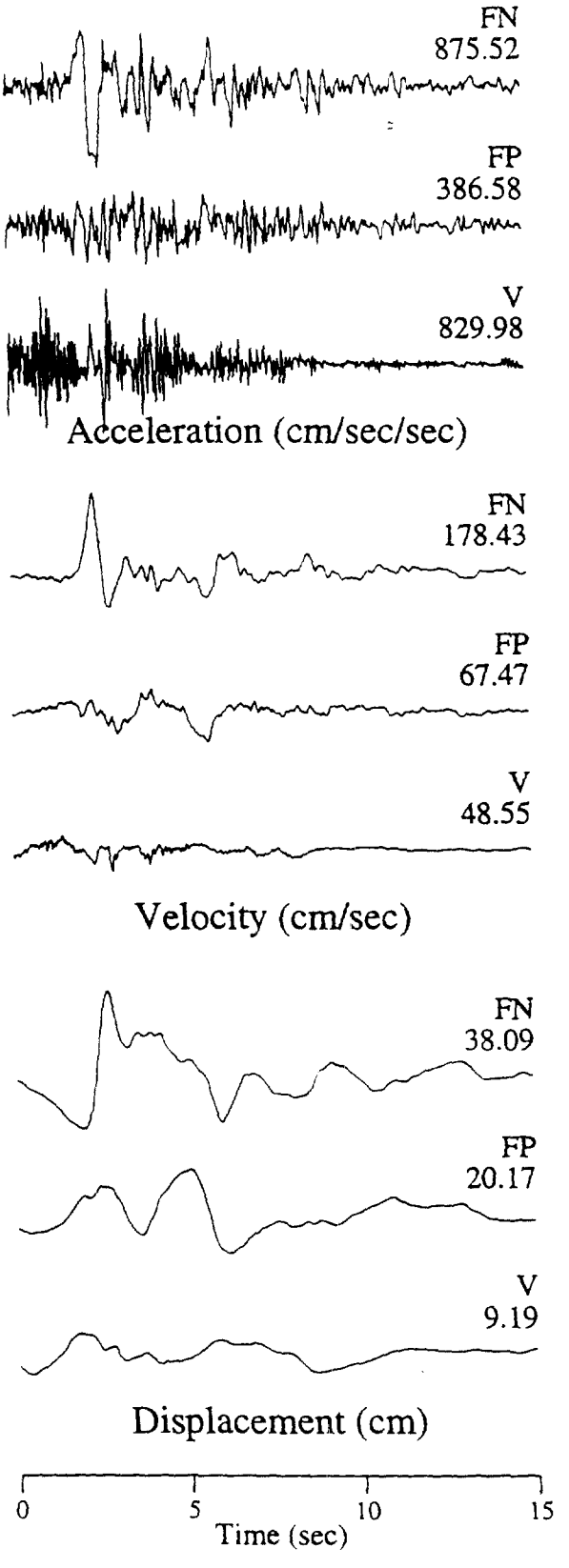

Figure 5. Recorded acceleration, velocity and displacement time histories of the 1994 Northridge earthquake at Rinaldi rotated into fault-normal and fault-parallel components.

