

SECTION #15005

SECTION NAME

- 1.01 RELATED DOCUMENTS
- 1.02 GENERAL
- 1.03 RELATED DOCUMENTS
- 1.04 DEFINATIONS
- 1.05 GENERAL DESIGN AND PERFORMANCE REQUIREMENTS
- 1.06 SUBMITTAL DATA REQUIREMENTS
- RELATED WORK
- CODE AND STANDARDS REQUIREMENTS
- QUALITY ASSURANCE

PART 2 PRODUCTS

- 2.01 DESCRIPTION
- 2.02 VIBRATION AND ISOLATION TYPES
- 2.03 SEISMIC RESTRAINT TYPES
- 2.04 EQUIPMENT BASES
- 2.05 FLEXIBLE CONNECTORS

PART 3 EXECUTION

- 3.01 EXAMINATION
- 3.02 COMPONENT INSTALLATION
- 3.03 EQUIPMENT INSTALLATION
- 3.04 PIPING AND DUCTWORK INSULATION
- 3.05 EXCLUSIONS
- 3.06 FIELD QUALITY CONTROL, INSPECTION

TABLES, CHARTS AND FORMS

THIS PAGE INTENTIONALLY LEFT BLANK

## PART 1 - GENERAL

## 1.01 RELATED DOCUMENTS

- A. All of the Project "General Documents" apply to work specified in this Section; consult them in detail for applicable instructions. **Particular attention is called to Paragraph G5-K.8, therein.**
- B. Manufacturers referenced in the technical specifications are for the purpose of establishing a standard of quality. Alternate manufacturers providing the same quality materials or equipment will be given consideration by the Architect and/or Engineer if they are notified in writing per General Conditions Par. G5-K.6.
- C. This Section applies equally and specifically to all Contractors and Subcontractors supplying labor and/or equipment and/or materials as required under the Heating, Ventilating and Air Conditioning, Plumbing, Sprinkler and Electrical Sections of the Specifications.
- D. Section 15000 - Special Requirements for Mechanical and Electrical Work shall apply.

## 1.02 GENERAL

- A. This specification combines vibration control and seismic restraints where applicable, with the new wind load requirements for all roof mounted equipment in any location. Additionally included are provisions for flood control as stated herein. When projects are located in a geographically active seismic, wind or flood location, Article 1.05, General Design & Performance Requirements will elaborate on those requirements and include requirements pertaining to a facilities "continued operation". Article 1.05, Paragraph C is a partial list of components covered herein. This specification is part of the general conditions for the Plumbing, Fire Protection and Electrical contracts. This is a Seismic IV Design Category C Project.
  - 1. All equipment, piping, ductwork and conduit as noted on the drawings schedule or in the specification shall be seismically braced if the building is classified as listed herein. Vibration control shall apply as described in all cases herein.
  - 2. All roof mounted components shall comply with section 1609, Wind Load, IBC-2009. There shall be no decrease of the effects of wind load on a component due to other structures or components acting as blocks or screens.
  - 3. All below, at grade or above grade locations located in a flood hazard area as defined and located herein.
  - 4. Seismic bracing, wind, flood load and isolation materials shall be the certified products of the same manufacturing group and shall be certified by that group.
  - 5. It is the intent of the seismic and wind load portion of this specification to keep all mechanical, electrical, plumbing and fire protection building system components in place during a seismic or high wind event and additionally operational where the occupancy category of the building so requires as listed herein.

SECTION 15005  
VIBRATION ISOLATION AND SEISMIC RESTRAINTS  
FOR HVAC, FIRE PROTECTION, ELECTRICAL AND PLUMBING

OMDEX INC.

6. All such systems must be installed in strict accordance with seismic / wind codes, component manufacturer's and building construction standards. Whenever a conflict occurs between the manufacturers or construction standards, the most stringent installation practice shall apply.
  7. This specification is considered to be minimum requirements for seismic, wind, flood and vibration control considerations.
  8. Any variation which results in non-compliance with the specification requirements shall be corrected by the contractor in an approved manner.
- B. The work in this section includes, but is not limited to the following:
1. Vibration isolation for piping, ductwork, conduit and equipment all referred to as components.
  2. Equipment isolation bases.
  3. Seismic restraints for isolated equipment.
  4. Seismic restraints for non-isolated equipment.
  5. Wind restraints for isolated equipment.
  6. Wind restraints for non-isolated equipment.
  7. Flood restraints for isolated equipment.
  8. Flood restraints for non-isolated equipment.
  9. Certification of seismic, wind or flood restraint designs and installation supervision and sign off by a New Jersey Professional Engineer.
  10. Certification of seismic attachment of housekeeping pads.
  11. All equipment (components) requiring IBC compliance.
  12. All inspection and test procedures for equipment (components) requiring IBC compliance.
- C. All mechanical, electrical, plumbing or fire protection equipment and pipe, within on or outdoors of the building. Equipment buried underground is included if essential to the building's function. Entry of services to the building, up to but not including the utility connection is part of this Specification.

Equipment referred to below is typical. (Equipment not listed is still included in this specification.) All systems listed in this paragraph or are part of the structure in any way are referred to as components.

AC Units	Humidifiers
Air Handling Units	
Air Separators	Light Fixtures
Battery Chargers	Motor Control Centers
Battery Racks	Ductwork
Boilers	Pipe
Bus Ducts	Pumps (all types)
Cabinet Unit Heaters	Risers
Cable Trays	Rooftop Units
Chillers	Supports
Compressors	Switch Gear
Computer Room Units	Tanks (all types)
Gas Detection Systems	Transformers
Generators	Unit Heaters
Curbs	Unit Substations
Dry Coolers	Unit Ventilators
Electrical Panels	Variable Frequency Drives
Fans (all types)	Vibration Isolators
Fan Coil Units	Water Heaters
Fire Alarm Panels	
Heat Exchangers	

### 1.03 RELATED DOCUMENTS

Drawings and general conditions of the contract, including General Supplementary Conditions and Division 1 Specification Section apply to this section. In the event that this section conflicts with the isolation or seismic requirements of other sections, the more stringent criteria stated herein shall apply.

### 1.04. DEFINITIONS (building & components), all codes.

#### A. ESSENTIAL FACILITIES

1. Buildings and other structures that are intended to remain operational in the event of extreme environmental loading from flood, wind, snow or earthquakes.

#### B. LIFE SAFETY & HIGH HAZARD:

1. All systems involved with fire protection including sprinkler piping, jockey pumps, fire pumps, control panels, service water supply piping, water tanks, fire dampers and smoke exhaust systems and fire alarm panels. (Life Safety)
2. All mechanical, electrical, plumbing or fire protection systems that support the operation of or are connected to emergency power equipment including all lighting, generators, transfer switches and transformers. (Life Safety)
3. All medical and life support systems. (Life Safety)

4. Hospital heating systems and air conditioning systems for maintaining normal ambient temperature. (Life Safety)
5. Automated supply, exhaust, fresh air and relief air systems on emergency control sequence including air handlers, duct, dampers, etc. or manually operated systems used for smoke evacuation, purge or fresh air relief by the fire department. (Life Safety)
6. All gases or fluids which must be contained in a closed system which are flammable or combustible. Any gas which poses a health hazard if released into the environment. (High Hazard)
7. Heating systems in any facility in Occupancy Category IV, IBC-2006 where the ambient temperature can fall below 32 degrees Fahrenheit.

### C. GENERAL

**Anchor:** A device, such as an expansion bolt, for connecting duct or pipe bracing members into the structure of a building.

**Approved Agency:** An established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved.

**Attachment:** see **Positive Attachment** below.

**Basic Wind Speed:** The basic wind speed, in mph, for determination of the wind loads shall be as per section 1609, (IBC-2009). Local jurisdictions shall determine wind speeds for indicated special wind regions located near gorges or mountainous terrain. Section 6.5.4 of ASCE-7-05 shall be used after determination of basic wind speed by the local jurisdiction. See section 1609.3, ASCE-7-05 for basic wind speed determination in non-hurricane prone regions.

**Bracing:** Metal channels, cables or hanger angles that prevent ducts and pipes and/or equipment components from breaking away from the structure during an earthquake or high winds. See also **Longitudinal Bracing** and **Tranverse Bracing**. Together, they resist lateral loads from any direction.

**Certificate of Compliance:** A certificate stating that materials and products meet specified standards or that work was done in compliance with approved construction documents, provided by an approved agency. (Issued by equipment component manufacturer )

**Component:** A part or element of an architectural, electrical, mechanical, or structural system within or without a building system.

**Component, equipment:** A mechanical or electrical component or element that is part of a mechanical and/or electrical system within or without a building system.

**Component, flexible:** Component, including its attachments, having a fundamental period greater than 0.06 seconds.

**Component, rigid:** Component, including its attachments, having a fundamental period less than or equal to 0.06 seconds.

**Dynamic properties of piping:** The tendency of pipe to change in weight and size because of the movement and temperature of fluids in them. This does not refer to movement due to seismic forces.

**Equipment:** Systems associated with ducts, pipes and conduit, also called components.

**Flood or Flooding:** A general and temporary condition of partial and complete inundation of normally dry land from:

1. The overflow of inland or tidal waters.
2. The unusual and rapid accumulation of runoff of surface waters from any source.

**Flood Hazard Area:** The greater of the following of two areas:

The area within a flood plain, subject to a 1-percent or greater chance of flooding in any year.

The area designated as a flood hazard area on a community's flood hazard map, or otherwise legally designated.

