



# Seismic Testing Requirements of Nonstructural Components

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LEED AP**

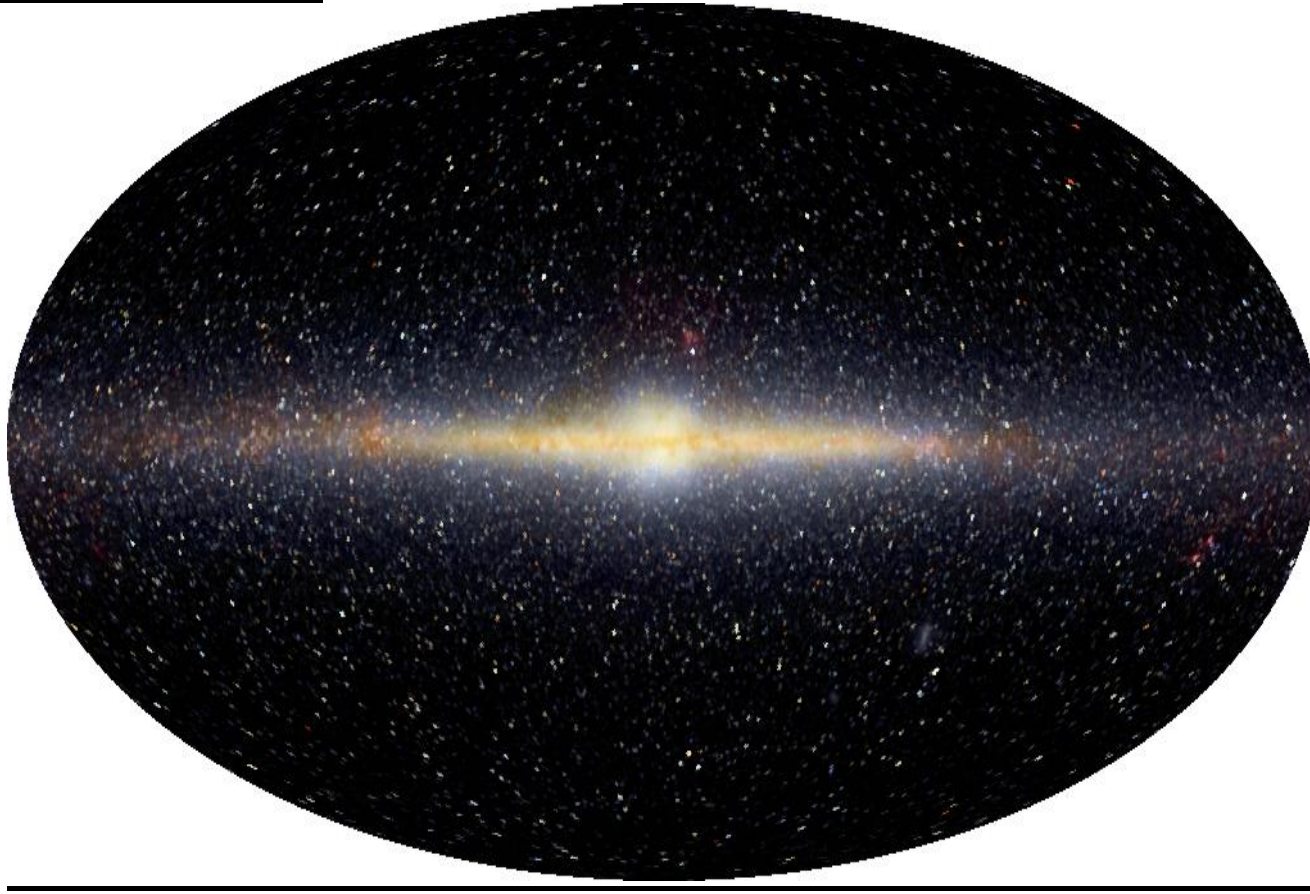
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3839 Birch, Newport Beach, Ca 92660.