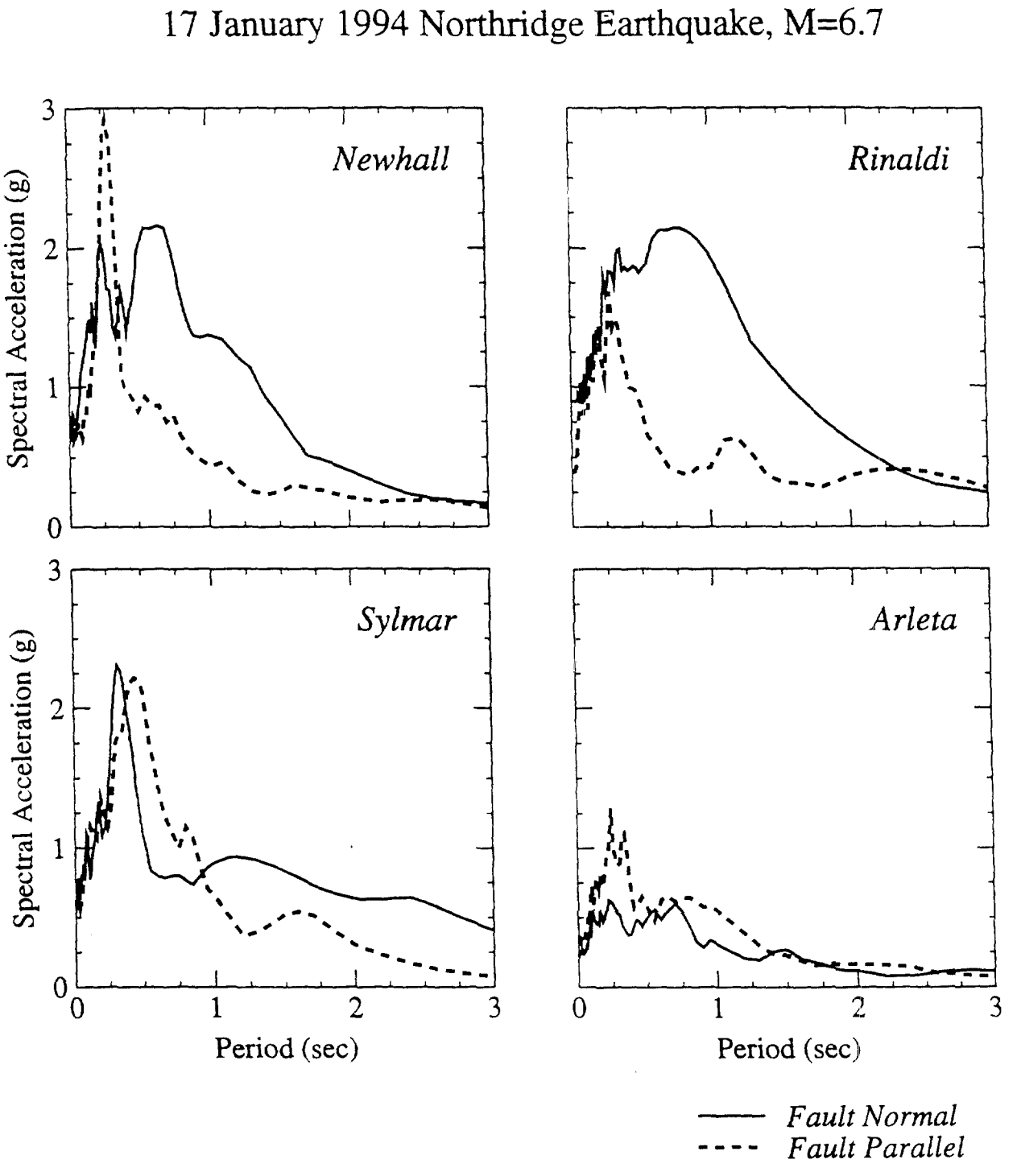

Figure 6. Response spectral acceleration of the fault-normal and fault-parallel components of the 1994 Northridge earthquake recorded at Newhall, Rinaldi and Sylmar (forward directivity) and Arleta (neutral directivity).

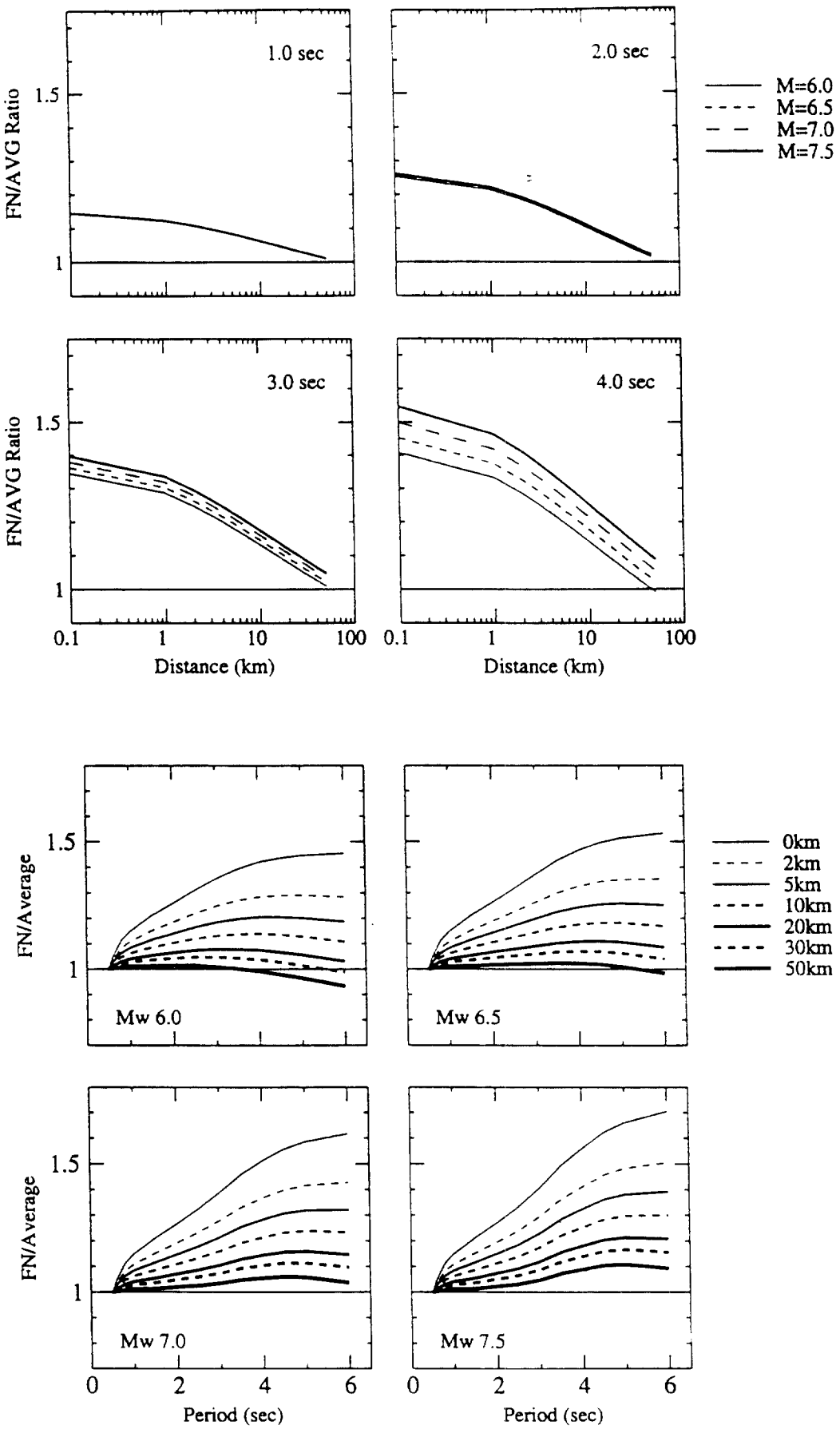

Figure 7. Empirical model of the fault-normal to average horizontal response spectral ratio, for average rupture directivity conditions, shown as a function of distance for various magnitudes and periods (top) and as a function of period for various magnitudes and distances (bottom).