**Flood Hazard Area Subject to High Velocity Wave Action:** Area within the flood hazard area that is subject to high velocity wave action and shown on a Flood Insurance Rate Map (FIRM) or other flood hazard map as zone V, VO, VE or VI-30.

**Flood Insurance Rate Map (FIRM):** An official map of a community on which the Federal Emergency Management Agency (FEMA) has delineated both the special flood hazard areas and the risk premium, zones applicable to the community.

**Gas pipes:** For the purposes of this Specification Guide, gas pipe is any pipe that carries fuel gas, fuel oil, medical gas, or compressed air.

**Hazardous Contents:** A material that is highly toxic or potentially explosive and in sufficient quantity to pose a significant life-safety threat to the general public if an uncontrolled release were to occur.

**Hurricane Prone Regions:** Areas prone to hurricanes include the U.S. Atlantic Ocean, Gulf Coasts, Hawaii, Puerto Rico, Guam, Virgin Islands, and American Samoa where the wind speed is greater than 90 mph.

**Inspection Certificate:** An identification applied on a product by an approved agency containing the name of the manufacturer, the function and performance characteristics, and the name and identification of an approved agency that indicates that the product or material has been inspected and evaluated by an approved agency (*see Section 1703.5 and "Label" and "Manufacturer's Designation and "Mark"*).

**Label:** An identification applied on a product by the manufacturer that contains the name of the manufacturer, the function and performance characteristics of the product or material, and the name and identification of an approved agency and that indicates that the representative sample of the product or material has been tested and evaluated by an approved agency (*see Section 1703.5 and "Inspection Certificate" and "Manufacturer's Designation and "Mark"*).

**Lateral forces:** Force acting on a duct or pipe in the horizontal plane. This force can be in any direction.

**Longitudinal bracing:** Bracing that prevents a duct or pipe from moving in the direction of its run.

**Longitudinal force:** An applied force that happens to be in the same direction as the duct or pipe run.

**Manufacturer's Designation:** An identification applied on a product by the manufacturer indicating that a product or material complies with a specified standard or set of rules (see also "Inspection Certificate" and "Label").

**Occupancy Category:** A classification used to determine structural load requirements including those imposed by wind, flood, snow and seismic based on occupancy of the structure.

**Occupancy Importance Factor:** A factor assigned to each structure according to its Seismic Use Group.

**Positive Attachment:** A mechanical device, designed to resist seismic forces, that connects a non-structural element, such as a duct, to a structural element, such as a beam. Bolts and welding are examples of positive attachments. Glue and friction anchorage does not constitute positive attachment. Examples of positive attachment are epoxy cast in anchors and drill in wedge shaped anchor bolts to concrete and welded or bolted connections directly to the building structure. Double sided beam clamps only loaded perpendicular to the beam are also acceptable. Single side beam clamps, C type are not acceptable as either brace point attachments to the structure or for the support of the component at the bracing location.

**Seismic Design Category:** A classification assigned to a structure based on its Seismic Use Group or Occupancy Category and the severity of the design earthquake ground motion at the site.

**Seismic Forces:** The assumed forces prescribed herein, related to the response of the structure to earthquake motions, to be used in the design of the structure and its components.

**Seismic Use Group, Occupancy Category, IBC-2009:** A classification assigned to a building based on its use as defined in *Section 1604.5*.

**Seismic:** (adj.) Related to an earthquake. Seismic loads on a structure are caused by wave movements in the earth during an earthquake.

**Site Class:** A classification assigned to a site based on the types of soils present and their engineering properties as defined in *Section 1615.15.52, (IBC-2009)*.

**Special Inspection, Continuous:** The full-time observation of work requiring special inspection



by an approved special inspector who is present in the area where the work is being performed.

**Special Inspection, Periodic:** The part-time or intermittent observation of work requiring special inspection by an approved special inspector who is present in the area where the work has been or is being performed and at the completion of the work.

**Special Inspection:** Inspection as herein required of the materials, installation, fabrication, election or placement of components and connections requiring special documents and referenced standards (*see Section 1704*).

**Story Drift Ratio:** The story drift divided by the story height.

**Transverse bracing:** Bracing that prevents a duct or pipe from moving from side to side.

**Wind-Borne Debris Region:** Portions of hurricane-prone regions that are within 1 mile of the coastal mean high water line where the basic wind speed is 110 mph or greater, or portions of hurricane-prone regions where the basic speed is 120 mph or greater or Hawaii.

## 1.05 GENERAL DESIGN & PERFORMANCE REQUIREMENTS

### A. General design requirements.

**1. SEISMIC CONSIDERATIONS:** This project has design requirements as follows:

- a) All components and additionally, components requiring a manufacturer's Certificate of Compliance to prove, "on line capability".

**2. WIND CONSIDERATIONS:** This project has design requirements as follows

- a) Wind load in hurricane and or wind-born debris regions have a building height less than 60 feet.

**3. FLOOD CONSIDERATIONS:** This project has design requirements in accordance with FEMA and or FIRM, (Flood Insurance Rate Map) as follows:

- a) Flood Hazard Area

### B. General Performance Requirements

**1. Seismic & Wind Load Certification and Analysis:**

- a) Calculations by the Manufacturer's qualified licensed Engineer substantiating the mounting system, seismic or wind restraints and recommended anchor bolts shall be submitted for approval along with the shop drawings. Seismic loads shall have their calculations based on seismic loads as established in article 1.5, *paragraph B.5, "Design Seismic Loads"*. Wind loads shall have their calculations based on paragraph B.6 "*Design Wind Loads*". All analysis shall be stamped by a registered professional having a PE from the same state as the project.

SECTION 15005  
VIBRATION ISOLATION AND SEISMIC RESTRAINTS  
FOR HVAC, FIRE PROTECTION, ELECTRICAL AND PLUMBING

OMDEX INC.

b) Unless otherwise specified, all equipment, piping and ductwork shall be restrained to resist seismic forces. Restraints shall maintain equipment, piping or ductwork in a captive position. Restraint devices shall be designed and selected to meet seismic requirements as defined in the latest issue of:

- NFPA, (fire protection only).
- IBC International Building Code 2009

2. OCCUPANCY CATEGORY IV, IBC-2009

In addition to all of the above provisions, projects that are Occupancy Category IV, IBC-2009 all trades shall comply with sections 16 & 17 of the International Building Code using when available, vendors that comply with the provisions stated herein and submitting the special inspections listed within these specifications. Where compliance is not possible, each contractor shall submit a vendor report, ( form CVC-1 at end of this specification) clearly indicating that none of the specified, listed or other vendors known to the contractors meet the compliance, testing and certification portions of the IBC specifications Section 16 and 17 Special inspections of the component installation shall still be conducted, even if no vendors meet the following requirements. All non-isolated and isolated equipment, (components) shall be secured to the structure in accordance with that code!

a) All component manufacturers will submit for approval the following as listed below:

- 1) All **life safety system** components noted in this specification will have the manufacturer of that component submit the Approved Agencies Certificate of Compliance for the specific equipment on this project when the Seismic Design Category is “C-F”. Analytical or Shaker Test certification thru the component’s load path including structure at its center of gravity shall include **anchorage, structural and online capability.** Use of historical data shall be permitted if evidence confirms historical based component having the same construction and weight with accompanying center of gravity as submitted unit and basis of historical claim conforms to loads derived in testing with accompanying accelerations based on AC-156.
- 2) In addition, all components needed for the continued operation of the facility in the above stated categories will have the manufacturer of that component submit the Approved Agency’s Certificate of Compliance for their equipment when the Seismic Design Category is “C-F”. Analytical or Shaker Test certification through the components load path to structure at its center of gravity shall include on line capability. This requirement also pertains to projects that combine an emergency preparedness center within a structure of another Use Group. Where components do not effect the facilities functional operation but could effect the performance of other components should they dislodge, only anchorage of that component requires compliance. Components needed for continued operation of the building require Analytical or Shaker Test certification through the total component’s load path to structure calculated at its center of

SECTION 15005  
VIBRATION ISOLATION AND SEISMIC RESTRAINTS  
FOR HVAC, FIRE PROTECTION, ELECTRICAL AND PLUMBING

gravity. Testing shall prove, anchorage, structural and on line capability. For use of historical data, see above, (1).

- 3) All Components Containing **Hazardous** or **Flammable** materials will have the manufacturer of that component submit the Approved Agency's Certificate of Compliance for their equipment when used on any project having a minimum Seismic Design Category of "C-F". Testing shall be conducted by Analytical or Shaker Test through the total component's load path to structure at its center of gravity and shall prove anchorage, structural capability and hazardous material containment. Testing shall prove that no internal component will rupture to insure against loss of hazardous or flammable (explosive) material which could support combustion, ignite or contaminate.
- 4) All components requiring anchorage compliance only not listed in the above categories shall have the manufacturer of each component submit a PE stamped calculation package that their project specific equipment will accept anchorage through the component's load path to structure at its center of gravity at the designated anchorage locations. This requirement is for all projects having a Seismic Design Category of C-F.

3. SPECIAL & PERIODIC INSPECTION.

The following systems shall require Special Inspection and Periodic Special Inspection for anchorage during the course of construction, as defined earlier in this section for all buildings in Seismic Design Categories C-F.