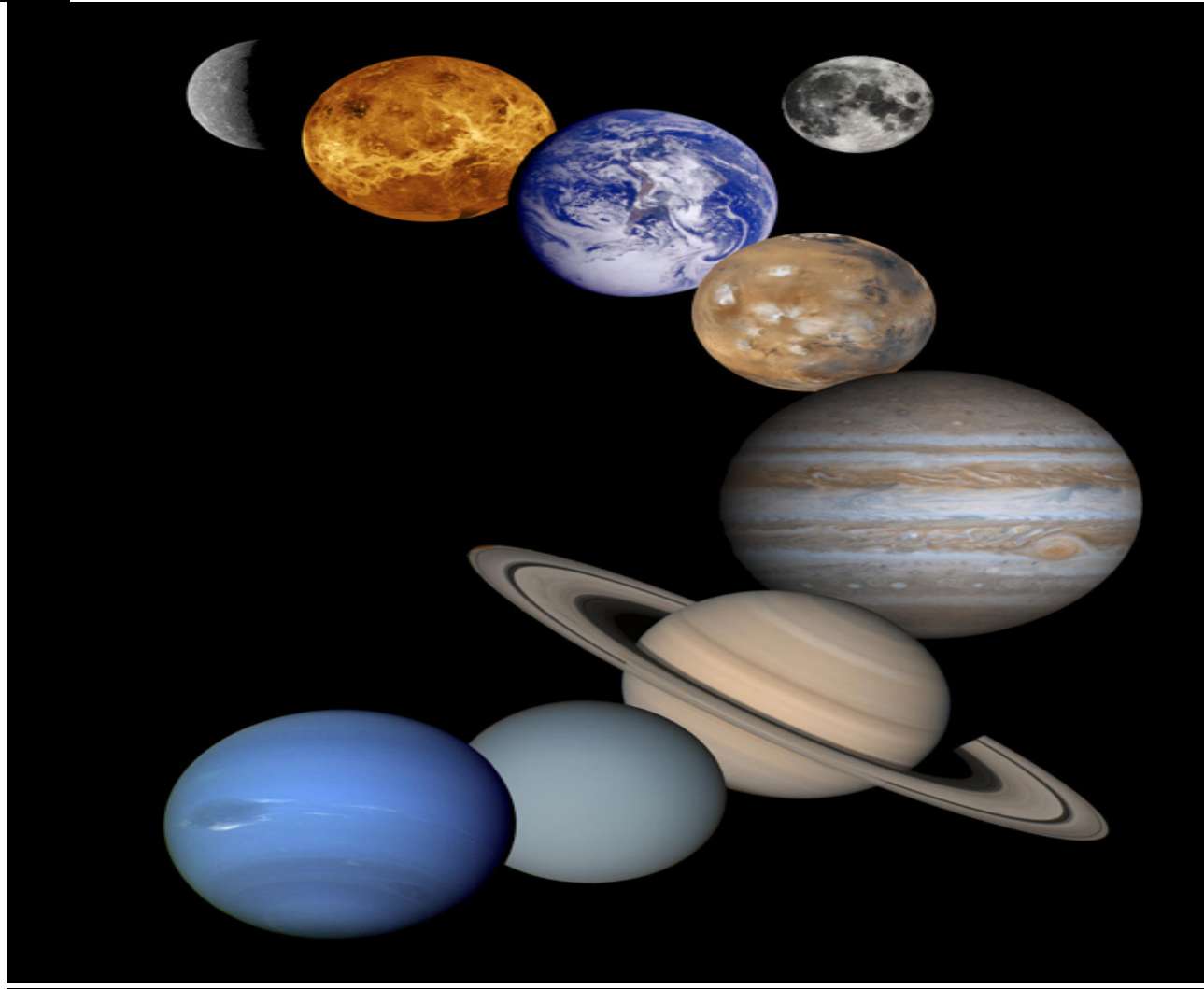
949 852 8700. 949 852 1918 fax

***Covering the Nation***

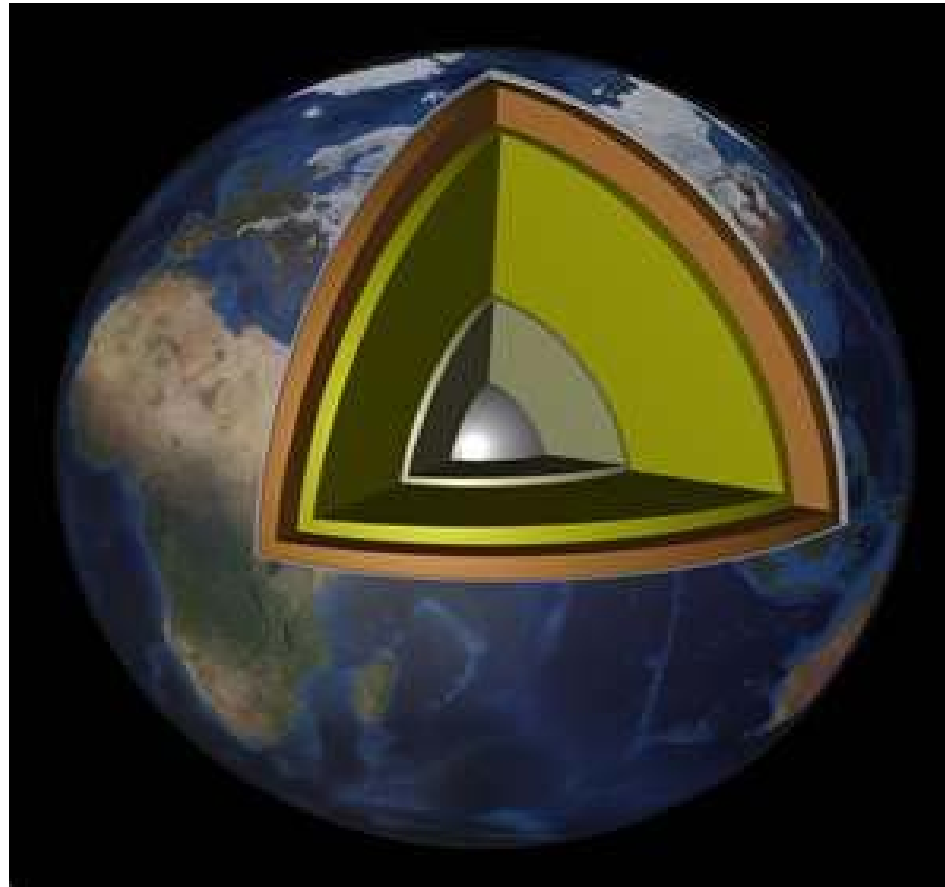
- **Universe: Milky way**



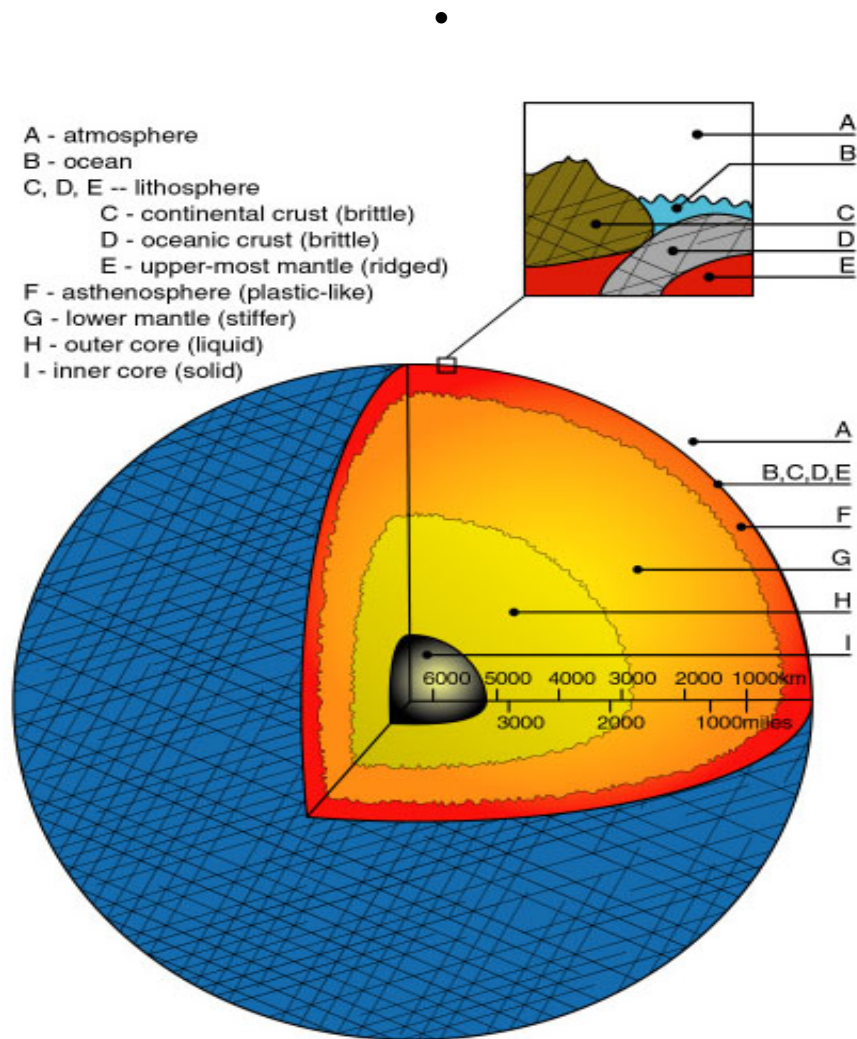
## Solar System:



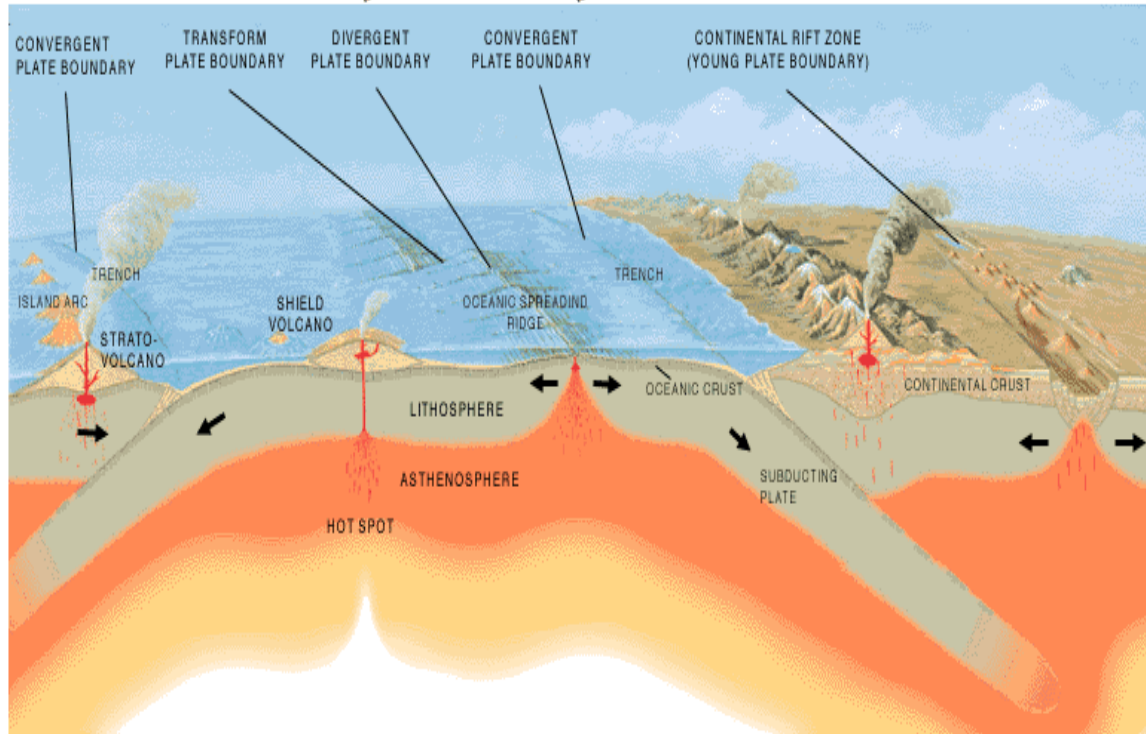
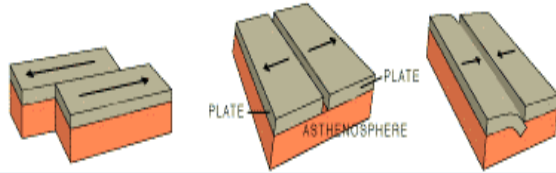
- **Earth:**