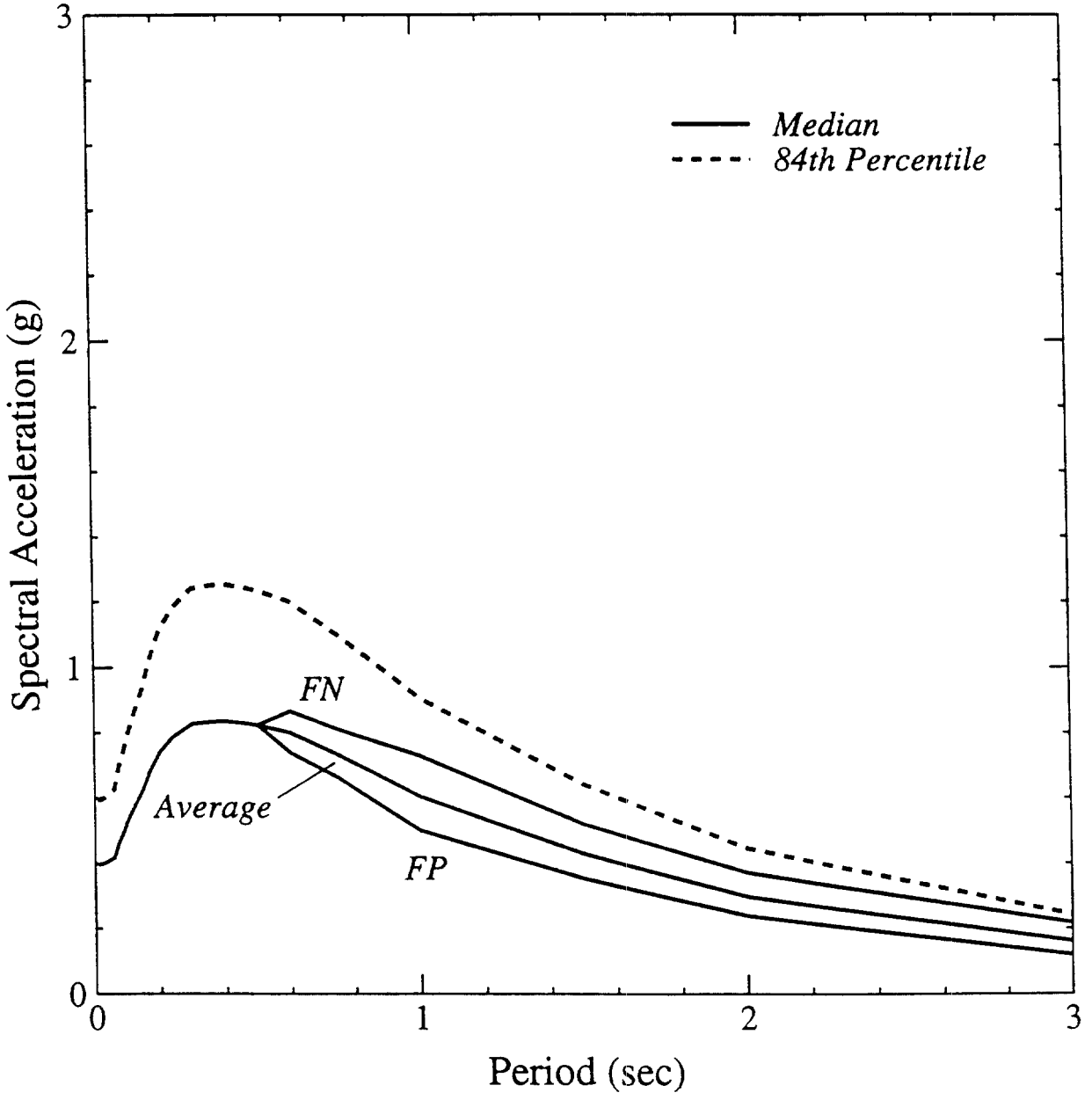

Figure 8. Response spectra for average rupture conditions for a magnitude 7 strike-slip earthquake at a closest distance of 6 km on soil. The fault-normal and fault-parallel components are shown for the median ground motion level.