- a) All smoke control systems. Periodic Special Inspection during erection of ductwork and prior to concealment, for leakage testing. Additionally, prior to occupancy for pressure differential testing.
- b) All electrical components for standby or emergency power systems require Periodic Special inspection. \*
- c) All electrical equipment in Seismic Design Categories E and F. (Periodic)\*
- d) All flammable, combustible and highly toxic piping and their associated mechanical systems. (Periodic) \*
- e) All ductwork containing hazardous materials. (Periodic) \*
- f) All equipment using combustible or toxic energy sources. (Special<sup>-1</sup>)
- g) All electric motors, transformers, switchgear unit substations and motor control centers. (Special<sup>-1</sup>)
- h) Reciprocating and rotating type machinery. (Special<sup>-1</sup>)
- i) Pipe, 3" & larger. (Special<sup>-1</sup>)

SECTION 15005  
VIBRATION ISOLATION AND SEISMIC RESTRAINTS  
FOR HVAC, FIRE PROTECTION, ELECTRICAL AND PLUMBING

OMDEX INC.

- j) Tanks, heat exchangers & pressure vessels. (Special<sup>-1</sup>)
- k) Isolator units for seismic isolation system (Periodic)\*
- l) Manufacturer's Quality Control Program for projects in Seismic Design Categories E or F.

4. Contractor Responsibilities and Approvals:

- a) Each contractor responsible for the installation of the components asterisked above, (\*) shall be responsible for submitting to the design team for their approval, a written contractor's Statement of Responsibility, (IBC Section 1706.1) as outlined below. In addition all (-1) items above require special inspection in accordance with *IBC Section 1707.8* (Form CQAP & SQA-1) at the end of this specification.
- b) Identify the components that are part of the Quality Assurance Plan. (asterisked above)\*
- c) Identify all Special Inspection and Testing for components installed as part of this contract.
- d) List control procedures within the contractor's organization for all special inspection and testing including methods, frequency of reporting and their distribution of those reports.
- e) List personnel and their qualifications exercising control over the seismic aspects of the project.

5. Design Seismic Loads:

- a) Projects located in the United States have a minimum design load of .4g for statically mounted components and 5g. for resiliently mounted components. Actual loads for both internal or external isolation and/or anchorage of components shall be as above or as calculated for the specific project location but in no event shall it be less than the above.
- b) Exclusions for seismic restraint of piping and duct shall be according to applicable codes. The minimum horizontal restraint capability shall be .4g horizontal and .27g vertical. Life safety equipment defined above shall be designed to survive a horizontal load of .9g and a vertical load of .6g.
- c) Testing or calculations (including the combining of tensile and shear loadings) to support seismic restraint designs must be stamped by a registered PE with at least five years of seismic design experience and licensed in the state of the job location. Testing and calculations must include shear and tensile loads as well as one test or analysis at 45° to the weakest mode. IBC Component testing must be by an Approved Agency.

SECTION 15005  
VIBRATION ISOLATION AND SEISMIC RESTRAINTS  
FOR HVAC, FIRE PROTECTION, ELECTRICAL AND PLUMBING

- d) Analysis for anchorage must indicate calculated dead loads, static seismic loads and capacity of materials utilized for connections to equipment and structure. Analysis must detail anchoring methods, bolt diameter, embedment and/or welded length. All seismic restraint devices shall be designed to accept, without failure, the forces detailed in Section 4 acting through the equipment center of gravity. Overturning moments may exceed forces at ground level.
- e) Vertical load shall be calculated at 2/3 the horizontal load.
- f) Internally isolated equipment in lieu of specified isolation and restraint systems must meet all of the requirements of section 4, all articles.
- g) A seismic design Errors and Omissions insurance certificate **MUST** accompany the equipment manufacturer's certification. Product liability insurance certificates are not acceptable.
- h) In the event that the equipment is internally isolated and restrained, the entire unit assembly must be seismically attached to the structure. Curb or roof rail mounted equipment must not only have seismic or wind attachment of the equipment to the roof but also to the curb or rails. The attachment and certification thereof shall be by this section. Sheet metal screw attachment is acceptable provided that the following three conditions are met and verified.
  - Calculations support sufficient quantity & size of sheet metal screws to handle all loads including shear.
  - Space or gap between the inside overhang of the rooftop unit and the curb at each of the screw locations is closed with structural material, tapered to contour to both the curb and the components inside edge structure.
  - The method of attachment does not violate the NRCA rating of the curb by violating the roofs member waterproofing.
- i) Failure is defined as the discontinuance of any attachment point between equipment or structure. Permanent deformation is acceptable as long as the component continues to operate without failure and if permanent, it is within acceptable manufacturing or structural tolerances.

6. Design Wind Loads

- a) All outdoor mounted components shall be positively fastened to their supporting structure as discussed below.
  - If curb or equipment support mounted, article 1.05 paragraph 5h, Design Seismic Loads, shall be followed for all roof mounted components in excess of 9 sq. ft. in area. Curbs shall be as described in Base Type B-3 if isolated, Base type B-4 if non-isolated.

- If equipment support mounted, article 1.05, Design Seismic Loads paragraph 5h. shall be followed for all roof mounted components requiring waterproofed rail supports. Equipment supports shall be Base type B-5 if isolated, Base type B-6 if non-isolated.
  - If equipment is dunnage mounted, positive attachment will occur through welding or bolting of equipment to dunnage steel.
- b) Loads and calculations shall be based on IBC-2006, figure 1609 and relating sections in ASCE7-05.
- c) Where buildings are less than 60 feet in height, loads on roof mounted components shall be based on Section 6.5.15.1, ASCE-7-05.
- d) Equivalent basic wind speed shall be based on IBC-2009, Table 1609.3.1.
- e) In no event shall adjacent buildings, structures or screens be considered to diminish the calculated wind load or its effect on an outdoor component.
7. Design Flood Loads
- a) When a building or structure is located in a flood hazard area, anchorage for all components subjected to those locations shall follow article 1.05, paragraph 2 d. for their proper fastening to structure.
- b) Components used for anchorage purposes shall be hot dipped galvanized, cadmium plated or powder coated for the purpose of anticorrosion.
8. Additional Seismic Design Requirements for Fire Protection Components.
- a) Fire sprinkler piping system shall be braced meeting the minimum requirements of NFPA No. 13. Additionally, all branch lines will be braced for structures in Occupancy Category IV, IBC-2009.
- b) All branch lines shall be end tied if not braced.
- c) Standpipe risers shall be provided with a minimum of (1) flexible coupling, (Victaulic Style 77 or equal) to accommodate lateral drift at each floor level.
- d) Vertical pipe risers shall have their weight where possible supported above the center of gravity of the riser. Provide lateral guides at the top and bottom of the riser and at intermediate points not to exceed 30'.
- e) Friction connections of any fire protection line to structure is not permissible under any circumstances. All connections must be positive.
- f) Branch lines can never act as a brace to mains.
- g) All pipe sleeves either vertical or horizontal through walls or floors shall be designed to accommodate differential movement.

1.06 SUBMITTAL DATA REQUIREMENTS

- A. Refer to Part I.02 General.

- B. The manufacturer of vibration isolation, seismic, wind and flood restraints shall provide submittals for products as follows:
1. Descriptive Data:
    - a. Catalog cuts or data sheets on vibration isolators and specific restraints detailing compliance with the specification.
    - b. Detailed schedules of flexible and rigidly mounted equipment, showing vibration isolators and restraints by referencing numbered descriptive drawings.
  2. Shop Drawings:
    - a. Submit fabrication details for equipment bases including dimensions, structural member sizes and support point locations.
    - b. Provide all details of suspension and support for ceiling hung equipment.
    - c. Where walls, floors, slabs or supplementary steel work are used for restraint locations, details of acceptable attachment methods for ducts and pipe must be included and approved before the condition is accepted for installation. Restraint manufacturer's submittals must include spacing, static loads and seismic/wind loads at all attachment and support points.
    - d. Provide specific details of restraints and anchors; include number, size and locations for each piece of equipment.
  3. e. Calculations shall be submitted as required in Section 1.4, General Design Performance Requirements.

#### 1.07 RELATED WORK

- A. Housekeeping pad design shall be in accordance with concrete design specifications.

Attachment shall be designed and certified according to this section by the seismic/isolation supplier. Material and labor required for attachment and construction shall be by the concrete section contractor, or by this contractor where specified. Housekeeping pads shall be sized to accommodate a minimum of 6" of clearance all around the equipment or 12 times the anchor bolt diameter, whichever is greater. Where exterior isolators are used, this distance shall be as measured from the outer most holes in the isolator base plate to the edge of the housekeeping pad.

- B. The project's structural engineer shall design all roof and interior steel to support and make connections to all components, including roof-mounted equipment specified in other sections. Design shall comply with IBC requirements including load path to structure.

SECTION 15005  
VIBRATION ISOLATION AND SEISMIC RESTRAINTS  
FOR HVAC, FIRE PROTECTION, ELECTRICAL AND PLUMBING

OMDEX INC.

- C. Roof steel supporting roof-mounted equipment shall be designed for all seismic and wind forces including, but not limited to, tension, compression and moment loads.
- D. Chimneys, stacks and boiler breeching passing through floors are to be bolted at each floor level or secured above and below each floor with riser clamps.
- E. Where ceiling are not braced lighting fixtures shall have independent 4 corner diagonal wire ties to structure.
- F. Lay-in ceilings in compliance with seismic zone requirements may use earthquake clips or other approved means of positive attachment to brace fixtures such as panel light and diffusers less than 75 pounds to T-bar structures. Local codes dictate fixture support requirements.

1.08 CODE AND STANDARDS REQUIREMENTS

- A. Typical Applicable Codes and Standards
  - 1. All City, State and Local Codes (Code)
  - 2. SMACNA Guidelines for Seismic Restraint of Mechanical Systems (To be used as a Standard, not a code)
  - 3. NFPA 13 and 14 for Fire Protection System (Standard)
  - 4. American Society for Testing and Materials (ASTM) (Standard)
  - 5. International Building Code (Code)
  - 6. ASHRAE (Standard)
- B. In cases where requirements vary, the guideline for the most stringent shall be utilized.
- C. Use IBC-2009 as reference code standard unless otherwise designated.

