SECTION 5

Geoscience—Field Investigation

Equipment to Take

1. Hand-held inclinometer.
2. Optical survey equipment.
3. Maps. Every effort should be made to acquire a reasonable topographic map of the affected area prior to departure. A 1:100,000 scale map is good for a regional overview. Maps of 1:25,000 or less are better for more focused and site-specific concentration. Geologic maps and hazard maps (if available) are quite useful. Aerial photos, including stereo pairs, can be especially helpful. If time is available, topographic maps can be obtained from a variety of library services. Aerial photos can be obtained from institutions such as USGS, U.S. Department of Agriculture, NASA, and the Department of the Army. Refer to Appendix C, Information Sources.

Types of Data to Be Collected and Recorded

Collect information on the tectonic setting, faulting, ground motion, surface manifestations, seismicity, shock parameters, aftershock sequence, etc.

CHECKLIST

Geoscience

Regional Earth Movements—Tectonic Origin

1. Note location.
2. Describe fault(s).
3. What is relationship of fault(s) to local geologic structure and stratigraphy?
4. What is joint system?
5. Note post-earthquake gravity measurements.
6. Note post-earthquake P- and S-wave velocity measurements (from aftershocks).
7. What were pre-earthquake P- and S-wave velocity measurements?
8. Describe type of earth materials in slope.

Characteristics of Causative Fault

1. Note name of fault and its location (latitude and longitude).
2. Note type of fault. Indicate strike and slip.
3. Describe direction of movement.
4. What is total length of causative fault (m)? What portion ruptured?
5. Draw geologic cross-section of fault to “basement rock” indicating nature of earth materials on each side of fault. Use back of form sheet for sketches or additional notes.
6. Describe expression of fault trace (continuity, straight, curved, sinuous, single or multiple), mole track, scarps, graben, parallel or en echelon fractures, sag pond, other.
7. What is relationship between main fault and subsidiary faulting?

8. Describe compression or tension features.
9. If there is evidence of fault creep, note location, amount, and direction of movement. Was it caused by a foreslip or afterslip? What was its relationship to aftershocks?
10. Note any new faulting in old fault zone.
11. Develop strain maps.
12. Plot damage pattern on geologic map for better correlation between Modified Mercalli Intensity and geology.
13. If underwater, note depth, sea conditions, current velocity (m/sec) and direction, and wave height.

Acceleration

1. Describe peak and general level accelerations as a function of orientation to source magnitude, type of faulting, radiation pattern, travel paths, distance, regional and local geology, and water table depth.
2. Describe nature of ground acceleration, e.g., direction of motion, etc., close to and at a distance from the fault.
3. Collect ground motion data from instrumented buildings.
4. Examine the compatibility of main shock accelerograph records of basement and free-field motions.
5. Aftershock measurements, if adopted, should be quickly implemented in order to catch some of the larger aftershocks. It is very important to coordinate with seismologists regarding the location of seismometers.

Duration of Motion

1. Correlate duration of motion (from strong-motion records) as a function of magnitude, distance, local geology, and depth to water table.
2. Relative importance of duration of motion and ground failures as a function of local geology.
3. Duration of motion, damage to engineered structures, and arrival of P-, S-, Love, and Rayleigh waves.

Topographic, Focusing, and Resonance Effects

1. Describe apparent focusing of energy due to subsurface geology, wave guides, and wedge or boundary effect.
2. Note existence and importance of shadow zones.
3. What is relative importance of focusing and resonance in alluvial valleys?
4. What is importance of topographic effects on landslides and engineering structures?
5. Document any areas of anomalous high or low damage.
6. Characterize effects of topography, focusing (basement-complex geometry), and resonance as a function of distance, magnitude, and seismic wave type (body and surface waves).
7. Note general travel path effects (regional geology) such as reflection and refraction.

Field Investigation Form—Geoscience

Name of Investigator:_______________________ Date: __________

Regional Earth Movements—Tectonic Original

Uplift: Subsidence:

Location:

Regional and local tilting and ground warping:

Post-earthquake gravity measurements:

Post-earthquake P- and S-wave velocity measurements (from aftershocks)

Pre-earthquake P- and S-wave velocity measurements:

Characteristics of Causative Fault

NAME OF FAULT:
LOCATION (LATITUDE AND LONGITUDE):
TYPE OF FAULT: DIRECTION OF MOVEMENT:
DRAW GEOLOGIC CROSS-SECTION OF FAULT TO "BASEMENT ROCK" INDICATING NATURE OF EARTH MATERIALS ON EACH SIDE OF FAULT (USE BACK OF THIS SHEET).
TOTAL LENGTH OF CAUSATIVE FAULT: (M)
LENGTH OF ENTIRE FAULT RELATED TO RUPTURED FAULT: (M)
TOTAL LENGTH OF RUPTURE: (M) WIDTH: (M)
COMPRESSION OR TENSION FEATURES:
DESCRIBE GEOLOGIC STRUCTURE ON EACH SIDE OF FAULT (MAP UNITS, BEDDING AND/OR JOINT ATTITUDES, OTHER FAULTING):

EXPRESSION OF FAULT TRACE (CONTINUITY, STRAIGHT, CURVED, SINUOUS, SINGLE OR MULTIPLE), MOLE TRACK, SCARPS, GRABEN, PARALLEL OR EN ECHELON FRACTURES, SAG POND, OTHER:

Recommendations for Further Geoscience Research

Name of Investigator:________________________ Date: ___________

Location:

Why needed:

Trenching and/or Boreholes

Where, how deep, how many:

Why:

Instrument Installation

Type and number:

Aftershock Studies

Location:

Engineering importance:

Type of fault mechanism:

Topographic effects:

Geology and soils:

Well water monitoring (elevation and chemical composition):

Geophysical Studies

Location:

Engineering importance:

Recommendations for study: