CALIFORNIA LEGISLATURE

SENATE SELECT COMMITTEE
ON
MOBILEHOMES

SENATOR WILLIAM A. CRAVEN
CHAIR

HEARING ON
EARTHQUAKE SAFETY IN MOBILHOME PARKS

MARCH 8, 1994

STATE CAPITOL
SACRAMENTO, CALIFORNIA

826-S

California Legislature

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Senate Select Committee on Mobilehomes

SENATOR WILLIAM A. CRAVEN
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TRANSCRIPT OF HEARING ON

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March 8, 1994

SENATE SELECT COMMITTEE ON MOBILEHOMES
SENATOR WILLIAM A. CRAVEN, CHAIRMAN

MOBILEHOME EARTHQUAKE SAFETY HEARING
Tuesday, March 8, 1994
Room 3191, State Capitol

BACKGROUND PAPER

The Northridge Earthquake on January 17, 1994, again raised concerns about the earthquake safety of manufactured housing in California and the manner in which mobilehomes are installed, particularly in mobilehome parks. According to the Department of Housing's (HCD) figures, more than 4,400 mobilehomes fell off their supporting structures, some 900 shifted on their supports, and 184 burned down, in 69 parks in Los Angeles and Ventura Counties, as a result of the January quake.

Mobilehome Installations

Mobilehomes are factory built units constructed on a steel chassis with wood framing and metal siding. They are normally transported on their own wheels and axles to the site, where they are jacked up, leveled and supported by piers or blocks spaced at a maximum of six feet on center along the frame. There is a state minimum 1 foot clearance required from the I-beam to the earth, although most homes are set about 18 inches to 2 feet off the ground.

Over the years, newer standards have been imposed and in some cases stiffened. Gas pipe connectors from the outlet to the home must be a maximum of 6 feet and made of flexible material. Gas appliances in the homes, such as water heaters, must be tied down. In 1973, new state regulations became effective for the first time establishing installation standards for mobilehomes, which are basically the manufacturer's installation procedures as approved by HCD. Since 1980, tow-bars, wheels, and axles have been permitted to be removed.

1980 Seismic Safety Commission Report

In 1980, the Seismic Safety Commission published a report analyzing damage to mobilehomes in four California earthquakes from 1971 to 1980. The Commission cited numerous failures of steel pier, concrete pier or concrete block supports where a mobilehome was not otherwise tied down to the ground. According to the report, the most severe damage to mobilehomes in these quakes, other than gas or electrical fires, was where homes partially or completely fell off their supports, damaging accessories - such as porches, awnings, skirting, and carports - and, in some instances, bending the frame and structure and damaging the floor - which was sometimes "punched through" by failed piers.

Earthquake Resistant Bracing Systems (ERBS)

Recognizing the problem with earthquake survivability of mobilehome support systems, in 1981 the Legislature enacted SB-360 (Alquist),

Chapter 533, which required the Department of Housing and Community Development (HCD) to adopt regulations to provide for the certification and listing of state-approved earthquake resistant bracing systems (ERBS) for mobilehomes, to assure that such systems meet generally accepted seismic design standards.

An HCD certified ERBS device is designed to limit the fall of a home from its support system to a maximum of 2 inches. ERBS devices are not designed to prevent damage but, rather, limit that damage. Support systems may have to be re-installed and the home re-leveled, but with an ERBS the home usually does not suffer major structural damage. As of December, 1993, 24 different earthquake bracing systems for mobilehomes had been certified by HCD. Currently, the installation of ERBS is at the discretion of individual homeowners, but the Seismic Safety Commission and some ERBS manufacturers have advocated that the devices be made mandatory for new mobilehome installations in California.

Loma Prieta

The October 17, 1989 Loma Prieta Earthquake caused damage to 596 mobilehomes in 27 parks in 3 counties. 592 fell off their supports, 2 were destroyed by fire, and 2 were structurally damaged beyond repair.

Following that quake, the Department of Housing investigated the damage to mobilehomes and gathered information on the performance of various support systems, which was detailed in an HCD survey provided to this committee for a hearing on March 5, 1990. In the twelve parks and 479 homes surveyed, the majority of homes which fell off their supports were supported by steel or concrete piers or blocks.

1990 Hearing

The March 5, 1990 hearing of this committee, subsequent to Loma Prieta, focused on a number of mobilehome earthquake safety issues, such as the adequacy of existing state standards for pier structures and support systems, gas connectors, and the imposition of tie-downs or earthquake resistant bracing systems (ERBS) on new as well as existing installations, among other issues. There was much conflicting testimony among representatives of homeowners, manufacturers and installers of ERBS and support systems for mobilehomes, the Seismic Safety Commission, and others who spoke. In fact, the committee found the testimony by some of those representing the support system industry to be more self-serving than helpful. The committee did recommend, however, that HCD conduct a comprehensive study on the earthquake safety of mobilehomes and report back to the Legislature. Subsequent to the hearing, Senate Bill 2518 (Craven) was passed and signed by the Governor to require HCD to conduct such a study of mobilehome support systems, structures and utility connection devices and report to the Legislature on the Department's findings.

1992 HCD Report

In putting together the report, HCD relied heavily upon its earlier survey of the damage to mobilehomes in Loma Prieta. Additionally, HCD

conducted fact finding hearings throughout the state during 1990 and utilized questionnaires sent to local building officials and mobilehome manufacturers, as well as information from other agencies, such as the Seismic Safety Commission. After some delay, in June, 1992 the Department of Housing finally released its report entitled, "The Effectiveness of Manufactured Home Support Systems During Earthquakes", dated April, 1992. A copy of the report is available as an attachment to this background paper.

The 1992 HCD report concluded that current state housing regulations - which do not require mobilehome support systems to be attached to the frame or ground, do not require support devices to be resistant to lateral forces, and do not require tie-downs - are deficient.

The report recommended that Department regulations be revised to:

1) require prospective installations to have tie-downs in accordance with design requirements for those mobilehomes;

2) require prospective installations to have support systems which have a mechanical connection of the steel or concrete pier to both the frame of the home and to the footing of the pier structure;

3) require improvement of prospective ERBS installations by requiring the ERBS to be mechanically connected to the manufactured home and to eliminate the allowance for the home to fall as much as 2" under current ERBS regulations.

The report also indicated that persons testifying at HCD's fact finding hearings recommended that the Legislature consider new laws:

1) to provide a disclosure to buyers of used mobilehomes, not installed on foundation systems, of the existence or non-existence of an HCD-certified ERBS and of the ability of ERBS to reduce damage to the mobilehome during an earthquake; and

2) to provide incentives in the form of tax credits, low-interest loans or grants to lower-income mobilehome owners for the purpose of bringing mobilehome installations up to current HCD code requirements.

Legislative and Administrative Action since 1992

Until recently, none of the HCD recommendations have been acted upon.

SB-47 (Torres), which would have provided a tax credit for up to $200 for the installation of ERBS on manufactured homes, died in 1992.

SB-750 (Bergeson) - now pending in the Assembly Housing Committee - is in the process of being amended by Assemblyman Katz to - among other things - require that certified ERBS systems be required on new mobile and manufactured housing installations as of January 1, 1995. The bill will be supported by the Seismic Safety Commission.

SB-634 (Craven) - also pending in the Assembly Housing Committee - has

recently been amended to impose stiffer penalties on contractors who defraud consumers in the repair of homes, including the re-installation of mobilehomes, damaged as the result of a natural disaster, such as the Northridge quake. The bill has an urgency clause and is supported by the Golden State Mobilehome Owners League.

HCD is now in the beginning stages of the administrative process for making some of the regulatory changes for tie-down and support systems for mobilehomes recommended in the 1992 HCD report.

The State Office of Emergency Services (OES) is now finalizing a program to be managed by Kaiser Engineers of Oakland to fund installation of ERBS and other work on mobilehomes downed in the 69 parks identified by HCD in the Northridge quake. Funding will come from Federal Emergency Management Agency (FEMA) grants, and contracts will be awarded by park on a bid basis to contractors and installers.

Fire

In addition to continued questions about the adequacy of support structures for mobilehomes, the Northridge quake raised particular concerns about fire safety. Most homes which fall off their piers can be re-installed and repaired, but fire becomes the ultimate enemy. Although only two mobilehomes burned in Loma Prieta, some 184 burned down in the most recent quake, taking the life of one woman. In a couple parks, dozens of homes burned down, row upon row. To date, no final determination has been made as to the cause of these fires, although factors blamed include natural gas connectors damaged or broken when mobilehomes fell on them or pulled them out of their utility pedestals, unstrapped gas appliances, especially falling water heaters, and in one park, an alleged methane gas problem, all coupled with the fact that fire departments - in such a massive emergency as an earthquake - were often not able to render timely assistance.

Purpose of the Hearing

The committee will take input from individuals and groups concerning their views on changes in laws & regulations relating to mobilehome earthquake safety, particularly in light of the most recent disaster.

The Department of Housing will lead off the hearing with a presentation of HCD's assessment, to date, of the damage to manufactured housing in the Northridge quake, as well as actions which HCD and other agencies are now taking to both help mobilehome owners adversely affected by the quake and recommendations for changes in laws and regulations to mitigate mobilehome damage in such future disasters. The committee will then hear from mobilehome owners and representatives of mobilehome installers, manufacturers of mobilehome support systems, public utilities and others.

The hearing will be recorded and video-taped. The testimony and information from the hearing will be analyzed by committee staff, and copies of the transcript of testimony and legislative recommendations of the committee will be made available as soon as possible.

TRANSCRIPT OF TESTIMONY

MARCH 8, 1994

SENATE SELECT COMMITTEE ON MOBILEHOMES
HEARING ON EARTHQUAKE SAFETY IN MOBILEHOME PARKS
ROOM 3191, STATE CAPITOL, SACRAMENTO
MARCH 8, 1994

SENATOR CRAVEN: Good afternoon. We want to call this meeting of the Senate Select Committee on Mobilehomes to order. On my left I have Senator Dan McCorquodale, Senator Ruben Ayala, and Sally Ridgeway, who is the Secretary for the Committee, and John Tennyson, on my right, who is the Consultant for the Committee, and I am Bill Craven, the Committee's Chairman. We may have, during the course of this hearing, other Senators or, perhaps, Assembly members join us, and you should be told, or maybe you are already aware of the fact that, hearings on other subject areas are going on within the building and many of our members are in attendance there. So, if you see them coming in and out, you will understand why, hopefully.

This hearing has been convened, primarily, because of the Northridge earthquake in Southern California on the 27th of January. There was damage to mobile and manufactured homes in that earthquake which has been extensively covered in the media. As of today, there have been 5,000 mobilehomes damaged or destroyed in the Northridge quake, a record in California earthquakes to date. This is not the first hearing on this subject. The Seismic Safety Commission has held a number of meetings over the past 10 years touching on earthquake safety of mobilehomes. This Committee held a similar hearing 4 years ago on this subject after Loma Prieta. The 1992 Department of Housing's report on the adequacy of support systems for mobilehomes, copies of which are available for this hearing, provides important information on the adequacy of state standards for support systems.

There are many questions and, perhaps, not enough answers, which can be asked and which, hopefully, could come out of this meeting on this subject area, which I have briefly described. It is a situation that is not necessarily new to us, but it is one I think that we must treat very carefully and not get carried

away by the emotion which has a tendency to surround anything of a catastrophic nature. So, this is the reason that my colleagues and I have asked you to join with us today to offer testimony on various aspects of the problem, so that we would have a clear or, at least, a clearer understanding of what is involved and, hopefully, from that, we may evolve into legislative activity which can be introduced either by the Committee or the members of the Committee aggregately or separately. So, we hope, in a rather short period of time, to accommodate those of you who have taken your time to be with us, and we are going to listen intently to what you have to say. I should tell you that when you come up here you need to state your name and organization and where you're from, if you will, and recognize that this hearing is not only being recorded, it is being taped, I guess is the word for televised, which you may have seen on your local Cable channels throughout the State of California, not only of this Committee, of course, but many of the other ones.

So, with that in mind, do we have the agenda there, John? The first gentleman is someone who has been very helpful to us through the years. He is the Deputy Director of the Codes & Standards Division of the Department of Housing & Community Development, known as HCD, Travis Pitts. Travis.

TRAVIS PITTS: Mr. Chairman and Members, the Department of Housing responded early to the Northridge earthquake. Within 3 hours, the Division of Codes & Standards had dispatched inspectors to the affected area to determine the extent of the damage. That's only one part of the Department's response. You may be aware of our California Natural Disaster Assistance Program, that also responded to the disaster assistance centers, but I will try and limit my remarks to the activities in my Division in Manufactured Housing.

It took about three days for us to finish our damage assessment after going through 113 mobilehome parks and approximately 8,500 manufactured homes to determine we had identified the extent of the problem. We discovered that there were 4,466 homes that were actually down. That means they were off their primary support systems and on the ground. Another 955 had shifted

substantially, meaning that although they were not down, they had moved around enough that they had to be reinstalled -- many of those were on earthquake resistant bracing systems -- and 175 had burned. We had earlier reported a different number but that's been refined to 175.

By Friday of that first week, Governor Wilson had waived the reinspection fee of $120 for the manufactured home and the $80 fee for installation of accessory structures. We had mobilized our Northern California inspectors for transportation to Southern California to assist. We had opened our Southern area office on a 7-day per week basis. During the following week, we moved Northern California inspection personnel into the Northridge area and opened 3 additional offices within mobilehome parks within the affected area to assist in the issuance of permits and coordination of inspections. We have been open on a 7-day a week basis in those offices ever since. As of today, we have issued (as of last night, actually) 4,065 permits for the installation of some 5,600 homes. A total of 2,842 reinstallation inspections have been performed. Unfortunately, we're experiencing about a 33 percent failure rate of those inspections, which is causing us to go back time and time again. However, we have approved 1,902 reinstallation, and the families are back in their homes.

SENATOR CRAVEN: So, let me just... the failure is the failure of the remedial action taken by the owners presumably, not of the inspectors?

TRAVIS PITTS: A failure of the installed home to pass inspection.

SENATOR CRAVEN: Yes.

TRAVIS PITTS: Of the 175 fires, we did a semi-investigation, semi meaning it was late, it was after the fact. It depended a lot on information provided to us by the fire service and by the mobilehome park operators, not scientific by any means. But, what we did discover is about 76 percent of the homes that had burned had shifted across the utility pads.

If you are familiar with a mobilehome park setting, you know that within the lot we have a pad that encompasses the gas, electrical, water and sewer connections and, approximately 76 percent of the homes had fallen across or scraped across that utility pad, severing the gas and electrical connections at the pad, certainly providing sources of ignition for the fire. In 17 percent of the instances, we believe the fire was caused by the hot water heater in the manufactured home being virtually catapulted from within its enclosure, severing the gas line, and, of course, the pilot light providing the source of ignition. In roughly 7 percent of the cases, the cause was unknown; however, it is highly suspect of being conflagration from the homes next door, or adjacent to it, burning. And, those are... again, they are not scientific. They were the best we could determine in discussions with the fire service and our own observations well after the fact.

Senator, I would be most pleased to respond to any questions that the Committee might have.

SENATOR CRAVEN: Fine, Travis, thank you. Dan, have you had any thoughts that you..., Senator Ayala?

SENATOR AYALA: You indicated that most of the problems caused by the earthquake were the mobilehomes shifting over away from the foundation causing all kinds of problems. Do you have any suggestions how that can be corrected? I know we won't be able to come up with a solution that will resist any and all but at least some of the moderate shakes?

TRAVIS PITTS: Well, we have *recommendations*. They are in the form of regulations which is the method by which we effect changes in the standards for manufactured homes. We have what we call a Task Force. It's basically an industry group of the manufacturers, the dealers, the homeowners, the park operators and, in this instance, the building officials who are helping us because we distributed our proposals to them and ask for their input. How best

can you stabilize this piece of personal property without permanently affixing it to the underlying real property and creating all manner of problems with respect to other provisions of California law? We are in the process of refining our proposals with their recommendations, and we hope to bring something back to you that, as you point out, is not a perfect solution but would, in fact, resist up to moderate earthquakes.

SENATOR AYALA: How many homes were destroyed, over 4,000?

TRAVIS PITTS: Not destroyed. In fact, one of the things about manufactured housing that is almost unique is that this product can be reinstalled relatively quickly. The only delays that we are seeing is the absence of enough contractors to get them back up. We have over 2,000 of these homes installed and occupied at this point. The difficulty is that they fall to the ground. They are only supported..., their vertical weight is supported and, in the event of a seismic or a wind load applied to the side, they have a tendency to fall down. They are no longer occupiable at that point. They need to be reinstalled on some sort of a support system and reconnected to utilities. We have long recognized that this product, that isn't permanently tied down, needs to have some flexibility. The electrical connections, the gas connections, are all flexible, but not sufficiently flexible to withstand what we saw in Northridge.

SENATOR AYALA: Do you have recommendations forthcoming that will help that situation -- retrofitting, or whatever it takes, to make sure that they can resist a pretty good shake?

TRAVIS PITTS: We will continue to process our regulations, Senator. They, by our authority, will be prospective in nature. We do not have the authority to make those regulations retroactive.

SENATOR AYALA: Are you saying those will be grandfathered in as they are today but not asked to retrofit their units?

TRAVIS PITTS: I do not, under current law, have the authority to make any regulatory requirement retroactive, Sir.

SENATOR AYALA: Will you be suggesting legislation along those lines?

TRAVIS PITTS: It is possible although I am, at this point, still in substantial discussion with the homeowners -- the people who are most affected by our regulatory efforts. We are attempting to address their concerns and the potential cost. We have not been able to provide an answer to their concerns as to who pays for all of this.

TIM COYLE: Senator Ayala, if I could... Tim Coyle, Director of the Department of Housing. I'm sorry, I'm a little late, Mr. Chairman. I just arrived from Los Angeles.

SENATOR CRAVEN: No problem.

TIM COYLE: Your question is, "Should we apply these bracing devices retroactively?" Clearly, that's going to affect the greatest universe of properties and what we have seen, in the aftermath of the Landers earthquake and this earthquake down in Los Angeles, is that the bracing systems do seem to reduce the level of damage that would otherwise occur if they weren't braced. But, I want to make one point and that is, as far as we know, we studied this and Travis has been involved in this for a good long time, and we have been dealing and working directly with building engineers, as well as the manufactured housing industry, the manufacturers themselves, the park owners... and, as Travis said, we have convened a group to discuss this.

I am not aware of anything that is going to sustain, or is going to be able to sustain, the force of a 6.6 or a 6.8 earthquake. Many of those parks that were affected in this recent earthquake were right there in the epicenter of this quake and, as we saw in some parks, even those that were retrofitted, significant damage was done, as a result of other things going on, some that led

to fire. I think these bracing systems have to be pursued. The city of Los Angeles... Senator Ayala, you may be interested in looking into a financing program, a Code enforcement program, to go in and retrofit with funding... but, that's Travis' point and that's our big concern. There is going to be a tradeoff. For a product and a program that provides such tremendous affordability for people who are on fixed incomes and others who can't quite accumulate the money to buy a home, these are a... manufactured homes are a...tremendous housing product, and we wouldn't want to compromise the affordability aspects of those by unilaterally requiring retrofit. So, I think what we have decided to do is to invite representatives of the buyers and users of manufactured homes, as well as the producers and the park owners, to develop the best approach to doing this. Maybe it will be something along the lines of encouraging localities such as the city of Los Angeles to use their CDBG funds for this kind of retrofit. That may make the most sense.

SENATOR AYALA: Having gone through what you did in that area, the experience from that, couldn't you then provide some kind of suggestions for those other areas? For instance, the areas that I represent, which have the San Andreas fault going right through them, have a lot of mobilehomes up there, too. Can we use something you learned from the experience that you just went through and retrofit some of the other ones before it does happen? At least, put them at the same level that they can withstand a 6.5 or whatever?

TIM COYLE: I think clearly the benefit of these bracing systems should be brought to the attention of your homeowners out in your district and that's something that we can do in cooperation with the Western Mobilehome Association and the California Manufactured Housing Institute. Consumer information can go a long way, as we found out just talking to individuals who went ahead and retrofitted their homes. Their homes were still standing and they felt they had made the right decision. As you know, we certify the eligible producers of these bracing systems so we could also, in our literature, indicate those with whom the homeowner should contract. But, you're absolutely right. Yes, we can bring this to the attention of more homeowners around the state.

SENATOR CRAVEN: Tim, one thing that I wanted to ask is, do you think that we are in a position today to make a judgmental call on the efficacy of what we have presently, either in production or in use? Obviously, the aftermath of the most recent quake has probably shown us many things wherein we could have, perhaps, improved the situation if we had known that the earthquake could get to that magnitude. The thing that I am concerned about is, are we going to encourage people to utilize equipment that we may well know is not necessarily sufficient to do the job when it reaches that intensity?

TIM COYLE: And that's a danger. Yes, there is that possibility because we do know what happens with these bracing devices. The home, which as you know is already set up on piers, drops when the shaking begins. It falls off its pier mountings and it drops but, with these bracing systems which span the entire length or the width of the home, it drops only an inch or maybe two inches, depending on the device, and any more damage from falling is virtually eliminated. But, once it achieves that level and the earth is still shaking, the home does move. What kind of damage does that cause? It can cause minimal cosmetic damage to the skirting around the home, it could cause more significant damage to the awning or the steps going into or out of the home, undermine other aspects of the site but, by and large, I would say this in response to your question, based on what we know now these are good devices and so long as the public doesn't expect that this is going to be a product or a device that withstands, as I said, a substantial earthquake, that we provide that caveat emptor in anything that we recommend.

SENATOR CRAVEN: I understand. John Tennyson.