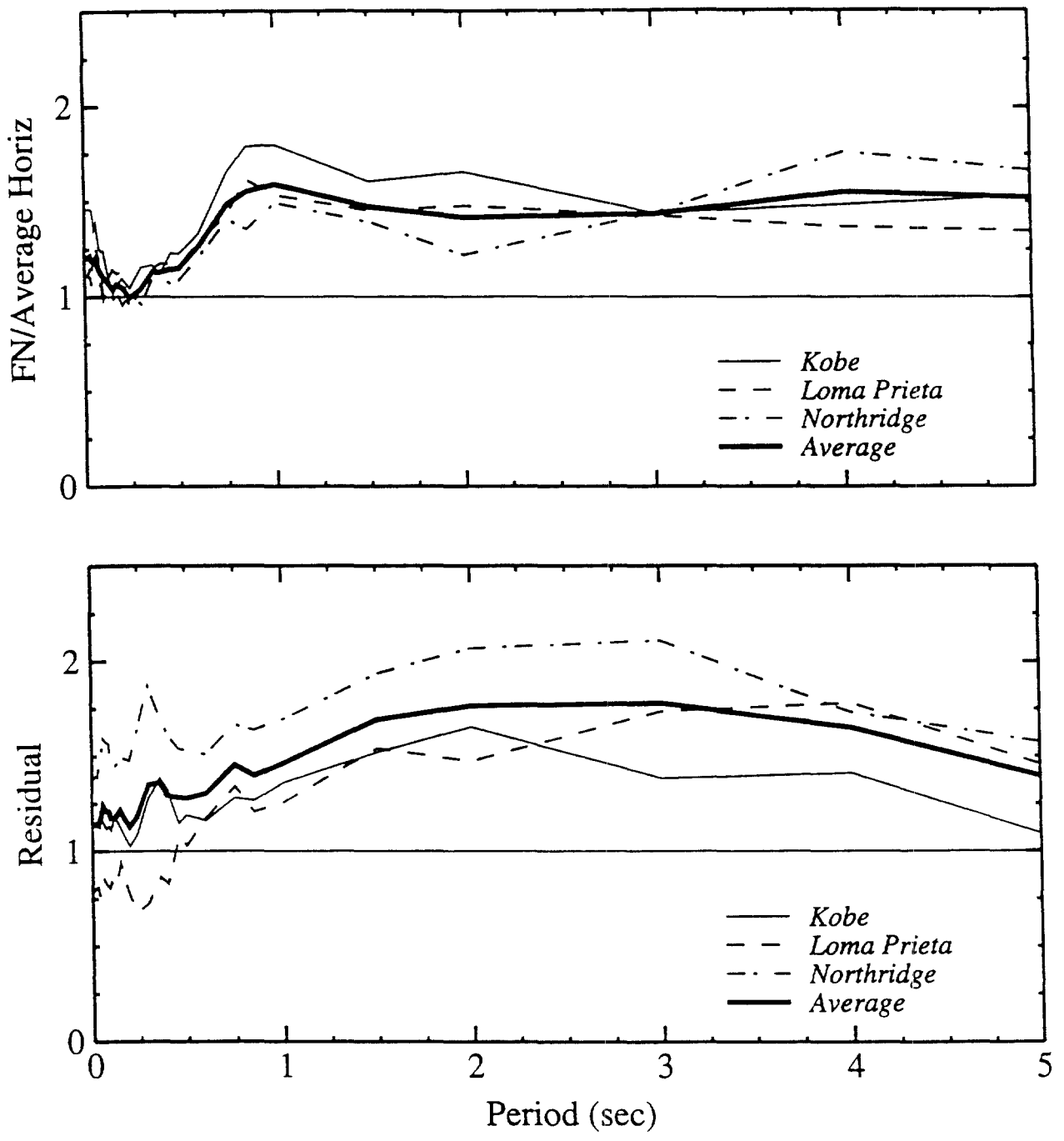

Figure 9. Ratio of fault-normal to average horizontal response spectra (top) and ratio of average horizontal response spectra to that predicted by the attenuation relation of Abrahamson and Silva (1995; bottom) for near-fault recordings containing forward directivity. The ratios are shown for three recent earthquakes and for the average of all three.

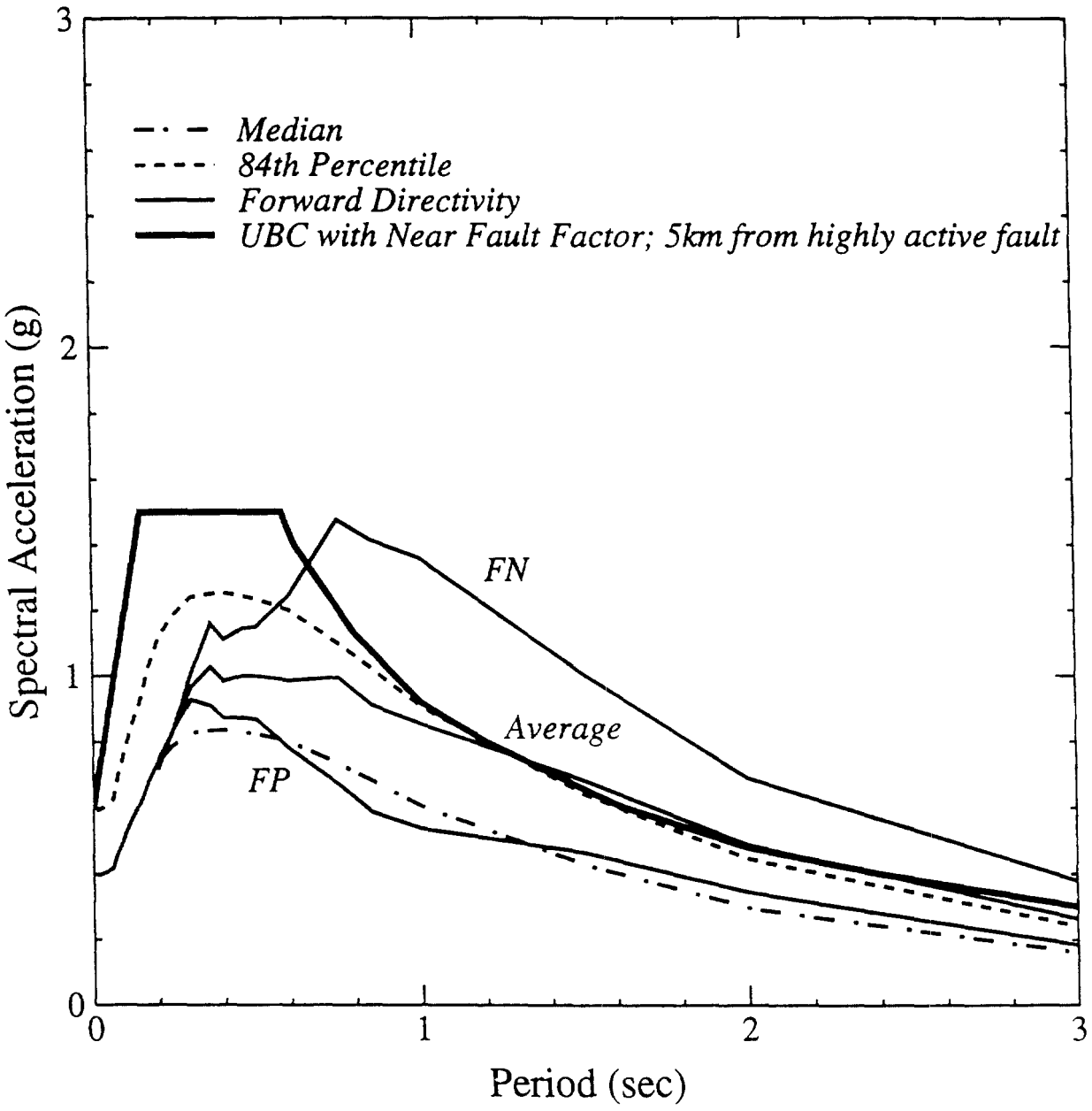

Figure 10. Response spectra for forward rupture conditions for a magnitude 7 strike-slip earthquake at a closest distance of 6 km on soil. The fault-normal, fault-parallel and average horizontal components are shown for the median ground motion level. The UBC spectrum for a closest distance of 5 km from a highly active fault for site category D, which includes a near-fault factor of 1.5, is also shown.

State of California

Memorandum

To : Seismic Safety Commission Date: June 30, 1997

From : Fred Turner, Staff Structural Engineer FSM
Seismic Safety Commission
1900 K Street, Suite 100, Sacramento Ca 95814 (IMS D-4)
Phone (916) 327-1606; Fax (916) 322-9476 Internet:: fredt5@aol.com

Subject : **Continuation of Hearing on Near Source Effects on Tall Structures**

Summary

The Structural Engineers Association of California and the Los Angeles Tall Buildings Council has asked to respond to statements made at the Commission's May hearing on near source effects.

