

# Attachment A

## Earthquake

### The Hazard

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<b>Nature of the Hazard</b>	A sudden, violent shaking or movement of part of the earth's surface caused by the abrupt displacement of rock masses, usually within the upper 10 to 20 miles of the earth's surface. The earthquake hazard may consist of:
<i>Ground Motion</i>	Vibration and shaking of the ground during an earthquake is the most far-reaching effect and causes the most damage to buildings, structures, lifelines, etc.
<i>Ground Surface Fault Rupture</i>	The ground shaking is the result of a rupture of a fault beneath the surface. When the ground shaking results in a rupture of the surface of ground, an opening of up to 20 feet may occur.
<i>Liquefaction</i>	The ground temporarily loses its strength and behaves as a viscous fluid (similar to quicksand) rather than a solid.
<i>Landslides</i>	Sometimes an earthquake causes a landslide to occur. This involves a rock fall and slides of rock fragments on steep slopes.
<i>Tsunamis</i>	Tsunamis are sea waves produced by an undersea earthquake. These sea waves caused by the earthquake can reach 80 feet and can devastate coastal cities and low-lying coastal areas.
<i>Secondary Hazards</i>	Consequences of earthquakes may include fire, HAZMAT release, or dam failure, among others.
<b>Risk Area</b>	Wide areas of the United States have some vulnerability to earthquakes. Thirty-nine States face the threat of a major damaging earthquake and are considered to be earthquake hazard areas. The planning team in each of the jurisdictions in these States should use information from their State's earthquake hazard identification study to quantify the seismic hazard their community faces. This study addresses the magnitude, estimates the amount of ground shaking that could occur, and delineates the associated geological hazards (landslide, liquefaction, etc.) that may occur as a result

of a catastrophic earthquake. Further, a vulnerability assessment should have been prepared as part of the hazard analysis. The assessment provides the planning team information related to probable consequences and damages their jurisdiction may suffer if struck by an earthquake. It focuses on casualties and injuries; potential building losses and identifies the buildings most vulnerable to seismicity (including critical facilities such as hospitals, EOCs, mass care centers, emergency services organizations' work centers, water and waste management plants, power companies, etc.); medical needs versus available medical resources; loss of utilities and replacement/repair time; etc. caused by the earthquake and the collateral hazards it may trigger (e.g. fires, dam or levee failure, tsunamis, HAZMAT spills, etc.). This information will help the team develop the appropriate information for inclusion in the EOP.

## **Earthquake Unique Planning Considerations**

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This section contains a listing of the functional annexes that typically would require the preparation of a hazard-specific appendix for earthquakes. It also identifies the unique and/or regulatory planning considerations that should be examined by the planning team and used, as appropriate, when preparing earthquake-specific appendices.

### **Direction and Control**

For this hazard it is essential for emergency response personnel to take immediate action to gather damage assessment information. This information is needed to determine the severity and extent of injuries and damages. Further, this data gathering effort should provide much of the information decision makers will need to implement and prioritize response actions for: US&R activities, access control and re-entry to the impacted area, debris clearance, restoration of utilities and lifeline repairs, and the inspection, condemnation, and or demolition of buildings and other structures.

Therefore, provisions should be made, as appropriate, to address the following planning considerations in one or more appendices to a direction and control annex:

### *Damage Assessment*

Conduct of ground and aerial surveys to determine the scope of the damage, casualties, and the status of key facilities.

*Search and Rescue*

Removal of trapped and injured persons from landslides, buildings collapses, and other structural collapses, administering first aid, and assisting in transporting the seriously injured to medical facilities. This activity involves the use of professional and volunteer search teams including the use of dog teams. Consideration should be given to:

- Use of damage assessment information to identify the facilities and areas where US&R operations are to be conducted and to establish a priority for conduct of these operations.
- Request for Federal assistance to perform US&R operations.