JOHN TENNYSON: Yes, Mr. Coyle and Mr. Pitts, do you have any specific information with regard to how ERBS systems operated in this most recent quake? Were they..., I know in Loma Prieta, I believe the Department had a report that most all of the systems performed satisfactorily. Is that the case or do you have that kind of information for this quake?

TRAVIS PITTS: Travis Pitts, Mr. Tennyson. We have preliminary information. It's not by any means final but in Loma Prieta we determined that earthquake resistant bracing systems performed well. We went even further to say even those that weren't certified by HCD had performed well. The Northridge earthquake is a different experience. We have now had some experience with the homemade devices or those that were pre-certified that did not perform as well. We also have experience with some of the devices under the homes that were installed prior to the requirement that they be inspected by the Department. Although they were portions of a certified system not all the system had been installed. If it called for four longitudinal supports, it only had two. They performed better than nothing, if you will, but we now are in a position of telling you that unlike the Loma Prieta earthquake where even the non-certified systems performed well, that is not the case in Northridge. The certified systems that were properly installed all performed within the limits of their expectations. They certainly didn't make the home earthquake proof, as the Director pointed out, but they substantially reduced the damage to the home.

SENATOR CRAVEN: Any other questions? Dan?

SENATOR McCORQUODALE: No.

SENATOR CRAVEN: Very well. Thank you both very much.

TIM COYLE: We'll give you our findings when...

SENATOR CRAVEN: Good. We'll look forward to receiving them. Next we have a member of the Assembly, Richard Katz, the 39th Assembly District, Los Angeles, and nice to have you here, Rich.

ASSEMBLYMEMBER KATZ: Senator Craven, Senators, thank you very much. I'll be brief. I do appreciate the opportunity to testify regarding the homes that were impacted in my District. In fact, by way of reference, where we live is about equal distance between the two mobilehome parks that blew up and everybody saw

on television. It's where my house is and probably the second or third scariest thing that happened to my wife and I that January 17th morning was when the shaking stopped and when we got out of the house the first two things we saw on the street, which was in total darkness, but there was an orange glow about two blocks left of us, which was one of the mobilehome parks that was on fire and the orange glow about a quarter or half a mile to the right of us, which was the other mobilehome park that was on fire. The hillsides were starting to catch fire behind that and it was a very frightening sight, certainly not nearly as frightening as having been in one, I would imagine. But, that is why I'm appreciative of this hearing that your Committee is doing and the look you are taking at what we can do.

What the Director said, there are no guarantees. I certainly know that working on the freeway system in my capacity as Chairman of the Assembly Transportation Committee. But, we do have an obligation, I think, to make it as safe as we can based on what we know and the best available science and technology. There are no guarantees in this and that is one of the hard parts. I do believe, based on what the Department says, what we've seen in the field in talking to the FEMA people and the OES people out there, that the bracing systems were the least damaged by what took place in the Northridge quake.

There are two things we are going to pursue and legislation is pending before your Committee, Senator, in looking at Senator Bergeson's bill, and it will be before your Committee on return actually. We have been working with Senator Bergeson. She has a bill currently pending in the Assembly that she is working on with us to amend that would allow local governments to pass ordinances which are stricter than the state building codes in terms of dealing with earthquake safety, earthquake standards for mobilehomes. I know that's been controversial in the past from a statewide perspective. It may be that something like that fits hand in hand with what Director Coyle said a little while ago, which was looking at the city of L.A. in considering the use of CDBG grants as a way to finance. I think the city might be more responsive and be more willing if they could also recognize that there are parts of L.A. that sit in serious seismic

they could set standards more appropriate to those zones that may exceed the statewide standard. That may also make them feel better about using CDBG grants as a financing mechanism.

The one other part that we will be looking at and working with the Committee on is requiring new mobilehomes to be fitted with earthquake resistant bracing systems that have been approved by the Department starting July 1 of '95, and that way we can at least ensure that the future homes are as safe as we can possibly make them. We would very much like to work with your Committee in developing other solutions as you see them so we can protect people in mobile home parks, not just in my District, obviously, but throughout the state.

SENATOR CRAVEN: We would be delighted to do that and we appreciate the input that you have made, and we are also very happy that you are here to tell us about it.

ASSEMBLYMEMBER KATZ: I appreciate that, Senator. Thank you.

SENATOR CRAVEN: You bet. Any other questions...

SENATOR AYALA: Mr. Katz, you have indicated that as you left after the quake, that you looked at some orange-like fire in the distance from the mobilehome park. There was one or two on fire at the time?

ASSEMBLYMEMBER KATZ: Yes, Sir.

SENATOR AYALA: Well, what caused those fires as opposed to a home or a street light or something like that. Why the fires at those mobile parks?

ASSEMBLYMEMBER KATZ: My understanding is that when the homes are knocked off their foundation, mobilehomes that were inspected after the quake, had either shifted or fallen off their foundations. The combination of that shifting, the rupture of gas lines attached to those individual homes, and resulting fires and

explosions that came from those gas leakages were the result, were the cause rather, of those fires that we were observing.

SENATOR AYALA: Yes, but wouldn't that be true of residential homes as well?

ASSEMBLYMEMBER KATZ: The mobilehomes in many cases were completely off the foundation and in many cases these are homes that are not very..., for example, one of the mobilehome parks backs up to a mountain range in that area. I've got a staff member that lives in those foothills, and those mountains are 15 inches higher now than they were the day before the quake. You can have a gas line connected that when something moves 15 inches, it is going to be pretty impossible to absorb that kind of movement. In their case, their water pipe fittings broke from their tanks in their house. Fifteen inches of vertical shift will detach almost anything including a gas line, and these mobilehomes in many cases came completely off the foundation and the lines separated, and the movement caused the fires which then engulfed the homes and the parks.

SENATOR AYALA: My second question is, you indicated that Senator Bergeson has a bill allowing local governments to be more stringent in their regulations than the state as it pertains to mobilehome parks. Can't they do it now?

ASSEMBLYMEMBER KATZ: My feeling is there's a statewide standard of earthquake standards and Senator Bergeson has allowed me to use a bill to allow local jurisdictions to hold to a more stringent standard.

SENATOR AYALA: Normally, you know, the state sets the regulation. Local governments can be as strong or stronger than what the state indicates, but nevertheless, in this case they had no jurisdiction at...

ASSEMBLYMEMBER KATZ: The state standard can't be exceeded by local government.

SENATOR AYALA: But was it pre-empted by the state?

ASSEMBLYMEMBER KATZ: It was pre-empted by the state and we are looking to allow locals to go further.

SENATOR CRAVEN: Senator McCorquodale.

SENATOR DAN McCORQUODALE: We're talking about tougher mobilehome standards related to earthquakes?

ASSEMBLYMEMBER KATZ: That's correct.

SENATOR McCORQUODALE: Will locals use more stringent standards, like permanent foundations, to prevent mobilehomes or parks in their communities?

ASSEMBLYMEMBER KATZ: That's a concern. Some, given an opportunity, will require concrete slabs or conventional building requirements or other means to figure out a way to do away with mobilehomes. It could be used as a guise under "loving it to death," so to speak as we hear the phrase, to be an excuse to prevent mobilehomes. I would oppose letting locals going that far, because I think they provide a much needed resource for people in terms of housing that's affordable, and it is something that I would like to see continue, frankly.

SENATOR CRAVEN: Anyone else?

SENATOR CRAVEN: Let me introduce Senator Ralph Dills of Gardena, Los Angeles County.

SENATOR RALPH DILLS: El Segundo now.

SENATOR CRAVEN: The earthquake moved you.

SENATOR DILLS: The earthquake and the Supreme Court.

SENATOR CRAVEN: Do you have anything that you would like to add to what you've heard?

SENATOR DILLS: No, I just apologize for being late.

SENATOR CRAVEN: No problem at all. We are delighted to have you.

SENATOR DILLS: Thank you.

ASSEMBLYMEMBER KATZ: Senators, thank you very much.

SENATOR CRAVEN: I would like to take a moment to introduce to you the sergeants, Eric Dair and Jody Barnett. Jody appears here nightly about 7:00 until closing. Next is Pat Lowery, Vice President, Southern Zone, GSMOL. Pat.

PAT LOWERY: I live about five miles from the epicenter of the earthquake. I was a very lucky lady in my park because none of the homes in our park went down. They shifted minimally and I wondered why I was so lucky. I found out that our park was on bedrock and even though we were so close -- it was right at the 118 freeway about four miles from where the big split was in the freeway -- there is a lot of difference. You can talk about these earthquake braces and everything else, but its the land underneath that helps, too, because my park owner owns another park in Fillmore which is about 30 miles from the epicenter, and it was built on a flood plain and that went down. I think a lot of it has to do with the county and city planning commissions on where they allow the mobilehome parks to be built. That's another side of this that you have to take a look at because in our park we didn't need earthquake bracing although I want to get it now, and we went through the earthquake.

I'm here, too, to talk about the feelings of the people in Los Angeles and the only thing I can liken it to is when there is a death in the family and you have a funeral. Everybody goes to the funeral, everybody wants to help, everybody is

very solicitous and very caring which we know all of you are here today but, you know, when the funeral is over everybody goes home and these people still have to live with the sorrow and devastation that's facing them. I am passing around some pictures here. These are pictures I took myself, some of them a month after the earthquake in the Tahitian Park and the devastation that I saw in that park. I'll tell you, I can know they're crying for those people and they're going to live like that for a long time.

I just want to make sure today that, please, whatever you decide, think of the people. Don't put any more on them. They've had enough. It's well and good to say they have to have this and they have to have that. They are in such shock right now they can't take very much more. I get it on a daily basis because through GSMOL, and you know, Senator, a lot of the people call us to ask what to do and I hear heartbreaking stories day in and day out. The phone just never stops. Everybody's got loan programs for us and they want to put earthquake bracing on our homes. Right now, I can get earthquake bracing through the FEMA programs, but the thing is I don't know which one is safe. As I said before, my home... I feel safe because it's on the bedrock, but the other people aren't. It's all so confusing to hear. We don't hear exactly what systems are good and what systems are not good. I went to the parks with Dave Hennessy. I went to other parks with my regional manager, and we would go to one home and look at earthquake bracing and, yes, it stood up and yet two doors down with the exact same bracing system and the home is completely down on the ground and destroyed. I am not an engineer. I don't know what the answer is. Please, whatever decisions you make, put an awful lot of thought into them.

SENATOR CRAVEN: Well, I think one of the difficult things to think about and approach in trying to resolve some of the portions of this problem is the effect it has on the constituency. If we could legislate the human personality we would be way ahead of things, but unfortunately we never will. But I think that all of us understand what you're saying. We have to factor that into the thinking. Unfortunately, most things that we look toward as an improvement invariably cost money or time or personal sacrifice. We try our very best to

keep away from that. Those things that you said, were you saying that people should have soils tests prior to the installation or the approval of a site or did I just...?

PAT LOWERY: As I say, I am not an engineer. I don't know what engineering steps should be taken, but I think something should be done. From what I have read in the papers since the earthquake, they talk about the water tables. If the water table was very high, it magnified the shock of the earthquake to much more than the 6.8 and that's what blasted these places out. Nothing should be built in these places. I'm not just begging for mobilehomes not to be built in an area like this. Nothing should be built there where you are going to take so much more of a chance of having the buildings go down than if they were built on decent land.

I'm worried now about another park in my area because it's in a landslide area, and what has happened because of the earthquake, this has been magnified. You'll see. I have pictures of it there where the cracks are getting wider and wider. They are eight feet deep and about two feet wide under the mobilehomes, and there are about thirteen homes in that park. I'm afraid they're going to go right down the mountain, now. I have talked to the Seismic Safety Commission about this, and one of the commissioners is trying to help me out at the moment and he is a geologist. And, I am very concerned.

SENATOR CRAVEN: I think without saying, perhaps we are going to have a consensus of thought and a cooperative move on the part of all of the people and the affected agencies that serve them. I think that that may not be the total solution, but I think it will move us in the right and appropriate direction. So, and also I should mention to the persons in attendance, you mentioned Dave Hennessy, who is the President of your organization, GSMOL, and it is nice to know that he was involved. He is a very active man.

PAT LOWERY: He most certainly is. He's been a great help to the people and a great inspiration to us. There is one other thing that I would like to say.

SENATOR CRAVEN: Please do.

PAT LOWERY: In going to the parks, especially the one park that I went into. There was a manager in that park that when all this happened..., he was not present when the earthquake hit. His assistant manager was in charge of the park. The man did not know where the gas shutoffs were, and under the law they are supposed to know. They are supposed to have a 24-hour manager or someone on duty that knows how to turn off all the utilities. No one was there, no one knew how to turn off the utilities. Luckily, the firemen showed up. They had to look all over the park to find out where the utility shutoffs were. When they got there, there wasn't even a wrench to turn them off with. The fire department finally found something to turn it off with, and it took three people to turn that gas off in that park. It is darned lucky that it didn't all go up in flames.

We have been pushing for a long time for managers to be licensed, to be trained. They must be. I think a lot of the catastrophes down there could have been stopped if the managers had done the jobs that they were supposed to be doing. They leave them in the parks from 9:00 to 5:00 and then they say, "After 5:00, call 911." That's not right. That's not what the law says and it's got to be strengthened.

SENATOR CRAVEN: John, didn't we have a bill along that line years ago?

JOHN TENNYSON: I believe there was some legislation some years ago, but I don't believe it saw the light of day.

PAT LOWERY: Well, let's hope because of this..., I know this same park went through the Malibu fire and the fire department issued a voluntary evacuation notice. This particular manager put the notice up on the bulletin board in his office and left the park. No one in the park knew that there was a voluntary evacuation in a fire area. That's how much they cared. This cannot go on.

SENATOR CRAVEN: Well, I'm not going to argue that point with you.

PAT LOWERY: Thank you, Senator.

SENATOR CRAVEN: But, we appreciate your bringing it to our attention, and it's also nice to see you again.

PAT LOWERY: It's nice to see you and I want to thank all of you for your help.

SENATOR CRAVEN: Well, you're very kind. Thank you very much. I'd like to introduce a recent arrival. This is Senator Marian Bergeson from the county of Orange who has always been a very interested party when it comes to the mobilehome community and the equipment involved. Good to have you, Marian. Thank you. Next is Maurice Priest, who my agenda says is the Advocate for the Golden State Mobilehome Owners League. That sounds almost biblical when I read it there.

MAURICE PRIEST: Thank you. Senator Craven and members, my name is Maury Priest. I am the Legislative Advocate for Golden State Mobilehome Owners League and on behalf of GSMOL and mobilehome owners throughout the state, we do appreciate the chance to address your Committee and to express a few of our points on the problems that our members have faced from the recent earthquake. In the 14 years that I've lobbied for GSMOL, the organization has opposed the infrequent efforts to require the installation of earthquake bracing systems, either to retrofit existing homes or to require bracing systems on new homes. I must say that our motivation for that position during the last 14 years has really been primarily financial. Mobilehomes and mobilehome owners have been classified and referred to as the people occupying affordable housing, and with the dramatic increases that we have seen at least up until about the last two years in real estate prices in California, mobilehomes have represented the most affordable. And, it was our fear that by requiring the installation at consumer expense of systems that could cost minimally at least several hundred dollars, if not thousands of dollars, it would be more than the average homeowner could bear, and that was our reason for traditionally opposing them. I have had several meetings with Assemblyman Katz and his staff and they have been helpful,

and I am certainly aware of their interest in addressing the problem, and the interest that your office and others have shown on the problem. With regard to the requirement in Senator Bergeson's bill, SB 750, about requiring new homes first sold after January, 1995, to have those bracing systems, our concern remains the ability of the consumer to pay for these systems. And, I must say, that in view of the recent damage - the substantial property damage that has been suffered - it's tough to continue a position that just flat-out opposes them regardless. I mean, because we're aware of the damage that's been done.

But, our primary remaining concern is that the efforts to require installation of earthquake bracing systems also bring into play either federal or state funding which is available for different types of problems, whether it be disaster relief or FEMA to help the consumer pay for that required earthquake bracing system. It is still our position that if new homes sold after January, 1995 are required to purchase systems then, number one, we are going to need the report that HCD is now working on finding out which of even their certified systems performed well. So that, as Pat Lowery stated, the consumers who are now in the process of putting their homes back together can be careful to choose the correct system. So, as soon as that report is available from HCD, that's an important part of the equation. And then to try to put into SB 750 or into other bills the means of, either through federal or state grants or long term low interest loans, making available some form of full or partial funding that will assist the consumer doing that.

Pat Lowery made reference to possible funding from FEMA in not only helping to pay for the reinstallation of homes that were damaged, but also enable them to select and purchase earthquake bracing systems. That's something that I don't *think*... we haven't been able to confirm whether it's true or not that FEMA funds are available for the acquisition and installation of earthquake bracing systems, but if that is true that is something that is important for us to let the rank-and-file victims of the earthquake know about so that they can choose a correct system for their home. How the consumer goes about paying for this mandate is something that is of concern to us, and I'll continue working with

Senator Bergeson's office and Assemblyman Katz' office to try to address that point through utilizing funds that are readily available already in one program or another. And, if they are not readily available from one program or another, perhaps modifying some existing source of funding that's been used for a related or collateral purpose for this earthquake bracing cost.

We are also in support, as the analysis indicates, of SB 634 by Senator Craven, that addresses the fraud that has taken place in some areas of the earthquake disaster, and that's nothing new. Unfortunately, in whatever disasters occur there are always those that try to take advantage of it and so we are in full support of increasing penalties for those who would take advantage of an earthquake or a disaster situation to further cause pain to those who have already been victimized by it, and we will be urging everyone to support that.

With regard to the comments by Mr. Pitts and Director Coyle, the gas hookups seem to be one area that either through HCD regulation or through legislation in the California Legislature should be addressed. Gas hookups..., in other words, right now doing something in the law either by regulation or legislation that requires the use of flexible connections so that gas explosions and gas leaks don't readily occur. In other words, whether it be the use of flexible pipes that are already on the market but that can now be mandated because that does appear to be the primary cause of the fires and explosions in homes that shifted and cut off the fixed connections.

SENATOR BERGESON: Mr. Chairman, could I ask something?

SENATOR CRAVEN: Yes, Senator Bergeson.

SENATOR BERGESON: Just a point. This is not related to the earthquake, but to the fire. Where you have fires obviously it becomes a concern. In Laguna Beach, where an entire mobilehome park was destroyed virtually by propane explosions - where it was like the 4th of July when they all started exploding - has any thought been given to how some mitigating measures could be provided to avoid that sort of thing from happening?

MAURICE PRIEST: I've had some limited experience in the propane tank problem. And, propane tanks are not commonly used in the newer parks that have been developed but in the older parks that have evolved. Especially in some areas like the foothill areas, you know, propane has been a popularly used form of utility because of the remoteness, the inability for them to lay gas pipelines below the surface of the ground. Those types of things. And HCD does have setback requirements where you have propane tanks. They have to be so many feet from the next adjoining structure, but many of these regulations go way back when. To avoid that problem from reoccurring I think a lot of it will happen by attrition. The fact that there are no parks that are being developed, to my knowledge, that would allow the use of propane tanks on every site, that would prevent it. In most of the newer developments, they have gas pipeline systems that are below the ground. And with regard to the recent earthquake, my understanding of those parks that suffered fire damage, it wasn't because of propane tanks like the Laguna Beach example, but where there is an underground pipeline and each home gains access to the pipeline by, traditionally, a fixed pipe that broke when the mobilehome shifted. So, if there is a flexible pipe from the point of connection, that hopefully will eliminate some of these. So that's one way we could address the fire and explosion problem.

SENATOR CRAVEN: Hold on just a moment. John.

JOHN TENNYSON: I think we need a point of clarification at this juncture. There has been some confusion on this issue. The current regulations require that a flexible gas connector, Title 25, HCD regulations, that a flexible gas connector for natural gas be installed from the pedestal, utility pedestal, on each space to the mobilehome. So, the law right now requires flexible connectors from the pedestal, not underground, but from the pedestal to the home. The problem is that the connectors may not be long enough because the Code provides that they be up to six feet in length. It doesn't mean they have to be six feet, just up to six feet. Some of them may be three feet. And then, of course, the problem with the homes falling on the connectors as well. And, the question I had for you, Maury, do you really think the Department of

Housing, which was aware of these problems as long as four and five years ago and made recommendations in their '92 report that specific regulatory changes be made, is really going to be able to address this problem in a timely manner in the next 10 years or 15 years or 20 years, or do you think the Legislature should attempt to take a crack at it? Do you see what I'm...

MAURICE PRIEST: Yes, I do. It's a serious problem and having frequent contact with HCD, I know that with regard to certain programs, the level of funding and the level of staffing is a concern. Like, we've already taken a couple of back steps on our regular park inspection program. We know that it's going to take a bit longer to perform and to complete the inspections of all parks than we had originally thought when the legislation was introduced a few years ago. And whether HCD alone can do it or whether it needs to be a joint effort with the local governments that are qualified and willing to do it. You know, we've been through that before, too, where some local government said they wanted to do the job and then either they failed miserably at doing it and it just fell back to HCD by default. Whether they can do it or not, I don't know. I know that they are concerned about the staffing in certain areas. But, this is something that's very important.

I'm concerned about just the cost to the consumer. I don't think the answer is just mandating a program and saying the consumer will pay. If that's the case, then we have to recognize that mobilehomes are not going to remain affordable housing in California, and I think that type of approach would fail to acknowledge the fact that most of them are still seniors on limited incomes or new families, first time home buyers that don't have all of the resources perhaps to get into conventional site built housing. So, on your question, John, whether HCD alone can do it or not, I don't know. But I think that in our discussions here if we establish what we believe to be the outside time frame that's acceptable to the Legislature and to the state for acting, okay, and just have some frank discussions between the departments and the agencies involved. If we say that this has got to be in a more safe condition within the next four years, then we are going to have to have those discussions and find out whether

HCD can do it alone within that time or whether there has to be a joint effort done with local efforts, once we have established the outside time frame. If we don't establish a time frame or a goal by which we are going to accomplish the things then we're going to be here, you know, 15 years from now wondering - well, maybe we won't be here 15 years from now - but we'll be wondering what happened with all these problems.