Background

At the May 8th Commission meeting, Professor Tom Heaton stated that "Perhaps we should declare a moratorium on tall buildings until we figure out how they actually perform." Chairman Cluff summarized the session by noting that "the scientific and government community should be careful not to overly alarm people about near-source effects because other site conditions are also important. The general message should be a positive one, that well designed and constructed buildings on good sites did well." Commissioner Shapiro observed that "codes are beginning to recognize near-source effects, but large directivity pulses are still major concerns that are not being addressed."

Speakers Responding to these Statements

Dr. Charles A. Kircher representing the Structural Engineers Association of California (SEAOC) will present the SEAOC Seismology Committee's recently successful changes to the 1997 Uniform Building Code that address near-source effects. The

Committee also met since the May meeting to discuss Professor Heaton's statements and to develop a recommendation for the Commission.

The Committee met with Professors Heaton and Hall more than a year ago on this same subject and offered to review the computer models that Heaton and Hall used to generate their conclusions. At the time, Heaton and Hall agreed to share their models, however, no detailed review eventually took place. One recommendation from SEAOC may be to try again to perform an independent review of Heaton and Hall's work.

Dr. Kircher is a Civil Engineer and chairs SEAOC's Ground Motion Subcommittee of the Seismology Committee and is largely responsible for the near-source code change as well as similar proposed changes now undergoing ballot for the 1997 NEHRP Provisions.

Mr. Roy Johnston, representing the Los Angeles Tall Buildings Council, has also requested to speak. This is an organization of mostly engineers who hold an annual conference and exchange information on the design, retrofit, repair, and construction of tall buildings. Mr. Johnston is a Structural Engineer from Brandow and Johnston in Los Angeles and a former Building Standards Commissioner.

Staff Recommendation

As of this date, the staff has received nothing in writing from the two speakers, but anticipates that they will recommend that the Commission consider taking an action on this subject

Richard McCarthy
Executive Director

Testimony Before the Seismic Safety Commission on Near Source Effects (July 10, 1997)

Good morning ladies and gentlemen. My name is Farzad Naeim and together with Mr. Nabih Youssef and Dr. Gary Hart we are privileged to present to you the views of the Los Angeles Tall Buildings Structural Design Council on the subject of a proposed moratorium on base isolated buildings and buildings over 10 stories. Mr. Youssef is Executive Director of our council and Dr. Hart and I have both served as Council president. I will present to you our comments and the three of us can then answer any questions you may have.

The Los Angeles Tall Buildings Structural Design Council was formed in 1988 is a nonprofit organization whose members are those individuals who have demonstrated exceptional professional accomplishments in the structural design of tall buildings. We are honored to have among our 18 council members Professor George Housner, the father of earthquake engineering and distinguished life-time professionals such as Roy Johnston, John Martin, Ed Teal and Clarkson Pinkham. Also serving on the council are two principal building officials from the City of Los Angeles.

I personally have been involved in studying and evaluation of earthquake records for many years. As a structural engineer, my main interest in earthquake records has been, and continues to be, the identification and classification of those characteristics which are most damaging to structural systems. In 1993 as the FEMA/EERI NEHRP Professional Fellow, I had the opportunity of evaluating and classifying all available accelerograms for north and central America, Alaska and Hawaii for the period of 1933 to 1992 (a total of more than 6000 earthquake accelerograms)[1]. In subsequent years in an investigation sponsored by USGS we expanded the scope of this evaluation to consider more than 640 components from the 1994 Northridge earthquake[2].

Near source effects, namely directivity, large ground velocity, and acceleration pulses near the source of energy release are real. But this is hardly new information, nor is it a discovery contributed by the Northridge and Kobe earthquakes. The first indication of this phenomenon

was observed in the Chalome Shandon Array #2 record obtained from the 1966 Parkfield earthquake. Much stronger indications were observed in a record obtained from the 1978 Tabas, Iran earthquake and several records obtained from the 1979 Imperial Valley earthquake. To this date the latter records probably represent the largest long-period pulses ever observed. In his 1981 Ph.D. Dissertation[3], and later during an ATC seminar in early 1984, Dr. J.P. Singh explained in detail the characteristics of near-source earthquake ground motions and their importance in building design[4]. During the same ATC seminar Prof. James C. Anderson and I, independent from Dr. Singh, presented similar observations. Furthermore, we took a computer model of a 10 story SMRF building designed and optimized to comply with the 1982 UBC code provisions and subjected it to records containing near-source effects and performed a series of linear and nonlinear dynamic analysis[5]. We then concluded that "*for flexible moment frames the most severe type of loading as far as damage is concerned is the impulse type of base motion which is representative of sites which are in close proximity to active faults. This type of motion tends to concentrate the relative displacement and inelastic behavior in the lower floors of structure*". We recommended that soft and weak stories be avoided at the base of tall buildings. We modified our code designed building to implement a strong column-weak girder philosophy which was not a part of building code for steel structures at the time and showed that such a minor refinement in design could bring about a building which could withstand the considered pulses quite successfully. A couple of years later we verified our conclusions by application to a 20-story SMRF designed similarly[6]. Many things have changed over the 12 years that has passed since we announced these conclusions. The codes have become much more prescriptive and provisions which were then on our wish-list are now integrated parts of contemporary codes. If our 1982 code based proper design could withstand near-source pulses successfully, we do not see why the properly designed and proportioned 1995 designs cannot.

Structural engineering as practiced by the three of us and our firms in general and seismic design of buildings in particular are a combination of science and professional experience. Proper design of a building requires a considerable amount of engineering judgment which results from this professional experience. Engineering judgment cannot be extracted from the code

provisions no matter how advanced the codes. Quite to the contrary, building codes embody the absolute minimum requirements deemed necessary to protect against lapses in judgment. Even the highest levels of technical excellence cannot be trusted to extract proper building design practice from code provisions. The article[7] published in the Science Magazine and presented to the Seismic Safety Commission during its May meeting does not meet the standards we expect and practice. We would have rejected such a design if it was reviewed as a part of a peer review process. For example, a 20 story frame with column depths changing along the height of the frame is very impractical and is very rarely, if ever, built. We have never seen a real lateral frame with the same girder size from the first level all the way up to the 15th. As Professor James Kelly of University of California, Berkeley said[8] in referring to the base isolation conclusions presented in the same paper *"What Heaton et al. have is not a building, but a mathematical model and yields when it is specified to yield"*. In another words, the example frame is not real.

