SECTION 16070 – ELECTRICAL SEISMIC RESTRAINTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract documents, as listed on the Table of Contents and including General and Supplementary Conditions and Division 1, General Requirements, shall be included in, and made part of, this Section.

1.2 DESCRIPTION OF WORK

A. Furnish and install necessary seismic restraints for electrical equipment in accordance with the IBC 2003, Seismic Design Category C Importance Factor 1.5 and the requirements of this specification.

B. The work in this Section shall include seismic restraints for the following:

1. Conduits and raceways, including hangers and supports.
2. Emergency generator and automatic transfer switches
3. Secondary entrance switchgear
4. Emergency switchgear
5. Low voltage distribution equipment
6. Lighting fixtures
7. Fire alarm system

C. Seismic restraints shall be provided for both vibration isolated equipment and conduit as well as non-isolated equipment and conduit.

1.3 RELATED WORK

A. For work to be included as part of this section, to be furnished and installed by the Electrical Subcontractor, refer to the Related Work section of Specification Section 16010.

B. Carefully examine all of the Contract Documents, criteria sheets and all other Sections of the specifications for requirements which affect work under this Section, whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all other Trades affecting or affected by the work of this Section. Cooperate with such Trades to assure the steady progress of all work under the Contract.

1.4 REFERENCES

A. Applicable provisions of the following Codes and Trade Standard Publications shall apply to the work of this Section, and are hereby incorporated into, and made a part of the Contract Documents:

1. NFPA 70: National Electrical Code
2. NFPA 72: National Fire Alarm Code
3. NFPA 99: Health Care Facilities
4. NFPA 101: Life Safety Code
5. Occupational Safety and Health Standards
6. National Fire Protection Association
7. International Building Code (IBC) 2003

1.5 ACCEPTABLE MANUFACTURERS

A. Products numbers listed in these specifications are those of Mason Industries, and are used to establish minimum standard. Other acceptable manufacturers shall be:

1. Mason Industries (MI)
2. Amber/Booth (AB)
3. Kinetics Noise Control (KNC)
4. Vibration Eliminator Co. (VEC)
5. Vibration Mountings & Controls (VMC)

1.6 SUBMITTALS

A. Refer to Section 01333—SHOP DRAWINGS, PRODUCT DATA & SAMPLES.

B. A seismic restraint Action Submittal shall be prepared for all systems and equipment covered by this section.

C. The submittal shall be prepared and stamped by a Structural Engineer registered in the State of Maine.

D. The following information shall be included for each piece of equipment or system:

1. Dimensions, weight and center of gravity.
2. The seismic restraint detail, including anchoring methods appropriate for the supporting structure.

3. The seismic restraint detail shall be derived from one of the following:

    a. Calculations showing demand lateral loading, restraint loading, and design of restraint and connections.
    b. Application of a pre-calculated seismic restraint system applicable for the required loads and carrying the approval of ICBO.
    c. Application of a pre-calculated seismic restraint detail for the applicable loads provided by the equipment manufacturer and carrying the approval of ICBO.

4. Documentation of approval for applications.
5. Anchors to concrete shall be specified in detail, including any testing requirements, and shall have ICBO Approval for the specific application.
6. Reaction loads to structure.
7. Layouts of seismic restraints for conduit, busways, etc. or specific instructions for determination of layout and appropriate bracing detail in the field.

E. The submittal shall be reviewed for completeness and use of applicable criteria by the Design Professional in charge of this section. The reaction loads to structure shall be approved by the project Structural Engineer.

F. Submission of samples may be requested for each type of seismic restraint. Samples will be returned for use at the job site if requested. Costs associated with submission of samples shall be borne by the Contractor.

1.7 QUALITY ASSURANCE

A. Refer to Section 01450 – QUALITY CONTROL

B. Qualifications

1. Manufacturer: Company specializing in the design and manufacturing of seismic restraints specified in this section, with documented experience of more than five (5) years.
2. Installer: Company specializing in executing the scope of work specified in this section with documented experience of more than five (5) years.

C. Quality Standards

1. Quality assurance testing required as a condition of product approvals such as concrete anchors shall be carried out and paid for by the contractor.
2. Upon completion of seismic restraint installation, the Contractor and the anchorage engineer shall indicate that, to the best of their knowledge, the seismic anchorage was installed according to the approved submittal and/or any approved revisions thereto. This report shall also identify changes made from the approved submittal. Reports may be submitted by system, or by like groups of components, or for the entire installation covered by this specification section.