SENATOR CRAVEN: Senator McCorquodale.

SENATOR McCORQUODALE: What happened to mobilehomes that still have their wheels and axles? I understand about the ERBS and whether it worked or not and we ought to get some information from the Northridge earthquake there. It seems to indicate that we will... But what's the current status of mobilehomes now with wheels and the tires and axles? Do those stay with the home and then the homeowner is free to sell them still, is that the practice?

MAURICE PRIEST: I think that probably the dealers or manufacturer's representatives could address that better than I could, but it's my understanding that in most mobilehome purchases the purchase price does not include the axles and the wheels. They would be left on the manufactured home until it is delivered to the site where it would be installed and at that time, in most of the practices, so I am told, are to remove the wheels and axles at that time so they can be used again.

SENATOR McCORQUODALE: They do it automatically and if you keep them you'll be expected to pay.

MAURICE PRIEST: I believe that's the approach they are using.

SENATOR McCORQUODALE: I wasn't sure. I know where people bought them and then they were able to sell them after '80, I think, when that law changed. It seemed like that might be a mechanism to just simply say that you can keep them

but you have to put the earthquake prevention on them, but that's probably a thing of the past at this point, so...

MAURICE PRIEST: In conclusion, I just wanted to comment on one suggestion that was made by Senator McCorquodale and it had to do with Senator Bergeson's bill. I appreciate Senator McCorquodale's comments that in giving local governments, certain local jurisdictions, the right to impose more stringent standards in SB 750, that we want to make sure that we don't go so far that some local governments require a permanent foundation. And, some would like to do that. I mean aesthetically it may look somewhat better, it may be much safer, but as the mobilehome manufacturing industry has pointed out, if we give that much flexibility to local governments, a permanent foundation could cost $10, $15, $20,000 or more and would run out the affordability of mobilehomes overnight. So, there has to be some balance so that the ability to impose more stringent standards doesn't translate into a preclusion of mobilehomes within that area. Thank you, Senator.

SENATOR CRAVEN: Thank you very much, Maury. Next we have Dave Hennessy, President, GSMOL. I didn't realize that Dave was here. I am happy that I made favorable comments about you. I could have told the truth. Good to have you here today.

DAVE HENNESSY: Thank you, Sir. Members of the Committee, this is Dave Hennessy and I am President of the Golden State Mobilehome Owners League. I had a prepared statement here until I heard the Director start and then Travis chimed in so I figured I'd better change my delivery to have it make some sense. I had prepared to give you the human element, and I had Maury come up so that he could lay the legislative picture to you. I'm here to beg you not to put the mobilehome people on a cross for legislative expediency.

It seems like everyone is running around like a six year old with an Uzi and as soon as they come up with the idea that we are going to come up with more regulations to give to Travis, and Travis is going to come back to the

Committee, he's going to tell the Committee he hasn't got money, he hasn't got people, and if we add some more problems to that Title 25 which they've still got up on the sixth floor. I think they are keeping it up there until all of the appointees get the Title 25 colored. They've got a coloring book up there. I guess that's what they're doing with it. We went through an awful lot of work and effort to put Title 25 back together again. Now, we've come up with some new legislation that we're going to add to it. I can't see it. I just think we ought to fall back and regroup and that's what I'm begging you to do because if you look at all of the terms..., I have never in my life..., how many people remember the time that Babe Ruth hit the home run? Everybody in the world on that day all saw that home run and now you're getting the same thing. I have never in my life seen so many experts on earthquakes in my life. They've all got a degree in this thing, but nobody knows what the hell's going on.

If we're going to come up with something, the ERB people are coming across now. They've invested time, effort and money into putting these things out there which are needed. The only thing that the consumer has asked for is which one is the band-aid and which one really works. I think that they would love to have, if the state can't do it, to get the answer for this Committee or come back like they should have a couple of years ago from a private committee from the private sector. Get qualified engineers to go out and look at them to re-certify them, find out which one is the band-aid, to come up and tell the mobilehome people that you should put XYZ on there. We know that XYZ is the best of the lot. Just the same thing that Senator Dan was after, I think. This way if they ask us to get involved in this, no matter which way it goes - remember that, no matter which way this goes - the consumer is going to be paying for it.

If we call the insurance people in and bring the papers from Los Angeles - about their recent insurance exploits in the state of California - if we'd bring them in and sit them down at the table and tell them what a predicament we are in, maybe they would start working with us because they have been hit right between the eyes. And then you get a hold of Jess Maxcy and have Jess come out

and have him sit down with Petrakos and we would work something out there. The biggest barrier we are going to have to the mobilehome world is legislation which is not effective. So, just ask him to weigh it out. Whatever we can do as consumers we want to get in, but no matter which way it goes, if it goes from the lenders, we pay, if it goes from the insurance, we pay. If the manufacturer is out something, we pay. I think you ought to weigh it out.

SENATOR CRAVEN: Were you here when we opened today?

DAVE HENNESSY: Yes, Sir.

SENATOR CRAVEN: Well, I didn't say what I said as eloquently as you have now, but basically what I said was what you just said.

DAVE HENNESSY: Same thing. That's what I meant, a change from my delivery.

SENATOR CRAVEN: And I had..., my only feeling is that you've got to inject a realism into what we do and I don't like to see us, you know, jump off the board without knowing how deep the water is. I think there are a lot of things that must be put together. It can be done, in my judgment, in a cooperative way and I'll bet it will pay dividends.

DAVE HENNESSY: Sir, I am just saying that if you go to all the time and effort to put together some legislation and turn it on over to HCD, and we feel as though, you know, you've done your job, it's not going to be done. You know it, I know it and everybody back there knows it. But, if we weigh out what's going to happen with this situation, just cool it. I think we can get the people to the table and put a little less paperwork, with a little less bureaucracy, I think you can work it out, but that's the way the League feels and we just wanted to come to you. And, as usual, we do come to Senator Craven.

SENATOR CRAVEN: Well, you're very kind. Nice to have you here today. Appreciate it very much.

DAVE HENNESSY: Thank you very much for your courtesy.

SENATOR CRAVEN: Next is Marvin Brown, President, Fall-Stop Corporation of Huntington Beach. I think I have had the pleasure of doing business with you in times past.

MARVIN BROWN: I think we have. Thank you. The thing that I noticed to be rather outstanding was that in the mobilehome parks I found that the water was allowed to go under the mobilehome. Many of the parks aren't graded properly and the drainage, even though there may even be curbs under there, when the earth is softened and we have such a tremendous uplift as to travel 15 inches - actually it traveled more than that - it's like a cannon shot. That's the reason our device was designed the way it was. In the '71 quake we saw that those gentlemen who made benches out of oil well tubing were unyielding as could be. And here, I have photographs of a vehicle where the earth shifted like a pie cut. It was four feet higher than the road bed and it was just unbelievable and there it was along the Sierra Highway. So, therefore I think that the grading should be taken into consideration. This is sort of looking at the horse after you've bought it because the mobilehome parks, many of them are on fill and in situations where they have been graded, but I think everything is correctible, I do believe. There are plastic pieces that could go in some of these parks around the edges of the mobilehomes to allow the water to drain and not allow it to go underneath to cause all kinds of structural problems. So, I can't agree more with what was said with regard to the vertical lift.

Site grading..., can I go to the piers? Many of them..., people coming into the parks were resetting the mobilehomes on piers that were not adequate and many of them were sold, and we all know this, as earthquake resistant bracing systems. Not true. Where were the certification labels? And, I saw all kinds of things

going under mobilehomes. No labels. We have played it so straight that we have a system. I can tell you where, when we first were certified, where the first one was placed and I think that if I may say, if our system of certification is going to work we have to have a traceable system. And the person buying these ERBS should have on their receipt either a disclaimer that it is not - these items are not earthquake resistant bracing systems items - or it is, and your label numbers are and that way it clarifies everything. There are no people coming in with chicanery.

Also, I think it is a reasonable time to bring out the contractor and no contractor types. There are a lot of people going into the parks. We really didn't know what they were doing, and there has to be some method of monitoring this. I think a sign-in at the manager's office or some place of that type. If they are going to do any work in the park, they should be registered at the park office, and they should show their license with perhaps a driver's license or a picture ID and that would remove a lot of that. I think all of this is solvable, solvable.

The lines, the gas lines..., I know there are high pressure lines and when they break, instead of being a lethal weapon, it closes, it causes an automatic closure. I don't know how expensive those items are but they are available. Maybe I should design them. But..., so there are solutions. I think that that is something worth looking into. The design that I placed in my system was to allow a slip surface between either a metal plate... Since then, with certification, we are putting a wooden plate underneath, attached to it and screwed onto it. The steel plate is attached to wood. But, you have a slip surface. And again, I did this once before a long time ago, but I have a pen here on top of a paper. In a low-level quake it just moves with it and maybe it will move a little bit, but you have a large display of energy laterally and it doesn't accept that cannon shot loading. So, therefore, it escapes a lot of the damage. This was very visible in the quake. We could hardly answer or make a phone call out for several days after the quake. People were calling us and telling us that this was the case and because of the configuration which allows

an absorption of the upward uplift, the shock, it attenuates or lessens the resulting damage to the home. And, laterally, it is this slip surface, vertically it is an attenuation due to the design of the unit.

I think that Cal Tech actually has come out with a zoned level of earthquakes in various areas. Some of them had much less damage and they received much less of a shock. In alluvial soil, fluctuated or it's just a loose soil, for whatever reason, will show and reverberate. This lady..., I wondered the name of that park. Pat, I would like to know the name of that park because I looked at that park traveling on the 118 and it didn't look like anybody was down. I couldn't figure it. I know we have thousands of installations, but I didn't think we got a whole park. If there is anything that I might do. I have 23 years of experience and we've never had a failure. The coach has always been supported by Fall-Stop. We had..., in a particular park we had a lot of installations and we are not alone in this. There are other units out there that have held up well. We simply made it a very strict point to attenuate the loading both vertically and laterally. Okay, but the load was so, the shock was so strong that it actually, in the attaching bar or plate, it bent that up a little bit while supporting the home. The home never failed. I don't want to take a lot of time. I know there are a lot of people here.

Oh, I should say something about FEMA, if I may. I was very disillusioned to see that a good effort seemed to be stunted and directed poorly. The numbers that we were given... Channel Two television gave the numbers and we took a photograph of the numbers on the television set so we had them correct. It was wrong and a lot of things in a catastrophe like this become jumbled, and people are excited and we couldn't call back into the area because the phones were out and we weren't allowed to call in. But, if we all work together we can certainly do a good job and I really and truly appreciate that this open forum is here, and we can throw out some ideas to just solve the problems in a very wholesome way. Thank you.

SENATOR CRAVEN: Thank you very much. We appreciate your being with us. Next, I guess they are going to do this in tandem. Richard Clifton, owner and Gene Adams, outside salesman, C & R Manufacturing of Colton.

GENE ADAMS: Mr. Clifton couldn't make it today.

SENATOR CRAVEN: All right, Sir. Gene Adams. Good to have you, Gene.

GENE ADAMS: I have here, Senator Craven, several booklets. This seems like a duplication of what we did four years ago, so some of the things I'll leave out. I have on many occasions had people in the industry when I attend conventions make the statement, "What can we do to improve our image in manufactured housing?" Number one, we all know that the home is no better than the foundation it sets on. I have made this statement many times. I, in the manufacturing end of the business - I've only been in that portion of the business for four years - however, I have been in the manufactured housing of mobilehomes for 35 years. Jess Maxcy is an old friend. We have both been at it a long time and I have a lot of respect for what he has to say. However, we don't agree on some things.

SENATOR CRAVEN: Nothing wrong with that.

GENE ADAMS: It occurred to me I have been asked, what do we mandate? Do we say that we are only going to insist on having an earthquake base under a new installation or do we have it under new installations, relocates, resales? If we don't have it under all of them, we are never going to save the people that we need to protect that could be the next ones with an earthquake.

There are a lot of differentials in the building of earthquake bracing. Different engineers have different ideas. It is all sent here to Sacramento and the state of California either does or does not approve it. And, why they approve one and not the other and why they approve different kinds is beyond me but that's what happens. The braces do the job. We all build a good brace. There are probably 15 of us now in the state that are building earthquake braces. I've been out among the parks for the last four or five weeks and if the earthquake bracing was properly installed, and when I say that I mean properly installed and there are some of them that weren't. However, if they

were properly installed they did what they were intended to do. I did see some that were only a partial system. You can't blame that on the earthquake brace. You've got to blame that on the individual that put it under there.

We would invite HCD, the Senators, anyone, to come to our factory and I'm sure any of our competitors would do the same thing, and include us in the conversations. Let us have some part in developing something for the manufactured housing industry. At this point in time it seems like it's from frame upward that people are concerned. From the frame down, where myself and others build earthquake bases and foundation systems, are not included. Many meetings are held. We don't even know about them until it's over.

I've heard statements here today. One of them was, in fact, that a permanent foundation under a manufactured home costs $12 to $15,000. That could be and I am sure some of them have, but I have a lot of contractors that would love to put my approved foundation system under a manufactured home, an average 24' by 60' for $3,500. Then they talked about the the individuals that cannot afford an earthquake brace. In the years that I was in the installation business, believe me, I did a lot of jobs for people that didn't spend the money they should have and do it right, but they had an automobile sitting under the carport. Let's not look past the fact that some of those people choose not to put earthquake bracing under their homes rather than not affording to do it.

And, if they can't afford it, we've got FEMA. We've got FEMA right now, but who needs FEMA? That's we taxpayers, so let's do it before we have the problem. They talk about fraud. When we have this problem we have fraud. They run in there and they are going to get all they can get right now. If we take care of the problem before it happens we would eliminate the fraud problem or a great deal of it because then the manufacturers would all be on the same level, the installers would be on the same level, the salespeople would be on the same level, people would have a chance to choose. Yet we wait and we talk about these things and four years later we've had another serious earthquake. The first time it was only 600 houses. This time it's pushing 6,000. What's the Next one going to be? Where is it going to be?

So, I don't want to take a lot more time. That's just the way we feel about it and we would like to encourage anybody to come to the factory. If they are concerned with what it costs, we would be glad to give them our price list. And one other thing, I've got a newspaper here that's dated the 13th of February that states that after the San Francisco quake there was $5 billion in bonds and tax money generated and there is still $2.8 billion of that that is unspent. Where is that money and why is it unspent? Why aren't we doing something with it? And, we don't understand that.

SENATOR AYALA: That question came up a number of times in committee, and I think the answer is that the bureaucrats are still trying to argue what is the best way to handle it but the money is there to be used, yes.

GENE ADAMS: Well, and then I know that they mentioned that should we leave this with HCD to make these changes or legislate it? I know that four years ago HCD was supposed to bring a report back to this Committee a year later and I think they got it last year. I don't think it will ever happen and I think if we leave it there, they're just going to procrastinate and go on forever. There needs to be legislation that mandates this because people aren't going to do it unless you mandate it, and we just keep having the problem and we keep spending the money to pick them up. Thank you.

SENATOR CRAVEN: John had a question.

JOHN TENNYSON: You stated that the financial problem could be resolved with FEMA. Unfortunately, FEMA's guidelines, the way I read them, only permit financing of ERBS systems for those homes that were down in the actual natural disaster. Do you have any proposals for how these devices, if they were mandated, could otherwise be financed for homes that weren't destroyed or homes in other parts of the state?

GENE ADAMS: This would have to be discussed with FEMA. This is not the time that we can do it because they're handling what they have to do now with the homes that are down that had no insurance and the people have no money. But,

I'm sure that if it were discussed with FEMA, we would come out favorably.

SENATOR CRAVEN: Very good. Thank you very much, Gene. Appreciate it. Yes, Senator Dills.

SENATOR DILLS: There are golf courses and things built upon land fills. Is it possible that local government can give and do give permits to build a mobilehome park on a previous landfill? Anybody who knows?

SENATOR CRAVEN: You want to hazard a guess on that?

GENE ADAMS: It's been done but it wasn't approved.

SENATOR CRAVEN: I think municipalities are vested with the ability to make land use decisions. My thought would be if they in their judgment and that of the Building Inspection Department feel that the land is sufficiently secure, they go ahead and do it without any trouble at all. It's really not a state situation in my judgment. You go to the City of Industry, right? There is a magnificent hotel, golf course, convention center, all built on fill.

As a matter of fact, it's like what they have in Fresno that they've never covered, at least not in my last visit there. It's not one of the more memorable, you know, views of Fresno, I might say. Does that help to answer?

SENATOR DILLS: Oh, yes it does.

SENATOR CRAVEN: Very good. Thank you, Gene. Nice to see you. Next is Billy Ware, Manager of Regional Government Relations, Southern California Gas Company. Billy.

BILLY WARE: How are you?

SENATOR CRAVEN: Fine, thank you. Nice to have you with us.

BILLY WARE: Good afternoon. On behalf of Southern California Gas Company, we really appreciate the opportunity to share with you today some of our findings in our investigations subsequent to the earthquake.

SENATOR CRAVEN: We are delighted to hear from you.

BILLY WARE: And, basically our findings will quite mirror, are quite similar to the findings of HCD with regard to numbers, etc. Mobilehome parks are unique with regard to natural gas systems. As you are aware, master metered parks are parks where the internal pipe systems belong to the mobile park owner. The mobile park owner has to install them, maintain them, do all the leakage repair, etc. On the individually metered units, the utility provides service directly to each coach and the piping systems are owned by the utilities.

One of the things that has been very clear is that the Northridge earthquake highlighted significant safety problems in both individual and master-metered units. There are over 350,000 mobilehome parks in our serving territory, 92,000 in L.A. County alone. As the HCD said earlier, our investigation revealed damage to approximately 5,000 units and 171 units destroyed by fire. With regard to those fires that were natural gas related, there were two primary causes based on our investigation. One was the insufficient strapping of water heaters. Water heaters actually moved and broke away from their connections and caused fires and, two, the inappropriate strapping or the lack of strapping of the units to their foundations. We feel very strongly, based on the experience in the Northridge quake and in our previous experience, that if these two conditions were addressed - that is, the adequate strapping of water heaters and the bracing of the units - that most of the fires that occurred in Northridge could have been avoided.

And so, the Gas Company is continuing its investigations. We have several task forces looking at various aspects of the mobilehome park situation. We will

produce a report this week that addresses mobilehome parks totally. That report will include our recommendations in terms of mitigation measures that can be taken. The Gas Company will strongly support regulations that address mobilehome supporting systems and water heater bracing. But, we are very, very much convinced that without enforcement neither of these measures will get us where we need to be. So, in addition to having regulations that address support systems, we think enforcement is the key in this as well as the development, design, testing of adequate strapping and bracing systems and that information can be provided to the consumer.

SENATOR CRAVEN: Let me ask you one question. The strapping and bracing of units, are all of these units exclusively inside the coach or are they outside or are they both?

BILLY WARE: With regard to water heaters, our investigation revealed they were all inside and they broke lose and sometimes even broke through the coach itself. A 30 gallon water heater becomes a 350 pound missile...

SENATOR CRAVEN: Pretty heavy.

BILLY WARE: Yeah.

SENATOR CRAVEN: Very good. Thank you.

BILLY WARE: The last thing I would add is that the Gas Company is very concerned about the private consumer, and we want to be responsive to the needs of the consumer in making these recommendations that we would support strapping and bracing. We think an important part of the equation in looking at things from this moment forward is to include the utilities as a *part* of the process. We feel that we are experts in the natural gas distribution systems which seem to have been a key focus of attention during these, Northridge, as far as with mobilehome parks. And we would like to offer our services, our reports to you, to HCD and to others that will be looking at these issues in a forward way after today.

SENATOR CRAVEN: All right. Thank you very much. Any questions of Mr. Ware? Your company has always been most cooperative and we are most happy to say that. Good to have you with us today.

BILLY WARE: Thank you.

SENATOR CRAVEN: Next is Larry Kroeker, contractor, Advanced Mobilehome Services from Watsonville. Good afternoon, Larry.

LARRY KROEKER: I'd like to say thank you for your interest, obvious interest in the safety of the residents of the mobilehome parks and manufactured homes. I couldn't agree more with Assemblyman Katz' recommendation that each new installed mobilehome be secured with ERBS-approved bracing systems. I might add that the Committee and the Assemblyman consider having these systems approved by HUD and by HCD as a foundation system. Like Gene said, C & R will put them on for $3,500. I have plans here. We can put on a new doublewide for $2,500 so the cost is not a major factor. I am not a manufacturer. I install several types of braces.

I think Mr. Pitts..., we listened to Pat Lowery, the Assemblyman..., you all have the greatest of intentions. I think your motives are excellent. I think you should be encouraged to push forward with the implementation of tougher codes and laws. With all of your fine intentions all of those could be just rhetoric and all of this is basically a useless endeavor. None of this will help one mobilehome resident unless, that's unless, you are willing to enforce and police these codes and the laws.

Mr. Kingsford works for HCD. One of the finest field inspectors. He also instructs other inspectors at the college and Mr. Dan Rivers, his superior. They tell me they are at least a year behind in most of their inspections. In some cases they are three years behind on inspecting roofs, roof installations. I contacted several roofers and I could only find a few that could come up with a signed-off building permit from HCD after four years. Now, as a contractor, every scab, every con artist, every park owner, and most of the residents know

that these installations will never be inspected. We have dealers pay $100 for a permit for a re-roof. Why? Because they were inspected. Where's their protection.