1.09 QUALITY ASSURANCE

- A. Manufacturer of vibration isolation, seismic and wind load control equipment shall have the following responsibilities:
  - 1. Determine vibration isolation and restraint sizes and locations.
  - 2. Provide vibration isolation and restraints as scheduled or specified.
  - 3. Provide calculations and materials if required for restraint of unisolated equipment.
  - 4. Provide installation instructions, drawings and trained field supervision to insure proper installation and performance.
  - 5. Certify correctness of installation upon completion.



## 6. All provisions of article 1.05, General Design &amp; Performance

B. All manufacturers including Original Equipment Manufacturer (OEM) providing equipment and/or vibration control, seismic, wind or flood restraint systems must provide a Seismic Design Error and Omissions Insurance Certificate for their firm or their design consultant to certify their ability to provide engineering and design as required by this section.

C. All manufacturers of any type of equipment including Original Equipment Manufacturers (OEM) are responsible for Article 1.05.

D. Equipment manufacturers' substitution of internally or externally isolated and or restrained equipment supplied by the equipment vendor, in lieu of the isolation and restraints specified in this section, is acceptable **provided** all conditions of this section are met. The Equipment

manufacturer shall provide a letter of guarantee from their Engineering Department PE stamped and certified per the article on Seismic Restraint Design (See Article 1.05, Paragraph B2), stating that the seismic restraints are in full compliance with these specifications. Where used on an Essential or High Hazard Facility, IBC -2009 is required, manufacturer's certification proving on line capability shall be in addition to all requirements which are stated in Article 1.05, Paragraph B.

E. Letters from field offices or representatives are unacceptable. All costs for converting to the specified vibration isolation and/or restraints shall be borne by the equipment vendor in the event of non-compliance with the preceding. Substitution of internal isolation is unacceptable for:

- Indoor or outdoor mounted equipment over or adjacent to:
  - Patient or operating areas
  - Theatre space
  - Office locations
  - Assembly areas

## PART 2 - PRODUCTS

## 2.01 DESCRIPTION

A. All vibration isolators and seismic restraints described in this section shall be the product of a single manufacturer. The basis of this specification is **The VMC Group including Vibration Mountings & Controls, The Amber Booth Company or Korfund Dynamics**. Products from other nationally recognized manufacturers are acceptable provided their systems strictly comply with these specifications and have the approval of the specifying engineer. (See Form VL-1 listing other manufacturers to be considered for use on this project)

## 2.02 VIBRATION ISOLATION TYPES

A. Type A: Spring Isolator - Free Standing  
VMC: ASC  
AB: SW

SECTION 15005  
VIBRATION ISOLATION AND SEISMIC RESTRAINTS  
FOR HVAC, FIRE PROTECTION, ELECTRICAL AND PLUMBING

OMDEX INC.

1. Spring isolators shall be free standing and laterally stable without any housing and complete with a molded neoprene cup or 1/4" neoprene acoustical friction pad between the base plate and the support.
  2. All mountings shall have leveling bolts that must be rigidly bolted to the equipment.
  3. Spring diameters shall be no less than 0.8 of the compressed height of the spring at rated load.
  4. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection.
  5. Submittals shall include spring diameters, deflection, compressed spring height and solid spring height.
- B. Type B: Seismically and Wind Restrained Spring Isolator  
VMC: AMSR, ASCM  
AB: CT
1. Restrained spring mountings shall have a Type A spring isolator within a rigid housing that includes vertical limit stops to prevent spring extension when weight is removed. The housing shall serve as blocking during erection. A steel spacer shall be removed after adjustment. Installed and operating heights are equal. A minimum clearance of 1/4" shall be maintained around restraining bolts and internal neoprene deceleration bushings so as not to interfere with the spring action. Limit stops shall be out of contact during normal operation. Since housings will be bolted or welded in position there must be an internal isolation pad. Housing shall be designed to resist all seismic forces.
- C. Type C: Combination Spring/Elastomer Hanger Isolator (30° Type)  
VMC: HRSA  
AB: BRSA
1. Hangers shall consist of rigid steel frames containing minimum 1 1/4" thick neoprene elements at the top and a steel spring with general characteristics as in Type A. The Durolene element shall have resilient bushings projecting through the steel box.
  2. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30° arc from side to side before contacting the rod bushing and short circuiting the spring.
  3. Submittals shall include a hanger-drawing showing the 30° capabilities.
  4. Hanger locations requiring pre-compression for holding piping at fixed elevation shall be type pre-compressed for all manufacturers.
- D. Type D: Elastomer Double Deflection Hanger Isolator  
VMC: HR  
AB: HRD/BRD

1. Molded (minimum 1 1/4" thick) Durolene element with projecting bushing lining the rod clearance hole. Static deflection at rated load shall be a minimum of 0.35".
  2. Steel retainer box encasing neoprene mounting capable of supporting equipment up to four times the rated capacity of the element.
- E. Type E: Combination Spring/Elastomer Hanger Isolator  
VMC: HRS  
AB: BSR
1. Spring and Durolene elements in a steel retainer box with the features as described for Type C and D isolators.
  2. Hanger locations requiring pre-compression for holding piping at fixed elevation shall be type pre-compressed for all manufacturers.
  3. 30° angularity feature is not required.
- F. Type F: Seismically Restrained Elastomer Floor Isolator  
VMC: RSM  
AB: RSM
1. Bridge-bearing neoprene mountings shall have a minimum static deflection of 0.2" and all directional seismic capability. The mount shall consist of a ductile iron or aluminum casting containing two separated and opposing molded neoprene elements. The elements shall prevent the central threaded sleeve and attachment bolt from contacting the casting during normal operation. The shock absorbing neoprene materials shall be compounded to bridge-bearing specifications.
- G. Type G: Pad Type Elastomer Isolator (Standard)  
VMC: Maxiflex  
AB: Maxiflex
1. One layer of 3/4" thick neoprene pad consisting of 2" square modules for size required.
  2. Load distribution plates shall be used as required.
  3. Bolting required for seismic compliance. Neoprene and duck washers and bushings shall be provided to prevent short-circuiting.
- H. Type H: Pad Type Elastomer Isolator (High Density)  
VMC: Fabriflex  
AB: NDB
1. Laminated canvas duck & neoprene, maximum loading 1000 psi, minimum 1/2" thick.

SECTION 15005  
VIBRATION ISOLATION AND SEISMIC RESTRAINTS  
FOR HVAC, FIRE PROTECTION, ELECTRICAL AND PLUMBING

OMDEX INC.

2. Load distribution plate shall be used as required.
3. Bolting required for seismic compliance. Neoprene and duck washers and bushings shall be provided to prevent short-circuiting.

I. Type I: Thrust Restraints

VMC: RSHTR

AB: TRK

1. A spring element similar to Type A isolator shall be combined with steel angles, backup plates, threaded rod, washers and nuts to produce a pair of devices capable of limiting movement of air handling equipment to 1/4".
2. Restraint shall be easily converted in the field from compression type to tension type.
3. Unit shall be factory precompressed.
4. Thrust restraints shall be installed on all cabinet fan heads, axial or centrifugal fans whose thrust exceeds 10% of unit weight.

J. Type J: Pipe Anchors

VMC: MDPA

AB: AB/AG

1. All-directional acoustical pipe anchor, consisting of two sizes of steel tubing separated by a minimum 1/2" thick 60 durometer neoprene.
2. Vertical restraint shall be provided by similar material arranged to prevent vertical travel in either direction.
3. Allowable loads on the isolation material should not exceed 500 psi and the design shall be balanced for equal resistance in any direction.

K. Type K: Pipe Guides

VMC: PG

AB: PG

1. Pipe guides shall consist of a telescopic arrangement of two sizes of steel tubing separated by a minimum 1/2" thickness of 60-durometer neoprene.
2. The height of the guides shall be preset with a shear pin to allow vertical motion due to pipe expansion or contraction. Shear pin shall be removable and reinsertable to allow for selection of pipe movement.
3. Guides shall be capable of + 1 5/8" motion, or to meet location requirements.

L. Type L: Isolated Pipe Hanger System

VMC: CIH, CIR, TIH, PIH

AB: CIH, CIR, TIH, PIH

1. Precompressed spring and elastomer isolation hanger combined with pipe support into one assembly. Replaces standard clevis, single or double rod roller, or double rod fixed support.
2. Spring element (same as Type A) with steel lower spring retainer and an upper elastomer retainer cup with an integral bushing to insulate support rod from the isolation hanger.
3. The neoprene element under the lower steel spring retainer shall have an integral bushing to insulate the support rod from the steel spring retainer.
4. Hangers shall be designed and constructed to support loads over three times the rated load without failure.
5. System shall be precompressed to allow for rod insertion and standard leveling.