1.8 SEISMIC RESTRAINT REQUIREMENTS

A. General

1. Equipment and systems shall be restrained for seismic requirements by Restraint Types as described in PART 2—PRODUCTS.
2. Floor or roof mounted equipment, regardless of weight or vibration isolation requirements, shall be restrained to the structure to allow for required acceleration.
3. Suspended equipment, shall be 2-point or 4-point independently braced with Type III restraints, installed taut for non-isolated equipment, and slack (with 1/2" cable deflection) for isolated equipment. Stiffeners for support rods may be required, certifications shall clearly delineate when such stiffening is required or not. Equipment supports and the required seismic bracing shall be anchored to the structure.
4. Where base anchoring of equipment is insufficient to resist seismic forces, restraints such as Type III shall be located above the unit's center of gravity to resist "G" forces. Vertically mounted tanks and upblast tubular centrifugal fans may require this additional restraint.
5. Design of restraints must consider capacity of structural elements. Project Structural Engineer shall be consulted prior to design of restraints for large or unusual loads.

B. Restraint Requirements

1. Conduit, busway and cable tray bracing shall be: 20'-0" maximum transversely; 40'-0" maximum longitudinally; and within 4'-0" each change of direction.
2. Seismic restraints are not required on the following:

    a. Individually supported electrical conduit less than 2“ nominal diameter.
    b. The exclusion for bracing can only be used for conduits with hangers less than 12” in length.

3. Suspended conduit, not excluded by diameter or distance from structure allowances, shall have Seismic Restraint Type III or V.
4. Trapeze hangers supporting conduit alone or in combination with piping, where each individual element does not require bracing, will require seismic restraint when the aggregate weight of all elements supported on the trapeze assembly exceeds 10 pounds per foot. Weight shall be determined assuming all pipes are filled with water and conduits are filled with conductors as scheduled.
5. Conduit and busway risers through cored shafts require no additional seismic bracing. (Core diameters to be a maximum of 2" larger than conduit O.D.)

C. Isolated Equipment Restraint Requirements

1. For seismic restraint of isolated equipment refer to restraint types listed for specific equipment in the Vibration Isolation Requirements of Section 16075. Coordinate seismic restraint with vibration isolator and equipment base requirements.

D. Non-Isolated Equipment Restraint Requirements

1. Ceiling suspended equipment.

a. Restraint Type III or V.

2. Suspended ceilings containing light fixtures may be considered as meeting seismic zone requirements. In which case, earthquake clips or other approved means of positive attachment shall secure fixture to T-bar structure.
3. Floor or wall mounted equipment.

a. Restraint Type III or V.

E. Provide restraints for suspended transformers and other suspended electrical equipment.

F. Install equipment on isolators and after the isolators have been adjusted for required deflection.

PART 2 - PRODUCTS

2.1 SEISMIC RESTRAINT – GENERAL

A. Seismic restraints shall be capable of accepting, without failure, seismic forces determined in accordance with the **[ ]** State Building Code. They shall maintain the equipment in a captive position and not short circuit isolation during normal operating conditions. Isolators shall have provisions for bolting and/or welding to the structure.

B. Metal parts of seismic restraint equipment installed out-of-doors shall be cold dip galvanized, cadmium plated, or neoprene or PVC coated after fabrication. Galvanizing shall meet ASTM alt Spray Test Standards and Federal Test Standard #14.

C. Attachment plates to be cast into housekeeping pads, concrete inserts and beam clamps that may be required for seismic compliance shall be provided by this Section.

2.2 SEISMIC RESTRAINT TYPES

A. Type I

1. Type I shall comply with general characteristics of spring isolator Type A (as specified in Section 16075) with snubbing restraint in all directions capable of supporting equipment at fixed elevations during installation. Cast or aluminum housings, except ductile iron are not acceptable.

a. Type I seismic restraint shall be Mason Industries Type SSLFH.

B. Type II

1. Each corner or side of equipment base shall incorporate a seismic restraint snubber having a minimum of 5/8" thick resilient pad limit stop. Seismic snubbers shall be in accordance with manufacturer's recommendations.
2. Type II seismic restraints shall be Mason Industries Type Z-1011 or Z-1225.

C. Type III

1. Type III shall be multiple metal cable or strut type with approved fastening devices to equipment and structure. System to be field bolted to deck or to overhead structural members using 2-sided beam clamps or appropriately designed inserts for concrete. All parts of the system including cables, excluding fasteners, are to be of a single supplier to ensure seismic compliance.

D. Type IV

1. Type IV shall have double deflection neoprene isolator (minimum 0.3") encased in ductile iron or steel casing.
2. Type IV seismic restraints shall be Mason Industries Type BR, RBA or RCA.

E. Type V

1. Non-isolated equipment shall be field bolted or welded (powder shots not acceptable) to the structure as required to meet seismic forces. Bolt diameter, imbedment data and/or weld length must be shown in certified calculations.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Seismic restraint systems must be installed in strict accordance with approved submittals, the manufacturer’s details, and IBC State Building Code requirements.

END OF SECTION