Properly designed buildings of various heights and shapes resist severe ground motions by a combination of strength, stiffness, and deformation capability. There is no magic number of stories beyond which a building is safe or unsafe. Limiting the number of stories is a very simplistic and narrow-minded approach to a very complex problem, and in our opinion has no scientific merit. To us proposing such a limit is to show disrespect for the profession of structural engineering.

A prudent approach, for well intended individuals and organizations, is to identify problems and then work to rectify the situation (for example as UBC-97 does in response to near-source ground motions) not avoid the problem by banning the practice.

The information contained in the Science Magazine article is not enough to permit independent duplication of the results Heaton et al. have obtained. What is the required information? As professional structural engineers we would expect as a minimum the same documentation that we are expected to provide to the State of California for design of a hospital building. For example, (1) a complete user's manual for the computer program utilized including a complete set of verification examples which sufficiently demonstrate the accuracy of the program; (2) a

complete source code listing, or cross-program verifications which could be used to evaluate the program in detail; and (3) a complete documentation of the assumptions made in development of the mathematical model used to represent the building. This type of documentation is standard in our professional practice and is needed if the results are to be evaluated in a professional manner. Not having access to the above information, we took their frame and made our best guess computer model of it the way we would have for a typical office building of the same size and height. According to our analysis, Heaton et. al.'s 20 story frame fails the UBC-94 inter-story drift limitation in 15 of its 20 stories.

Before we continue with the subject of tall buildings, we would like to bring to your attention the opinion rendered by Professor James Kelly one of the foremost authorities in base isolation for over 30 years in a letter to OSHPD[8] dealing with the same subject (copies of this letter can be obtained from him or us). He presents some calculations to prove that current code provisions provide reasonable requirements for near-source effects and he states that "*the conclusions drawn by Hall et. al., are based on a modeling of a base isolated structure that is seriously flawed. Furthermore, they state their model exceeds UBC requirements. This simply cannot be true and if they believe it is true, they must be interpreting the code in a very strange manner.*"

In order to clearly understand the irrationality of a proposal to ban base-isolated buildings, let us take a look at the worst possible scenario, the most catastrophic event that can possibly happen to base isolated buildings: either they exceed the bearing's deformation capacity and land on the backup gravity system and hence become a stable building a couple of feet away from their original position, or they hit the retaining wall in the vicinity of their maximum displacement and hence minimum kinetic energy. While this, of course, is not desirable, it poses minimum threat to life and limb. Compare this worst case scenario to that of more than 2,500 existing tuck-under wood-framed buildings (the type similar to that of the Northridge Meadows Apartments) in the City of Los Angeles alone and hundreds of non-ductile concrete buildings in the historical corridor of Los Angeles which have the potential of killing or injuring hundreds, if not thousands of people. Is it not time to focus our attention and resources on the real problems that we are facing, the real potential sources of loss of life and injury, rather than inventing fictitious ones?

The fact of the matter is that while our theories have changed somewhat after each major earthquake, the earthquakes have not. The sum total of our experience during the past century strongly suggests that well designed, well detailed, and well constructed buildings perform much better than we design them to perform. A clear case in point may be illustrated by evaluation of performance of extensively instrumented buildings during the 1994 Northridge earthquake[9]. Many of these buildings experienced base shears well in excess of their design strength (sometimes by a factor of 3 to 4), did not experience any significant structural damage, and exhibited lateral drifts which were far smaller than those predicted by conventional design analysis. Another commonly ignored characteristic is the fact that the motion at the base of significant structures is usually substantially smaller than that observed in free-field. This can be seen by a simple comparison of the motion at the base and at the parking lot of the Sylmar County Hospital during the 1994 Northridge earthquake.

Historical experience of earthquakes shows that generally speaking the geographic area affected and damaged by near-source effects is far smaller than the area affected and damaged by strong ground motion. This is also obvious from evaluation of available earthquake records. Among more than 7,000 earthquake records available today the number of records which exhibit strong near-source effects is less than 30 (0.4%). Does it make sense to ban those types of buildings which fare much better during more than 99% of cases in favor of those which fare better in less than half a percent of likely motions?

Historical experience also shows that most of the damage caused by earthquakes is concentrated on irregular buildings and poorly detailed fixed-base buildings of low to moderate height. Should we foreclose on a century of observed information on the basis of a couple of unsubstantiated theories and models?

In closing, it is our opinion that properly designed and constructed base isolated buildings as well as fixed base tall buildings are among the safest building types we have in existence. We also think that they are going to be even safer as new insight is obtained by studying the characteristics of near-source ground motions and refurbishing our design and analysis

techniques to further enhance the behavior of such buildings. Recent editions of building codes, UBC-97 provisions in particular, represent a very positive step in that direction.

We strongly recommend that the Seismic Safety Commission re-double it emphasis and focus on the real seismic challenges that faces us as a community, chief among them tuck-under wood framed buildings and non-ductile concrete frames. We further recommend that the Commission urge independent evaluations of the scientific merits of the Heaton et. al. article and ask the authors of the referenced article to cooperate with such independent evaluations. The Los Angeles Tall Buildings Structural Design Council will be pleased to be a party to such independent evaluation.

We thank you for this opportunity to present our opinions on this matter.

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Date: Wednesday, July 9, 1997 12:41:54 PM
From: gildavis@earthlink.net (Gil Davis)
Subj: Article
To: fredt5@aol.com

Faulty Towers?
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(415/364-7769, gildavis@earthlink.net)

It looks like a great office building.
It has an upscale address: 555 Twin Dolphin Drive in the Redwood Shores area of Redwood City.
Lots of people come and go from the large parking lot. Some drive off for lunch while others head for a jog up to Oracle and back.
But lurking beneath the rose-colored facade of this six-story building is a steel structure that was seriously damaged by the 1989 Loma Prieta Earthquake.
Cracks were recently found in over half the 192 critical beam-to-column steel connections in the building's north/south frames, according to a public document written by Ms. Maryann Phipps of Degenkolb Engineering in San Francisco.
In her report to the building's owner, Pacific Dolphin Corporation of San Ramon, she said 44 of those steel connections ranked 10 on a scale of 0 to 10 with 10 equaling "complete loss of moment resisting capabilities of the connection." (Earthquakes induce "moment" forces in this type of building.) An additional 51 connections were given a ranking of 8 and three more were ranked 4.
There was almost no damage to the east/west steel framework and the building is fully capable of supporting gravity loads, she said.
Ms. Phipps concluded, "Under seismic loads, however, the building in its

Park.
He said the destruction took place when the bay fill under this building
rocked back and forth a total of 4.5 inches at a peak acceleration of 0.29 of earth's
gravity.