The question might come up, is Kingsford negligent on his inspection, on his duties? No, last month on President's Day, he was with me on his own time discussing how would you get the inspection done on the dozens of earthquake braces that we put in in Santa Cruz County. He works 12 hour days. I mean, I was with him. He puts in 12 hours a day plus overtime, bills for eight hours. And I often say, "Why are you doing this, why do you do this?" And he says, "I see the fraud, I see the scams, I see the life threatening code violations." But, his hands are bound. He is not allowed to give them support to crack down on this fraud. He is only one guy doing what it should take eight to do. When he does find a violation does he have the support of the state of California to enforce the strictest penalties? This is strange coming from a contractor, but I think it's very, very important.

When we pay $100 for a roof, it may be $3.00 for ERBS earthquake system to put in, does all that money stay in HCD? If it does and if it's not enough to hire more inspectors, raise the fees, charge us more, and if it goes elsewhere stop it, put it back to HCD if that's where it belongs. You know, if it goes elsewhere I simply think that's fraud. I mean, we are..., we're paying for permits inspections, we're not subsidizing other entities of the state of California.

Another thing, why does HCD only charge me $63 for a reinspection? You can't send a man out for $63. Charge me $163 and all of the contractors $163 for a reinspection, and maybe we will watch our initial installations a little more closely. Somehow we have to give HCD or somebody some authority to turn this around.

I'll tell you just a brief story about an 84 year old widow. I don't want to take up your time but I think it's very important. I was in her home last

month. She's 84 years old, living alone in Santa Cruz in a mobilehome. Her name is Mrs. Fisher. She told the story. She said, "Larry, I need a new roof." She says, "See the stains over here on the ceiling?" I said, "Yes, I do." And I said, "Well, how old is this home." She says, "Six years old." And I said, "Then it's gotta be good, it's gotta be up for another 15 years." She says, "No, no, look at the stains I've got." "I have to have a new roof." I climbed on the roof and the manufacturer built it perfectly, did a great job. Someone had shoved the counter flashing..., had put in an awning and had shoved the counter flashing under the composition shingles and caulked it right at that seam. You don't caulk composition shingles because water gets under there and it finds its way out. They are designed to do that. The water dammed up and ran into her house.

I got back down and I called the roofing contractor in Scotts Valley, Bill Finzey. I said, "Bill, what would you charge to fix a roof of composition shingles?" He said, "$125 will take care of that." And I was so happy to tell this 84 year old widow that she didn't need a roof. And she said, "No, no, Larry, I have to have a roof." And this is why, she said, because these two contractors came in yesterday and said, "You've got to put a new roof on before it rains again, you have to." One of them, unfortunately, is from Sacramento here. So, he's going to charge her $5,420 unless she signs up today, then it's $4,661. On his way out he says, "Listen, if you sign it I'll give it to you for $1,880." He signed it, she didn't. The other contractor right behind, unfortunately from our area, only charged her $2,820 plus $100 for a permit.

I don't know, gentlemen, is that right or is that fraud? We need to stop... I think we need to stop this stuff. I think it's important that we..., I think we can turn the industry around. I think it's corrupt. I think most of the contractors try to do a good job, but there is so much dishonesty in this business because everybody knows they are not being watched. And, I think in ten years, given the proper authority and proper policing, we can turn this around. And, I think the answer is to police now, police and enforce, police and enforce everything we have on the books now, then let's put out some new laws and new codes only if you promise you can police and enforce them. Thank you very much.

SENATOR AYALA: I have a comment.

SENATOR CRAVEN: Yes, Senator Ayala.

SENATOR AYALA: The conversation you had with the roofers.

LARRY KROEKER: Yes.

SENATOR AYALA: I had a bill that the Governor signed last year that prior to my legislation..., the lady bought this mobilehome and it was leaking and looking at her papers where she purchased the mobilehome, it turned out that she had a life-time guarantee on that roof.

LARRY KROEKER: Right. I've heard this one too.

SENATOR AYALA: So, she looked up the contractor, or the dealer, whoever sold her the home. Anyway, it ended up that, no, that guarantee was only good as long as the original person lived under that roof. Once you sold the mobilehome there was no longer a guarantee. Well, I have a bill that says that now the new law is that when you purchase a home, whether it's a mobilehome or a regular residential home, that in the paperwork that you signed, in big letters it will say whether you have a guarantee or not on the roof. Whether it is a 20 year guarantee, or 40 year or life, it should be there. And, if there is no guarantee it will also state that there is no guarantee on your roof.

But, they wouldn't take care of this lady's roof leaking because a new owner had taken over. What's it got to do with a roof, you know? But, that's the way the guarantee is. Then they had a problem deciding who would be responsible, whether the people who sold the home or the manufacturers of the home. We ended up with the manufacturer of the roofing material. They were responsible for the guarantee. Those are the ones that give the guarantee, not the dealers or the Realtors, or the mover, but the law is that whenever you buy a new home, out on the front page of your paper would be in big letters that there is a guarantee or there isn't a guarantee. People when they purchase know before they buy it.

LARRY KROEKER: Good. Good point.

SENATOR CRAVEN: Thank you very much.

LARRY KROEKER: Thank you very much.

SENATOR CRAVEN: Next, we have Leonard Wehrman, Vice President for Government and Industry Relations, National Foundation of Manufactured Home Owners and the Commissioner, National Commission on Manufactured Housing. Len, good to see you.

LEONARD WEHRMAN: Good afternoon, Senator, and Senator Ayala and members. I am testifying here today as a member of the National Commission on Manufactured Housing. I had been appointed by the U.S. Congress as a National Homeowner Representative in December of 1990 as a result of 1990 Congressional legislation.

For the purposes of today's public hearing, I will limit my remarks to those for new homes that are being sited in new and existing manufactured housing communities. However, this will cover a wide range of topics from the development of new manufactured housing to warranties that include installation and transportation. And, may I add, Senator, I have taken your roof warranties, I have copied it 26 times and I have sent it to all the 26 state homeowner associations around the country asking them to do something similar to what you did here in California, and I thank you for that.

Mr. Chairman, prior to the meeting I presented the Committee with a copy of not only my testimony, but an interim report that the National Commission on Manufactured Housing has now presented to the Clinton Administration and to Secretary Cisneros and to key members of the U.S. Congress. The report contains approximately 100 recommendations or so relative to all the issues that we are talking about here, principally as they pertain to installation and those things

that I mentioned. In addition to the interim report, I have also given you a copy of a report entitled, "The Northridge Earthquake Effects On Manufactured Housing In California," dated February 4, 1994. That was a study that was done by the National Conference of States on Building Codes and Standards which is the contract agent to HUD.

Let me just cover the things I think it is important for you to understand in this whole issue. President Bush signed an Executive Order in January of 1990, approximately 90 days after the Loma Prieta earthquake, that would require the manufactured housing structure withstand a greater seismic force. These regulations are currently in process. They will be published very soon in the Federal Register and we expect them to go into effect later in 1994. They are directed principally in those areas where there are earthquakes, although some of the features that are in there will pertain to high wind areas and other places where there are natural disasters.

We also think there are some other things that are significant to all of this, as you have heard. Let me just tie a few of them together because one of the things that we want to attempt to do is to make sure that the integrity of the structure that is produced in the factory is the one that actually gets turned over eventually to the homeowner. So, transportation of that home on the highways, etc., is extremely important and that the home is not racked out of plumb position, that the structure stays intact, that while it is sitting on a dealers lot - although in California there are not many being set on dealers lots - we want to make sure that the homes are properly blocked while they are sitting on those sites, so when it gets to the ultimate site of the homeowner, again, that that home still stays in compliance.

There is another key factor in all of this that is extremely important, and Pat Lowery and others have touched on it, and that is the site and lot preparation. I have also served on ANSI, American National Standards Institute committees, developing the criteria for installation of homes. There are five or six different soil configurations, and it is not too difficult to determine what

kind of soil you are on and how that home should basically be installed. Not only how the lot should be graded, but whether the soil should be compacted and what kind of soil is there, to remove some of the debris that is there and crown it to divert water - that's already been mentioned before - and to be sure that the home is level, that one corner is not, when you site it, six inches off the ground and the other is three feet. That's exactly what happens in these earthquake situations when the homes go off of their blocks or the piers. What really happens is that they are sitting too high off the ground, making them very vulnerable to lateral and horizontal forces and making the homes fall off of the pier systems. Obviously, we have seen pictures when they fall off the pier systems. You see the pier systems push up through the floor or cause other peripheral damage that, frankly, should not have been caused in the first place.

I won't go through the rest of these, but I just want to summarize for you some of the things that I think you should take care of because there are some actual siting arrangements that should be done and one of them is these gas connectors and fittings, etc. It is my opinion that a lot of those that are being used are not listed fittings and listed materials. So, the first thing you want to be sure of is that these all have been properly listed. That is, they are Underwriters Laboratory-type listing or that they have gone through a testing procedure and, more important, that they are for the job that they are expected to perform.

Homes should be closer to the ground. Certainly no more than 12 inches from the ground or higher than 18 inches. This does make it more difficult to set because the person that is underneath that home setting it does not have room to work. But, let's remember, that home is going to sit there for another 40 years. Perhaps the inconvenience of an installer for a few hours would certainly outweigh the difference of what happens for the homeowner.

I would also suggest that HCD look very strongly once again, as has been suggested to them on numerous occasions, that they either ban or outlaw or

require some different configurations on metal piers. Metal piers that are at least 15 to 24 inches tall, a very small base for them, and the geometric flow of those makes them very easy to topple over. If an earthquake..., if you really move more than five degrees in many instances those homes will simply topple off of their pier systems regardless of what else you've got. I'd like to suggest again that this Committee and HCD look at the use of the different kinds of pier systems that are underneath there. Concrete blocks, when they are used, should have wooden spaces between them because one of the things that happens in seismic movement is you get movement both vertically and laterally, and the cinder blocks either break or they grind together causing a cracking motion. So, even though they may not fall, you still have a repair situation.

I am of the firm opinion that the actual systems, as has already been asked by one of the Senators before, should allow axles and wheels to remain to the extent possible. That is to say, if you are going to install a pier system underneath there, of course you may not be allowed to keep all the axles because there may be three, four, possibly five axles. Because of the spacing of the pier system you may have to take out one or two or more of those axles, but as a homeowner I believe the axle is the best insurance policy that there is.

One of the less expensive methods of consideration that HCD should look at is the operation of anchors and tie downs. If we have learned anything from the prior earthquakes, from Hurricane Andrew and those in South Carolina and around the country, it does not take really a lot to secure that home to the ground, surprising as it may seem, even though it may thrown a few inches up in the air. So, we are of the firm opinion that anchors and tie downs should be one of the less expensive methods of doing this. The difficulty lies, however, in most of the existing mobilehome parks. The park operator does not know whether the gas lines, water lines, electric, etc. are run underneath the ground or where these may be placed, and so that may be a dangerous situation.

The question was raised before about making more permanent or strapping down the hot water heaters. I am very pleased to be the individual who wrote the

California law for one of the Assemblymen, as I recall, about six or seven years ago, and I would like to think that people are complying with the strapping down provisions because that goes a long way to eliminate the process that we are talking about.

The last recommendation along this line would be that we recommend highly that the industry have a multi-year manufactured housing warranty for installation. As you have heard today, on numerous occasions today, that the enforcement of all the inspection programs, etc., is getting less and less. Budgetary limitations, traveling too far, can't keep enough personnel on board to maintain the status. So, what we are suggesting strongly is that there be a multi-year warranty, that the homeowner has to ensure that that home is in compliance with, not only the local building codes, but with the manufacturers instructions.

So, having deliberated long and hard over some of the recommendations, I think there are two levels of recommendations. First, I am very pleased to hear that there are a lot of people already talking about the curing of problems resulting from this Northridge earthquake. My concern is that we will lose some of this expertise if we don't start documenting it and putting it together as a collective group. So, I am encouraging highly, that as HCD deliberates this, they do form a review panel of interested people to highly document this because we should not be losing what's going on in Northridge, as surely there is going to be another earthquake in the next few years. Much of the documentation that we have is already available. We already know what it is. I am of the opinion it doesn't take much to put it all together.

Mr. Chairman, that summarizes my statement. I would like to suggest strongly that in those two reports I gave you, there, are in fact over 100 recommendations on things that one might consider - not that you want to do this - but things probably that you might want to consider, and I have given it to you with that purpose, and I thank you very much.

SENATOR CRAVEN: Fine, thank you, Len. All right, the next gentleman is George Sening, civil engineer. I don't know how you pronounce that, Klippel & Sening Engineering, Ltd., Sacramento. Excuse the voice.

GEORGE SENING: Good afternoon. I am here today to testify about earthquake bracing systems and foundation systems. I, myself, and my company have been involved with these particular structural systems within the last eight years or so. I have worked for several clients of mine designing systems that have worked, and I have testimony here to make it clear to you that the system actually works. So, the testimony that we heard before is incorrect.

Title 25. I am very familiar with what is in it and the general guidelines that are being laid down for engineers to design these systems. There are three different systems essentially described in this regulation. One is the earthquake bracing system, also called ERBS, then the foundation system and then the individual support systems. All of them are supposed to be designed to the UBC. The Uniform Building Code requires any system to be designed for vertical as well as lateral forces. Now, I want to correct here a misnomer, always talking about earthquake bracing systems. An earthquake bracing system is a lateral force that has to be resisted. There are two lateral forces, the wind and the earthquake. The wind is usually the governing factor. Actually, it is always the governing factor. So when these systems are being designed, and there is a regulation in their earthquake bracing system that says it has to be designed to Chapter 23 of UBC, 1982, there is a provision in there that says that in case the lateral forces produced by wind are greater, the system should be designed according to the lateral forces.

I have reviewed many systems at HCD -- they are on file for public review -- and I have discovered that my colleagues only design for earthquake systems. There is a reason for that. We're cheating them. We are not giving the consumer the exact things that they are entitled to. We are designing bridges, we are designing public buildings to move to the minimum requirements of the building code, but we do not give the people that live in mobilehomes the basic security

to have a home where they can live. Portable buildings are being used all over the industry. We have portable classrooms that are being used by our kids that can be moved. They have the same foundation system. They don't fail. Why don't they fail, the systems that are being sold out there? The reason is very simple. I can take one look--it always fails at the weakest point. If you look at these support systems, they have half-inch, three-quarter inch bolts to support a big huge structure that is sitting on top. That bolt is going to fail. We can see it in these pictures. There is nothing magic about it. HCD has all the tools in their hands to enforce the code, but the code, or HCD, is not doing the job.

In the past, as I can say from Loma Prieta to Landers to Northridge, about 6,000 homes have fallen off their foundation system or support system at a cost of $17,000 as shown in this report by HCD. That is $120 million. If I would be in charge of this Department I would have blood on my hands since I am producing or certifying that these systems are safe for the public to be used. I would lose my license. No one in this Department has any responsibility as far as I know. There is no licensed engineer employed in HCD that reviews our work, nor do they understand how lateral forces work and are applied to structures. It is nonexistent.

In the last report in 1992 that HCD prepared for the Legislature, they were talking that there is no regulation or no design requirements in existence. All they are talking about there is individual support devices. It has nothing to do with the foundation system. My client, Stabilizing Systems, produces a foundation system, which in actuality is not permanent. It can be moved. It can be disassembled and reassembled at another site. Also a retrofit system, a so-called earthquake resistant bracing system, which is designed for maximum wind load, which is the lateral force governing at this particular structure, at a cost of $3,500 installed for a double-wide mobilehome system. If you take this in perspective, a normal house ranges from $35,000 to $70,000 retail. This is a cost of about five or ten percent of the total cost. The sales commission on a sale like this is higher than that. Or, break it down on a square foot basis. It's only about $3.00 a square foot. It's nothing, it's peanuts.

Give these people an incentive like it was suggested in the report of 1992 by HCD, that we have a consumer agency actually test the performance of a system like that and that everybody works to the same standards. In my review I have noticed that every engineer uses a different cross section of a mobilehome. Each cross section has a different effect. If you take a sail and hold it in the wind, and if I make it larger it produces a bigger force, and if I make it smaller it produces a smaller force. If we all worked to the same standards and the system that performs the best gets a tax credit or some other incentive, then the consumer would be enticed to retrofit their mobilehomes or also install a better system. We have done it in the past when we had an energy shortage. We gave the consumer energy credits for installing solar systems. The same we can do on their foundation system to protect the safety and the general obligation of the general public, that is, you and me. Thank you.

SENATOR CRAVEN: Thank you very much. Next, Mr. Will Cossel, Representative, Contra Costa Mobilehome Association, Clayton. If I mispronounce your name, please correct me.

WILL COSSEL: No, it's fine. This is Doug Platt with the Owners Association and I will let him lead today.

SENATOR CRAVEN: Good to have you with us.

DOUG PLATT: Thank you, Senators. Good afternoon. I would like to mention your brains must be really boiling with all the changes that have been suggested. As a retired structural engineer some ten years ago, I don't know if the ground has changed, and if you don't examine the ground before you put something on it you are going to have a problem. Therefore, my suggestion would be to one of your engineers before you start doing something underground. That's not what I'm sitting here for. I represent Contra Costa Mobilehome Association, some 1,600 members. We live in the area, not very satisfactory according to residents. But, that's not what I'm here for. I'd like to present proper witness to what happens when a park owner terminates a resident. They usually know that

resident owes the bank and will sell it to him cheaply. He then sells it to anybody that will buy it. If the person does not get title, and should there be an earthquake, he would have great difficulty in trying to make a claim. That is as far as I will go. Mr. Cossel will carry it further. Thank you.

SENATOR CRAVEN: Thank you.

WILL COSSEL: I come to you today as an example of that problem. The mobilehome park that I live in is the Clayton Regency Mobilehome Park in Clayton. When I went into the Park I wanted to buy a mobilehome. I bought it five years ago and subsequently decided to buy two more as an investment to rent out. I found quickly that I had done something wrong because they wouldn't release the title to me. To date, I have yet to receive a bill of sale. There has been a catastrophe of water -- the flood situation two years ago -- where I have applied for FEMA and I was rejected because there was no registration. The state of California, HCD, had not gone to the... had not been able to do the completion of a title transfer because the mobilehome park would not issue to me a bill of sale.

This is a continuing problem. It is not only in my area. I have found this to be a problem out of the Southern California area, San Diego, and Escondido. When I was at the recent GSMOL meeting, others stated that this also was a problem that they had had in their area. If a park owner or if someone sells a park and carries back the paper and dies or disappears on them, they are stuck without a bill of sale, and there are all kinds of problems in getting that bill of sale. This could be a great problem to your people in Southern California in getting the FEMA package. I have a FEMA package here. And to get through it, it's a task. You've gotta go through all your taxes. You've gotta go through all your other problems of this package and you get it all finished. And, you go to FEMA and they say, "I'm sorry, without a registration you just aren't there." And, if you go through this..., in my case I went through the courts in trying to get that title and the courts have been lax in maintaining the state codes in that they will not force the owner to do what he has to do. And, I

suggest that the HCD be given a mandate to fast track all titles, that they be told that that is a very important thing to a person to have a title, so that if he gets ready to do something shortly after he buys the unit, if even to trade up or move out or decide whatever, he needs to have that title quickly. So, there should be a requirement that that bill of sale be furnished with the sale even if it may not be through an escrow situation, as it was in my case, particularly in a park that is of unscrupulous ownership.

Fraud--it seems to be rampant in this area. People are being chased out and being left without title. Titles never being transferred. Particularly in our area we are familiar with this most recently in Concord Cascades where the title of a man.... a man had, as I understand, Alzheimers, left and came back a couple of weeks later when they found him, or a couple of months later, excuse me, and his unit had been repossessed out from under him. He was in fact out without a home, from that point.

Code violations--these are all code violations, as I understand it. And that 798, there are different numbers in there. The courts aren't working well with this corruption. It's just going on like crazy in the mobilehome parks because of the owners and their attitude. We feel that they need to have licensing and certification. We have a felon that runs our park, alleged by himself of being a murderer. We need certifications that these people do not run parks in the state of California and that they know how to at least handle a three-wire electrical system, gas main turnoffs and know the systems throughout his park as well as I do, and I am only a haberdasher. I sell men's clothing. I know more about it than they do. We feel you can help us in that area. I think this is a falling-through-the-cracks situation where people are not going to be able to get FEMA, not be able to get SBA, not be able to get other loans that they might need and/or even the grants from the state of California in the event that all three of those should fail them. We will simply not be able to have anything to fix it up. They will have to leave it because they can't fix it. That's my message to you today.

SENATOR CRAVEN: All right, thank you very much.

SENATOR DILLS: I wouldn't think he should not be in the business of being a haberdasher. I remember Harry S. Truman was that too. He turned out to be a pretty fair president.

WILL COSSEL: Thank you very much. I work with the postal services, and I am their guy that sells them a uniform. So the guy that appears with a nice clean uniform, you know, it's because I was there.

DOUG PLATT: (inaudible)

SENATOR CRAVEN: Did you pick up on that?

DOUG PLATT: (inaudible)

SENATOR CRAVEN: Might as well, sure, why not?

DOUG PLATT: We have some documentation, here.

SENATOR CRAVEN: The sergeant will take it for you. Thank you very much, Sir.

DOUG PLATT: If you wouldn't mind returning them to me. I need it for further...

SENATOR CRAVEN: We'll give them back to you.

DOUG PLATT: Thank you.

SENATOR CRAVEN: We'll send them to you if we can do that.

DOUG PLATT: The oldest of those homes is 10 years, the youngest is 4. Thank you.

SENATOR CRAVEN: Next is Mr. Tom Naraghi, structural engineer, Naraghi Engineering, San Diego. Okay, now is that right?

TOM NARAGHI: Perfect.

SENATOR CRAVEN: Thank you.