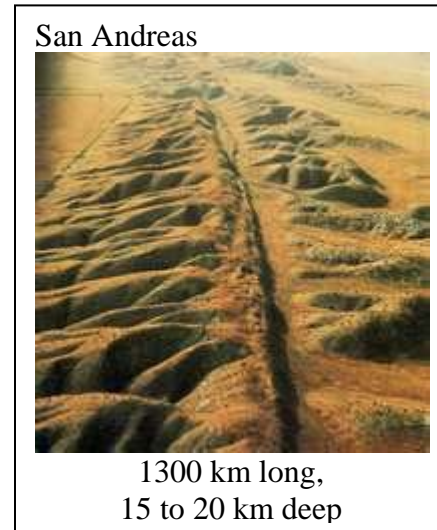
- **Earth Body:**

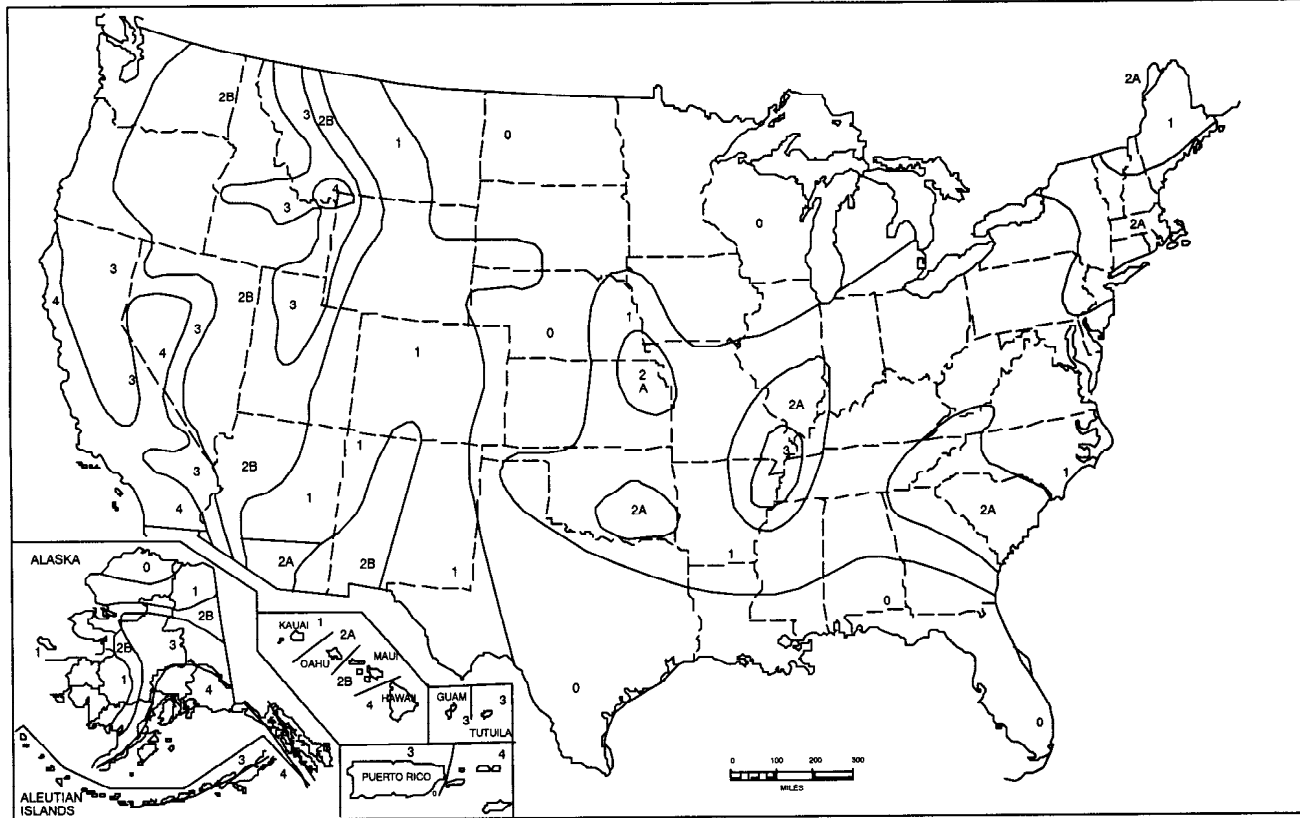


• **Earth Crust:**

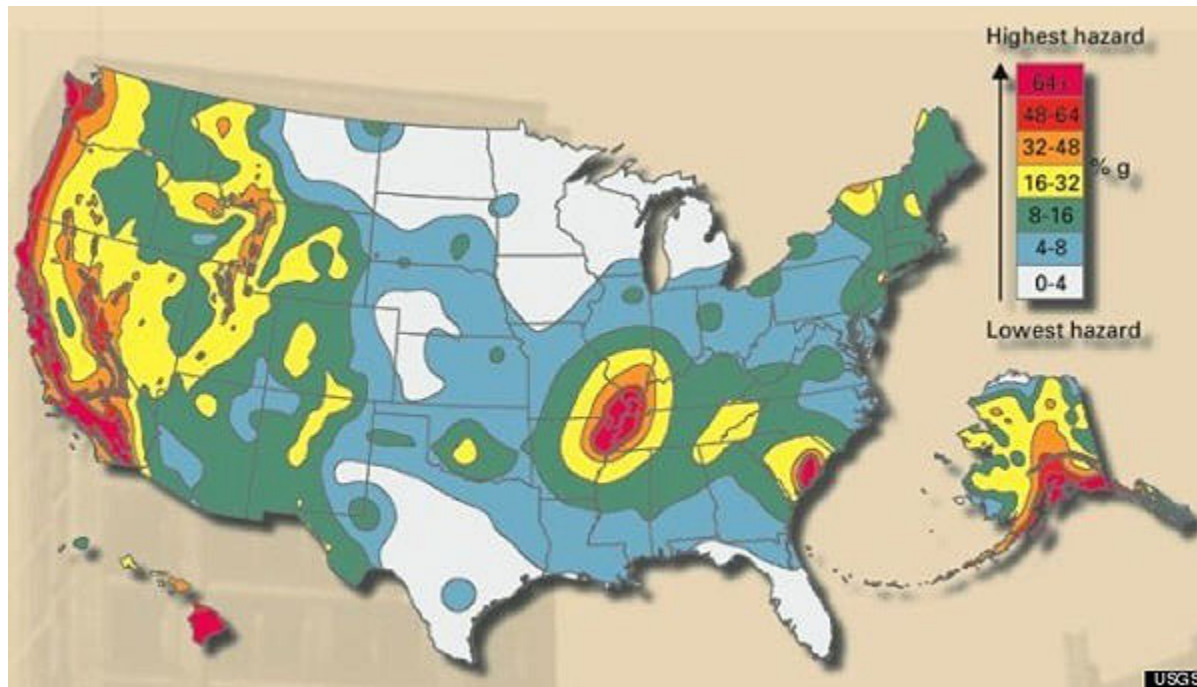


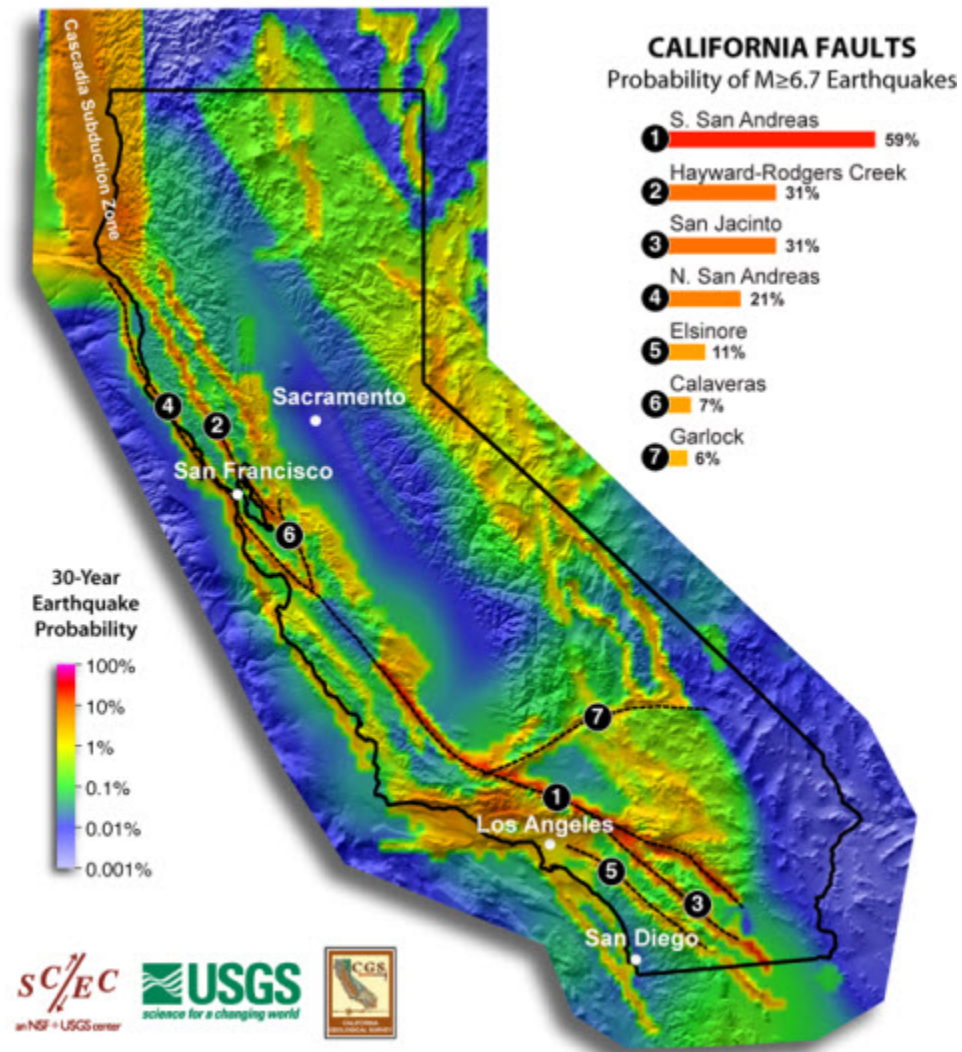
Type of Crust	Average Thickness	Average Age	Major Component
Continental Crust	20-80 kilometers	3 billion years	Granite
Oceanic Crust	10 kilometers	Generally 70 to 100 million years old	Basalt

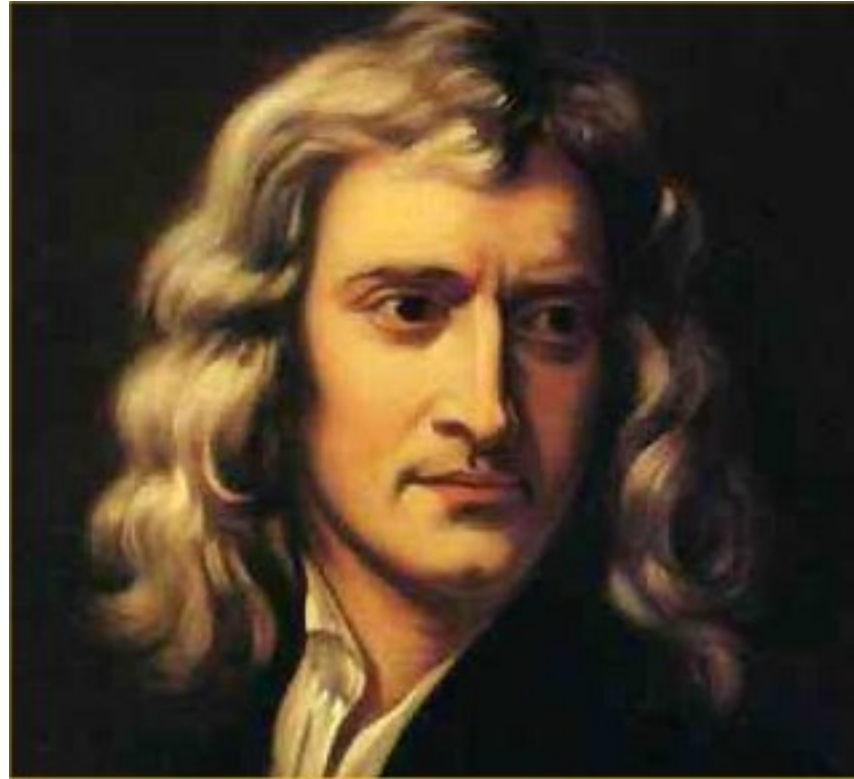




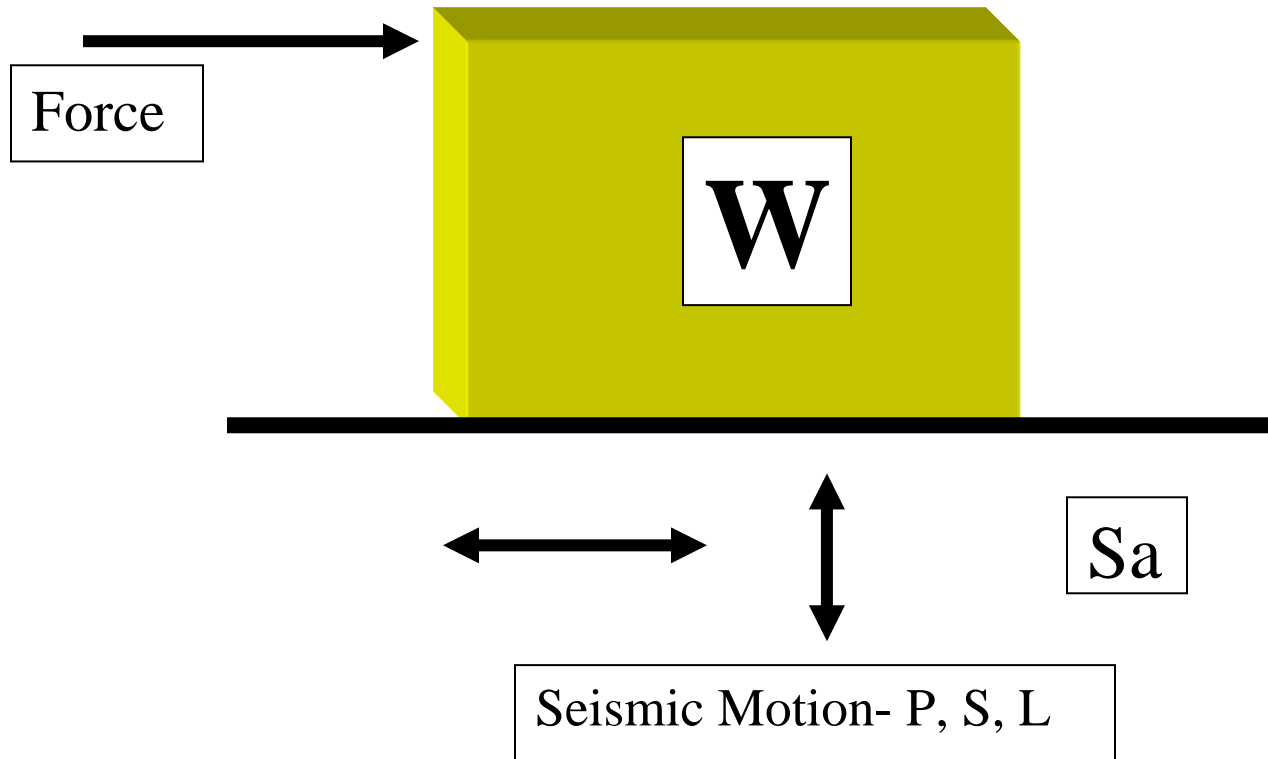
**FIGURE 16-2—SEISMIC ZONE MAP OF THE UNITED STATES**  
For areas outside of the United States, see Appendix Chapter 16.