"An earthquake shakes the ground with a wide range of frequencies," Holzer said. "Bay mud will take the low frequencies of about one cycle per
second and amplify them. Unfortunately, the one-per-second frequency is about
the natural frequency of high-rise buildings between six to 10 stories tall."
He explained the destructive phenomenon by citing a pendulum moving back and forth at one cycle per second. A little push applied at the right time can
make the pendulum swing in a much wider arc.
The danger for buildings located on Bay Area fill is highlighted by the fact
that 70 percent of the Loma Prieta Earthquake's destruction took place in
structures located on bay fill, said Holzer.
He said geologists have known about the amplification of bay fill since the
1960s when instruments located on bay mud recorded the force of atomic bomb
explosions at two to three times more than motions recorded on bedrock.

Bay Area Problem?
An estimated 900 medium to high-rise steel buildings in the Bay Area could have been impacted by the Loma Prieta Earthquake, according to Professor
Barclay Jones of Cornell University who is researching the number of different
types of buildings in the Bay Area.
He estimated there are 400 medium-rise buildings (100,000 to 200,000 square feet) in the earthquake's impact zone and about 500 high-rise buildings
(above 200,000 square feet) in the same area.
One of the most important structures in the Bay Area that's built on

Redwood Shores currently contains about 2 million square feet of office space, said Joshua Steinhauer, a representative for Redwood Shore Properties.

He said more construction by Oracle, Electronic Arts and Westport should bring the total square footage to 6 million and house some 24,000 workers.

Calls to 15 building officials up and down the Peninsula found no newly discovered steel buildings with problems like those uncovered at 555 Twin Dolphin Drive.

Building officials said that doesn't mean other Peninsula steel structures were not weakened by the Magnitude 7.1 Loma Prieta Earthquake. It just means building owners don't want to know about earthquake damage because of the high cost of repairs.

As a result, the only time such damage comes to light is when a building is for sale and a potential owner insists on a structural inspection, they said.

In the greater Bay Area, 24 to 40 steel structures are now known to have been significantly damaged by the Loma Prieta Earthquake, estimated two structural engineers.

Building Owners Warned

As early as November 1994, the California Seismic Safety Commission warned building owners, city councils, building code officials and engineers that buildings exposed to strong ground shaking from the Northridge and Loma Prieta earthquakes should be inspected to see if their steel joints were cracked.

"Because the Northridge earthquake damaged over 100 steel moment-resisting frame buildings, and because the future performance of this type of building is of concern throughout California, the Seismic Safety Commission

and
progressed across the panel zone. There are some instances where columns
fractured entirely across the section depth.
"The detection of structures containing this damage is quite difficult. Even

structures with a great many fractured connections often exhibit little outward
evidence that structural damage has occurred....Reliable detection of this damage
requires removal of fireproofing and careful visual and non-destructive examination of the connections.
"Historic practices used for steel moment resisting connections are no longer appropriate for design and construction of new steel buildings.
"As a class, existing undamaged steel moment frame buildings appear to have a lower risk of collapse than many other types of existing buildings with
known seismic vulnerabilities. Consequently, mandated or emergency programs
to upgrade the performance of these buildings does not appear necessary to
achieve levels of life safety protection currently tolerated by society.
"However, the risk of collapse is definitely greater than previously thought.
Individual owners should be made aware of the increased level of seismic risk
and encouraged to perform modifications to provide more reliable seismic performance.
"Following strong ground shaking, SMF (steel moment frame) buildings incorporating vulnerable connections should be subjected to rigorous evaluations
to determine the extent and implications of damage."
The distribution list for this advisory included major professional associations for architects, building owners, civil engineers, structural engineers
and building officials in the Bay Area, said Rojahn.

How It Happened
Since the Northridge Earthquake, structural engineers say they are looking

"However, it is
clear that where these fractures occur, both the lateral stiffness and strength of the
building is reduced, resulting in lower capacity to resist lateral forces such as are
induced by strong winds and earthquakes."

Hamburger said the public should understand that building codes typically
aren't designed to prevent damage to a building from an earthquake, but only to
prevent collapse so as to protect the lives of people inside.

He said it would probably cost more than California could afford to construct steel buildings that would resist an earthquake without damage.

Faith in steel buildings goes back to the 1906 San Francisco Earthquake when some 20 steel structures performed well, he said.

"This experience created the myth of invulnerability," Hamburger said. "Engineers didn't want to let go of that. It took the Northridge Earthquake to
reexamine that myth."

Up until the 1970s, steel buildings had been largely assembled using bolts
and rivets. During the early 1970's, laboratory tests on scale models showed steel
beams and columns could be welded together, he said.

"Over time, the kinds of steel used, the sizes, how they were welded together and other factors essentially revolutionized the industry, but building
codes were still being extrapolated from early tests on scale models. Very few
full-size tests were actually done," he said.

"What happened in the 1994 Northridge Earthquake was that several hundred steel buildings developed fractures in the connections between horizontal beams and vertical columns," Hamburger said.

He said both the damage and its severity were not anticipated by structural
engineers.

"It was more damage than we had ever seen before," Hamburger said. "There wasn't any case in which it was life threatening except a two-story

Because of the expertise he's developed. Castro said he's scheduled to speak at major steel industry conferences and the California Seismic Safety Commission.

"I'm urging everyone to really fix this problem and not sweep things under the rug," he said. "I don't want the litigation that could follow a major earthquake because that could mean hundreds, if not thousands, of people had died in collapsed steel buildings."

Castro said the main structural problem that was uncovered by the Northridge Earthquake was the "brittleness" of welded connections between steel girders. The welds didn't have the toughness to resist the bending and twisting forces that occur during an earthquake.