TOM NARAGHI: Good afternoon, Senators. I am a practicing structural engineer in San Diego. I have been involved in manufacturing homes and their foundation systems for the last ten years. I had the opportunity last month to work directly with the insurance companies in the earthquake damaged area in Los Angeles. Since I was involved with manufactured homes and their foundations I visually inspected several products and came up with the conclusion that almost 90 percent of the structures that I inspected were supported on standard pier systems with absolutely no connection to the under chassis. In the first moment of the earthquake these chassis literally slipped away from the foundation and dropped as much as three feet on the ground.

It is easy to say if you brace the water heater, and this and that. It would prevent a lot of damages. That is absolutely true, but when a home drops three feet you can really visualize what happens to the contents, the stuff inside the home. Now, a water heater..., I don't know if a 26-gauge strap could hold a water heater if the water heater drops three feet. So, I think the area that needs to be looked at, it comes back to the foundation. We have to design the foundation systems that can carry vertical loads and lateral loads. Most of the systems that I saw hardly would carry vertical loads. I saw a lot of ERBS systems, earthquake bracing systems, and to my surprise, even though some of them were not installed properly, they worked. They worked for what they were designed for.

But, I'm here to ask for stringent new requirements and specifications. Right now they are designed to allow a two-inch drop. Can you imagine what happens if your home drops two inches? When you are driving down the freeway, your car goes into a puddle of water, it drops two inches, your head hits the ceiling.

So, the same concept applies to manufactured homes. We have to minimize the drop to zero inches and with that we could accomplish a great deal of comfort for our homeowners.

One of the other things that I want to discuss here and bring up is the concept of tie downs. I was involved with designing tie downs for manufactured homes, and I came to this conclusion. They do not work for earthquake resisting systems, the reason being, the nature of earthquake forces. They change direction continuously, meaning these tie downs use large gauge strap metal around the I-beam and they only work in tension, meaning if they are pulling away from the building they hold it down. But, since the earthquake changes its direction in one second you might have tension, in the other second you have compression on these straps and it works like a fishing rod. It just snaps. It doesn't work. Besides, there are a lot of utilities underneath these mobilehomes that their whereabouts is unknown. So, by tying it down you could not provide ample support. You cannot out wrestle the forces of an earthquake with a 26-gauge metal strap.

My understanding is in order to provide ample support you have to dissipate energy throughout the entire mobilehome foundation system. Just using localized systems you are only inviting trouble because manufactured homes are designed to be flexible. You can see them driving down the freeway and the structure itself is capable of withstanding forces far more than a 6.5 earthquake. When you are traveling down the freeway they go through a hell of a lot more. The only problem we have is they sit up on inadequate foundations. I think my colleague was right. We should up the ante a little bit on the requirements that are set by building officials with the state. We have to.

At least if we have requirements, let's enforce them and, please, have engineers designing these sort of things involved in it. You know, they are the people that actually do the work. Why don't you ask them what it is that you are involved in that could make this system better? Let's have a possibility of systems that could actually work for earthquakes far beyond 6.5, - 6.5, as far as the magnitude, is really nothing. You know, what if you had an earthquake that was a magnitude of 8? Senator, I would not want to even think about that possibility because it really frightens me because I saw the damage. I saw over 100 mobilehomes and 90 percent of them were down at least two to three feet, and you could really imagine what these people went through when all the people which generally are living in these structures..., they were just devastated.

Earthquake bracing systems are not a solution, but are an approach. It is a very good approach, and I believe if you could strengthen the regulations on earthquake bracing systems, you could come up with a system that actually works. And, please use the expertise of these people that are already out there and rate these things. I mean, I know there are about 100, at least 100 earthquake bracing systems out there. I have designed probably several dozen of them. But, somebody has to come down and rate these systems. How they compare. They are like apples and oranges and literally they are like that.

One could be sold for $200, one could be sold for $5,000. Now, how does the homeowner really understand which is worth it and which is worth nothing? I mean, which does not work and half a dozen of them or more are like that. I think we have to come up with some sort of a situation that could separate the men from the boys.

And, I would like to conclude my speech here with the fact that, let's stand for the possibility of having a system that actually works. Thank you very much.

SENATOR CRAVEN: Very good, thank you very much. We have one more gentleman, Jess Maxcy, President of California Manufactured Housing Institute, and here he is.

JESS MAXCY: Thank you. I am the very Jess Maxcy that Gene Adams disagreed with, which kind of surprised me because I thought he was smarter than that. But, I just wanted to share a few things with you. I have been through the earthquake zone and I have inspected cursorily about 800 homes, thoroughly, perhaps 25 or 30 houses and I wanted to share some of the things that I...

SENATOR CRAVEN: Please do. Thank you.

JESS MAXCY: First, I would like to shed some light on some statements that have already been made. We've had some discussion about water heaters and the need to strap those. The current HUD code already requires that those be strapped. They are located not inside the house but inside a fire retardant compartment with outside access. In the 800 homes I looked at, I didn't see a single case of where a water heater had fallen out of a house. I saw one that had started to move and the strapping did what it was supposed to do, it held it. I don't doubt that it did happen. Travis claims that there were some reported in other parks that I didn't see, and I believe he's probably correct, but by and large those homes have water heaters that are already strapped.

There was also some comment made on outlying tripod piers. I am not an engineer. I don't profess to know all the ins and outs of structure. I have read the proposed regulations from HCD and they address tripod piers, and I think that the solutions that HCD has recommended will correct the problem of a pier tilting over because they are now going to require that they be mechanically fastened to the house, the I-beam, and to the pad upon which they sit. I think that will correct the problem.

I would also like to make a case for pre-emptive installation standards. There was some comment about whether or not local jurisdictions should be able to have standards that were greater than those required by the state. Pre-emptive standards on installation are an absolute must for this industry for the same reason that a pre-emptive construction code is. When a manufacturer builds the

home he does not always know in what jurisdiction it is going to be sited and unfortunately, it has been my experience over the last 32 years in this business, that some jurisdiction would use that opportunity to almost zone against manufactured homes, to discriminate against their placement and the placement of affordable housing in their communities. That's unfortunate but it does happen. So, we would need to have a pre-emptive installation standard. We do have it now and if it needs to be improved, well then, we need to improve it together.

And, lastly, I would like to share a statement with you that I made before the Seismic Safety Commission last week in Burbank. The California Manufactured Housing Institute believes that manufactured housing offers Californians additional opportunity to own and live in decent, safe and affordable housing. Toward that end we support the proper installation of manufactured housing. California is one of the few states nationwide that has worked with the industry and consumers to develop safe and adequate installation requirements. This unique partnership must remain intact as we review those requirements. Should what we learn from the Northridge disaster lead us toward changes in our installation requirements; we should keep in mind that if the new regulations are only prospective. A real solution to the problem will be a very, very long time in coming. These are my estimates. There are approximately 579,000 houses, manufactured homes, in California and 17,423 of those are on permanent foundations. About 28,078 are on earthquake resistant bracing systems. That leaves 539,499 homes in the state. If we assume that the state, the entire state, is an earthquake zone, at our current rate of replacing old homes with new it will take 106 years to correct this problem. That is too long to wait. Thank you.

SENATOR CRAVEN: You may be the only one here.

JESS MAXCY: You'll be here. You can bet on it.

SENATOR CRAVEN: I hope so.

JOHN TENNYSON: You're suggesting retrofits, is that what you're driving at here?

JESS MAXCY: I am suggesting that we consider it, and there are legitimately people who don't have the funds to retrofit their homes. We need to find a way to address that. This is a serious problem. HCD or FEMA or the Legislature, if someone has a solution, the perfect foundation system, we would like to know about that. If we need to retrofit then we are obviously going to have to find funding to do that. I am estimating that we only replace. New houses replacing old last year were only 509 houses. If we did new requirements on all new sets and perhaps all resales, if that's feasible, then we are digging into the problem of about 50,000 a year and we are making some headway at that point. At 509 a year, the next earthquake will do this again.

SENATOR CRAVEN: Would it be feasible or reasonable rather than untoward to ask if the industry might consider a situation wherein they would sell, but at the same time underwrite, for a purchaser to purchase? In other words, carry the paper for them?

JESS MAXCY: I don't know the answer to that. I do know that, as a result of this earthquake, I contacted all of the lenders, and they were willing to provide no-interest loans to retrofit houses in the earthquake zone.

SENATOR CRAVEN: Well, you know, as we said I think at the outset, we know the efficacy of VA in which you are involved and others, and we commend what they have done to this time, but we know also there are a lot of people out there who just can't afford that sort of thing, and even though they would let you, but unfortunately they can't. One of the gentlemen said, " Well, you should charge us more to do your job." Well, God bless him, that's nice. He's probably one out of 100,000 who says that. Most people don't react that way. In fact, they go in the opposite direction. But, I guess somewhere between the two there may be an answer. But, I appreciate all the comments that you've made. That's it? Very good. Thank you so very much.

This is the list that I have. If there is anyone else who wishes to speak and hasn't done so why please come forward. We've got a couple of minutes left.

_____ ??: (inaudible)

SENATOR CRAVEN: Well, haven't you spoken before? Yeah, let me get somebody who has not yet had the opportunity before the voice goes completely. Please come up, Sir.

FRANK GOODIE: My name is Frank Goodie. I am a former manufacturer of mobilehomes here in the state of California, and I have a couple of quick observations on today's hearings that I would like to pass on.

SENATOR CRAVEN: Very good.

FRANK GOODIE: One is that the failure rate of these mobilehomes in the earthquake was different from park to park because during the decade of the '60s and the '70s there were regulation changes dictating different requirements for the installation of mobilehomes. So, some of the homes that were installed in the late '50s, and some of the homes that were installed in the '60s, have a far inferior foundation system to those that were installed in later years where the pier spacing was more controlled. We didn't have to have installation inspections, for example, until 1974, that governed how mobilehomes are installed. So, the data that one would take should be weighed carefully because we are looking at different kinds of animals there.

SENATOR CRAVEN: I understand.

FRANK GOODIE: That's one observation. The other observation that was a real observation that we had as a result of our investigations and our work actively involved in raising these mobilehomes - we have done over 200 of them I guess - was that heavier homes that are produced in more recent years with drywall interiors, hard board siding on the outside, plywood on the roofs, suffered far

more damage if they weren't protected with state of California earthquake resistant bracing systems, which many of them weren't. And when they went down, they fell a lot harder and a lot of those were totaled. That was just an observation.

Another observation that was interesting to us was the homes that had the wheels removed but the axles still remained. The Senator over here asked a question regarding axles. We found in many instances that with the axles remaining there was more damage to the home than a home in an adjacent lot that had the axles removed. There was more damage with the axles because as the mobilehome started to fall the axles hit the ground and the forward movement suddenly and abruptly stopped and when it did, the front of the home went down and the piers which now were only canted maybe at 10 degrees went up through the floor. In one instance we found 17 penetrations of piers where there were axles underneath there. So..., and also the hitches that were left underneath the homes caused severe damage to the home.

SENATOR CRAVEN: You know those things that you were mentioning I find extremely interesting, and basically that's where we started out, or at least I did, with the thought that let's not jump into this until we have some empirical evidence as to what constitutes goodness versus the not so good.

FRANK GOODIE: Right.

SENATOR CRAVEN: It's something that is not easily obtained, but I think we have the expertise and I think we have the organizations and agencies collecting that data that can help us, really. Not necessarily the State of California. Obviously, they can help but there are many other agencies that we could call upon, I think.

FRANK GOODIE: There is one suggestion that I would like to make. It is that I for one would like to be called. I had no idea of this hearing until I haphazardly found out about it, you know, and I would like to have known about

it. I think there are people in the industry that can shed expertise in this area that aren't aware of your hearings or who can contribute greatly. I know a lot of my colleagues who could.

SENATOR CRAVEN: Mr. Goodie, where are you from?

FRANK GOODIE: I am from Ventura. I would be glad to give you my card.

SENATOR CRAVEN: Please do. I have a feeling that there are no earthquakes where you come from originally.

FRANK GOODIE: There weren't. No, I take that back. There have been earthquakes in New England, but not in recent years.

SENATOR CRAVEN: Very good. Thank you so very much. Yes, Mr. Tennyson reminds me of something that I am supposed to do at 4:30. One thing I will do now which is at 4:30 is to thank all of you for being here with us, and we hope that you have gotten some thoughts that you may not have had before, and maybe you had developed some other ideas because of what you have heard.

These are typical meetings of the Select Committee, to get the input from the people who have the interest as well as the expertise to advise us, and with that information we try to put together those palatable ideas that we can, you know, reach in the pot and pull out a palatable portion so that we can help solve the problem. We have done that in other areas of our interest, that is, mobilehomes, and there is no reason we can't do it now. But, whatever we do, we do best with your input and we thank you very much. Good afternoon.

A P P E N D I X

(Related Materials & Information)

MARCH 8, 1994

APPENDIX

LIST OF ATTACHMENTS:

1) Some Questions for Discussion

2) Explanation of Installation Requirements excerpted from April, 1992 HCD Report

3) Report on Northridge Quake in Tahitian Park by John Quick, GSMOL

4) Report on Northridge Quake in Region 3, GSMOL by Virginia Croft, Regional Manager

5) Letter from George Sening, Kmippel & Sening Engineering, Ltd., Sacramento

6) Statement on Earthquake from Southern California Gas Company

7) State OES Mobilehome Minimal Repair Program information

8) Senate Bill 750

9) WMA letter on revising earthquake standards

10) Mobilehome Industry News information on SB 750

11) Assembly Housing Committee Analysis of SB 750, April 6, 1994 version

12) Senate 3rd Reading Analysis of SB 750, June 22, 1994 (final) version

13) Senate Bill 634

14) Senate 3rd Reading Concurrence Analysis of SB 634, June 20, 1994 (final) version

15) HUD Research Report on Lateral Load Restraint Devices for Manufactured Homes

16) HUD Draft Report: "Northridge Earthquake Effect on Manufactured Housing in California

17) HUD Brochure: "Minimizing Damage & Repair Costs to Manufactured Homes During an Earthquake"

18) HUD Draft Report: "The Effect of Earthquakes on Manufactured Home Installations"

SENATE SELECT COMMITTEE ON MOBILEHOMES
SENATOR WILLIAM A. CRAVEN, CHAIRMAN

MOBILEHOME EARTHQUAKE SAFETY HEARING
Tuesday, March 8, 1994
Room 3191, State Capitol

SOME QUESTIONS FOR DISCUSSION

NORTHRIDGE QUAKE

(1) **Status**: What is the latest status of the progress being made to re-install and repair mobilehomes downed in the quake?

(a) How many re-installation permits have been issued?
(b) How many are yet to be re-installed? How many re-installations have been inspected by HCD?
(c) What is the estimate at this point of how long it will take to put the majority of homes back in place?
(d) Will the OES/FEMA Program, which proposes to finance re-installation and subsidize ERBS devices for downed homes, slow down the process?

(2) **Fraud**: There have been allegations of fraud in the repair and re-installation of mobilehomes in the aftermath of the Northridge quake, where installers have failed to obtain permits or have made improper repairs or made installations which are not up to code. What recourse do mobilehome owners have to get redress in these cases?

(3) **Cost**:

(a) How expensive is it for homeowners to repair "downed" mobilehomes?
(b) Are most covered by earthquake insurance?
(c) What is their usual exposure with an insurance deductible?

(4) **HCD Impact**: HCD has waived the permit fees for re-installation of mobilehomes and has diverted inspectors from other areas into Los Angeles County in order to speed up the inspection and approval process.

(a) How will this impact HCD's regular inspections in other parts of the state - the 5-year park inspection program, as well as HCD's response to health and safety complaints and normal inspections for certificates of occupancy on new installations elsewhere?
(b) How can the prospective bottleneck in response time be resolved?

HCD REGULATIONS ON MOBILEHOME SUPPORT SYSTEMS:

(1) **Delay:** Why is HCD just now getting around to considering changes in regulations relating to stronger standards for support systems and tie-downs - 2 years after specific recommendations for those changes were made in HCD's own April, 1992 report?

(2) **Specifics:** What specific changes in state regulations are proposed?

(3) **How:** Would these changes be implemented - on prospective installations only, or on a retrofit basis on existing installations as well?

(4) **When:** How long would it take to make the necessary changes to the regulations before they can be implemented? Would it be more expeditious to accomplish such changes legislatively than through the cumbersome administrative process of trying to change regulations?

(5) **Cost:** What would be the average cost to the buyer or homeowner of changes proposed to be implemented for - say - a typical double wide mobilehome? What financing mechanisms are available - or could be made available - to help homeowners pay for the costs of these up-grades?

(6) **HCD Impact:** How will these changes affect the future workload of the Department in terms of inspections and permit approvals?

EARTHQUAKE RESISTANT BRACING SYSTEMS (ERBS)

(1) **Performance:** How did ERBS systems fare in the Northridge Quake? Were any homes on certified ERBS systems significantly damaged? How? Did any one ERBS system fare better than other ERBS devices?

(2) **Changes in Standards:** What changes - if any - need to be made in existing ERBS certification? In view of the latest quake, are there areas where standards for ERBS need to be strengthened as well? What are they?

(3) **Mandated How:** Should ERBS be required on new mobilehome installations and, perhaps, even on older homes upon resale or some other retrofit basis?

(4) **Mandated Where:** If ERBS is required, should it be statewide or only in high-risk seismic areas?

(5) **Mandated Cost:** Some are advocating that the Legislature mandate the installation of ERBS on new mobilehome installations and, perhaps, even on older homes upon resale. Many people who live in mobilehomes are elderly and of low or moderate income.

(a) What is the cost of the average ERBS device for - say - an average double-wide mobilehome?
(b) How can they afford the cost of these devices? Are there any sources of funding for ERBS installations - public or private?

(6) **Alternatives**: What changes in regulations relating to pier structures and support systems, short of ERBS, can be made to improve support systems for mobile and manufactured homes? Would tie-downs in conjunction with stronger pier structures be a more economical - and almost as effective - alternative to ERBS?

TIE-DOWNS

(1) **Cost**: What is the cost of installing tie-downs on a typical double-wide?

(2) **Opposition**: Some park owners have objected to installation of tie-downs in older parks because of concerns about damage to buried and unknown utility lines? How can this issue be resolved?

(3) **Where**: If mandated, would it be advisable to require tie-downs statewide, or only in certain seismic zones or high wind load areas?

(4) **ERBS**: Do ERBS devices need tie-downs to provide resistance to lateral movement?

FIRE ISSUES

(1) **Mitigation**: Fire is the most dramatic and feared result of an earthquake. How can gas fires in mobilehomes, pursuant to an earthquake, be most effectively mitigated?

(2) **Investigation**:

(a) Has there been any formal investigation by HCD or other agencies of the cause of the multiple fires in some parks - where from 20 to 60 homes burned up row upon row? If not, why not?
(b) Are the causes of these fires known?

(3) **Water Heaters**: Although gas appliances are required to be fastened down in manufactured housing, there are allegations that replacement appliances are often not strapped.

(a) Should the replacement of gas appliances be subject to permit and inspection to assure that strapping is complied with?
(b) Should inspectors be given the authority to inspect inside the home to assure water heaters, etc. are strapped?

(4) **Gas Connectors**:

(a) Are current regulations on flexible gas connectors adequate?
(b) Should there be a better standard? Should connectors be required to be a minimum of 6 ft. - rather than a maximum of 6 ft. - or should they even be longer for new installations?

(5) **Automatic Shut-off Valves**: Some argue that automatic gas shut-off valves are impractical - because they shut down the system with every sonic boom or bump.

(a) Are automatic shut-off valves a cheaper alternative to safety? Is the cost of the valves in terms of the potential for saving lives worth the cost to utilities and park owners of re-arming the valves?
(b) Can other - better - types of valves be economically developed if the demand is there or if they are mandated by law?

(6) **All-electric**: Would new parks be better off with all-electric facilities? Why should natural gas systems in parks be permitted where the danger of fire starting and spreading in an earthquake is so great?

# # #

State of California
Business, Transportation and Housing Agency
Department of Housing and Community Development
Report on

THE EFFECTIVENESS OF MANUFACTURED HOME SUPPORT SYSTEMS DURING EARTHQUAKES

April, 1992

EXCERPT

EXPLANATION OF INSTALLATION REQUIREMENTS

EXPLANATION OF INSTALLATION REQUIREMENTS

JURISDICTION:

The Mobilehome Parks Act, HSC, Division 13, Part 2.1, is applicable to the installations of manufactured homes both in and outside of mobilehome parks. HSC Section 18613 and related regulations prescribe requirements for the installations of manufactured homes without foundation systems.

The Mobilehome Parks Act provides for the preemptive regulation of manufactured home installations and further provides for a local government option to assume enforcement responsibility for parks within their jurisdiction. Presently, the Department has enforcement responsibility in approximately 3,600 of California's 5,800 mobilehome and special occupancy parks with local governments having enforcement jurisdiction in the remaining parks as well as all manufactured home installations outside of parks.

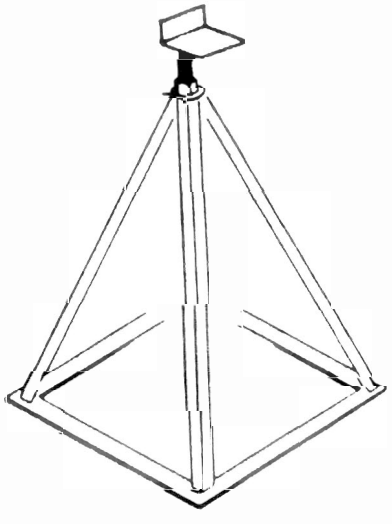
SUPPORT SYSTEM DEVICES:

Under current regulations, several types of support devices are approved by the Department for use with manufactured homes. To gain Department approval, the regulations require a manufacture of a support device to first have the load bearing support device listed by an approved listing and/or testing agency. Generally, these devices are either steel piers, concrete blocks, or concrete piers.