$$\begin{aligned}\text{Force} &= m a \\ &= mg a/g \\ &= W Sa\end{aligned}$$



# Disaster History

## Katrina- Mercy Hospital- Not Earthquake but Hurricane and Water



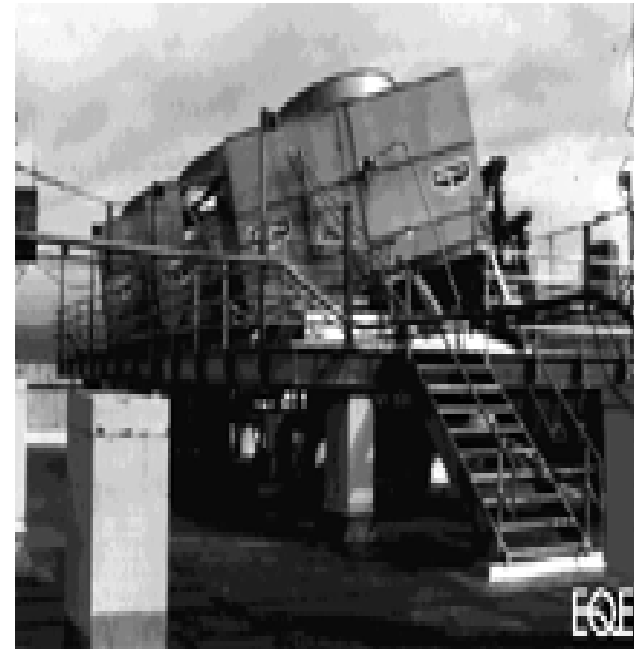
**Notable issues: Generators, Sanitation system, essential facilities--- Flooded**  
**Question: Where were the generators, essential equipments?**

## Fukushima – Earthquake and Water



**Notable issues: Generators, Sanitation system, essential facilities-  
Combination of Earthquake, Flood, Radiation-  
What happened to the reactor cooling systems/generators?**

## Northridge- Earthquake



o Q

*Left: Displaced and damaged rooftop air conditioning units at Sherman Oaks Fashion Square.*

*Right: The legs of three new, large, rooftop cooling towers in Sherman Oaks collapsed because of inadequate design.*

**All pendants system failed, all base supports were questionable, ...**

## Chances:

### California –

**Question is not if, the question is when it happens, then what ...**

**99% in 30 years of >6.7 Magnitude**

**97% in Southern California**

**93% in Northern California**

**23% between 2013 to 2020**

**>7.0 Magnitude      94%**

**>7.5 Magnitude      46%**

**>8.0 Magnitude      5%**

## Back to Basics

**F = Weight Element . Sa (ratio to g 32 ft/s sq)**

**$S_g = 0.4 a_p S_{DS} (1 + 2Z/h) W_P / (R_p/I_P)$**

**Sg has to meet:**

**between minimum to maximum value**

**$a_p, R_p =$  Tables**

**$I_P =$  Tables, and Importance Factor**

**Shake Table =  $a_p/R_p = 1$  stringent**

**$S_{DS} =$  Based on location**

- **Calculation is site specific.**
- **Shake Table = varies .... Most tested at near 2.0**  
**Issues: Base Spring base, loose connections, etc,**

**Codes:**

**CBC 2010**

**ASCE-07 05 to 10 Supplement**

**OSHPD Code Application Notice**

**AC156 and AC85**

**OSP= OSHPD Special Seismic Certification Preapproval**

**OPA= OSHPD Anchorage Preapproval**

**SPC= Seismic Performance Category**

**UUT= Unit Under Test**

## OCCUPANCY CATEGORY OF BUILDINGS AND OTHER STRUCTURES (ICC Table 1604.5)

I - Buildings and other structures that represent a low hazard to human life in the event of failure: Agricultural facilities. Certain temporary facilities. Minor storage facilities.

II - Buildings and other structures except those listed in Occupancy Categories I, III and IV

III - Buildings and other structures that represent a substantial hazard to human life in the event of failure. A few examples include:

Covered structures whose primary occupancy is public assembly with an occupant load greater than 300. Buildings and other structures with elementary school, secondary school or day care facilities with an occupant load greater than 250. Health care facilities with an occupant load of 50 or more resident patients, but not having surgery or emergency treatment facilities. Jails and detention facilities.

**IV - Buildings and other structures designated as essential facilities. A few examples include: "Essential"**

**Hospitals and other health care facilities having surgery or emergency treatment facilities. Fire, rescue and police stations and emergency vehicle garages.**

**Designated earthquake, hurricane or other emergency shelters. Buildings and other structures having critical national defense functions. (Los Angeles Airport!)**

ICC 1707.7.2 Ip of 1.0 or 1.5 three ways  
....calculations, experience, shake

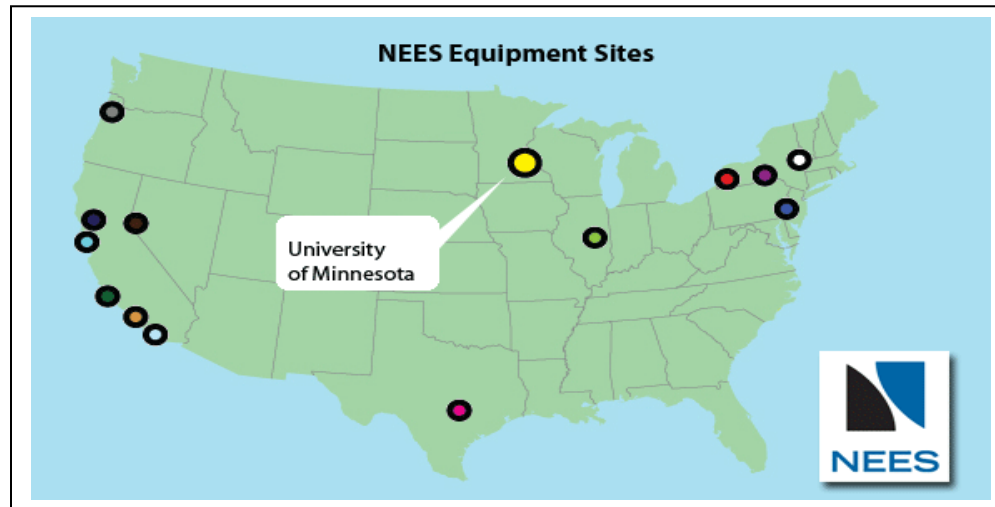
## Players in the Process:

- **Code Bodies**
- **OSHPD enforcement**
- **None-OSHPD group enforcement- DSA, ...**
- **Manufacturer: Insuring conformance of the products**

**. Engineer**  
**SEOR**  
**Mechanical**  
**Electrical**  
**Plumbing**  
**Others**

**. Installer**  
**Structural**  
**Mechanical**  
**Electrical**  
**Plumbing**  
**Others**

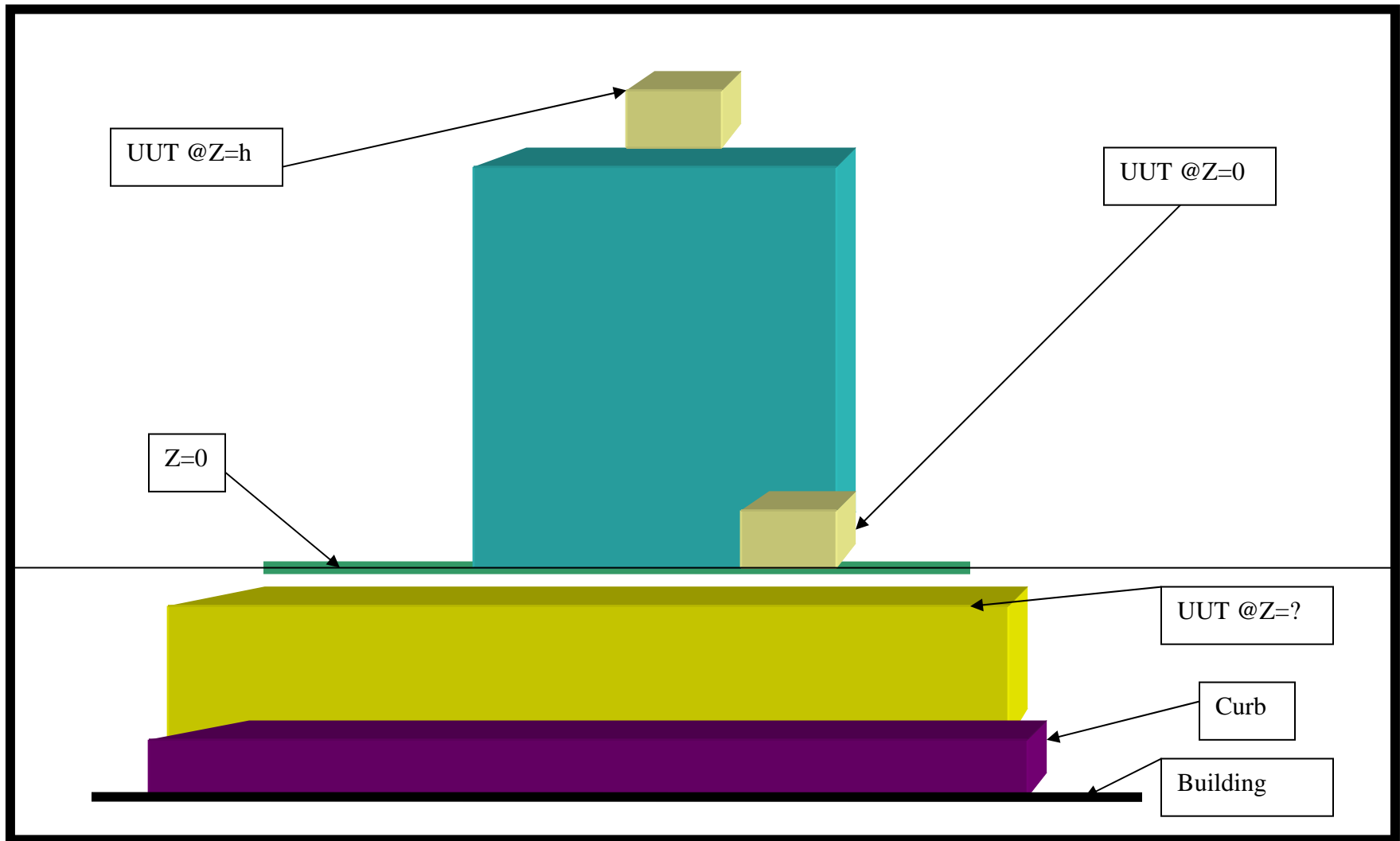
- **Consumer: Hospital, Fema, Fire Stations, etc.**
- **Third Party Vendor: Engineers & Laboratories**



