design documents.

C. Submit OSHPD Pre-approved Manufacturer's Certification (OPM) as noted on the design drawings.

PART 2 - PRODUCTS

2.01 SEISMIC RESTRAINT REQUIREMENTS

A. SUMMARY

1. This section covers the seismic restraint requirements for suspended distribution systems, vibration and non-vibration isolated items, systems and/or related suspended equipment.

2. The designers of record (DOR) as referenced in this specification shall be the project architect, structural engineer and the appropriate system engineer (e.g., electrical, etc.).

3. An OSHPD OPM determined by the DOR shall be considered as the specified seismic design for this project. Other designs may be submitted as an alternate provided that they meet or exceed all of the requirements contained within these specifications, OSHPD pre-approved service loads, installation applications, and engineering services.

B. SEISMIC RESTRAINT DESIGN
1. The attachment, supports and seismic restraints of suspended non-structural components and distribution systems listed below shall be designed to resist the total design seismic forces prescribed in the CBC.
   a. All equipment/components including but not limited to: electrical, mechanical, plumbing, and architectural.
   b. Without referencing OPM or OSHPD pre-approved seismic attachment and supports shown on the design document, seismic support and attachment shall be engineered and built by the applicable system contractor. Engineering shall be performed (signed & sealed) by a licensed California Structural Engineer and submitted to the DOR and OSHPD for acceptance prior to installation. Cost to be borne by the contractor.
   c. Design and installation shall consider seismic relative displacement in accordance with ASCE 7-16.
   d. Pipes with hazardous contents including but not limited to medical gas, fuel oil, natural gas piping larger than 1-inch diameter shall be seismically braced per the OPM or OSHPD pre-approved design.

2. Seismic restraint transverse and/or longitudinal spacing shall be in accordance with CBC and OPM and limited to the following;
   a. Seismic design forces equal to or less than the capacity of the building structure.
   b. 40’ feet transversely and/or 80’ feet longitudinally where pipes, conduits, and their connections are constructed of ductile materials (copper, ductile iron, steel or aluminum and brazed, welded or screwed connections).
   c. 20’ feet transversely and/or 40’ feet longitudinally where pipes, conduits, and their connections are constructed of nonductile materials (e.g., cast iron, no-hub pipe and plastic).
   d. 20’ feet transversely and/or 40’ feet longitudinally for bus ducts and cable trays, baskets, channels.

3. Contractor shall not adopt, use or otherwise implement the omission of any seismic restraints without prior review and acceptance by the designers of record. All submittals for omission of seismic restraints must include the following, and must be performed (signed & sealed) by a licensed California Structural Engineer and approved by OSHPD;
   a. Project specific cover letter clearly indicating that said engineer has completely reviewed the project documents, and that the items/systems were designed individually and in coordination with all other trades, and references the code section(s) where the omission of seismic restraints is allowed.
   b. Lateral motion of the supported items/systems shall not directly or indirectly impact adjacent life safety, emergency services and/or hazardous items/systems or their supports.
4. Seismic hardware brackets shall provide a (Captive) 360-degree connection that completely encloses or encircles the rod, anchor, bolt, fastener, etc. Open hook and/or open slot seismic hardware brackets shall not be allowed.

5. Seismic restraint assembly connections shall not incorporate the use of break-off bolts or nuts and pneumatic fasteners unless referenced in the OPM document.

6. Ceiling system shall not be used as a seismic restraint, sway brace and/or safety restraint material.

7. Non-seismic and/or safety restraints sway bracing shall meet or exceed that required for the attachment of seismic restraints to the building structure.

8. Seismic restraints shall be installed to provide a minimum of (2) two transverse and (1) one set of (2) two longitudinal braces per run and per the OPM document.

9. The accumulated load of multiple items at any given support (with or without seismic restraints) shall not overload the building structure and the support assembly.

10. Pipes, conduits, and other items attached to trapeze hangers shall be located uniformly along each individual trapeze hanger so that the accumulated load is evenly distributed.