These various support devices are installed on wood or concrete footings located under the chassis beam at approximately 6' on center, and at concentrated load points, as specified in the home manufacturer's installation instructions.

Steel Piers:

This type pier is typically of a triangular shape with a 9" X 9" to 12" X 12" base. The vertical "legs" of the steel pier extend upward 12 to 30 inches in height and are welded at the base and at the top. The top of the steel pier is usually a hollow cylinder having a hole large enough for an adjusting bolt to slide through. The bolt is used to adjust the finished height and to level the manufactured home. Welded to the top of the adjusting bolt is a thin, flat piece of steel which provides the bearing surface upon which the manufactured

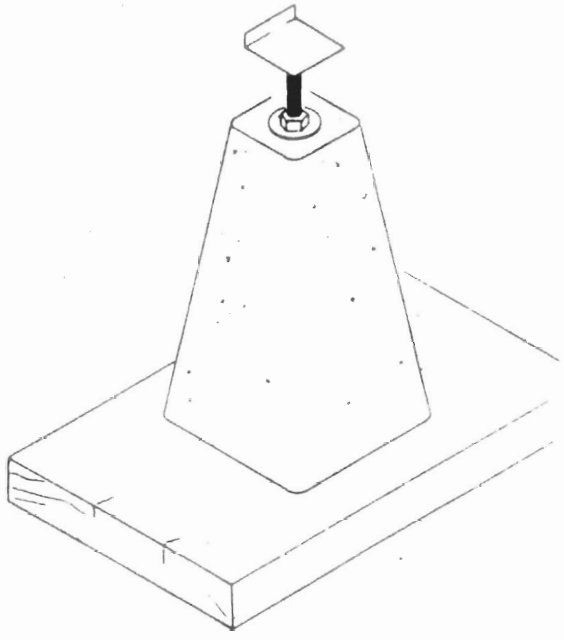


home chassis rests. This thin, flat piece of steel at the top of the pier is approximately 2" X 3", providing a very small bearing surface for each support device.

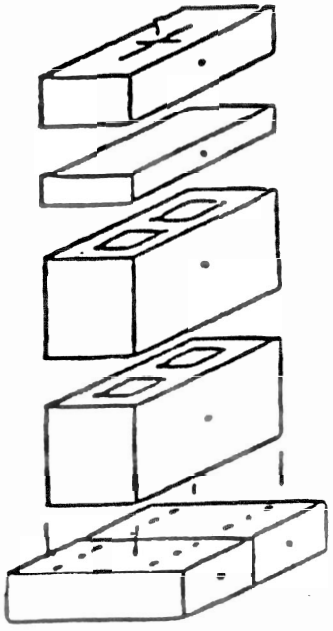
The steel pier is favored by many manufactured home installers because of its relatively light weight and triangular shape which allows these supports to be stacked one on top of the other requiring very little space during transportation. The steel pier has a significant capacity to resist vertical loads in relationship to its relatively light weight and low cost.

Concrete Piers

The concrete pier type support, like the steel pier, is triangular in shape having a base dimension of 9" X 9" to 12" X 12". It also comes in varying heights from 12 to 30 inches and has significant load bearing capacity. Normally, the lower two thirds of these devices are hollow to allow stacking during transportation as well as to reduce the weight. The top surface of these piers can be flat to accept a wedge leveling method consisting of two wedges cut 12 inches long from 2" X 4" lumber. However, the concrete cones or piers are normally manufactured with a hole through the top and a leveling bolt is used in the same manner as with a steel pier.



Concrete Blocks



This load bearing device consists of field assembled, 8" X 8" X 16" hollow core concrete blocks stacked vertically one on top of the other. Although the use of 1" X 8" X 16" wood blocks or spacers between the concrete blocks is recommended to distribute the loads between the concrete blocks it is not required. A 1 inch wooden cap block or 4 inch concrete cap block is also recommended to assure proper weight distribution although not required. Height adjustment and leveling are obtained by using wood wedges, between the top of the support device and the manufactured home chassis.

Note: Any support device that is in excess of 36 inches in height must be laterally braced in two directions at right angles to each other. When more than one forth of the manufactured home is supported at a height of three or more feet, the manufactured home must be installed on a permanently-constructed and approved support structure. A support structure must be designed to resist both seismic and wind loads for the area in addition to the vertical load to be supported.

Footing Materials

All three of the load bearing support devices described above require the use of an approved footing. Department regulations specify the materials and minimum sizes of footings. Generally, each footing for a load bearing support is either pressure treated lumber or three and one-half inch thick concrete which is precast or poured in place.

The length to width ratio of a footing may not exceed 2.5 to 1. Therefore, if a piece of 2" X 12" treated lumber is used as footing material, the maximum length would be 30 inches. Department regulations provide the method for calculating the total footing area and that all soil is presumed to have 1000 pounds per square foot of bearing capacity unless data to substantiate higher values is submitted to and approved by the enforcement agency.

G.S.M.O.L.
JOHN MICHAEL QUICK
CHAPTER PRESIDENT
TAHITIAN MOBILEHOME PARK
CHAPTER 322
15445 COBALT STREET, SPACE 218
SYLMAR, CALIFORNIA 91342
PHONE & FAX 818/367-8351

February 27, 1994

Pat Lowery, Vice President
11401 North Topanga Canyon Blvd. Space 126
Chatsworth, CA 91311

FAX 818/882-2054

Dear Pat;

In harmony with our phone conversation this morning, the following are earthquake issues and concerns raised by members of our chapter. I will be pleased to present them to the Seismic Safety Commission March 2.

LOCATION OF GAS METERS

The code requires meters to be placed within four feet of mobilehomes. In our park approximately twenty-five homes fell on their gas meters and broke the inlet pipe just above the ground line. This made turning off the valve on the meter useless.

The Department of Housing has told me they have and will approve permits to move gas meters in virtually any spot on a lot. But this is costly. Most mobilehome owners either can't or won't spend the money to relocate their meters. Without financial assistance for mobilehome owners, this broken meter pipe hazard will remain.

SEISMIC GAS SHUT-OFF VALVES

We believe the three separate fires that started in our park begin during the quake. One fire was caused by a fallen water heater not a broken meter pipe. By the time the individuals got out of their homes, manually shutting off the gas valves was too late.

A seismic valve may have prevented that fire. But the current design presents a nuisance. The slightest ground motion will activate the shut-off. Then the homeowner has to relight his or her pilots. Having to relight pilots frequently, would probably create a fire hazard in itself. We need better seismic gas valve.

MAINTAINING OF GAS DISTRIBUTION SYSTEMS

One hundred seventy spaces in our park are supplied from a park owned gas distribution system. Warren Davey is the park owner. The company he has contracted to maintain the gas distribution system is Pacific States Gas Co. Inc., Anaheim, CA.

Warren Davey buys natural gas from The Gas Company (formerly known as Southern California Gas Company). Then he bills each mobilehome owner for the natural gas they used based upon meter readings from meters he supplied. The meters are read by a another private billing company that he employs.
We don't know the name of the billing company at this time. If the mobilehome owners of this section of the park need natural gas service, they must report the problem to the park manager. Who regulates this privately owned gas system?

The remaining 57 spaces in the so called "new section" of our park are maintained by the Gas Company. We are billed directly by them. If we have a natural gas service problem, we phone the Gas Company. The park manager is not involved.

LACK OF WATER PRESSURE TO FIGHT THE FIRES

Fifty two homes in our park burned. The City of Los Angeles fire department arrived about twenty minutes after the earthquake. They never entered our park. After they attached hose lines to the hydrants located on Cobalt Street they declared that there was no water pressure and left.

At approximately the same time a hydrant located in our park on Avenue Eight, had pressure. Mobilehome owners uncapped the hydrant and attempted to divert the spray at burning homes. They had no hose the correct size to attach to the valve so they used boards pressed against the stream of water as best they could. They also formed a bucket brigade. There was plenty of water at that location. A Los Angeles fire fighting crew from San Pedro used this hydrant to fill their tank at approximately 10: A.M., January 17.
No effort was made to use the water in the park swimming pool

We are requesting that Budweiser and Guerro Baking Co. be questioned as to weather they had water pressure in their plants after the quake. They are located on Cobalt Street directly across from our park.

Fire fighters from Los Angeles County saw the flames as they were travailing by on the freeway. On their own initiative they came into our park at approximately 6:30 AM, January 17, and put the fire out with water they had on board their trucks. They also called in water drop helicopters.

FIRE HYDRANTS WITHIN MOBILEHOME PARKS

We believe all mobilehome parks should have a sufficient number of HYDRANTS with proper hoses near by. Gasoline powered pumps to use water from swimming pools should also be available. The residents of the parks with training from the Fire Department could then form a volunteer fire fighting team.

REPORTS FROM FIRE DEPT. AND PUBLIC UTILITIES

We want reports from Los Angeles City Fire Dept. Los Angeles County Fire Dept., The Gas Company and Los Angeles Dept. of Water and Power. These reports should be entered into the record as testimony subject to perjury laws if false.

Fire Departments. should state what they observed and did the morning of January 17. The Gas Company should tell what they observed and did that morning. As well, what oversight they gave prior to the earthquake. How often was the park gas distribution system inspected? From the Department of Water and Power we want testimony about water pressure.

MOBILEHOME QUAKE BRACING

If existing mobilehomes are required to have earthquake bracing, financial assistance will be required. As you know, FEMA is paying for the bracing systems in the earthquake disaster zone. Some form of government help for all mobilehomes in California should be available.

EARTHQUAKE REPORT by Virginia Croft; Regional Manager of Region 3

On January 17; 1994 at 4:31a.m we were rocked with a 6.8 earthquake. Having been thru the Sylmar quake in 1971 which was quiet, this one went off like the largest SONIC boon I had ever heard. Then the motion like a jackhammer started and went on for a long time, it was so strong that one could not get out of bed.

As soon as it stopped and the first aftershocks stopped, I grabbed a sweatsuit and ran thru broken glass all over the living room, dining room and kitchen trying to find my two cats, one was frozen with fear behind the couch, I dumped her into a carrying case; found the other one on the enclosed patio and and put her into the carrying case, feeling it would be safer on the drive than in the coach I placed them there. Jim Britton came around and shut off my gas; at this point we looked across the park and saw a coach go up in flames, my phone was out as was Jims, but my next door neighbors was not; she called the fire dept. We could smell a strong odor of gas in the front area of the park, so Jim and I were telling people not to light a match or start a car it could trigger a fire there; we went looking for the manager; he was on vacation. The assistant manger we found but he did not know where the main shut off for the gas lines was; we found an older resident that did know and went to shut it off; the assistant manager did not have a wrench large enough to shut the gas off; so our next step was to get one of the firefighters to shut it off, we did this and it took three grown men to shut it off; it was now 5:01A.M. The time it took to locate the master meter and get a large enough wrench the part could have burnt down; there was no water in the park, the only water available to the firefighters was what was on their trucks. They kept the fire from spreading beyond two coaches.

The Emergency Committee had begin to gather. so Jim and I went to the clubhouse as it began to get light and I told the person in charge we would help. We were both given a CB each and set out around the park coach to coach to be sure no one was trapped, and many of the residents had helped others out of the coaches; many of the coaches the doors would not open and had to be pried open; we walked the park checking on anything and everything; as the after shocks continued to come people were out in front of their coaches or in the driveways, barbecue began to appear and water to be heated for hot coffee; it was cold and most of us were in shock. At this point we had no water, gas or electricity.

Looking at my house and other peoples houses I wondered how we would ever clean the mess up; there were dishes, glasses, crystal, china, bottles that had been full broken or shattered is a better word all over the floor; the carpet was wet from wine breaking on it, soy sauce was all over the kitchen mixed with glass; the bathroom medicine chest had empted all over the floor; there was not a room in the house that didn't have glass all over the floor. This was typical of most of the mobilehomes.

There were many coaches on the ground having fallen from their piers, and each aftershock took them down closer to the ground, gas mains were broken, water lines were broken,electrical power was down. Looking at the valley there were no lights, just fires burning.

The earth on Zuni had opened up and left a mobilehouse sitting where no one should be; the earth had opened up; unknown to us at that time there were many more on the preminter that had split.

There was no management people in the park on Monday or Tuesday, so we shifted for ourselves. Vons below was giving away water, milk, and baked goods, someone went down and brought some back, coffee seemed to be what kept us going.

We continued to check the homes and make sure where people were and to get something for them to eat; all were afraid that the food would spoil before power came back on. Some people were getting water from the pool to flush their toilets, on Wednesday they stopped this afraid it would damage their disposal system. Instead we were told to put plastic bags in the toilets, use them then to dump this into the trash. I called the health dept, I knew this was not legal.. Another resident went to work on getting port-a-potties into the park. On Wednesday a water truck came up and we had drinking water and flushing water in two separate trucks. I left on Thursday for the GSMOL Convention in San Jose, at this point we still did not have disaster help in the park.

Upon returning to the park Sunday night I found we had port-a-potties; a water truck parked at the front gate one had to go down and get water in their own jugs, it was not possible for our older residents to do this; we did have electricity; but no water or gas. There were management people in the park at this time. People were afraid to leave their homes for a motel as they could not lock their doors, and people were roaming in the park that were not residents. Some of the older residents were cold had not had hot food since the quake and I was worried about disease breaking out in the park of 224 coaches.

Pat Lowery gave me the numbers to call on January 24, 94 and we got the Red Cross into the park, as well as stress management people, and any medical help that might be needed. The Red Cross brought a truck load of food, water and blankets on the evening of the 25th and put them on the driveway; we gave it to residents. The food truck came into the park on the 26th and Jim, his son and myself walked ahead of the truck in the park letting resident know that this was for them. Some hesitated, but not for long, for many it was the first hot meal sine the 17 January; 94.

The 26th of January Sparkletts brought two large truck loads of drinking water into the park, they had some young people who distributed three gallons of water to every door, and the balance we put onto a porch so we had plenty of drinking water. We still had no water or gas.

There were many contractors in the park; which decided that the contracts had to have 1 million liability, plus workmans comp, and of course the right type of license. One contractor was thrown out because he had only 1/2 million liability. Between the residents and myself the contractor took out more insurance andc was allowed back into the park after much ado.

The Clubhouse was set up for the contractors to use, but the residents still find it locked to them.

On touring the other parks we found that gas was one of the biggest problems, and a shut off meter would not work as the lines broke before the shut off would work on the coach. I strongly feel that a shut-off on the master meter, in sub-metered parks, would solve that matter.

On checking the main gas meter , I find there is still no wrench chained to the meter for shutting it off in an emergency; I feel this should be mandatory for each park that has residents.

I feel that in a park our size we need a full time manager, not someone who goes home at 5 P.M.. The managers should have to have training, and know where the utility cutoffs are at, not try to find out in an emergency.

In the fires we had, The manager put a sign on the door, " Voluntary Evacuation of the park" the residents were not notified of this, the manager left the park after posting it saying the residents were not his problem. I question whose are they?

A park as large as ours needs a full time manager that cares about the people. He or she should be trained and know the park utilities systyem locations; know most of the residents over time and also know those residents that will need help in and emergency.

In Top of Topanga, many senior residents would have been in trouble if some of us had not stepped in to help them, there was an assistant manager, but not trained in what tools to have and no wrench was available for the gas meter, we could have had the park burn as we had no water it was only due to the Topanga firefighter that we did not have this problem.

I understand there were phone calls to the park office about individuals and the office had no knowledge where the people were or if they had been injured.

On visiting other parks with Pat Lowery Vice-President we noticed that earthquake bracing did not hold, the coaches fell to the ground in many case; in some two inches, they moved away from their location, some went up into the air and came back down on their front porches. The burned ones had the gas main break below where the shut off was at. We saw one type of bracing that seem to hold in Oakridge park, owner had little inside damage done.

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March 9, 1994

Senate Select Committee on Mobile Homes
Senator William A. Craven, Chairman
1020 N Street, Room 520
Sacramento, CA 95814

Dear Senator Craven:

I appreciate the time you spent listening to me on the subject of mobile home safety on March 8, 1994. Since this was short notice for me I was not prepared properly and I feel I have not communicated my concerns and opinions to you satisfactorily. I'll try to rephrase it to you in short order.

HCD has a mandate to protect the health and welfare of mobile home owners and occupants. The rules regulating this mandate are spelled out in Title 25.

Engineering and design issues basically follow the minimum design requirements of the Uniform Building Code. Modern buildings designed and constructed in accordance with these minimum standards survive those natural disasters with minimum damage and without catastrophic failure. Therefore, present legislation is adequate.

We have designed a mobile home support system meeting the minimum standards of the UBC which has been installed in over 4,000 homes and has so far successfully weathered the earthquakes in Loma Prieta, Ferndale, Landers and Northridge. The system costs $3,500 installed on a double wide mobile home.

There are many foundation and support systems available to the consumer, all carrying the label of approval of the State of California. With misleading advertising claims and high pressure sales tactics, such as those depicted in the movie "Tin Man", the unsuspecting and uninformed consumer buys the apparent "good deal" without knowing anything about the performance of the system. The consumer is lulled into false security since the product carries the approval of the State of California. In natural disasters of any magnitude, when things fail (or don't) we have to ask why.

I have reviewed the work of my colleagues and examined the available products on the market and have come to the conclusion that these other systems do not meet the minimum building code standards.

716 ALHAMBRA BLVD. • SACRAMENTO, CA 95816 • TEL. (916) 444-5976 • FAX (916) 444-0489

All systems on the market are certified to be safe by HCD. If all systems would fail a standardized test, I would have to say none of us know what we're doing. However, I know our system works by simply meeting the minimum UBC standards.

HCD is in a very powerful position because it grants state wide approval of these systems. Even if local jurisdictions recognize design deficiencies, they have no choice but to accept the state approval.

My suggestions to you are as follows:

--Rewrite design regulations of Title 25, simplify, streamline and make it easily understandable for everybody.

--Review HCD's mobile home operations. Cancel all present certifications, have a blue ribbon committee review all applications to determine that minimum standards are being met and, if so, recertify.

--Condense certification into one process for a foundation system.

--Tie downs should not be mandatory. Overturning is a problem only in single-wide units, but it can be dealt with by other means.

--Crack down on false, misleading and inflated advertising claims.

--Collect sales brochures yearly and compare with design standards and test results. If infractions occur, suspend certification.

--Establish tax incentives for mobile home owners to retrofit foundation systems.

Please feel free to call me if I can be of further assistance or if you have any questions.

Sincerely,

George W. Sening, RCE 31151
General Partner

SOUTHERN CALIFORNIA GAS COMPANY: MOBILE HOME PARK SAFETY & NATURAL GAS SERVICE

The Southern California Gas Company (Gas Company) distributes natural gas and provides service to millions of residential and business customers.

Unique to the gas distribution system are mobile home parks. While the Gas Company usually provides gas service directly to residential customers, this is not always the case with mobile home parks. Many of these are "master metered," where the gas distribution system within the park is privately owned and operated by the park owner. Others are individually metered and are fully serviced at the coach by the Gas Company.

The issue of mobile home park safety has been the concern of numerous local and state regulatory and legislative bodies. This concern is based on the inadequacy of the current state code and building standard (Title 25), as well as the integrity of privately operated gas lines. The California Department of Housing and Community Development is the state agency responsible for building standards relative to mobile homes, while the California Public Utilities Commission has responsibility for inspection of the mobile home park underground utility system.

The recent Northridge earthquake again highlighted the significant safety problems in both individual meter and master meter parks. Inadequate safety precautions for mobile home parks resulted in property damage, and suggests the need for tighter safety codes and building standards relative to the mobile home coach and all attendant utilities.

At present it is believed that 168 mobile homes were destroyed by fire during the Northridge earthquake. These fires typically originated at a single coach and then spread rapidly to others. According to Gas Company investigators, there were two primary causes of natural gas-related fires: (1) when coaches fell off their foundations and broke the risers supplying gas to the mobile homes, and (2) when appliances, primarily water heaters, fell and broke the interior gas lines. Coaches that had installed adequate earthquake bracing systems were the least damaged.

Based on reports from the field, and experience from past earthquakes, the Gas Company strongly believes that many of the gas-related mobile home fires could have been avoided if the following safety provisions had been implemented:

- bolting of coaches to earthquake bracing systems to avoid slippage of the coach and possible severing of utility systems;
- adequate strapping of water heaters.

The recent Northridge earthquake once again highlights the susceptibility of mobile homes to earthquake damage, and suggests the need for a tighter state safety codes and building standards. The Gas Company continues to investigate the types of damage caused by the recent quake, in order to recommend safety measures to reduce the risk of future earthquake damage to mobile home parks.

02/16/94 10:02 AM

Governor's Office of Emergency Services (OES)

MOBILE HOME MINIMAL REPAIR PROGRAM

Questions and Answers
March 4, 1994

1. What will the Mobile Home Minimal Repair Program do?

If you join the program your mobile home will be put back on its piers, jacks or blocks, leveled, and tied down (if it was tied down before the earthquake). Your mobile home will also be seismically braced, using a system certified by the State Department of Housing and Community Development (HCD). Utilities will be brought to your unit ready for hook-up by the utility companies. Repairs will be made that are necessary for your home to receive a certificate of occupancy from HCD. It will not provide for repair or removal of appliances or other items inside the home. These and other additional repairs may be covered by other federal and state loan or grant programs. To determine your eligibility for these additional programs, you must apply for disaster assistance from FEMA. You can apply by telephone by calling 1-800-462-9029, or in person at a Disaster Application Center.

2. What will the program cost me?

The program will not cost you anything. FEMA is funding this program to help you make your home habitable.