**Network for Earthquake Engineering Simulation** is a shared national network of 14 experimental facilities, centralized data repository, collaborative tools and resources and earthquake simulation software. [Learn more](#)

- Shake Tables
  - [University at Buffalo, SUNY](#)
  - [University of CA, San Diego](#)
  - [University of Nevada, Reno](#)
- Tsunami Wave Basins
  - [Oregon State University](#)
- Geotechnical Centrifuges
  - [Rensselaer Polytechnic Institute](#)
  - [University of CA, Davis](#)

- Field Experiments/Monitoring
  - [University of CA, Los Angeles](#)
  - [University of CA, Santa Barbara](#)
  - [University of TX, Austin](#)
- Large Scale Laboratories
  - [Cornell University](#)
  - [Lehigh University](#)
  - [University of CA, Berkeley](#)
  - [University of IL, Urbana](#)
  - [University of Minnesota](#)



Graphics of Unit Placement

## **Lab Testing or Calculations?**

**Is the Unit hanging?**

**Is the unit on Base?**

**Is the unit Wall Mount?**

**Is it on ground floor?  $Z=0.0$**

**Is the unit on roof?  $Z= h$**

**Are there any spring mounting on the base?**

**Custom made or factory product line?**

**Listed product: ISO 9000 or two product test?**

**A complete drawings of the interior, materials, specifications, etc.?**

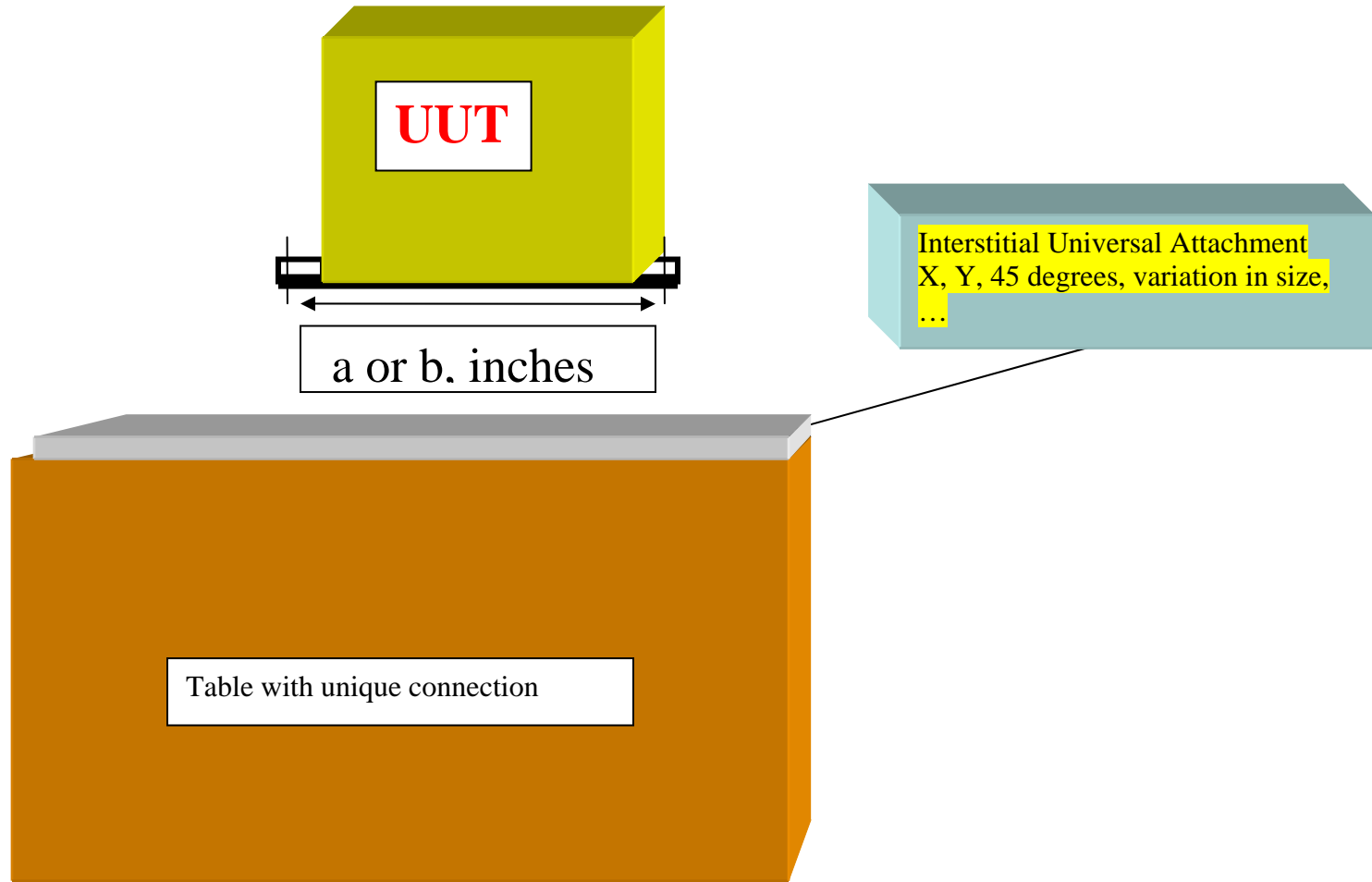
## **Other issues:**

### **Table is a flat surface:**

**A Jig/Chassis has to be created to satisfy the table, hold the unit (Vertical or Horizontal) position.**

- **Support of the specimen must mimic the actual final condition. “Rigid”**
- **SEOR of the building controls the connection of the unit to building.**

**Designer decides to make life simple for the SEOR and the Lab.**



## **Activities:**

**Calculations Only- All but OSHPD Buildings, FEMA Rated Buildings, Court Houses, Police Stations, Airport, ... ?**

- **A unit selected**
- **Full set of drawings**
- **Isometric of the unit**
- **Material/component list**
- **Check by SEOR of the Building**
- **Check by OSHPD**
- **How Conservative?**

## **Activities:**

### **Shake Table Only- All but OSHPD Buildings-**

- **Site Specific**
- **Unit selected: ISO 9000**

### **Analytical Check**

- **Full set of drawings**
- **Isometric of the unit**
- **Material/component list**
- **Pre/Post Test: Operational check test of unit –  
Engineer verified or Third Party Verification**

## **Shake Table (AC156)**

- **Man Handling to the table**
- **Table seating and attachment to simulate the future roof-Anchorage**
- **The “exact” Curb to be used**
- **Curb to have pre-OSP**
- **Three Dimensional Test+ 45 degrees**
- **Post Operational test- Engineer verified or Third Party Verification**

## Activities:

**Calculations Only- All but OSHPD Buildings- Fema  
Rated Buildings, Court Houses, Police Stations, Airport,  
... ?**

## Items to be Certified:

### Non OSHPD

- **Hanging: Anything that is greater than 20 lbs, except  
Electrical fixtures 56 lbs**
- **Platform: Greater than 400 lbs**

### OSHPD

- **Anything greater than 20 lbs except rugged equipment**
- **What is **rugged**?-**

## A Sample Specification and a Code section to Ponder ....

ASCE 07 similar to Chapter 16 on 20 lb Hanging.....

Section 13.1.4 Exemptions 4 and 5 — Several important clarifications occur in this section.

4. Mechanical and electrical components in Seismic Design Categories D, E, ~~and~~ or F where the component importance factor,  $I_p$ , is equal to 1.0 and ~~either~~ both of the following conditions apply:

- a. **flexible connections between the components and associated ductwork, piping, and conduit are provided, ~~or~~ and**
- b. **components are mounted at 4 ft (1.22 m) or less above a floor level and weigh 400 lb (1780 N) or less.**

5. Mechanical and electrical components in Seismic Design Categories D, E, and F where the component importance factor,  $I_p$ , is equal to 1.0 and both of the following conditions apply

- a. **flexible connections between the components and associated ductwork, piping, and conduit are provided, and**
- b. **the components weigh 20 lb (89N) or less or, for distribution systems, weighing 5 lb/ft (73 N/m) or less.**

And the Specification .....

## 1.1 SEISMIC PROTECTION

NOTE: The requirements for seismic protection measures described in this section apply to all electrical components **except** for the following:

- Electrical components where  $I_p = 1.0$ , and flexible connections between the components and associated conduits are provided, and the components are mounted at **4 ft or less above the floor**, and the components **weigh 400 lb or less**.
- Electrical components weighing **20 lb or less** where  $I_p = 1.0$  and flexible connections between the components and associated conduits are provided.
- Electrical distribution systems **weighing 5 lb/ft or less** where  $I_p = 1.0$ . (With respect  $I_p = 1.5$  !?)