### 2.03 SEISMIC RESTRAINT TYPES

- A. Type I: Spring Isolator, Restrained  
VMC: ASCM, AWR  
AB: CT
  1. Refer to vibration isolation Type B.
- B. Type II: Seismically Restrained Elastomer Floor Isolator  
VMC: RSM RUD  
AB: RSM
  1. Refer to vibration isolation Type F.
- C. Type III: All-Directional Seismic Snubber  
VMC: SR  
AB: ER
  1. All-directional seismic snubbers shall consist of interlocking steel members restrained by a one-piece molded neoprene bushing of bridge bearing neoprene. Bushing shall be replaceable and a minimum of 1/4 inch thick. Rated loadings shall not exceed 1000 psi. A minimum air gap of 1/8 inch shall be incorporated in the snubber design in all directions before contact is made between the rigid and resilient surfaces. Snubber end caps shall be removable to allow inspection of internal clearances. Neoprene bushings shall be rotated to insure no short circuits exist before systems are activated.
- D. Type IV: Floor or Roof Anchorage  
VMC: FA  
AB: FA

SECTION 15005  
VIBRATION ISOLATION AND SEISMIC RESTRAINTS  
FOR HVAC, FIRE PROTECTION, ELECTRICAL AND PLUMBING

OMDEX INC.

1. Rigid attachment to structure utilizing wedge type anchor bolts, anchored plates machine screw, bolting or welding. Powder shots are unacceptable.
- E. Type V: Seismic Cable Restraints  
VMC: SCR  
AB: ERS
1. Seismic Cable Restraints shall consist of galvanized steel aircraft cables sized to resist seismic loads with a minimum safety factor of 2 and arranged to provide all-directional restraint. Cable end connections shall be steel assemblies that swivel to final installation angle and utilize 2 clamping bolts to provide proper cable engagement. Cables must not be allowed to bend across sharp edges. Single arm braces with resilient bushings can be substituted for seismic cable restraints. Deck fitting shall have two through bolts spaced to ICBO standards for attachment to concrete!
- F. Type VI: Rigid Arm Brace  
VMC: SAB  
AB: SAB
1. Seismic solid braces shall consist of steel angles or channels to resist seismic loads with a minimum safety factor of 2 and arranged to provide all directional restraint. Seismic solid brace end connectors shall be steel assemblies that swivel to the final installation angle and utilize 2 through bolts to provide proper attachment spaced to ICBO standards for attachment to concrete.
- G. Type VII: Internal Clevis Cross Brace  
VMC: ICB  
AB: SAB
1. Internal clevis cross braces at seismic locations shall be pre-cut pipe sized for internal clevis dimensions.
- H. Type VIII: Seismic Waterproof Foundation Wall Sleeve  
VMC: SWFWS  
AB: SWFWS
1. Seismic waterproof foundation wall sleeves shall consist of two elastomeric sleeves that shall be mounted both inside and out of the vertical foundation wall. The conical design shall have a suitably waterproof means of fastening to both concrete and to its concentric utility pipe. Allowable vertical drift shall be plus or minus 2" from the installed neutral point along the vertical "y" axis. All fittings shall be stainless steel or galvanized.
- 2.04 EQUIPMENT BASES
- A. General
1. All curbs and roof rails are to be bolted or welded to the building steel or anchored to the concrete deck (minimum thickness shall be 4") for resisting wind and seismic

load forces in accordance with the project location. (Fastening to metal deck is unacceptable.)

B. Base Types

1. Type B-1: Integral Structural Steel Base  
VMC: WFB  
AB: SFB/WSB
  - a. Rectangular bases are preferred for all equipment.
  - b. Centrifugal refrigeration machines and pump bases may be T or L shaped where space is a problem. Pump bases for split case pump shall include supports for suction and discharge elbows.
  - c. All perimeter members shall be steel beams with a minimum depth equal to 1/12 of the longest dimension of the base.
  - d. Base depth need not exceed 12" provided that the deflection and misalignment is kept within acceptable limits as determined by the manufacturer.
  - e. Height saving brackets shall be employed in all mounting locations to provide a minimum base clearance of 2".
2. Type B-2: Concrete Inertia Base  
VMC: MPF/WPF  
AB: CPF
  - a. Vibration isolation manufacturer shall furnish rectangular welded or bolted modular steel concrete pouring forms for floating and inertia foundations.
  - b. Bases for split case pumps shall be large enough to provide for suction and discharge elbows.
  - c. Bases shall be a minimum of 1/12 of the longest dimension of the base but not less than 6".
  - d. The base depth need not exceed 12" unless specifically recommended by the base manufacturer for mass or rigidity.
  - e. Forms shall include minimum concrete reinforcing consisting of 1/2" bars welded in place a maximum of 8" on centers running both ways in a layer 1-1/2" above the bottom.
  - f. Forms shall be furnished with steel templates to hold the anchor bolts sleeves and anchors while concrete is being poured.
  - g. Height saving brackets shall be employed in all mounting locations to maintain a 2" minimum clearance below the base.

- h. Flush profile wooden formed bases having correct depth and reinforcing requirements are acceptable.

- 3. Type B-3: Seismic Isolation Curb  
VMC: P62/P6300  
AB: RTIC

Option: Sound Package 1&2 VMC/AB-RPFMA/SRPFMA

- a. Curb mounted rooftop equipment shown on isolation schedule shall be mounted on structural seismic spring isolation curbs. The upper frame must provide continuous support for the equipment and must be captive so as to resiliently resist wind and seismic forces. The lower frame must accept point support for both seismic attachment and leveling. The upper frame must be designed with positive fastening provisions (welding or bolting), to anchor the roof top unit to the curb, which will not violate the National Roofing Contractor's Association (NRCA) ratings of the membrane waterproofing. Sheetmetal screws are only acceptable if all provisions in Article 1.05 Paragraph B, 5h, Design Seismic Loads, are met. Contact points between the roof top unit, the curb and the building's structure shall show load path through those locations only.
- b. All directional neoprene snubber bushings shall be a minimum of 1/4" thick. Steel springs shall be laterally stable and rest on 1/4" thick neoprene acoustical pads.
- c. Hardware must be plated and the springs provided with a rust resistant finish.
- d. The curbs waterproofing shall be designed to meet all NRCA requirements.
- e. All spring locations shall have access ports with removable waterproof covers and all isolators shall be adjustable, removable and interchangeable.
- f. The curb shall be the sound attenuating, open screen type utilizing standard 2" roof insulation supplied and installed by the roofing contractor to act thermally outside and acoustically inside, (TAS, open thermal acoustical screening system). Curbs supplied without this feature shall be factory acoustically lined with 2" duct liner.
- g. Isolated curbs shall be supplied with a continuous air seal between the upper floating member and the stationary wood hailer.

Option #1 Where sound barrier package is required, curb shall have full size lay in attenuation panels having a minimum STC rating of 60 when combined with the roof deck's rating. Attenuation system shall add a full sound attenuation structural floor to the curb capable of spanning the curb's width and designed for live loads of 20 psf. Panels shall not weigh more than 6 psf. The 4" nominal galvanized panel shall be joined to



SECTION 15005  
 VIBRATION ISOLATION AND SEISMIC RESTRAINTS  
 FOR HVAC, FIRE PROTECTION, ELECTRICAL AND PLUMBING

allow for airtight construction and additionally shall have a support system where the panels are used below an outside condenser section. Panels shall be waterproof for both outdoor and indoor application. The space below the curb panels and the roof deck shall have 4" of insulation contractor furnished and installed.

Curb wall construction shall utilize the roofer's standard insulation where curbs use the TAS open thermal acoustical screening system. Solid wall curbs shall use 2" of factory ductliner installed by the curb manufacturer. The entire curb shall have a continuous neoprene air seal. Type RPFMA shall use an open return system with the roof return opening set as far as possible from the unit's return opening.

Option # 2 When curb type SRPFMA (Supply Return Plenum Construction) is required, in addition to Option # 1 the walls of the supply section will use 2" sound attenuating panels as well as a continuous inner neoprene air seal and isolated plenum divider. Both supply and return ducts shall seal directly to curb base floor attenuation panels.

4. Type B-4: Seismic Non-Isolated Curbs  
 VMC: P6000  
 AB: RTC  
 Option: Sound Package VMC –RPFMA/SRPFMA System
  - a. Seismic curbs shall have all provisions as Type B-3 curbs with the exception of spring isolation.
  
5. Type B-5: Isolated Equipment Supports  
 VMC: R7200/R7300  
 AB: R7200/R7300
  - a. Continuous structural equipment support rails that combine equipment support and isolation mounting into one utilized roof flashed assembly with all features as described for Type B-3.
  - b. System shall be designed for positive anchorage or welding of equipment to supports and welding of supports to the building steel.
  
6. Type B-6: Non-Isolated Equipment Supports  
 VMC: R7000  
 AB: R7000
  - a. This shall have the same provisions as Type B-5 without the spring isolation.
  
7. Type B-7: Computer Room Unit Base  
 VMC: CRC  
 AB: CRC
  - a. Computer Room air conditioning units shall be welded or bolted to welded structural steel stands having a minimum 0.5 "G" certified lateral acceleration capabilities.

- b. Durolene elastomer isolated stands shall have 1” of adjustment to accommodate floor irregularities and .25” of static deflection.
- c. Bolting or welding is required to meet seismic criteria
- d. Stands to have positive fastening provisions for bolting of computer room unit to seismic floor stand and fastening of seismic isolated floor stand to structure.

2.05 FLEXIBLE CONNECTORS

- A. Type FC-2: Flexible Stainless Steel Hose  
 VMC: BS  
 AB: SSFP/SSPM

- 1. Flexible stainless steel hose shall have stainless steel braid and carbon steel fittings. Sizes 3" and larger shall be flanged. Smaller sizes shall have male nipples.

- B. Type FC-2 connector shall be braided bronze for freon connections.