"What should be happening right now is for the state legislature to urge Congress to supply low-interest loans so building owners can afford to repair and upgrade their structures," he said. "If we don't take this constructive route, I predict cities will eventually pass ordinances mandating the removal of all brittle welds or the building will have to be vacated, just like was done with non-reinforced brick buildings."

Castro said structural engineers should especially be promoting this legislative avenue because if one or more high-rise steel buildings collapses during an earthquake, people are going to be calling for criminal prosecution.

"I know what engineers will say in court. They'll say I used this design, and these materials because it's cheaper for the owner and my buddy down the street does the same thing," he said. "But that's not a standard of care, that's a pattern of negligence."

above ground increases, Button said.

"With seismic isolation, a building's top floor might experience 0.1 gravity while a non-isolated structure's top floor might have to resist nearly 10 times that motion," he said. "People in tall buildings experience this phenomena in an earthquake when they sway back and forth."

Button said dynamic isolation was much more accepted in Japan after the Kobe Earthquake in January 1995 compared with the United States following the Northridge Earthquake in January 1994.

Japan increased the rate of construction of seismically isolated buildings from an average of eight per year to 200 per year. By contrast, there was almost no similar increase in the US after Northridge, he said.

"Obviously, the Japanese are taking their earthquake problems a lot more seriously than we do in this country," Button said.

###

Sidebar: What You Should Know:

- A relatively new, six-story office building in Redwood Shores may be the tip-of-the-iceberg in terms of structural damage caused to steel buildings in the Bay Area by the Loma Prieta Earthquake.
- An estimated 26 to 40 Bay Area steel buildings are now known to have been damaged by the 1989 Loma Prieta Earthquake. They are in the counties of Alameda, San Mateo and Santa Clara.
- An estimated 900 Bay Area medium to high-rise steel buildings could have been impacted by the Magnitude 7.1 earthquake on Oct. 17, 1989.
- The condition of these 900 buildings is largely unknown because

help
develop new building codes.

• A Los Angeles attorney immersed in representing property owners involved in Northridge Earthquake litigation is calling for public loans to help
owners of steel-buildings. Using this money owners could inspect and repair their
structures before another earthquake results in collapsed buildings and "unlimited
liability" for anyone involved in constructing such buildings.

###

---------- Headers ----------

From gildavis@earthlink.net Tue Jul 8 11:36:59 1997
Return-Path: <gildavis@earthlink.net>
Received: from italy.it.earthlink.net (italy-c.it.earthlink.net [204.250.46.18])
by mrin58.mail.aol.com (8.8.5/8.8.5/AOL-4.0.0)
with ESMTP id LAA11469 for <fredt5@aol.com>;
Tue, 8 Jul 1997 11:36:56 -0400 (EDT)
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by italy.it.earthlink.net (8.8.5/8.8.5) with SMTP id IAA22550
for <fredt5@aol.com>; Tue, 8 Jul 1997 08:36:40 -0700 (PDT)
Message-ID: <33C1FCFE.1AB9@earthlink.net>
Date: Tue, 08 Jul 1997 08:40:31 +0000
From: Gil Davis <gildavis@earthlink.net>
Reply-To: gildavis@earthlink.net
X-Mailer: Mozilla 3.0-C-NSCP (Macintosh; U; PPC)
MIME-Version: 1.0
To: fredt5@aol.com
Subject: Article
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Content-Transfer-Encoding: 8bit

Clarendon Alternative Elementary School

Clarendon Alternative Elementary School
Japanese Bilingual Bicultural Program
Second Community Program
500 Clarendon Avenue
San Francisco, CA 94131
415.759.2796

September 9, 1997

Hillary E. Gitelman
The Environmental Review Officer
Planning Department
1660 Mission St., 5th Floor
San Francisco, CA. 94103-2414

Dear Ms. Gitelman:

As the principal of Clarendon Alternative Elementary School I am requesting that we be provided with any and all available seismic studies done on Sutro Tower before any additions are approved. Concerned neighbors of the school have informed the staff and parent groups of a plan to add another HDTV tower within the existing structure.

Clarendon Elementary houses over 560 students in grades K-5 and 50 staff members. In concern for the health and safety of these individuals our school community would like to be assured that we will be safe from any future Fall Zone disaster or other environmental dangers involving Sutro Tower.

I respectfully request that the EIR place Clarendon Alternative Elementary School on the list to receive a revised EIR report.

Sincerely,

Dr. Kanani Choy

Dr. V. Kanani Choy
Clarendon Principal

Lynn E. O'Connor, Ph.D.
4440 23rd Street, San Francisco CA 94114

Phone: (415) 821-4760 **Fax: (415) 641-7047**
E-mail: LynnOC@aol.com

September 2, 1997

Hillary E. Gitelman
The Environment Review Officer
Planning Department
1660 Mission Street, 5th floor
San Francisco CA 94103-2414

Dear Ms. Gitelman:

I have recently been informed that Sutro Tower Inc. is planning to add a new support structure with additional antennas which will broadcast digital TV as well as analog NTSC television from existing antennas. I am writing as a citizen of Noe Valley, San Francisco and as a clinical psychologist practicing in the city, to object to this plan.

I have lived and raised my children under the shadow of Sutro Tower, with a vague sense of unease which I managed to put aside. However, as we have all become increasingly alert to the dangers of "minor" radiation and other environmental hazards, it seems incredible to me that Sutro Inc. is planning to expand this already questionable artifact of our technology. The claim that this level of radiation presents no danger to people or the environment may turn out to be equivalent to the tobacco companies asserting that nicotine is not an addictive drug, nor detrimental to our health. It was in the financial interests of the tobacco companies to withhold growing evidence about the dangers of tobacco, and it is certainly in the financial interests of Sutro to withhold evidence related to the effects of various levels of radiation. Those of us who live near Sutro know that it effects our use of electronic equipment, and most certainly it must be having some kind of effect on us personally, on a physiological level.

As a clinical psychologist, I can tell you that there are profound psychological effects on people who are forced to live with technological dangers. They either become extremely anxious --an adaptive response to an environment of danger, and one that when possible leads to safety-seeking action-- or when