Seismic restraints are not required for electrical conduit less than 2-1/2 inches trade size and not containing conductors for life-safety, safety-significant, or safety-class systems; provide seismic protection for all other interior conduit as specified.

Accomplish resistance to lateral forces induced by earthquakes without consideration of friction resulting from gravity loads.

Design the functional and physical interrelationship of components and their effect on each other so that the failure of an electrical component shall not cause the failure of a nearby life-safety, safety-significant, or safety class mechanical or electrical component.

Seismic Criteria: Use the following criteria to calculate seismic design forces and relative seismic relative displacements in accordance with the ICC and ASCE 7.

- Seismic Design Category = D
- $S_{DS}$  = design spectral response acceleration at short periods
  - o  **$S_{DS} = 0.54g$**
- Amplification, Response Modification and Importance factors (i.e.,  $a_p$ ,  $R_p$ ,  $I_p$ ) listed in ASCE 7:
  - o  $a_p = 2.5$  for electrical distribution systems (e.g., busducts, conduit, cable tray, etc.)
  - o  $a_p = 1.0$  for electrical equipment (e.g., switchgear, transformers, batteries, etc.)
  - o  $a_p = 1.0$  for luminaries
  
  - o  $R_p = 5.0$  for electrical distribution systems (e.g., busducts, conduit, cable tray, etc.)

- $R_p = 2.5$  for electrical equipment (e.g., switchgear, transformers, batteries, etc.)
- $R_p = 1.5$  for luminaries
- $R_p = 1.5$  for components anchored by shallow expansion anchors, shallow chemical anchors, or shallow (low deformability) cast-in-place anchors
  
- $I_p = 1.5$  for life safety related components (e.g., emergency generators, etc.)
- $I_p = 1.5$  for components with hazardous content (e.g., lead-acid batteries, etc.)
- $I_p = 1.5$  for safety class or safety significant components.
- $I_p = 1.0$  for all other components

A. Provide and install seismic protection in accordance with the ICC, ASCE 7, and additional data furnished in this Section and Section 13 4800 Sound, Vibration and Seismic Control.

\*\*\*\*\*

Edit the following article to match project conditions; add items to list as required; delete items not included in the Project. It may be necessary to note the equipment IDs for the particular items of equipment (e.g. GDE-1, SUS-B, etc.) that must meet the requirements of this article. **Delete the article if there is no equipment with  $I_p$  greater than 1.0.**

NOTE: Seismic protection does not guarantee that the equipment itself is rugged enough to survive earthquake shaking. When a piece of equipment is required to remain operational after an earthquake, consult the manufacturer regarding the capabilities of the equipment to withstand seismic loading.

\*\*\*\*\*

B. Equipment Qualification: The following equipment designated **with  $I_p$  greater than 1.0** and furnished under this contract shall be certified by the manufacturer to withstand the total lateral seismic force and seismic relative displacements specified in the ICC or ASCE 7. Component manufacturer’s certification shall be based on shake table testing or experience data (i.e., historical data demonstrating acceptable seismic performance), or by more rigorous analysis providing for equivalent safety. Required response spectra shall exceed 1.1 times the in-structure spectra determined in accordance **with ICC AC156** Acceptance Criteria for Seismic Qualification by Shake-Table Testing of Nonstructural Components and Systems.

Engine-generator[s] [GDE-1]; Secondary Unit Substation[s] [SUS-B]; Transformer[s] [XFMR-3]; Switchboard[s] [SWBD-2]; Motor control center[s] [MCC-E]; ...

## **Activities for the Engineer:**

- A. Communicate with Architect on the building Type**
- B. Communicate with SEOR on the structure**
- C. Please no spring mounting**
- D. Do not hang the unit**
- E. Coordinate S and M Sheets- Weight/size/connections**
- F. Try to specify similar units - i.e. Repeat all 5 tons**
- G. Coordinate all bases to be in similar conditions  
concrete pads, etc.- Steel bases are best**
- H. Your primary concern will be time. 4 to 6 months**
- I. Use standard curbs with SE approvals**
- J. ...**

# What **building** Require **units** to be **tested**?

### ***13.1.3 Component Importance Factor ASCE 7-05***

#### **Section 13.1.3-Component Importance Factor.**

All components shall be assigned a component importance factor as indicated in this section. The component importance factor,  **$I_p$ , shall be taken as 1.5** if any of the following conditions apply:

- 1. The component is required to function for life-safety purposes after an earthquake, including fire protection sprinkler systems.**
- 2. The component contains hazardous materials.**
- 3. The component is in or attached to an Occupancy Category IV structure and it is needed for continued operation of the facility or its failure could impair the continued operation of the facility.**

**All other components** shall be assigned a component importance factor,  $I_p$ , equal to **1.0**.

Listed on the project's structural drawings, under ***design loads***, the following **3 parameters are "red flags"** for when special seismic qualification may be required on a project:

▪ An  $S_Ds$  of .167 or greater

▪ Occupancy Category IV

▪ Seismic Design Category of C, D, E or F

**An  $S_{DS}$  of .167 or greater**

**Based on relative location to fault**

Table 1616.3(1): Seismic design category based on 0.2 second period response accelerations.

Value of SDS	Seismic Zone
$SDS < 0.167g$	Zone 1
$0.167g \leq SDS < 0.33g$	Zone 2
$0.33g \leq SDS < 0.50g$	Zone 3
$0.50g \leq SDS$	Zone 4

**TABLE 11.6-1 SEISMIC DESIGN CATEGORY BASED ON SHORT PERIOD RESPONSE ACCELERATION PARAMETER**

Value of $S_{DS}$	Occupancy Category		
	I or II	III	IV
$S_{DS} < 0.167$	A	A	A
$0.167 \leq S_{DS} < 0.33$	B	B	C
$0.33 \leq S_{DS} < 0.50$	C	C	D
$0.50 \leq S_{DS}$	D	D	D

## Occupancy Category IV

**1604.5 TABLE 1-1 OCCUPANCY CATEGORY OF BUILDINGS AND OTHER STRUCTURES**

Occupancy Category	Nature of Occupancy
I	Building and other structures that represent a low hazard to human life in the event of failure, including agricultural, temporary, and minor storage facilities.
II	All other structures that aren't in categories I, III, or IV.
III	<p>Building and other structures that represent a substantial hazard to human life in the event of failure including:</p> <ul style="list-style-type: none"> <li>• Covered structures the primary occupancy of which is public assembly with an occupant load of 300.</li> <li>• Buildings and other structures with elementary-school, secondary-school, or day-care facilities with an occupant load greater than 250.</li> <li>• Buildings and other structures with elementary-school, secondary-school, or day-care facilities with an occupant load greater than 500 for colleges or adult-education facilities.</li> <li>• Health-Care facilities with an occupant load of 50 or more resident patients without surgery or emergency-treatment facilities.</li> <li>• Jails and detention facilities.</li> <li>• Any structure with an occupant load greater than 5,000.</li> <li>• Power-generating stations, water-treatment facilities for portable water, waste-water-treatment facilities, and other public-utility facilities not included in Occupancy Category IV.</li> <li>• Buildings and other structures not included in Occupancy Category IV containing sufficient quantities of toxic or explosive substances that would be dangerous to the public if released.</li> </ul>
IV	<p>Buildings and other structures designated as essential facilities, including:</p> <ul style="list-style-type: none"> <li>• Hospitals and other health-care facilities with surgery or emergency-treatment facilities.</li> <li>• Fire, rescue, and police stations and emergency-vehicle garages.</li> <li>• Designated earthquake, hurricane, or other emergency shelters.</li> <li>• Designated emergency-preparedness, communication, and operation centers and other facilities required for emergency response</li> <li>• Power-generating stations and other public-utility facilities required as emergency-backup facilities for Occupancy Category IV structures.</li> <li>• Structures containing highly toxic materials as defined in Section 307 of the 2006 International Building Code.</li> <li>• Aviation control towers, air-traffic control centers, and emergency-aircraft hangers.</li> <li>• Buildings and other structures with critical national-defense functions.</li> <li>• Water-treatment facilities required to maintain water pressure for fire suppression.</li> </ul>

## Seismic Design Category of C, D, E or F

### What is a Seismic Design Category? Combination of Occupancy and Site.

If A Seismic Design Category is a classification assigned to a structure based on its occupancy category, and the severity of the design earthquake ground motion. The category assignment can range from A-F, and can be defined as the following:

Seismic Design Category A – Corresponds to buildings in areas where expected ground shaking will be minor. Good Soils

Seismic Design Category B - Corresponds to buildings of Occupancy Groups I,II and III where expected ground shaking will be moderate. Stratified soils with Good and poor Soils

Seismic Design Category C - Corresponds to buildings of Occupancy Groups IV ( Hospitals, Police Stations Emergency control centers etc) I where expected **ground shaking will be MODERATE AND buildings of occupancy categories I, II, and III where MORE SEVERE ground shaking will occur**

Seismic Design Category D Corresponds to buildings and structures in areas expected to experience **severe and destructive ground shaking But NOT located close to a major fault. Sites with poor soils are a good example**

Seismic Design Category E- Corresponds to buildings of Occupancy Groups I,II and III in areas **NEAR MAJOR ACTIVE FAULTS. Soil or rock is of no consequence**

Seismic Design Category F - Corresponds to buildings of Occupancy Groups IV ( **Hospitals, Police Stations Emergency control centers etc**)areas **NEAR MAJOR ACTIVE FAULTS. Soil or rock is of no consequence**

A Good Soils report from a Geotechnical engineer will and should provide to the structural engineer and architect the parameters necessary to determine the Seismic Design Category OR provide the Seismic Design category outright.

Discussion: Barn located in a high seismic area (southern Cal) would be seismic design category D. A critical facility in Minnesota is SDC A. The SDC is a combination of site and occupancy. Category E and F apply only when the  $S_1 > 0.75$ . ASCE 7-05 section 11.6

## 2.0 Equipment and Components Requiring Special Seismic Certification

Special Seismic Certification is required for certain equipment and components that are part of the designated seismic system pursuant to Section 13.2.2, ASCE/SEI 7-05. Only active mechanical and electrical components that must remain operable following the design earthquake require Special Seismic Certification.