- 1. Minimum lengths shall be as tabulated:

<u>Flanged</u>		<u>Male Nipples</u>	
3 x 14	10 x 26	1/2 x 9	1½ x 13
4 x 15	12 x 28	3/4 x 10	2 x 14
5 x 19	14 x 30	1 x 11	2½ x 18
6 x 20	16 x 32	1¼ x 12	8 x 22

- 2. Hoses shall be installed on the equipment side of the shut-off valves horizontally and parallel to the equipment shafts wherever possible.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. All areas that will receive components requiring vibration control, seismic or wind load bracing shall be thoroughly examined for deficiencies that will affect their installation or performance. Such deficiencies shall be corrected prior to the installation of any such system.
- B. Examine all “rough ins” including anchors and reinforcing prior to placement.

3.02 COMPONENT INSTALLATION, (General)

- A. All vibration isolators and seismic, wind restraint systems must be installed in strict accordance with the manufacturer’s written instructions and all certified submittal data.
- B. Installation of vibration isolators and seismic, wind restraints must not cause any change of position of equipment, piping or ductwork resulting in stresses or misalignment.

- C. No rigid connections between equipment and the building structure shall be made that degrades the noise and vibration control system specified herein.
- D. The contractor shall not install any isolated equipment, piping or duct, which makes rigid connections with the building unless isolation is not specified. "Building" includes, but is not limited to, slabs, beams, columns, studs and walls.
- E. Coordinate work with other trades to avoid rigid contact with the building.
- F. Overstressing of the building structure must not occur because of overhead support of equipment. Contractor must submit loads to the structural engineer of record for approval. General bracing may occur from flanges of structural beams, upper truss cords in bar joist construction and cast in place inserts or wedge type drill-in concrete anchors.
- G. Seismic cable restraints shall be installed slightly slack to avoid short circuiting the isolated suspended equipment or piping.
- H. Seismic cable assemblies are installed taut on non-isolated systems. Seismic single arm braces may be used in place of cables on rigidly attached systems but can also be used on isolated systems when incorporating resilient bushings.
- I. At locations where seismic cable restraints or seismic single arm braces are located, the support rods must be braced when necessary to accept compressive loads. See Table "E".
- J. At all locations where seismic cable braces and seismic cable restraints are attached to the pipe clevis, the clevis bolt must be reinforced with pipe clevis cross bolt braces or double inside nuts if required by seismic acceleration levels.
- K. Vibration isolation manufacturer shall furnish integral structural steel bases as required. Independent steel rails are not permitted.
- L. Where piping passes through walls, floors or ceilings, the contractor shall provide wall seals or resilient packed pipe sleeves.
- M. Air handling equipment and centrifugal fans shall be protected against excessive displacement which results from high air thrust in relation to the equipment weight. Horizontal thrust restraints shall be those described in the specification when horizontal motion exceeds 3/8".
- N. Special and Periodic Inspections for items listed in Article 1.05, Paragraph B shall be conducted and submitted on a timely basis.

### 3.02 EQUIPMENT INSTALLATION

- A. Equipment shall be isolated and or restrained as per Tables A-E at the end of this section.
- B. Place floor mounted equipment on 4" high concrete housekeeping pads properly sized and doweled or expansion shielded to the deck to meet acceleration criteria (see Article 1.05). Anchor isolators and/or bases to housekeeping pads. Concrete work is specified under that section of the contract documents.

C. Additional Requirements

1. The minimum operating clearance under all isolated components bases shall be 2".
2. All bases shall be placed in position and supported temporarily by blocks or shims, as appropriate, prior to the installation of the equipment, isolators and restraints.
3. The equipment shall be installed on blocks to the operating height of the isolators. After the entire installation is complete and under full load including water, the isolators shall be adjusted so that the load is transferred from the blocks to the isolators. Remove all debris from beneath the equipment and verify that there are no short circuits of the isolation. The equipment shall be free in all directions.
4. Ceilings containing diffusers or lighting fixtures must meet seismic requirements by using earthquake clips or other approved means of positive attachment to secure diffuser and fixtures to T-bar structure.
5. All floor or wall mounted equipment and tanks shall be restrained with Type V restraints.

3.03 PIPING AND DUCTWORK ISOLATION

A. Vibration Isolation of Piping

1. HVAC Water Piping: All spring type isolation hangers shall be precompressed if isolators are installed prior to fluid charge. If installed afterwards, field precompressed isolators can be used. All HVAC piping in the machine room shall be isolated as well as pressurized runs in other locations of the building 6" and larger. Horizontal pressurized runs in all other locations of the building shall be isolated by Type E hangers. Floor supported piping shall rest on Type B isolators. Heat exchangers and expansion tanks are considered part of the piping run. The first 3 isolators from the isolated equipment will have the same static deflection as specified for the mountings under the connected equipment. If piping is connected to equipment located in basements and hangs from ceilings under occupied spaces, the first 3 hangers shall have 0.75" deflection for pipe sizes up to and including 3", 1 3/8" deflection for pipe sizes thereafter. Where column spacing exceeds 35', isolation hanger deflection shall be 2-1/2" for pipes exceeding 3" diameter. Type L hangers may be substituted for the above where isolation hangers are required.
2. Steam and Condensate Piping: All ceiling suspended piping in the mechanical equipment room shall be isolated with Type D hangers. All floor supported piping shall be supported with Type F isolators.
3. Plumbing Water Lines. Plumbing water lines in the machine room shall only be isolated if connected to isolated equipment. (See Table B). Isolator type shall be as listed in Paragraph 1, above.
4. Riser Location: All risers shall be supported on Type J or K anchors or guide

restraints positively attached to both the riser and structure. Spiders welded to the pipe can substitute for Type K guides using J Type anchors.

5. Control Air Piping: Where control air piping is connected to mechanical piping equipment shall be flexibly connected in horizontal and vertical plane with Type FC-2 flexible connectors.
6. Gas lines shall not be isolated.
7. Fire protection lines shall not be isolated.

B. Seismic Restraint of Piping, Conduit, Bus Duct and Cable Tray

1. All high hazard and life safety pipe regardless of size such as fuel oil piping, fire protection mains, gas piping, medical gas piping and compressed air piping shall be seismically restrained or braced. Type V seismic cables restraints or resilient single arm braces shall be used if piping is isolated. Type V seismic cable restraints or Type VI single arm braces may be used on unisolated piping. **There are no exclusions for size or distance in this category.**
2. Seismically restrain piping located in boiler rooms, mechanical equipment rooms and refrigeration equipment rooms that is 1 1/4" I.D. and larger. Type V seismic cables restraints or resilient single arm braces shall be used if piping is isolated. Type V seismic cable restraints or Type VI single arm braces may be used on unisolated piping.
3. Seismically restrain all other piping 2 1/2" diameter and larger. Type V seismic cables restraints or resilient single arm braces shall be used if piping is isolated. Type VI seismic cable restraints or single arm braces may be used on unisolated piping.
4. See Table D for maximum seismic bracing distances.
5. Multiple runs of pipe on the same support shall have distance determined by calculation.
6. Rod braces shall be used for all rod lengths as listed in table "E".
7. Clevis hangers shall have spacers placed inside of hanger at seismic brace locations.
8. Where thermal expansion is a consideration, guides and anchors may be used as transverse and longitudinal restraints provided they have a capacity equal to or greater than the restraint loads in addition to the loads induced by expansion or contraction.
9. For fuel oil and all gas piping, transverse restraints must be at 20' maximum and longitudinal restraints at 40' maximum spacing.
10. Transverse restraint for one pipe section may also act as a longitudinal restraint for

a pipe section of the same size connected perpendicular to it if the restraint is installed within 24" of the elbow or TEE or combined stresses are within allowable limits at longer distances.

11. Hold down clamps must be used to attach pipe to all trapeze members before applying restraints. Use Type V or VI restraint, if trapeze is smaller than 48" long.
12. Branch lines may not be used to restrain main lines.
13. All PVC and glass pipe less than 6" are braced only if the pipe use involves hazardous or toxic materials. All other PVC and glass pipe greater than 6" shall be braced at 20' transversely and 40' longitudinally with bottom shields.
14. All fire protection branch lines shall be end tied.
15. Where pipe passes through a two sided sheet rock wall, the wall if tight to the pipe shall act as a lateral / transverse brace for pipe sizes up to and including 4".
16. Where horizontal pipe crosses a building's drift expansion joint, allowance shall be part of the design to accommodate differential motion.
17. Vertical pipe rises between floors shall have their differential of movement part of the seismic design for building drift.
18. For horizontal passage of all underground utilities through building's foundation wall, all pipes shall pass freely through an oversized opening and waterproofed accordingly to accommodate maximum allowable building drift. (Seismic Restraint Type VIII).

C. Vibration Isolation of Ductwork

1. All discharge runs for a distance of 50' from the connected equipment shall be isolated from the building structure by means of Type E combination spring elastomer hanger or Type A floor spring isolators. Spring deflection shall be a minimum of 0.75".
2. All duct runs having air velocity of 1500 feet per minute (fpm) or more shall be isolated from the building structure by Type E combination spring elastomer hangers or Type A floor spring supports. Spring deflection shall be a minimum of 0.75".

D. Seismic Restraint of Ductwork

1. Restrain rectangular ductwork with cross sectional area of 6 square feet or larger. Type V seismic cable restraints or Type VI single arm braces shall be used on this duct. Duct which serves a life safety function or carries toxic materials in an "Essential or High Hazard Facility" must be braced with no exceptions regardless of size or distance requirements..