Major consequences associated with an earthquake are the collapse of buildings and other structures, and landslides. In a metropolitan area that is struck by a major earthquake many hundreds to thousands of people could be trapped. These trapped people need immediate assistance. In such situations, it is likely that local and State governments would be overwhelmed by the demand for emergency services. Further, most jurisdictions do not have a sufficient quantity of specialized equipment or enough trained teams available to accomplish the large-scale search and rescue operations that would be needed to respond to a catastrophic earthquake. In order to assist State and local governments to accomplish this critical lifesaving activity, the Federal Government has established Federal US&R teams. These teams are available to State and local jurisdictions upon request. The FRP's ESF-9 includes provisions for deploying Federal US&R teams. These teams augment State and local emergency response efforts to locate, extract, and provide for the immediate medical treatment of victims trapped in collapsed structures.

*Access Control and Re-Entry*

This section deals with the immediate actions to be taken, as soon as conditions permit, in the area that was severely impacted by an earthquake. Relevant considerations include:

- Control of access to the area until it is safe. Only those people directly involved in emergency response operations should be allowed to enter.
- Establishing a protocol for determining the appropriate time to allow evacuees and the general public to re-enter the area that was severely impacted.

*Debris  
Clearance*

The identification, removal, and disposal of rubble, landslides, wreckage, and other material which block or hamper the performance of emergency response functions should be a high priority action. Activities may include:

- Demolition and other actions to clear obstructed roads.
- Repair or temporary reinforcement of roads and bridges.
- Construction of emergency detours and access roads.

*Inspection,  
Condemnation,  
Demolition*

Inspection of buildings and other structures to determine whether it is safe to inhabit or use them after an earthquake has occurred. Activities may include:

- Inspection of buildings and structures which are critical to emergency services operations and mass care activities. Designate those that may be occupied and identify/mark those that are unsafe.
- Inspection of buildings and structures that may threaten public safety. Identify/mark those that are unsafe and may not be occupied.
- Inspection of dams and levees.
- Inspection of less critical damaged structures. Designate those that may be occupied and identify/mark those that are unsafe to occupy.
- Arrangements for the demolition of condemned structures.

*Utilities and  
Lifeline  
Repairs*

Restoration and repair of electrical power, natural gas, water, sewer, and telephone and other communications systems to minimize the impact on critical services and the public.

**Warning**

Earthquakes usually occur without warning. Although some earthquakes have been successfully predicted, a reliable warning system has not been developed. However, it is appropriate for those jurisdictions located on the West Coast, Hawaii, and Pacific Insular areas where a large seaquake or undersea volcanic eruption may occur to include an appendix in their plan that will facilitate the issuance of a tsunami warning.

**Emergency  
Public  
Information**

The flow of accurate and timely emergency information is critical to the protection of lives and property in the wake of a catastrophic earthquake. This section deals with the provisions that should be included in the plan for the preparation and dissemination of notifications, updates, warnings, and instructional messages. The following planning considerations should be examined and addressed, if appropriate, in one or more appendices to an EPI annex:

- Survival tips for people on what to do during and immediately after an earthquake.
- Warnings and advice on the continuing threat of fire, unsafe areas, building collapse, aftershocks, and other hazards.

**Evacuation**

Immediately following an earthquake people may need to be evacuated. People should be evacuated from structures that have been damaged and are likely to receive more damage when hit by one or more of the aftershocks. An appendix to an evacuation annex should address special provisions for moving the residents of custodial facilities (hospitals, jails, mental health facilities, nursing homes, retirement homes, etc.) following an earthquake.

**Mass Care**

The information gained from the vulnerability assessment should be used to ensure the following needs are addressed, if appropriate, in one or more appendices to a mass care annex:

*Safe Location  
of Facilities*

If possible, identify mass care facilities in low seismic risk areas that are also out of the way of secondary effect threats (e.g., flooding from a damaged dam).

*Structural  
Safety*

If the facilities selected for use are located within the earthquake hazard area, ensure that a structural engineer, knowledgeable of the earthquake hazard:

- Identifies facilities for use that are structurally sound, well retrofitted or built to code.
- Ranks the facilities based on the amount of earthquake resistance/protection each one offers.

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