### 2.1 List of Equipment and Components Requiring Special Seismic Certification

The following equipment and components require Special Seismic Certification:

1. Emergency and standby power systems equipment including generators, turbines, fuel tanks, and automatic transfer switches.
2. Elevator equipment (except elevator cabs).
3. Components with hazardous contents excluding pipes, and ducts.
4. Smoke control fans.
5. Switchgear.
6. Motor control centers.
7. Built-up or field assembled mechanical equipment.
8. X-Ray machine(s) in the fluoroscopy room (as required to meet the minimum basic radiological/imaging service space requirements of Section 1224.18, 2007 CBC).
9. Air conditioning units.
10. Air handling units.
11. Chillers used for HVAC.
12. Cooling Towers designed as components.
13. Transformers.
14. Electrical substations.
15. UPS and associated batteries.
16. Distribution panels including electrical panel boards.
17. Control panels, including fire alarm, fire suppression, pre-action, and auxiliary or remote power supplies.

Equipment and components that are considered to be rugged pursuant to Item 2.2 of this CAN are deemed to comply with Section 13.2.6, ASCE/SEI 7-05 and are exempt from the requirements of this section.

## 2.2 Rugged Equipment and Components

The equipment and components listed below are considered rugged and shall not require Special Seismic Certification:

1. Valves (not in cast-iron housings, except for ductile cast iron).
2. Pneumatic operators.
3. Hydraulic operators.
4. Motors and motor operators.
5. Horizontal and vertical pumps (including vacuum pumps).
6. Air compressors.
7. Sterilizers.
8. Blanket warmers.
9. Anesthesia power columns, ceiling or wall mounted.
10. Refrigerators and freezers.
11. Microwave ovens for patient service.
12. Film illuminators.
13. Elevator cabs.
14. Underground tanks.
15. Equipment and components weighing not more than 20 lbs. supported directly on structures (and not mounted on other equipment or components) with supports and attachments in accordance with Chapter 13, ASCE/SEI 7-05, as modified by Section 1614A, 2007 CBC. Exemptions in this section are for factory assembled discrete equipment and components only and do not apply to site assembled or field assembled equipment or equipment anchorage. The list is based in part on the 1999 SEAOC Blue Book commentary Section C 107.

## OSHPD Special Seismic Certification Preapproval (OSP) by Category

### OSHPD 11/1/2011

#### 1. Emergency and Standby Power Systems

##### Generators:

- OSP-0028-10: Cummins – Generator Sets
- OSP-0082-10: Kohler – Generator Sets
- OSP-0084-10: Caterpillar – Generator Sets
- OSP-0117-10: MTU – Generator Sets
- OSP-0189-10: Kohler – Electrical Power Generator

##### Automatic Transfer Switches:

- OSP-0005-10: Russelectric - Automatic Transfer Switches
- OSP-0014-10: Eaton – Automatic Transfer Switches
- OSP-0029-10: Cummins – Automatic Transfer Switches
- OSP-0032-10: ASCO – Automatic Transfer Switches
- OSP-0035-10: GE Zenith Controls – Automatic Transfer Switches
- OSP-0096-10: Russelectric - Transfer Switches
- OSP-0114-10: Caterpillar – Automatic Transfer Switches & Switchgears
- OSP-0172-10: Caterpillar – Automatic Transfer Switches
- OSP-0193-10: MTU – Automatic Transfer Switches

##### Paralleling Switchgear Controls:

- OSP-0030-10: Cummins – Digital Master Controllers
- OSP-0036-10: GE Zenith Controls – Paralleling Switchgear Controls
- OSP-0120-10: Kohler – Switchgear Control Panels

##### Miscellaneous Generator Support Components:

- OSP-0129-10: YoungTouchtone – Radiators
- OSP-0130-10: YoungTouchtone – Charge Air Coolers
- OSP-0131-10: Stored Energy Systems – Battery Chargers
- OSP-0152-10: IEA – Radiators
- OSP-0192-10: IEA – Radiators and Engine Coolers

#### 2. Elevator Equipment (except elevator cabs)

##### Elevator Controllers:

- OSP-0092-10: Otis Elevator – Elevator Controllers
- OSP-0124-10: Computerized Elevator Control – Elevator Controllers
- OSP-0143-10: ThyssenKrupp Elevator – Elevator Controllers
- OSP-0166-10: ThyssenKrupp Elevator – Hydraulic Elevator Controllers
- OSP-0175-10: Kone – Elevator Controllers & Drives
- ~~OSP-0209-10: ThyssenKrupp Elevator – Traction Elevator Controllers~~

##### Elevator Control Panels & Switches:

- OSP-0011-10: Eaton – Elevator Control Panels & Switches

#### 3. Components with Hazardous Contents

##### Batteries:

- OSP-0054-10: Electronic Systems Support – Battery Cabinets
- OSP-0088-10: C & C Power - Battery Cabinets
- OSP-0138-10: Power Battery – Battery Cabinets
- OSP-0194-10: Square D – Battery Racks

##### Fuel Tanks:

- OSP-0126-10: Professional Power Products – Fuel Tanks
- ~~OSP-0185-10: Global Power Components – Fuel Tanks~~
- OSP-0187-10: Phoenix Power Products – Fuel Tanks

##### Medical Gas Systems:

- OSP-0200-10: Cryoquip – Cryogenic Fluid Vaporizers
- OSP-0221-10: Praxair – Medical Oxygen Supply Regulator Module

#### 4. Exhaust/Smoke Control Fans

- OSP-0033-10: Loren Cook – Exhaust/Smoke Control Fans
- OSP-0102-10: Loren Cook – Centrifugal Blowers
- OSP-0148-10: Greenheck Fan – Centrifugal Ventilation Fans
- OSP-0195-10: Twin City Fan – Utility Centrifugal Ventilating Fans
- ~~OSP-0223-10: Greenheck Fan – Mixed Flow and Lab Exhaust Fans~~

## OSHPD Special Seismic Certification Preapproval (OSP) by Category

### OSHPD 11/1/2011

#### 5. Air Conditioning/Air Handling Units

##### Custom Air Handling Units:

- OSP-0063-10: ClimateCraft – Custom Air Handling Units
- OSP-0069-10: Energy Labs– Custom Air Handling Units
- OSP-0075-10: Huntair– Custom Air Handling Units
- ~~OSP-0076-10: TMI – Custom Air Handling Units~~
- OSP-0079-10: Temtrol – Custom Air Handling Units
- OSP-0080-10: Governair – Custom Air Handling Units
- ~~OSP-0118-10: Alliance – Custom Air Handling Units~~

##### Packaged Air Handling Units:

- OSP-0027-10: Carrier – Roof Top Air Handling Units
- OSP-0050-10: Trane – Packaged Air Handling Units
- OSP-0147-10: Johnson Controls – Packaged Air Handling Units
- OSP-0153-10: Carrier – Roof Top Air Conditioning Units
- ~~OSP-0180-10: AAO – Packaged Rooftop Air Handling Units~~
- OSP-0203-10: Trane – Packaged Air Handling Units
- OSP-0213-10: York – Packaged Air Handling Units

##### Split Air Conditioning and Fan Coil Units:

- OSP-0105-10: Greenheck Fan – Fan Coil Air Handling Units
- OSP-0108-10: Mitsubishi – Split Air Conditioners and Heat Pumps
- OSP-0125-10: Carrier – Split Condensing and Fan Coil Units
- OSP-0211-10: IEC – Hydronic Fan Coils
- OSP-0227-10: Xpediair – Hydronic Fan Coils
- OSP-0229-10: Carrier– Hydronic Fan Coils

##### Data Room Air Conditioners:

- OSP-0049-10: Emerson Network Power –Liebert Air Conditioners for Computer Rms
- ~~OSP-0230-10: Stulz – Computer Room Air Handlers~~

##### Inline Fans & Terminal Air Conditioners:

- OSP-0113-10: Greenheck Fan – Centrifugal and Axial Fans
- OSP-0122-10: Loren Cook – Filtered Air Supply Fan
- OSP-0123-10: Trane – Air Terminal Devices
- OSP-0219-10: Loren Cook – Inline Fan

##### Humidification Systems:

- ~~OSP-0216-10: Dri-Steam – Humidification Systems~~
- OSP-0225-10: Walter Meier – Humidifier

#### 6. Chillers

##### Water Cooled Chillers:

- OSP-0026-10: Carrier – Chillers
- OSP-0034-10: Carrier – Chillers
- OSP-0045-10: Johnson Controls – Chillers
- OSP-0048-10: Climacool – Chillers and Master Control Panel
- OSP-0116-10: McQuay – Chillers
- OSP-0135-10: Carrier – Water and Air Cooled Chillers
- OSP-0150-10: Multistack – Chillers
- OSP-0159-10: Johnson Controls – Chillers
- OSP-0161-10: Carrier – Water Cooled and Condenser less Chillers
- OSP-0167-10: Smardt– Chillers
- OSP-0168-10: Trane – Chillers
- OSP-0188-10: Trane – Liquid Chillers
- OSP-0190-10: Trane – Liquid Chillers
- OSP-0204-10: Multistack – Maglev Flooded Chillers
- OSP-0205-10: Trane – Helical Rotary Water Chillers

##### Air Cooled Chillers:

- OSP-0128-10: Trane – Air Cooled Chillers
- OSP-0135-10: Carrier – Water and Air Cooled Chillers
- OSP-0169-10: Dimplex– Air Cooled Condensing Process Chillers
- OSP-0170-10: Siemens – Air Cooled Water Chillers
- OSP-0173-10: Johnson Thermal Systems – Air Cooled Chillers
- OSP-0184-10: Carrier – Air Cooled Chillers

##### Condensers:

- ~~OSP-0181-10: AAO – Condensers~~
- OSP-0182-10: Emerson Network Power – Liebert Condensers

#### 7. Cooling Towers

- OSP-0001-10: Baltimore Aircoil - Cooling Towers
- OSP-0002-10: Baltimore Aircoil - Cooling Towers
- OSP-0111-10: Evapco - Cooling Towers
- OSP-0171-10: SPX Marley - Cooling Towers
- ~~OSP-0224-10: Baltimore Aircoil – Cooling Towers~~

## OSHPD Special Seismic Certification Preapproval (OSP) by Category

### OSHPD 11/1/2011

#### 8. Radiography and Fluoroscopy System in Fluoroscopy rooms

- OSP-0051-10: GE Medical Systems - Radiography and Fluoroscopy System
- OSP-0061-10: Philips Healthcare – Radiography and Fluoroscopy System
- OSP-0062-10: Siemens Medical Solutions - X-Ray Machines
- OSP-0081-10: Toshiba Medical Systems - X-Ray Machines
- OSP-0086-10: Siemens Medical Solutions - Radiography and Fluoroscopy Imaging Systems
- OSP-0133-10: Toshiba Medical Systems – Radiography and Fluoroscopy Imaging Systems

#### 9. CT Systems

- OSP-0085-10: GE Healthcare – CT & PET-CT Systems
- OSP-0100-10: Siemens Medical Solutions – CT Systems
- OSP-0149-10: Philips Healthcare – CT & SPECT – CT Systems
- OSP-0174-10: Toshiba –CT Systems
- OSP-0212-10: Siemens Medical Solutions – PET-CT Systems

#### 10. Nurse Call Systems

- OSP-0067-10: Rauland-Borg – Nurse Call Systems
- OSP-0132-10: West-Com – Nurse Call Systems
- OSP-0179-10: Hill-Rom – Nurse Call Systems
- OSP-0198-10: Jeron Electronic Systems – Nurse Call Systems
- OSP-0207-10: GE – Nurse Call Systems

#### 11. Switchgear/Switchboards

##### Low Voltage Switchgear:

- OSP-0005-10: Russelectric – Low Voltage Switchgear
- OSP-0007-10: Square D – Low Voltage Switchgear
- OSP-0018-10: Eaton – Low Voltage Switchgear
- OSP-0021-10: IEM - Switchgear
- OSP-0023-10: Square D - Low Voltage Switchgear
- OSP-0043-10: GE – Low Voltage Switchgear
- OSP-0070-10: ASCO – Switchgear
- OSP-0090-10: Siemens – Low Voltage Switchgear

##### Switchboards:

- OSP-0022-10: Square D – Switchboards
- OSP-0038-10: Square D – Switchboards
- OSP-0047-10: Square D – Enclosed Heavy Duty Safety Switches

##### Medium Voltage Switchgear:

- OSP-0019-10: Eaton – Medium Voltage Switchgear
- OSP-0024-10: Russelectric – Medium Voltage Switchgear
- OSP-0037-10: Square D - Medium Voltage Load Interrupter Switchgear
- OSP-0042-10: GE – Load Interrupter Switchgear
- OSP-0046-10: Square D – Medium Voltage Metal-Clad Switchgear
- OSP-0053-10: Square D - Medium Voltage Switchgear
- OSP-0103-10: Powell Industries – Medium Voltage Switchgear
- OSP-0141-10: Siemens – Medium Voltage Metal-Clad Switchgear
- ~~OSP-0142-10: Siemens – Medium Voltage Switchgear~~
- OSP-0157-10: G & W Electric – Switchgear

#### 12. Motor Control Centers

##### Low Voltage Motor Control Centers:

- OSP-0006-10: Eaton – Motor Control Centers
- OSP-0052-10: Square D – Low Voltage Motor Control Centers
- OSP-0074-10: Siemens – Low Voltage Motor Control Centers
- OSP-0093-10: GE – Low Voltage Motor Control Centers

##### Medium Voltage Motor Control Centers:

- OSP-0106-10: GE – Medium Voltage Motor Control Centers
- ~~OSP-0151-10: Eaton – Medium Voltage Motor Control Centers~~

## OSHPD Special Seismic Certification Preapproval (OSP) by Category

### OSHPD 11/1/2011

#### 13. Transformers

##### Dry Type Transformers:

- OSP-0008-10: Eaton – Dry Type Transformers
- OSP-0023-10: Square D - Low Voltage Transformers
- OSP-0025-10: ABB – Dry Type Transformers
- OSP-0041-10: GE - Low Voltage Transformers
- OSP-0056-10: MGM Transformer – Dry Type Transformers
- OSP-0097-10: Siemens – Dry Type Transformers
- OSP-0109-10: Jefferson Electric – Dry Type Transformers
- OSP-0110-10: Powersmiths – Dry Type Transformers
- OSP-0136-10: Hammond – Dry Type Transformers

##### Liquid Filled Transformers:

- OSP-0098-10: Prolec GE - Liquid Filled Transformers
- OSP-0115-10: ABB – Liquid Filled Transformers
- OSP-0121-10: Cooper Power Systems – Liquid Filled Transformers

#### 14. Electrical Substations

- OSP-0017-10: Eaton – Unitized Power Center (UPC)
- OSP-0059-10: Square D – Integrated Power Center (IPC)
- OSP-0146-10: Square D – Medium Voltage Package Substations

#### 15. UPS and associated Batteries

- OSP-0013-10: Eaton – UPS and Options Cabinets
- OSP-0066-10: UP System – UPS
- OSP-0101-10: Emerson Network Power – UPS & Rack
- OSP-0107-10: Mitsubishi – UPS
- OSP-0119-10: Toshiba – UPS
- OSP-0144-10: APC – UPS
- OSP-0145-10: APC – UPS
- OSP-0163-10: VYCON – Flywheel Energy Storage System
- OSP-0196-10: APC – UPS
- OSP-0197-10: APC – UPS
- OSP-0206-10: GE – UPS
- OSP-0220-10: APC – UPS
- ~~OSP-0228-10: Emerson Network Power – UPS~~

#### 16. Distribution Panels

##### Electrical Panelboards:

- OSP-0009-10: Eaton – Electrical Panelboards
- OSP-0016-10: Square-D – Panelboards
- OSP-0021-10: IEM - Panelboards
- OSP-0040-10: GE - Panelboards
- OSP-0058-10: Square D – Modular Panelboard System
- OSP-0064-10: Square D – Enclosed Circuit Breakers
- OSP-0078-10: Siemens - Panelboards

##### Electrical Switchboards:

- OSP-0010-10: Eaton – Electrical Switchboards
- OSP-0012-10: Eaton – Low Voltage Switching Devices
- OSP-0015-10: Eaton – Enclosed Control
- OSP-0044-10: GE - Switchboards
- OSP-0047-10: Square D – Enclosed Heavy Duty Safety Switches
- OSP-0060-10: Siemens – Safety Switches
- OSP-0089-10: Siemens – Switchboards

## OSHPD Special Seismic Certification Preapproval (OSP) by Category

### OSHPD 11/1/2011

**17. Control Panels**

## Fire Alarm Panels:

- OSP-0004-10: SimplexGrinnell -Fire Alarm Control Panels
- OSP-0057-10: Siemens – Fire Alarm Control Panel
- OSP-0065-10: Honeywell, Silent Knight – Fire Alarm Control Panels
- OSP-0071-10: Honeywell, Fire-Lite – Fire Alarm Control Panels
- OSP-0072-10: Honeywell, Notifier – Fire Alarm Control Panels
- OSP-0073-10: Honeywell, Gamewell-FCI – Fire Alarm Control Panels
- OSP-0139-10: Kirkland – Graphic Annunciator Panels
- OSP-0154-10: Mircom - Fire Alarm Control Panels

## Fire Protection Panels:

- OSP-0031-10: GE Security – Fire Protection System
- OSP-0077-10: Fike – Fire Detection Equipment Line
- OSP-0104-10: Fireflex – Integrated Fire Protection Systems
- OSP-0112-10: Siemens – MXL Fire Protection System
- OSP-0158-10: ASCO – Fire Pump Controllers
- ~~OSP-0155-10: Eaton – Fire Pump Controllers~~

## HVAC Control Panels:

- OSP-0055-10: Climatec – HVAC Control Panels
- OSP-0068-10: Systecon – HVAC Control Panels
- OSP-0127-10: L & H Airco – Temperature Control Panels
- OSP-0183-10: Emcor – Temperature Control Panels
- OSP-0199-10: Schneider Electric – Temperature Control Panels
- OSP-0201-10: Functional Devices – AC Power Supplies for Changing Voltage
- OSP-0214-10: Sunbelt Controls – Automated Logic Control Panels
- OSP-0226-10: Southland – Temperature Control Panels

## Lighting Control Panels:

- OSP-0091-10: Acuity Brands Controls – Lighting Control Panels
- OSP-0134-10: Philips– Low-Voltage Lighting Control Panels
- OSP-0164-10: Philips – Lighting Control Cabinets
- OSP-0202-10: Steris – Surgical Lighting Control Panels
- OSP-0215-10: Lutron Electronics – Lighting Control Panels

## Variable Frequency Drives (VFDs) and Starters:

- OSP-0020-10: Square D – Packaged AC Drives & Soft Starts
- OSP-0083-10: ABB - Variable Frequency Drives (VFDs)
- OSP-0087-10: Danfoss - Variable Frequency Drives (VFDs)
- OSP-0099-10: Eaton – MV Adjustable Frequency Drive (AFDs)
- OSP-0137-10: Trane - Variable Frequency Drives (VFDs)
- OSP-0156-10: Square D – Combination Starters and Lighting Contactors
- ~~OSP-0165-10: Eaton – Medium Voltage Variable Frequency Drives (VFDs)~~

## Fuel Oil Control Panels:

- OSP-0160-10: Fuel Oil Systems – Fuel Oil Control Panels
- OSP-0191-10: ElectroDesign – Fuel Oil System Control Panels
- OSP-0208-10: Lescure – Fuel Oil Control Panels

**18. Internal Communication Servers and Routers**

- OSP-0003-10: Nortel Network - Private Branch Exchange (PBX)
- OSP-0039-10: NEC - Voice Communications Server
- OSP-0140-10: Johnson Controls – Network and Security Control Panels

## Building Automation Systems:

- OSP-0217-10: Siemens – Building Automation System
- OSP-0218-10: Siemens – Building Automation System

**19. Power Isolation and Correction Systems**

- OSP-0095-10: Square D –Power Correction Systems
- OSP-0162-10: Teal – Power Distribution Units
- OSP-0176-10: Bender – Power Isolation Panels
- OSP-0210-10: PG LifeLink – Isolated Power Distribution Panels

**20. Electrical Busways & Grounding Systems**

- OSP-0094-10: Square D – Low Voltage Busways
- ~~OSP-0178-10: Eaton – Low Voltage Busways~~
- OSP-0177-10: Post Glover Resistors – Neutral Grounding Resistors
- OSP-0186-10: Post Glover Resistors – High-Resistance Grounding Systems
- OSP-0222-10: Technibus – Medium Voltage Busways

**OSHPD Special Seismic Certification Preapproval (OSP) by Category**  
OSHPD 11/1/2011

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# End- Part 1