2. Restrain round ducts with diameters of 28" or larger. Type V seismic cable restraints or Type VI single arm braces.
3. Restrain flat oval ducts the same as rectangular ducts of the same nominal size.
4. See Table D for maximum seismic bracing distances.
5. Duct must be reinforced at the restraint locations. Reinforcement shall consist of an additional angle on top of the ductwork that is attached to the support hanger rods. Ductwork is to be attached to both upper angle and lower trapeze. Additional reinforcing is not required if duct sections are mechanically fastened together with frame bolts and positively fastened to the duct support suspension system.
6. A group of ducts may be combined in a larger frame so that the combined weights and dimensions of the ducts are less than or equal to the maximum weight and dimensions of the duct for which bracing details are selected.
7. Walls, including gypsum board non-bearing partitions, which have ducts running through them, may replace a typical transverse brace. Provide channel framing around ducts and solid blocking between the duct and frame.
8. If ducts are supported by angles, channels or strut, duct shall be fastened to same at seismic brace locations in lieu of duct reinforcement.

### 3.04 EXCLUSIONS

#### A. EQUIPMENT

- Curb mounted mushroom, exhaust and vent fans with curb area less than nine square feet are excluded unless specifically detailed in the schedules or drawings.
- Floor mounted equipment weighing less than 400#s and not resiliently mounted.

#### B. DUCT

Rectangular, square, and oval air handling ducts less than six square feet in cross sectional area. Round air-handling duct less than 28 inches in diameter. Duct supported at locations by two rods less than 12 inches in length from the structural support to the structural connection to the ductwork.

#### C. PIPE, CONDUIT, CABLE TRAYS & BUS DUCTS (Components)

All pipe or conduit less than 2 1/2" diameter suspended by individual hanger rods. All clevis supported pipe or conduit less than 12" from the top of the pipe to the underside of the support point. Trapeze supported pipe, cable trays and bus ducts suspended by hanger rods having a distance less than 12" in length from the underside of the pipe support to the support point of the structure.

#### D. EXCLUSIONS DO NOT APPLY FOR:

LIFE SAFETY or HIGH HAZARD COMPONENTS needed for the continued operation of the facility. or whose failure could impair the facility's continued operation, Category IV, IBC-2006-as listed in Article 1.02, Paragraph C regardless of governing code for HVAC, Plumbing, Electrical or Fire Protection. (*A partial list is illustrated*) High Hazard is additionally classified as any system

SECTION 15005  
VIBRATION ISOLATION AND SEISMIC RESTRAINTS  
FOR HVAC, FIRE PROTECTION, ELECTRICAL AND PLUMBING

OMDEX INC.

handling flammable, combustible or toxic material. **Typical systems not excluded are additionally listed below.** The above includes equipment and piping components.

1. **ELECTRICAL**  
Includes critical, standby or emergency power components including conduit (1" nominal diameter and larger), cable tray or bus duct, lighting, panels, communication lines involving 911, etc.
2. **PIPING**  
Fuel oil, gasoline, natural gas, medical gas, steam, compressed air or any piping containing hazardous, flammable, combustible, toxic or corrosive materials. Fire protection standpipe, risers and mains. Branches must be end tied.
3. **DUCT**  
Smoke evacuation duct or fresh air make up connected to emergency system, emergency generator exhaust, boiler breeching or as used by the fire department on manual override!
4. **EQUIPMENT**  
Previously excluded non life safety duct mounted systems such as fans, variable air volume boxes, heat exchangers and humidifiers having a weight greater than 75 lbs require ~~independent~~ seismic bracing.

3.05 **FIELD QUALITY CONTROL, INSPECTION**

- A. All Independent Special and Periodic Inspections must be performed and submitted on components as outlined in Article 1.05, Paragraph B3. (See also Contractor Responsibility, Article 1.05, Paragraph B4). Note: Special Inspection services are to be supplied by the owner.
- B. Upon completion of installation of all vibration isolation devices, the local representative shall inspect the completed project and certify in writing to the Contractor that all systems are installed properly, or require correction. The contractor shall submit a report to the Architect, including the representative's report, certifying correctness of the installation or detailing corrective work to be done.



<b>HVAC EQUIPMENT TABLE "A"</b>										
<b>ON GRADE, BASEMENT OR SLAB ON GRADE</b>							<b>ABOVE GRADE</b>			
EQUIPMENT (See Note!)		MTNG	ISOL	DEFL (in.)	BASE	RESTR	ISOL	DEFL (in.)	BASE	RESTR
Absorption Machine		Flr.	---	---	---	IV	B	0.75	B-2	IV
Air Handling Units Indoor		Flr	B	0.75	---	IV	B	1.5	---	IV
		Clg	E	0.75	---	V	E	0.75	---	V
Air Compressor Tanks	To 10 HP	Flr	B	0.75	---	IV	B	1.50	---	IV
	>10 HP	Flr	B	0.75	B-2	IV	B	1.50	B-2	IV
Dry Coolers Condensers/Condensing Outdoor Units		Roof	---	---	---	IV	B	2.50 (minimum)	B-5	IV
Axial Fans (Inline Type)		Flr	B	0.75	---	IV	B	See Guide	---	IV
		Clg	E	0.75	---	V	E	See Guide	---	V
Base Mounted Pumps	To 15 HP	Flr	B	0.75	B-2	IV	B	0.75	B-2	IV
	>15 HP	Flr	B	0.75	B-2	IV	B	1.50	B-2	IV
Boilers		Flr	G	0.10	---	IV	B	0.75	---	IV
Cabinet Fans & Packaged AHU Indoor	To 1 HP	Flr	F	0.20	---	IV	B	0.75	---	IV
		Clg	D	0.35	---	V	E	0.75	---	V
	>1 HP	Flr	B	0.75	---	IV	B	See Guide	---	IV
		Clg	E	0.75	---	V	E	See Guide	---	V
Centrif. Chillers		Flr	B	0.75	---	IV	B	1.50	---	IV
Centrif. Fans Arr. 1 & 3	Class 1	Flr	B	0.75	B-1	IV	B	See Guide	B-1	IV
	Class 2 & 3	Flr	B	0.75	B-2	IV	B	See Guide	B-2	IV
Centrif. Fans (Vent Sets) Arr. 9 & 10	Class 1	Flr	B	0.75	---	IV	B	See Guide	See Note 2	IV
	Class 2 & 3	Clg	E	0.75	B-2	V	E	See Guide	B-2	V
Computer Room Units		Flr	F	0.20	B-7	IV	B	1.5	B-7	IV
Condensate Pumps		Flr	F	0.20	If req.	IV	F	0.20	If req.	IV
Cooling Towers		Flr	B	0.75	---	IV	B	2.50	B-5 opt.	IV
Curb Mtd. Equip. (Non-Isol.)		Roof	---	---	---	IV	---	---	B-6	IV
Fan Coil Units		Flr	F	0.20	---	IV	B	0.75	---	IV
		Clg	D	0.35	---	V	E	0.75	---	V
Outdoor Reciprocating, Rotary or Screw Chillers		Flr	F	0.20	---	IV	B	1.50	---	IV
		Roof	---	---	---	IV	B	2.50	B-5	IV
Rooftop AHU/AC	< 10 Ton	Roof	---	---	---	IV	B	1.50	B-3 *(3,4)	IV
	> 10 Ton	Roof	---	---	---	IV	B	2.50	B-3 *(3,4)	IV
Unit/Cab Heaters		Clg	D	0.30	---	V	D	0.30	---	V

(3,4) refers to notes

Minimum Deflection Guide for Table "A"

SECTION 15005  
 VIBRATION ISOLATION AND SEISMIC RESTRAINTS  
 FOR HVAC, FIRE PROTECTION, ELECTRICAL AND PLUMBING

OMDEX INC.

<b>Units Lowest R.P.M.</b>	<b>DEFLECTION</b>
<b>Less than 400</b>	<b>3.50"</b>
<b>401 to 600</b>	<b>2.50"</b>
<b>601 to 900</b>	<b>1.50"</b>
<b>OVER 900</b>	<b>0.75"</b>

Note for TABLES A, B, & C:

GENERAL:

ISOL= ISOLATOR

DEFL= DEFLECTION

RESTR = SEISMIC RESTRAINT

MTNG= MOUNTING.

ALL DEFLECTIONS INDICATED ARE IN INCHES.

Note 1: For equipment with variable speed driven components having driven operating speed below 600 rpm, select isolation deflection from minimum deflection guide

Note 2: For roof applications, use base Type B-5.

Note 3: Specification Option #1 called out on equipment schedule in curb Type B-3 shall use sound barrier RPFMA when there is no concrete under roof top units and this option is selected. Curbs can be used for return plenums. (See Option #1 under curb type B-3)

Note 4: Specification Option #2, called out on equipment schedule in curb Type B-3 shall be used where curbs require supply and return sound attenuation package type SPFMA shall be used. (See Option #2 under curb type B-3)

Note 5: Units may not be capable of point support. Refer to separate air handling unit specification section. If base is not provided by that section and external isolation is required, provide Type B-1 base by this section for entire unit.

Note 6: Static deflection shall be determined based on the deflection guide for Table "A".

Note 7: Deflections indicated are minimums at actual load and shall be selected for manufacturer's nominal 5", 4", 3", 2" and 1" deflection spring series, RPM is defined as the lowest operating speed of the equipment.

Note 8: Single stroke compressors may require inertia bases with thickness greater than 14" maximum as described for base B-2. Inertia base mass shall be sufficient to maintain

double amplitude for 1/8".

Note 9: Floor mounted fans, substitute base Type B-2 for class 2 or 3 or any fan having static pressure over 5".

Note 10: Indoor utility sets with wheel diameters less than 24" need not have deflections greater than .75".

Note 11: Curb mounted fans with curb area less then 9 square feet are excluded.