11. Trapeze systems installed in a multi-layer configuration shall have seismic restraints designed and installed for each individual trapeze layer.

12. Design of supports, seismic restraints and anchorage to the structure shall consider all conditions that involve thermal, structural separation, relative displacement, building expansion and contraction.

13. SMACNA details shall not be used without prior approval by Structural Engineer of Record (SEOR).

C. ACCEPTABLE MANUFACTURERS

1. OSHPD Pre-approved Certified Manufacturer (OPM)

D. ANCHORS, INSERTS AND FASTENERS

1. All anchors, inserts, fasteners or connections to the structure shall be submitted to the structural engineer of record for review and acceptance prior to installation.

2. Do not use any anchor or insert in concrete or metal decking with concrete fill, which does not have one of the following:
   a. ICC evaluation report
   b. OSHPD pre-approval

3. Cast-in-place inserts that contain internal threads shall include the installation of a jam or lock nut to secure the connection of the vertical support rod to the cast-in-place insert.

4. Cast-in-place inserts that allow for horizontal adjustment shall not be allowed,
unless an engineered solution is provided to assure positive captured positioning and secured attachment.

5. Do not use powder driven and power driven (Shoot-In) fasteners, expansion nails or internally threaded anchors in concrete or metal decking with concrete fill without prior approval of the Project Manager and verifying that the embedment depth will not damage any buried conduits or piping.

6. All beam clamps shall be constructed of malleable iron or steel. All single flange mounted beam clamps shall include a retaining strap or J-hook and must be submitted to the project structural engineer of record of review and acceptance prior to installation. Beam clamps shall not be used to resist seismic loads.

E. FIELD QUALITY CONTROL

1. Inspection of seismic restraints by the Inspector of Record (IOR), and/or Authority Having Jurisdiction (AHJ).

2. Special inspection for special seismic certification per CBC 1705A.12.4.

PART 3 - EXECUTION

3.01 SEISMIC ANCHORING AND RESTRAINTS

A. Equipment anchors:

1. All equipment shall be anchored. Anchor equipment per details shown on the drawings where provided.

2. Anchor installation shall be in accordance with the current ICC report.

3. Anchor details provided are based on specific equipment information. Submit design for approval for anchoring of equipment which varies from design.

B. Conduit supports:

1. Conduits shall be supported and braced per CBC.

C. Lighting fixture supports:

1. Provide independent seismic support system per CBC.

D. Minimum clearance:

1. Diagonal braces and hanger supports shall maintain 6 inches minimum clearance from unbraced ducts and conduits, and 1 inch minimum clearance from braced ducts and conduits.

3.02 INSTALLATION AND TESTING OF MECHANICAL ANCHORS:

A. Where permitted in other Sections of this specification, drilled-in expansion-type anchors or other post-installed concrete anchors may be used in hardened concrete.

B. All post-installed concrete anchors shall be tested. Testing shall be performed in the presence of the Inspector of Record. Number of anchors to be tested shall be as shown on
the drawings with a minimum of 50% of anchors installed and at each support. Testing shall be performed by torque or pull test, and to the values noted on the drawings. Test loads, frequency and acceptance criteria of post-installed anchors in concrete shall be in accordance with CBC 1910A.5.

C. Internally threaded shell-type anchors and displacement controlled anchors (e.g., drop-in anchors, screw anchors, adhesive anchors, etc.) shall not be tested using a torque wrench.

D. Screw anchors shall be installed with a calibrated torque wrench and may be loosened a maximum of one full turn to facilitate the positioning of a tension test collar. Following the tension test, the anchor shall be re-torqued in accordance with the manufacturer's installation instructions.

E. Tension test of chemical/adhesive anchors and power actuated fasteners shall be in accordance with CBC and as noted on the drawings.

F. All testing procedures shall be in accordance with CBC 1910A.5, and as noted on the drawings.

G. Locate existing reinforcing steel and conduits in slabs and walls prior to drilling holes for the mechanical anchors.

END OF SECTION 01451