Surface Fault Rupture Mitigation Workshop

New Mitigation Concepts and Political Challenges

AEG • ASCE • EERI

A Knowledge and Technology Transfer Workshop

Orange County, California

May 10, 2013

Surface Fault Rupture Mitigation Workshop

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Program

8:00	**9:00**	**Registration and Social**	**Yannick Wirtz**
9:00	**9:15**	**Introduction**	**Roy Shlemon**
9:15	**9:30**	**Statement of Purpose**	**Eldon Gath**
9:30	**10:30**	**Building Near Faults**	**Jonathan Bray**
10:30	**10:45**	**Break**	**All**
10:45	**11:30**	**Resolution of Fault Displacement**	**Thomas Rockwell**
11:30	**12:15**	**Geotechnical Observations and Considerations for Buildings Overlying Fault Rupture**	**Alan Kropp**
12:15	**1:00**	**Lunch**	**Noonerz Catering**
1:00	**1:20**	**Structural Mitigation for Seismically-Induced Ground Deformation**	**Craig Comartin (by Jon Bray)**
1:20	**1:40**	**Implementation of the Alquist-Priolo Earthquake Fault Zoning Act in Los Angeles County**	**Charles Nestle**
1:40	**2:20**	**What is Acceptable Risk?**	**Roy Shlemon**
2:20	**3:00**	**Legal Aspects of Surface Fault Mitigation**	**Ben Benumof**
3:00	**3:15**	**Break**	**All**
3:15	**3:30**	**Structural Issues of Lifelines at Earthquake Faults**	**Rupa Purasinghe**
3:30	**3:45**	**Summary and Defining a Path Forward for Change**	**Eldon Gath Roy Shlemon**
3:45	**5:00**	**Discussion**	**All**
5:00		**Adjourn**	

Abstracts

BUILDING NEAR FAULTS

Jonathan D. Bray, Ph.D, P.E.
University of California, Berkeley

Sound engineering and earth science principles can be employed to address the hazards associated with surface fault rupture. Robust procedures exist for evaluating the consequences of ground movements on structures. Whereas their use in designing systems to accommodate ground movements due to a variety of phenomena is widely accepted, their use in areas containing surface traces of active faults is often questioned, even when the anticipated ground movements are minimal. Active faults cannot always be avoided, nor should they be avoided when their hazard is far less than other hazards.

GEOTECHNICAL OBSERVATIONS AND CONSIDERATIONS FOR BUILDINGS OVERLYING FAULT RUPTURE

Alan Kropp, President and Principal Engineer
Alan Kropp & Associates, Berkeley

Observations will be provided of a number of sites where existing buildings are located over fault traces that have or could rupture during an earthquake. Several case histories will be provided where either new structures were designed to accommodate fault movements or foundations of existing structures were modified to improve performance during such events. A number of other situations will be discussed where foundation improvements of an existing building may be possible from a technical sense, but may be precluded by existing codes and whether there are any alternatives for the building owners to improve the performance of their buildings.

STRUCTURAL MITIGATION FOR SEISMICALLY INDUCED PERMANENT GROUND DISPLACEMENT

Craig D, Comartin, SE
CDComartin, Inc.

This presentation addresses structures subject to seismically induced permanent horizontal and vertical displacements. Examples of observations in past earthquakes illustrate concepts of basic behavior mechanisms. The structural consequences of these characteristic mechanisms are idealized for structural analysis and design purposes. Several examples of new design and retrofit of major structures are reviewed. General application for displacements hazards is discussed.

IMPLEMENTATION OF THE ALQUIST-PRIOLO EARTHQUAKE FAULT ZONING ACT IN LOS ANGELES COUNTY

Charles Nestle
County of Los Angeles Dept. of Public Works

Review of property development in Alquist-Priolo Earthquake Fault Zones in Los Angeles County is directed by codes and regulations promulgated by the A-P Act. Since taking effect on March 7, 1973 some variation in interpretation of requirements of the Act has occurred, but for at least the last 30 years interpretation has been stable. The role of a reviewer is to ensure that any new property development complies with existing laws, codes, and regulations, and that any subjective interpretation is supported by sufficient data that reasonable conclusions may be drawn.

STRUCTURAL ISSUES OF LIFELINES AT EARTHQUAKE FAULTS

Rupa Purasinghe, Howard Lum , John Shamma and Craig Davis
Cal State Los Angeles – Dept. of Engineering

For underground structures and lifelines in seismically active zones, structural performance can be determined by assessing the anticipated ground strains and fault ruptures. In particular, lifelines crossing active faults are vulnerable to breakage as large displacement induces rupture at fault locations. The probability, magnitude and direction of fault rupture during a major earthquake event are of

primary concern, since this could result in pipeline damage or failure. In order to mitigate pipeline damage, water utilities in United States and elsewhere have introduced designs that will allow pipelines to deform with the ground while maintaining the structural integrity for continuous service after an earthquake.

This research evaluates pipeline behavior subject to fault displacement by simplified testing of steel pipelines in a lab environment that simulates a fault rupture. An approach using an enlarged excavated section at fault crossing with cellular concrete backfill was used to allow the pipeline to accommodate the large fault displacement. The laboratory tests provide stress-strain deformation data for both the cellular concrete encased pipe and plain steel pipe subject to progressive loading until failure. Data obtained through these tests will explore the correlation between field installed pipelines and laboratory test cases. This research will allow engineers to develop predictive tools for pipeline behavior at fault crossings and better design the lifelines in response to large ground deformations.

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Attendees List

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