Note 12: For equipment with multiple motors, Horse Power classification applies to largest single motor.

<b>PLUMBING EQUIPMENT TABLE B</b>										
ON GRADE, BASEMENT OR SLAB ON GRADE							ABOVE GRADE			
<b>EQUIPMENT</b>	<b>HP</b>	<b>MTNG</b>	<b>ISOL</b>	<b>DEFL (in.)</b>	<b>BASE</b>	<b>RESTR</b>	<b>ISOL</b>	<b>DEFL (in.)</b>	<b>BASE</b>	<b>RESTR</b>
<b>Air Compressors &amp; Vacuum Pumps</b>	<b>to 10</b>	<b>Flr</b>	<b>F</b>	<b>0.20</b>	<b>---</b>	<b>IV</b>	<b>B</b>	<b>0.75</b>	<b>---</b>	<b>IV</b>
	<b>&gt;10</b>	<b>Flr</b>	<b>E</b>	<b>0.75</b>	<b>B-2</b>	<b>V</b>	<b>E</b>	<b>1.50</b>	<b>B-2</b>	<b>V</b>
<b>Base Mounted Pumps</b>	<b>to 15</b>	<b>Flr</b>	<b>F</b>	<b>0.20</b>	<b>B-2</b>	<b>IV</b>	<b>B</b>	<b>0.75</b>	<b>B-2</b>	<b>IV</b>
	<b>&gt;15</b>	<b>Flr</b>	<b>B</b>	<b>0.75</b>	<b>B-2</b>	<b>IV</b>	<b>B</b>	<b>1.50</b>	<b>B-2</b>	<b>IV</b>

**TABLE C  
 VIBRATION ISOLATION & SEISMIC RESTRAINT  
 REQUIREMENTS FOR ELECTRICAL EQUIPMENT  
 INSTALLATION ATTACHMENT POINT**

			ON GRADE				ABOVE GRADE			
EQUIPMENT	SIZE	MTNG	ISOL	DEFL	BASE	RESTR	ISOL	DEFL	BASE	RESTR
TRANSFORMER Dry type	ALL	Flr	--	--	--	IV	D	0.30	*	IV
		CEILING	--	--	--	V	E	0.20	*	V
GENERATORS	ALL	Flr	B	1.0	--	IV	B	1.50	*	IV
GENERATORS	ALL	Over Occupied Space					B	2.50	*	IV
UPS SYSTEMS	M		II	.40		IV	B	1.50	*	IV

*\* where component cannot be point supported base type B-1 shall be used.*

<b>TABLE D</b>			
<b>SEISMIC BRACING TABLE</b>			
<b>(Maximum Spacing Shown- Actual Spacing to Be Determined by Calculation)</b>			
<b>EQUIPMENT</b>	<b>ON CENTER TRANSVERSE</b>	<b>ON CENTER LONGITUDINAL</b>	<b>CHANGE OF DIRECTION</b>
<b>DUCT</b>	<b>30 FEET</b>	<b>60 FEET</b>	<b>4 FEET</b>
<b>PIPE THREADED, WELDED, SOLDERED OR GROOVED</b>			
<b>TO 16"</b>	<b>40 FEET</b>	<b>80 FEET</b>	<b>4 FEET</b>
<b>18" – 28"</b>	<b>30 FEET</b>	<b>60 FEET</b>	<b>4 FEET</b>
<b>30" – 40"</b>	<b>20 FEET</b>	<b>60 FEET</b>	<b>4 FEET</b>
<b>42" &amp; LARGER</b>	<b>10 FEET</b>	<b>30 FEET</b>	<b>4 FEET</b>
<b>PIPE - NO HUB OR BELL AND SPIGOT</b>			
<b>2.5" &amp; LARGER</b>	<b>10 FEET</b>	<b>20 FEET</b>	<b>4 FEET</b>
<b>BOILER BREECHING</b>	<b>30 FEET</b>	<b>60 FEET</b>	<b>4 FEET</b>
<b>CHIMNEYS &amp; STACKS</b>	<b>30 FEET</b>	<b>60 FEET</b>	<b>4 FEET</b>
<b>CONDUIT</b>	<b>40 FEET</b>	<b>80 FEET</b>	<b>4 FEET</b>
<b>BUS DUCT</b>	<b>20 FEET</b>	<b>40 FEET</b>	<b>4 FEET</b>
<b>CABLE TRAY</b>	<b>40 FEET</b>	<b>80 FEET</b>	<b>4 FEET</b>

**TABLE E**

**Seismic Rod Bracing Schedule  
 of  
 Vertical Hanger Rod**

<b>VMC Rod Bracing Clamp No.</b>	<b>Rod Dia (Inches)</b>	<b>Rod Lengths Over "X" Inches</b>	<b>Steel Angle Size Inches</b>	<b>Clamp Spacing</b>	<b>Min # of Clamps per Stiffener</b>
<b>SRBC – 1</b>	<b>3/8"</b>	<b>20"</b>	<b>1 x 1 x 1/4"</b>	<b>16"</b>	<b>2</b>
<b>SRBC – 1</b>	<b>1/2"</b>	<b>25"</b>	<b>1 x 1 x 1/4"</b>	<b>20"</b>	<b>2</b>
<b>SRBC – 1</b>	<b>5/8"</b>	<b>31"</b>	<b>1 x 1 x 1/4"</b>	<b>12"</b>	<b>3</b>
<b>SRBC – 1 1/2</b>	<b>3/4"</b>	<b>37"</b>	<b>1 1/2 x 1 1/2 x 1/4"</b>	<b>16"</b>	<b>3</b>
<b>SRBC – 1 1/2</b>	<b>7/8"</b>	<b>43"</b>	<b>1 1/2 x 1 1/2 x 1/4"</b>	<b>12"</b>	<b>4</b>
<b>SRBC – 1 1/2</b>	<b>1"</b>	<b>50"</b>	<b>1 1/2 x 1 1/2 x 1/4"</b>	<b>16"</b>	<b>4</b>
<b>SRBC – 1 1/2</b>	<b>1 1/8"</b>	<b>62"</b>	<b>1 1/2 x 1 1/2 x 1/4"</b>	<b>20"</b>	<b>4</b>

**FORM CQAP: OCCUPANCY CATEGORY IV PROJECTS, IBC-2009**

Section 15005  
Vibration Isolation and Seismic Restraints

Contractor Name: \_\_\_\_\_

Date: \_\_\_\_\_

Project: \_\_\_\_\_

Specification Section: \_\_\_\_\_

Contractor IBC Quality Assurance Seismic Program.

This form is to be filled out as the identifying document for the Contractors Quality Assurance program, (see Contractor Responsibility Section 1.05, Paragraph B4) before the first submission in any vendor group by the installing contractor. All items listed herein shall be part of that program.

1. Acknowledge special requirements contained in the quality assurance plan
2. Acknowledge that control will be exercised to obtain conformance with the construction documents
3. Procedures for exercising control within the contractors organization including frequency and distributions of inspections and testing reports
4. Identification and qualification of the persons exercising control of this program within their organization

Contractor to submit this program acknowledging receipt and program implementation. Each of the 4 listed programs are to be submitted including all applicable details as listed above.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Print Name

**FORM CVC-1 OCCUPANCY GROUP IV PROJECTS, IBC-2009**

Section 15005  
 Vibration Isolation and Seismic Restraints

Contractor Name: \_\_\_\_\_

Date: \_\_\_\_\_

Project: \_\_\_\_\_

Specification Section: \_\_\_\_\_

*Notes to the installing contractor*

The purpose of this form is for you the contractor to fill in all vendors that are IBC compliant as part of your initial submission for any group of equipment, ie., fans, ac units, pumps, etc. It is acceptable to submit vendors that will be compliant as long as a factory letter is issued stating full compliance will occur at time of shipment. Only IBC compliant vendors can participate on this project. In the event that no vendor in any group is IBC compliant, this information must be submitted to the project's MEP for approval.

<b>Manufacturer</b>	<b>Yes</b>	<b>No</b>

\_\_\_\_\_  
 Signature

\_\_\_\_\_  
 Print Name



**FORM SQA-1 FOR OCCUPANCY CATEGORY IV PROJECTS, IBC-2009**

Section 15005  
Vibration Isolation and Seismic Restraints  
Seismic Quality Assurance Plan for The Installation of Life Safety  
And High Hazard Systems, (Inspections)

Contractor Name: \_\_\_\_\_

Date: \_\_\_\_\_

Project: \_\_\_\_\_

Specification Section: \_\_\_\_\_

The following are required for the Seismic Quality Assurance Installation Plan for Life Safety and High Hazard systems to be prepared and submitted by each installing contractor, ( see Contractor’s Responsibilities Article 1.05, Paragraph B4). This plan must reflect all of the provisions and reports outlined in the paragraphs below. As part of this contractor’s final requisition, this form must accompany, along with all satisfactorily completed tests and reports, the final payments request including all applicable certification reports.

- Special field inspection and testing is required by IBC Sections 1704, 1707 & 1708 during the installation of Life Safety and High Hazard System components including equipment, piping and all electrical connections. Components must be inspected by a Building Official or approved independent special inspector periodically during the course of installation. Contractor shall submit such inspection reports as part of his project wrap up for each group of equipment, components so requiring this program. All components, which are Life Safety designate or Handle Hazardous substances fall into this category. Typical Life Safety and High Hazard components well are outlined in Article 1.05, Paragraph B and Article 3.04 Paragraph D.1 thru D.4.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Print Name

THIS PAGE INTENTIONALLY LEFT BLANK