3. How do I sign up?

Representatives of the program will hold meetings during February and March at each mobile home park to pass out applications and answer questions. Contact your park operator or owners' association to find out when a meeting is scheduled. If you miss the meeting, extra applications will be available from the park operator or head of the owners' association. Applications are also available at the DACs and Service Centers, but you are strongly advised to wait until meetings are held to fill out your application (many incomplete applications have been submitted). You may call the toll-free information lines

(1-800-877-4253 for English and 1-800-997-4253 for Spanish) if you have questions. If you have not applied for federal disaster assistance, you must register either by telephone or at a DAC or Service Center before work can begin. You can also register by calling 1-800-462-9029.

The deadline for signing up for this program has been suspended indefinitely. We encourage anyone who is interested to sign up as quickly as possible.

4. What if I am a renter in a mobile home?

This program only applies to homeowners who lived in their mobile homes at the time of the earthquake. If you are a renter you need to encourage your landlord to apply for a Small Business Administration loan to cover the damage in the mobile home he/she rents to you. He/she can apply for such a loan by telephone (1-800-462-9029) or by visiting a Disaster Application Center.

5. When will the work be done?

Before work can begin, mobile home owners must complete their application forms. Outreach staff are working in the various mobile home parks to get completed application forms from all affected owners. As completed forms for the whole park are received, contractors will be scheduled to begin work. We will contact you before the work begins.

6. What if I suffered no damage to my mobile home but I am in a park that suffered damage?

You are not eligible for participation in this particular program. It may be to your benefit to investigate investing in an HCD-certified bracing system. A list of such systems can be sent to you upon request to the Mobile Home toll free number, 1-800-887-4253.

7. What if I have insurance?

This program cannot duplicate your insurance coverage. If you have had to pay eligible out of pocket expenses because of a high insurance deductible, you

may qualify for additional assistance. You receive this additional assistance through the application process to FEMA. For further information about your claim you can call the FEMA Helpline at 1-800-525-0321. You must return to the state any insurance payment you received for work performed under the program up to the FEMA allowable amount.

8. What if I'm not insured?

The federal government will cover the cost of all eligible work, as outlined in the program. If you have already paid for this work and you have applied to FEMA for disaster assistance, you will be reimbursed for eligible work up to the allowable maximum costs. Be sure and save all receipts. To determine the status of your application you can call the FEMA Helpline at 1-800-525-0321.

9. What if I have already paid to get my mobile home replaced on its piers, jacks or blocks?

If you have already paid for this work and you have applied to FEMA for disaster assistance, you will be reimbursed for eligible work up to the allowable maximum costs. (In fact you may already have been reimbursed). You receive this assistance directly from FEMA, not from the Mobile Home Minimal Repair Program. To determine the status of your claim, contact the FEMA Helpline at 1-800-525-0321.

You may have been waiting for a check from FEMA to begin this work. If you have not already selected a contractor you can participate in this program. However if you choose to participate, you must return to FEMA (through the Mobile Home Minimal Repair Program) the amount you receive to reset your mobile home. If you have already selected a contractor you are should honor that agreement, and your eligible repair expenses will be covered by the disaster assistance process.

10. What if I already paid to get my mobile home up but I did not include a seismic bracing system?

This program will pay for a seismic bracing system to be installed on any mobile home damaged in the Northridge earthquake in Los Angeles, Ventura

and Orange counties if the owners wish. If you did not purchase a bracing system when you had your mobile home repaired, the program will allow a contractor to come in and install such a bracing system. You must fill out and sign an application form and you must also be registered with FEMA and determined eligible for assistance.

You have the choice of having the bracing system installed by a contractor under this program, or you may select your own contractor. If you select your own contractor, be sure and save all receipts. Contact the FEMA Helpline at 1-800-525-0321 for further information about including eligible bracing costs in your FEMA disaster application.

11. Can I get a seismic bracing system installed if I have not incurred damage to my mobile home?

If your mobile home did not shift on or off its foundation in this earthquake you are not eligible to have a seismic bracing system installed under this program. However, it may be to your benefit to investigate investing in an HCD-certified bracing system.

12. How do I as a contractor/laborer get work on the project?

The restoration work will be performed by licensed contractors who participate in a competitive bid process. Contractors may call (213) 253-5786 to learn how to be placed on a bidder's list.

FEDERAL/STATE/LOCAL COORDINATING OFFICE

The Governor's Office of Emergency Services (OES) is coordinating with the Federal Emergency Management Agency (FEMA) and the State Department of Housing and Community Development (HCD) on a program to repair mobile homes damaged by the Northridge earthquake.

Who is eligible for the program?

- Owner occupants who resided in their mobile homes as a primary residence until the earthquake made them unlivable.
- Owner occupants who have already reset their homes on jacks or piers but who did not add HCD-approved seismic bracing.
- Owner occupants who have no insurance or whose insurance does not cover the full cost of repairs offered under this program.

-- Owner occupants must apply (or have already applied) for assistance and be determined eligible by FEMA. Renters are not eligible for this program. --

What will the program do?

- Set fallen coaches up on HCD-approved systems and level them.
- Add HCD-approved earthquake-resistant bracing systems.
- Make necessary repairs to utilities damaged by the earthquake. Make connections to each coach when approved by the HCD inspector.

What is the cost? No cost to owners for the above-described work. The program will cover all costs that are not covered by insurance -- all costs if you are uninsured.

How do I join? You must do <u>two</u> things:

- Apply for FEMA assistance if you have not done so already. Call 1-800-462-9029 or register in person at a Disaster Application Center. You must be determined eligible for a FEMA grant to qualify for this program.
- Complete an application and agreement. Return these to your Mobile Home Park Operator or mail to:

  Mobile Home Minimal Repair Program
  355 S. Grand Avenue, Suite 2800
  Los Angeles, CA 90071

  You will also need to sign a waiver when we meet with you before work begins.

When will work start? Work has already begun. As soon as we have completed forms for all interested and eligible parties in your park, a contractor can be hired and work will begin.

Questions? Call the Mobile Home Minimal Repair Program Hotline:

1-800-887-4253 in English 1-800-997-4253 en espanol

Contractors interested in bidding? Call the Contractor Hotline: 213 253-5786

FEDERAL/STATE/LOCAL COORDINATING OFFICE

APPLICATION FOR OES MOBILE HOME MINIMAL REPAIR PROGRAM

-- You must apply for FEMA assistance and complete an application ~~by March 18, 1994~~ to be eligible for this program.

1. Today's Date: _____

2. Your Name: _____

3. Telephone: Home_____ Work_____

4. Mobile Home Park Name: _____

5. Your Space Number or Address:_____

6. Who is the owner of your mobile home? ___ Self ___ Other _____

7. Is your mobile home your primary residence? ___ yes ___ no

-- If you do not own and occupy your mobile home as your primary residence, you do not qualify for this program --

8. Type of Home: ___ Single ___ Double ___ Triple ___ Other

9. Are there any room additions? ___ Yes ___ No

10. Is there an attached carport? ___ Yes ___ No

11. What was the condition of your home right after the earthquake?

	YES	NO
a. Knocked off piers, but repairable	___	___
b. Shifted, but still on piers	___	___
c. Not shifted	___	___
d. Burned	___	___
e. Knocked off piers, not repairable	___	___

If you checked yes for categories c, d, or e, you are not eligible for this program.

12. Are you living in your home today? ___ Yes ___ No

13. If you are NOT living in your home, why not?

	YES	NO
a. Needs to be reset on piers	___	___
b. Utilities not connected	___	___
c. Destroyed or damaged by fire	___	___
d. Destroyed by earthquake	___	___

e. Other (explain) _____

_____

14. Did your home have seismic bracing before this earthquake? ___ Yes ___ No

15. Were your utility connections damaged? ___ Yes ___ No

16. Have the connections been repaired? ___ Yes ___ No

17. Do you have home insurance? __ Yes __ No

18. Does your insurance cover earthquake damage? __ Yes __ No

--If you answered yes to question 18, answer questions 19 through 21; otherwise, skip to question 22.--

19. Have you submitted a claim to your insurance company for earthquake-related loss? __ Yes __ No

a. When did you submit your claim? Date(s): _____

b. Has your insurer responded? __ Yes __ No

If yes, what was your insurer's response? __ Denied Coverage __ Admitted Coverage

If your insurer has admitted coverage, describe steps taken by your insurance company to satisfy your claims; _____

_____

_____

_____

20. Name of your insurance company: _____

a. Contact and telephone number: _____

21. Your policy number: _____

7.

-- You are not eligible for the program if your insurance covers all costs of the work that would be accomplished by the program. --

22. Have you received temporary housing assistance from any other source? __ Yes __ No

23. If so, describe: _____

_____

_____

24. FEMA Control Number: _____

– You must apply to FEMA for assistance to join the program –

WARNING: KNOWINGLY PROVIDING FALSE INFORMATION IN CONNECTION WITH AN APPLICATION FOR DISASTER ASSISTANCE CAN RESULT IN LOSS OF BENEFITS, CIVIL PENALTIES, AND CRIMINAL PROSECUTION.

I hereby certify and declare that the above information is, to the best of my knowledge, true and correct.

Date: _____ _____

Signature

FEDERAL/STATE/LOCAL COORDINATING OFFICE

-- A completed Agreement is required to join the program --

MOBILE HOME MINIMAL REPAIR PROGRAM AGREEMENT

Applicant requests the following services:

___ Set coach on HCD-approved supports

___ Level coach

___ Provide HCD-approved earthquake-resistant bracing system

___ Make utility repairs and make utility connections when approved by HCD inspector

-- You must have an earthquake-resistant bracing system installed if you join the program --

Please initial all applicable items:

___ I understand that the program only provides the repairs checked above.

___ I understand that the program does not address carports or other structures external to the coach.

___ I understand that the program will not provide for repair of appliances or removal of items inside the home.

___ I authorize the OES Mobile Home Minimal Repair Program to receive from my insurance company the amount *in excess of my deductible* required to pay for the above repairs.

___ I hereby authorize my insurance company to release information to the OES Mobile Home Minimal Repair Program regarding coverage and deductible amount under my policy.

___ I agree to return any money received from FEMA, my insurer, or any other source that duplicates the benefit under this repair program to the OES Mobile Home Minimal Repair Program if repairs have not yet been performed.

___ I agree that if I receive any other temporary housing assistance from FEMA or the State of California for a period of time following completion of the work to my coach and its being returned to a habitable condition, that I will return such funds to their source.

___ In the event that I violate or fail to perform any of the terms or promises of this Agreement, or in the event that any of the statements or representations contained herein or in my Application are untrue, I hereby authorize the State of California and/or FEMA to exercise those rights of collection and imposition of penalties as are allowed by law, including but not limited to those rights extended to FEMA pursuant to 42 USC Section 5155(c).

___ I acknowledge that I am under no obligation to participate in the OES Minimal Repair Program and that I have been informed that in the event any of the terms or conditions of the program are unacceptable to me that I have the right and option to not participate in the program and to instead seek assistance directly from FEMA and to conduct the minimal repairs through contractors of my own choosing.

___ I wish to participate in the OES Mobile Home Minimal Repair Program.

___ I authorize the agents and contractors of the OES Mobile Home Minimal Repair Program right-of-entry to my mobile home and lot. I understand that I or someone who I designate will need to be present when the program requires entry to my home unless I waive my right to be present.

_____
Signature

_____
Print Name

_____
Date

Application and Agreement approved and accepted:

_____ Date: _____

By: _____

RETURN THIS FORM TO YOUR MOBILE HOME PARK OPERATOR OR HEAD OF YOUR RESIDENT'S ASSOCIATION, OR MAIL TO:

Mobile Home Minimal Repair Program
355 South Grand Avenue, Suite 2800
Los Angeles, CA 90071

Questions: Leave a message on the hotline:

1-800-887-4253

1-800-997-4253 en espanol

agreemen 3-28

10.

Senate Bill No. 750

CHAPTER 240

An act to amend Section 18613.1 of, and to add Section 18613.4 to, the Health and Safety Code, relating to housing, and declaring the urgency thereof, to take effect immediately.

[Approved by Governor July 20, 1994. Filed with Secretary of State July 21, 1994.]

LEGISLATIVE COUNSEL'S DIGEST

SB 750, Roberti. Housing: manufactured homes and mobilehomes: design and seismic requirements.

(1) Existing law, known as the Mobilehome Parks Act, generally regulates the operation of mobilehome parks, as defined. The Mobilehome Parks Act provides that any person who willfully violates any of its provisions, or any building standards or other rules and regulations adopted pursuant to the act, is guilty of a misdemeanor.

Existing law provides that the requirements for installation of a manufactured home or mobilehome shall not exceed the requirements set forth in a specified provision of law.

This bill would instead provide that those requirements shall not exceed additional requirements specified by this bill. By expanding the applicable requirements, the willful violation of which would be subject to misdemeanor penalties, this bill would impose a state-mandated local program by creating a new crime.

This bill would require that all manufactured homes or mobilehomes, when initially installed or subsequently reinstalled on a different lot pursuant to a specified provision of law, to be installed to resist specified horizontal wind pressures or the design wind load, whichever is greater. It would specify the requirements applicable to the installation manufactured homes or mobilehomes whose installation requires tiedowns, where the manufacturer's installation instructions are or are not available.

This bill would provide that all manufactured homes or mobilehomes may be installed or reinstalled in accordance with plans and specifications signed by a licensed architect or engineer that meet the requirements imposed by this bill. It would further require the manufactured homes or mobilehomes installed before the effective date of this bill that do not meet the standards imposed by this bill be reinstalled if federal funds are available for grants or direct payment of the additional installation costs.

This bill would require the Department of Housing and Community Development to develop standards for mechanical connections of the manufactured homes or mobilehomes and their footings.

This bill would require the Department of Housing and Community Development to adopt emergency regulations in accordance with a specified provision of the Administrative Procedure Act in order to implement the purposes of the bill. This bill would not apply to the installation of any manufactured home or mobilehome for which escrow has been opened in accordance with a specified provision of the Mobilehomes-Manufactured Homes Act of 1980 prior to the operative date of the bill. This bill would become operative 60 days after the date it is chaptered.

(2) The California Constitution requires the state to reimburse local agencies and school districts for certain costs mandated by the state. Statutory provisions establish procedures for making that reimbursement.

This bill would provide that no reimbursement is required by this act for a specified reason.

(3) The bill would declare that it is to take effect immediately as an urgency statute.

The people of the State of California do enact as follows:

SECTION 1. Section 18613.1 of the Health and Safety Code is amended to read:

18613.1. The requirements for any installation of a manufactured home or mobilehome shall not exceed the requirements set forth in Sections 18613 and 18613.4.

SEC. 2. Section 18613.4 is added to the Health and Safety Code, to read:

18613.4. (a) All manufactured homes or mobilehomes, when initially installed or subsequently reinstalled on a different lot pursuant to Section 18613, shall be installed to resist, in conjunction with vertical loads, either forces from horizontal wind pressures of 15 pounds per square foot or the design wind load of the home, whichever is greater.

(b) For the purposes of complying with subdivision (a), all manufactured homes or mobilehomes with manufacturer's installation instructions that include requirements for tiedowns shall be installed in accordance with all of the following:

(1) The manufacturer's installation instructions.

(2) If not included in the manufacturer's installation instructions, a minimum of four additional tiedowns per section shall be installed to resist the same wind forces in the longitudinal direction of the manufactured home or mobilehome as the total of those forces required to be resisted in the transverse direction. No portion of the tiedown extending beyond the vertical plane of an exterior wall of the manufactured home or mobilehome shall be above the ground.

(3) When used, concrete or steel piers shall have mechanical connections to the home and their footing that resist separation of the supports from the home and the footing. Mechanical connections

shall not require modifications to the manufactured home or mobilehome.

(c) For the purposes of complying with subdivision (a), when no manufacturer's installation instructions are available that include requirements for tiedowns, the manufactured home or mobilehome shall be installed in accordance with both of the following:

(1) Department regulations, which shall include requirements for tiedowns meeting the standards in subdivision (a).

(2) The requirements specified in paragraphs (2) and (3) of subdivision (b).

(d) For the purposes of complying with subdivision (a), all manufactured homes or mobilehomes may be installed or reinstalled in accordance with plans and specifications signed by a licensed architect or engineer that meet the requirements of this section.

(e) Manufactured homes or mobilehomes installed before the effective date of the act that added this section that do not meet the standards in subdivision (a) and need to be reinstalled due to damage caused by wind or seismic forces shall be reinstalled to meet the requirements of subdivision (a) and paragraphs (2) and (3) of subdivision (b), if federal funds are available for grants or direct payment of the additional installation costs.

(f) Nothing in this section prohibits the use of alternative materials, installation methods, devices, et cetera, as permitted in Section 18305, as long as the forces specified in subdivision (a) and in paragraph (2) of subdivision (b) are resisted.

(g) The department shall adopt emergency regulations in accordance with Chapter 3.5 (commencing with Section 11340) of Part 1 of Division 3 of Title 2 of the Government Code in order to implement the purposes of this section.

(h) The department shall develop standards for mechanical connections for concrete block supports that connect the blocks to the manufactured homes or mobilehomes and their footing and resist the separation of the supports from the home and the footing. By the adoption of the act that adds this subdivision, it is not the intent of the Legislature that the concrete blocks used as vertical supports be required to be mechanically attached to the manufactured homes or mobilehomes and their footings.

(i) This section shall not apply to the installation of any manufactured home or mobilehome for which escrow has been opened in accordance with Section 18035 prior to the operative date of the act that adds this section.

(j) This section shall become operative 60 days after the date that the act that adds this section is chaptered.

SEC. 3. No reimbursement is required by this act pursuant to Section 6 of Article XIII B of the California Constitution because the only costs which may be incurred by a local agency or school district will be incurred because this act creates a new crime or infraction, changes the definition of a crime or infraction, changes the penalty

for a crime or infraction, or eliminates a crime or infraction. Notwithstanding Section 17580 of the Government Code, unless otherwise specified in this act, the provisions of this act shall become operative on the same date that the act takes effect pursuant to the California Constitution.

SEC. 4. This act is an urgency statute necessary for the immediate preservation of the public peace, health, or safety within the meaning of Article IV of the Constitution and shall go into immediate effect. The facts constituting the necessity are:

To ensure that as many manufactured homes and mobilehomes as possible are protected at the earliest possible time from sudden devastation by earthquakes, it is necessary that this act take effect immediately.

O

WMA

WESTERN MOBILEHOME PARKOWNERS ASSOCIATION

March 3, 1994

Rosemarie Smith
Housing and Community Development
1800 Third Street
Sacramento, CA 95814

RE: PROPOSED REVISIONS TO TITLE 25, EARTHQUAKE STANDARDS

Dear Ms. Smith:

Dave Milton has asked that I forward to you a summary of the comments received to date regarding HCD's proposed revisions to Title 24, regarding Earthquake Standards. While our circulation was extensive, we did not receive a significant number of comments.

TIEDOWN PROPOSAL

WMA would not support the currently proposed wind tiedown criteria because it will not allow any movement of the home, causing the piers to collapse if the earth has an upward movement. We recommend placing 4" steel posts at the corners to stop horizontal movement. This would allow some up and down flexing. Vertical tie downs are effective for wind, but will cause damage in an earthquake.

PIER PROPOSAL

WMA supports the proposal that piers be mechanically connected to the home and the footing. We believe increasing the strength of the piers will give the home increased lateral support.

OTHER SUGGESTIONS

The proposed regulations call for use of plans by an architect or licensed engineer, if the manufacturers instructions are not available. Requiring engineered plans on an individual basis will place an undue and unneeded hardship on the mobilehome owners. In addition, an engineer or architect who is unfamiliar with our industry would most likely be unqualified to perform the design. This would leave the mobilehome owner in a difficult situation, trying to locate someone to

perform the design. We suggest that provisions be added to Title 25 which would spell out alternative requirements. This could be set forth in a manner similar to that of the requirements listed in Section 1342.

WMA also suggests with some emphasis that the regulations be amended to clarify that retrofitting is the sole responsibility of the mobilehome owner; not the responsibility of the parkowner. WMA is concerned that HCD may try to enforce Title 25 against the parkowner under the theory that the parkowner will be required to comply on behalf of the resident and then charge the resident with the costs of compliance by increasing rent or other charges. This will involve many difficult compliance and collection problems for the parkowner. The responsibility for installing earthquake resistant bracing systems should be the sole responsibility of the mobilehome owner and the regulations should clearly reflect this.

If we receive other comments we will forward them to you.

Very truly yours,

Sheila S. Dey
General Counsel

cc: Travis Pitts, Housing & Community Development
Dave Milton
Craig Biddle

Mobilehome Industry News

March, 1994 A Newspaper Exclusively For Manufactured Housing Professionals Vol. 1, Issue 1

June 9, 1994

To: ALL PARTIES OF INTEREST IN SB-750

AS A COURTESY, WE ARE FORWARDING TO YOU A COPY OF THE EDITORIAL WE ARE ABOUT TO RUN IN OUR JUNE ISSUE. WE WOULD APPRECIATE IT IF YOU WOULD REVIEW AND COMMENT ON THE SUBJECT MATTER. WE WILL HOLD OPEN A FOUR DAY COMMENT PERIOD BEFORE PUBLICATION. WE INTEND TO SUBMIT THIS EDITORIAL, IN ARTICLE FORM, TO VARIOUS WIRE SERVICES AND HOPE IT WILL BE PICKED UP BY THE GENERAL PRESS IN CALIFORNIA. WE FEE THIS IS A SUBJECT VITAL TO THE INTERESTS OF ALL MANUFACTURED HOUSING PROFESSIONALS IN CALIFORNIA. UNLESS MODIFIED BY US AS THE RESULT OF YOUR COMMENTS, THE EDITORIAL WILL READ AS FOLLOWS:

CALIFORNIA EARTHQUAKE SAFETY BILL WILL RESULT IN LESS EARTHQUAKE PROTECTION!

What would you think if the regulatory agency in charge of creating and regulating mobilehome earthquake safety in your state were to tightly regulate one half of the industry and *left* the other half unregulated? Do you think it would make any sense if a regulatory agency were to support legislation that tightly regulated one popular class of mobilehome support but left completely unregulated another widely used type which has proven itself inherently dangerous and unstable in past earthquakes? We don't think such things make much sense either, but that's exactly what is happening right now in Sacramento, CA.

This situation has developed as the result of a measure introduced into the California legislative process by Assemblyman Richard Katz and attached to a Senate bill (SB-750) previously introduced by Senator Roberti. Katz"s provision requires two things. (1) That all homes installed be tied down with wind anchors, and (2) that "...concrete or steel piers shall have mechanical connections to the home and their footing that resist separation of the supports from the home and the footing. Mechanical connections shall not require modifications to the manufactured home or mobilehome." It is this second requirement, for the attachment of support piers, that is the subject of this editorial.

Sounds innocent enough, right? Sounds like a good idea, Right? We agree. It's a great idea to tie homes down and to attach support devices to the frame and to the pad. It should have been done a long time ago. So where's the problem? The problem lies in what the bill language doesn't say. It doesn't say that "ALL SUPPORT DEVICES" should be connected, only that steel or concrete piers be connected and thereby excludes all other types of support devices from the requirement to be attached.

The net effect of restricting the language to only include steel and concrete piers will be to leave the vast majority of homes which will be installed in California after passage of the legislation, completely unprotected by the current legislation and to unfairly impose a higher level of performance and regulatory compliance on one class of support product while prejudicially excluding all other classes of products from the same requirement.

In short, without a change of the language of this bill to extend its requirements to "All" classes of mobilehome support devices, this bill only does half the job it should do and will likely end up damaging

efforts to improve earthquake safety because far fewer homes will end up being installed on improved, more earthquake resistive foundations than would have otherwise been the case.

Additionally, this measure unfairly endangers and places at a competitive disadvantage an entire class of products currently used by the industry in favor of another class of inherently dangerous and unstable products that has identically the same problems the legislation supposedly is seeking to cure.

There is no question that this bill strangely, unfairly and unwisely discriminates against steel and concrete piers in favor of concrete blocks. The question then becomes, "Are blocks earthquake resistive where piers are not?" The answer is a resounding NO! Reports of the Seismic Safety Commission in every earthquake in which mobilehomes have fallen have concluded that concrete blocks are inherently unstable and prone to failure, just as piers are. In fact, in every earthquake were both piers and blocks have been present in the quake zone, both types of support devices have failed significantly and allowed homes to fall.

This author has personally observed thousands of fallen homes in earthquakes going all the way back to the Livermore quake in 1980. In virtually every instance, blocks have failed in significant numbers just as piers have. In the Livermore earthquake a significant number of homes that fell were supported by blocks. In the Coalinga quake in 1983 the majority of homes that fell were supported by blocks. In the 1986 Palm Springs quake majority of the homes that fell were supported by piers. In the Bishop earthquake two weeks later, very close in magnitude to the Palm Springs quake, the vast majority of homes that fell were supported by blocks. In the 1987 Whittier quake, most of the homes that fell were supported by piers. In the 1989 Loma Prieta quake I went into parks in Watsonville where as many as 220 or so homes out of about 230 were down and nearly all were supported with blocks, while in Hollister, just a few miles away the majority of homes had piers and significant numbers of them were down.

Are you seeing the pattern here? The pattern is that there is no pattern. Each type of support is inherently unstable in earthquakes. The devices which fail in each quake are primarily of the type of device used most predominantly within the quake area. It doesn't make any difference if it's piers or blocks. In Northern California above Sacramento, most homes are supported by blocks. When a quake hits, the blocks fail. In Southern California most of the homes are supported by piers. When a quake hits, the piers fail. The truth is that it really doesn't make much difference which device is used. The only real visual difference is that sometimes piers go through the floors when homes fall and that makes for dramatic pictures but does not significantly increase damage figures over other cost factors. When it comes to frame damage, utility damage, structural damage to walls and attachments and contents damage, the really expensive stuff, there is virtually no difference between piers and blocks.

In terms of which support holds up the home best, the difference is so negligible as to be virtually immeasurable from quake to quake, with any degree of reliability. Sometimes piers out perform blocks and other times blocks out perform piers. And even if the difference were measurable, the threshold of damage is so close together that it would be like saying "I'm going to hit you on the head with a hammer, but I'll give you a choice, do you want me to hit you with the hammer that weighs ten pounds or would you prefer one that only weighs nine." Either way, the end result is the same amount of damage to your head. The truth is that homes supported by blocks have fallen in quakes as low as 5.3 RS magnitude. On the other hand, homes that have been supported by piers have fallen in quakes as low as 5.3 RS magnitude. Are you beginning to get the picture?

Am I alone in thinking this way? No! The California Seismic Safety Commission has concluded exactly the same thing. Here's what they said. "What then exists between the coach and the ground? Steel supports, concrete piers and unreinforced concrete block or cinder block are common and normally spaced at no greater than 6-foot centers along the coaches' main frame ... All of these represent highly unstable conditions. In effect, mobile homes in California are not earthquake resistive, and can (and do) fall as merchandise does from the shelves of a market." (Mobilehomes and Earthquake Damage in California, Seismic Safety Commission report # SSC-79-07)

No one, not even H&CD argues that blocks represent a stable means of supporting a mobilehome during earthquakes. All they say is that they prefer blocks to piers. H&CD understands that even if all homes in the state were supported with blocks, all that would mean is that all homes would be just as likely to fall during earthquakes as they are today.

A few lines ago we said that unless the language of the legislation is changed, fewer homes are likely to receive the benefit of becoming more earthquake resistant. Let me show you why that's true.

The positive benefit of the legislation would be that the combination of tie downs required by the legislation and the attachment of piers to the frame and pad will make a home supported by piers significantly more stable and resistive to earthquake forces than one supported by concrete blocks. But if the bill is approved in its present form, the very act that significantly improves the stability of pier support systems will also will assure that the product is rarely, if ever installed on new or refurbished homes. Here's why.

Under the legislation the cost of a pier foundation will increase significantly enough that it will no longer be competitive financially with blocks. (Piers and blocks are at a rough price parity now.) Despite the substantial post-legislation improvement in pier foundation stability, dealers, who are given a preestablished setup allowance by the institution financing the home, will undoubtedly choose to install homes on blocks rather than piers because it's significantly in the dealer's financial interest to do so. He wants to get the home installed as economically as possible so he can make more money off the sale. As a consequence, in the wake of the legislation as currently written, areas of the state that used to see primarily the installation of piers as the preferred means of support will almost certainly see a switch to blocks.

Thank about that for a moment. Isn't the intent of the legislation to increase the public's earthquake safety by improving earthquake resistance of mobilehome support systems and by having an ever larger percentage of manufactured homes in California made safer by means of that improved earthquake resistance? Of course it is. But because piers, which after the legislation will be much more earthquake resistant than blocks, are no longer being installed because blocks are suddenly considerably cheaper, few, if any homes will receive the benefit of the legislation because of the loop hole which allowed blocks to be excluded from the connection requirement. In which case the legislative intent of this bill to increase earthquake resistance and the percentage of homes made more earthquake resistant will be negated because homes aren't being installed on the products having the improved earthquake resistance intended by the legislation, but are rather being installed on the product which still is as inherently unstable and as likely to fail and allow the home to fall as it was before the legislation was enacted.

In other words, the legislation, in its practical application, would be worthless and ineffectual and would actually drive the class of safer products, improved for the public benefit, right out of the market place in favor of a now inferior, unimproved product which was wrongfully and negligently unchanged by being omitted and excluded by the legislation.

In this case, who would be the losers? The answer, quite simply, is everyone! The public would lose because they would be led to think, (until the truth comes out,) that they were getting earthquake protection when in fact, the language of the very legislation supposed to give that protection actually would conspire to accomplish exactly the opposite by pricing the safer, improved product out of the market in favor of an inferior less earthquake resistive product. The industry would lose because several of the largest mobilehome specialty products manufacturers, employers of hundreds of Californians, would be out of business. The legislators sponsoring the legislation would lose credibility once the public learned that another worthless, ill-conceived law had been dumped on them which purported to be to their benefit when it was really to their detriment, and, the State would lose because of the loss of productive, tax paying companies. Companies who today contribute to the State's well being but whom will become a substantial drain on the State's resources as hundreds of those company's workers seek financial relief through unemployment and welfare programs. That is a sad prospect for a state already burdened with very high unemployment pressures. And even sadder still because it is all so unnecessary.

The solution to this problem is so simple and obvious that, to us, it seems ridiculous to have to point

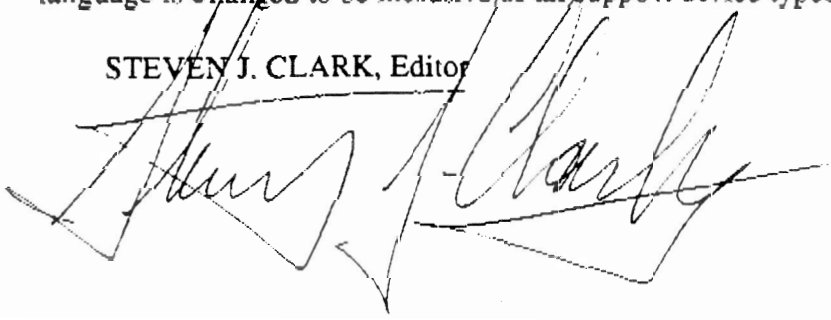
it out. All of this can be solved by simply requiring that **ALL** support devices have to be attached to the frame and to the ground the same as the legislation would require of piers. In that way there would be no compromise of earthquake safety or resistance regardless of the type of device being used to hold up the home. Would this work any more of a hardship on one product over another? No. Both piers and blocks would have to come up with means of attachment that neither include in their basic support system today. Do means exist in the marketplace to economically attach blocks? Yes, and there are more such products under development right now.

We pointed out a number of the above problems out to the bill's author, Rep. Katz, but he indicated that, despite the inequities and deficiencies and inherent unfairness of the bill to the public and the industry, he had no intention of changing the bill's language. We talked to Mr. Travis Pitts, the prime proponent of the current legislation in the hierarchy of H&CD, a man who has had a long standing unreasonable prejudice for concrete blocks over piers and who we understand was the primary contributor of the language used in Katz's bill, and pointed out the dilemmas and problems to him. He scoffed and pointedly told us that he frankly didn't care what happened to the pier industry in California. (His attitude and demeanor appeared to us so blatantly biased and unreasonable that it raised questions in our minds as to what possible interest he may have that has led him to so vociferously and slavishly defend the interests of blocks or block manufacturers in the state.) Just a day prior to our conversation with Pitts it was reliably reported to us that he cavalierly and quite arrogantly told another industry representative that he knew the bill was unfair and biased against piers but if we didn't like it we should just go ahead and sue him. (Just another fine bureaucratic example of our hard earned taxes at work, right?)

MIN is currently working with other concerned industry members to try and get the language of this bill changed to make it fair and effective for all interests. We certainly support all reasonable efforts to improve earthquake safety in California and other states but do not believe that goal can be achieved with this type of highly biased, unfair and ill-conceived legislation, especially when this bill has such an obvious, easy, fair and equitable way to be fixed. The instant this bill is amended to require attachment of ALL support devices, regardless of type, we will enthuastically support it all the way through the legislative process clear to the governor's desk.

But until the language is changed to be all inclusive, we strongly, adamantly, and absolutely oppose this legislation and urge every mobilehome professional, resident and all other concerned citizens and legislators to join us in seeing that this unfair, biased and ill-conceived bill never becomes law. We strongly urge all California manufactured housing professionals to call and write all members of legislative committees through whom this bill will pass and your individual Assemblymen and State Senators and clearly and loudly register your opposition to this bill in its current form. Anyone wishing information on how to contact their Assemblyman and/or Senator can call the main Legislator information number in Sacramento which is (916) 322-9900. They will give you the office number of any member you wish to contact. We would especially urge you to call Assemblyman Katz, Senator Roberti and particularly, Senator Craven, Chairman of the Senate Select Sub-committee on Mobilehomes, to let them know what you think of this bill. The bill is coming up for hearing on the Senate side very shortly. We would urge all of you to appear at the appropriate hearings, especially the Senate Select Sub-committee chaired by Senator Craven, and voice your opposition to this bill unless the language is changed to be inclusive of all support device types.

STEVEN J. CLARK, Editor



Date of Hearing: April 13, 1994

ASSEMBLY COMMITTEE ON HOUSING AND COMMUNITY DEVELOPMENT

Dan Hauser, Chair

SB 750 (Roberti) - As Amended: April 6, 1994

SENATE ACTIONS: NA

SENATE ACTIONS:

COMMITTEE	LOC. GOV.	VOTE	NA	COMMITTEE	VOTE
Ayes:				Ayes:	
Nays:				Nays:	

SUMMARY

Requires any new manufactured home or mobilehome manufactured on or after June 1, 1995 to be installed in accordance with specified wind standards and design and seismic requirements of the California Building Standards Code. In addition, the bill authorizes local jurisdictions to adopt seismic safety requirements for manufactured homes and mobilehomes which exceed those enforced under the Mobilehome Parks Act.

DIGEST

Existing law:

1) Requires manufactured homes/mobilehomes installed in mobilehome parks to be installed according to specific vertical support load requirements of the California Building Standard Code (CBSC) and the roof snow-load requirements for specific jurisdictions. Existing law does not require, hoever, that double-wide and triple-wide mobilehomes be installed to rsist any horizontal wind or seismic forces (the wind installation requirement is only required on single-wide homes installed i high-wind areas).

2) Requires manufactured housing and mobilehomes to be installed in accordance with the provisions of the Mobilehome Parks Act (MPA), which is administered by the Department of Housing And Community Development (HCD).

3) Establishes that the installation requirements of the MPA supersede any local ordinance.

- continued -

4) Authorizes a manufactured home/mobilehome to be installed upon a permanent "foundation system" that is designed to withstand the the vertical and lateral forces due to dead load, roof and floor live loads, wind and seismic loads, in accordance with the 1982 version of the Uniform Building Code (UBC) (which is adopted as the CBSC and contains the same structural/engineering requirements for site-built structures), and any other specific requirements established for permanent buildings within specific local areas.

5) Establishes regulations governing the installation and design of Earthquake Resistant Bracing Systems (ERBS), which meet 1982 UBC seismic requirements. ERBS are available for purchase and use by homeowners but, when installed, permit homes to "drop" toward the ground a maximum of two inches before the bracing systems are engaged.

6) Requires that the CBSC impose substantially the same requirements as are contained in the most recent editions of the following uniform industry codes: the Uniform Housing Code, the UBC, the Uniform Plumbing Code, the Uniform Mechanical Code, and the National Electrical Code.

7) Authorizes a local government to adopt building standards which are more stringent than the state standard and reasonably necessary because of local climatic, geological, or topographical conditions.

8) Provides that "building standard" does not include any regulation, rule, order, or standard pertaining to manufactured homes and mobilehomes, or mobilehome park, except for permanent facilities under the control and ownership or the park operator.

This bill:

1) Requires, notwithstanding any other provision of law, any new manufactured home or mobilehome manufactured on or after June 1, 1995 to be installed to meet its design wind-load requirement or 15 pounds per square foot, whichever is greater, and to meet the design and seismic requirements of the CBSC.

2) Authorizes, notwithstanding any other provision of law, local jurisdictions to adopt seismic safety requirements for manufactured homes and mobilehomes which are more stringent than those enforced under the Mobilehome Parks Act (MPA) and meet the seismic safety design requirements contained in the CBSC.

FISCAL EFFECT

Unknown. This bill contains a crimes and infractions disclaimer.

COMMENTS

1) The Author: According to the author, this bill is necessary because current state earthquake standards regarding the installation

- continued -

of mobilehomes are not strong enough for areas such as Los Angeles. In addition, the author states that mobilehomes suffered significant damage in the Loma Prieta and Northridge Earthquakes and much of that damage could have been prevented if the homes had been installed correctly.

2) Mobilehomes and Earthquakes: Mobilehomes and earthquakes do not coexist well. Over the last several decades, news reports of significant earthquakes in California are shortly followed with pictures, news stories, and live satellite feeds of toppled or, in some cases, burning mobilehomes. Why? Because a mobilehome is only required to be installed on a foundation consisting of either concrete cinder blocks stacked one on top of the other or a series of concrete or steel piers spaced at specific intervals which support the home with no required lateral bracing.

These block or pier foundations provide adequate vertical support for the weight of these homes; in fact, the foundations are required to meet vertical support standards of the CBSC. These foundations, however, are not required to meet any side-to-side or "horizontal" movement which may come from wind or seismic forces. (There is one narrow exception - single-wide homes in high wind areas must be tied to the ground to resist wind forces.)

According to HCD, more than 4,400 mobilehomes fell off their foundations, 900 shifted from their supports, and 184 mobilehomes burned down as a result of the Northridge earthquake.

3) Manufactured Homes not Correctly Installed: Prior to 1973, the installation of manufactured homes was unregulated, and few homes were installed in accordance with their installation instructions. The state first gained the ability to regulate the installation of manufactured homes in 1973. HCD's original proposal in their 1974 regulatory hearings was to require all manufactured homes to be installed in accordance with their manufacturers' installation instructions, which required the homes to be tied down to resist wind loads. This proposal was heavily opposed by homeowners and their representatives who cited additional costs of $750 to $1,500. In the end, the regulations that were adopted only required lateral bracing or "tie-downs" for single-wide homes in high-wind areas - exempting all multi-wide homes and the great majority of single-wide homes from lateral bracing requirements. In 1978, HCD again tried to require the installation of tie-down devices to meet the manufacturers' installation instructions, but that effort failed due to strong opposition.

4) Manufacturer Installation Instructions: According to the Uniform Building Code, "when the code-prescribed wind design produces greater effects (than seismic), the wind design shall govern." According to building officials, engineers from the California Manufactured Housing Institute, and HCD staff with expertise in mobilehome installations, the notion of wind-load requirements exceeding seismic load requirements is somewhat of a structural engineer's rule-of-thumb. In other words, if a mobilehome was installed or "tied down'" to meet its

- continued -

existing wind-load requirements in most cases that installation would also comply with seismic requirements.

5) Dual Standards: As drafted, the focus of this bill is confusing because the bill both authorizes local governments and requires the state to accomplish the same objectives - installing new manufactured homes to meet current seismic performance standards. Currently, state law, the pre-emptive MPA, has jurisdiction over the installation of mobilehomes. In most cases, the MPA is enforced by HCD, but local governments may also choose to implement the MPA. In fact, local governments have assumed jurisdiction under the MPA in approximately 40 percent of the state. For clarification, the scope and limits of authority for the state and local jurisdictions should be clearly spelled out. In other words, either local government or the state should have jurisdiction over seismic safety portion of the Act, not both.

6) Erosion of Mobilehome Parks Act? The effect of local jurisdictions being able to amend the MPA to enforce more stringent seismic safety standards begs the question of: "what's next?" The Committee has heard previous legislation, such as AB 3020 (Hunter) in 1992, where the sponsor, the City of Escondido, desired to locally amend the Act to require greater setbacks in order to install sidewalks.

In addition to mobilehome installations, the MPA covers all health and safety and design standards that occurs within the borders of mobilehome parks: setback requirements, electrical, fuel gas, plumbing, fire protection, accessory structures, maintenance, use, occupancy, permits and fees.

What are the benefits of statewide uniform standards for mobilehome parks vs. the flexibility of local control?

7) Opposition: The California Manufactured Housing Institute, in a letter of opposition to this bill, states:

a) Allowing local governments to set their own seismic standards may lead to a confusing array of local standards and that, in turn, would make it extremely difficult and costly for the manufactured home industry to build products in factories for statewide distribution.

b) Local governments could charge increased fees up to $1,000 for plan check, approval, and inspections.

c) Local agencies only enforce the MPA in 40 percent of the state, but this bill would allow local agencies to adopt standards different from the state's and then require HCD to enforce those standards.

d) If the bill is enacted, the industry should be relieved of warranty obligations for local requirements which degrade the structural performance of the home and put the homes out of compliance with the federal National Manufactured Housing Construction and Safety

- continued -

Act.

8) Legislative Hearings: In the wake of the Loma Prieta Earthquake, the Senate Select Committee on Mobilehomes held a hearing in 1990 which focused on a number of earthquake safety issues. As a result of that hearing, legislation was passed which required HCD to study the issue. The HCD study, which was completed in 1992, made the following recommendations:

a) Require new mobilehome installations to be tied down in accordance with manufacturers' instructions.

b) Require the supporting piers to be physically attached to the frame and footings of the mobilehome.

c) Require improvements to ERBS, which include requiring that the ERBS be attached to the frame of the mobilehome and eliminate the "two-inch drop."

HCD has yet to approve any regulations implementing any of the above suggestions. The Senate Select Committee on Mobilehomes held an additional hearing on mobilehome earthquake safety on March 7, 1994.

SUPPORT

Seismic Safety Commission (Cosponsor)

OPPOSE

California Manufactured Housing Institute

- continued -

CONFERENCE COMPLETED

SB 750

Roberti (D), et al

Conference Report No. 1,
6/22/94
27 - Urgency

55-15, p. 7359, 6/9/94

SUBJECT: Manufactured homes and mobilehomes: design and seismic requirements

SOURCE: The author

DIGEST: Assembly Amendments delete the Senate version of the bill relating to redevelopment.

The bill now requires that support or foundation systems for mobilehomes be improved in order to be protected from earthquake damage.

Conference Committee Amendments:

CONTINUED

1. Delete reference to the use of state funds for any increased costs as a result of the bill's requirement.

2. Require the Department of Housing and Community Development to develop standards and mechanical connections for concrete block supports that connect the blocks to the manufactured homes or mobilehomes and their footing and resist the separation of the supports from the home and footing.

3. State that by adopting the above language, it is not the intent of the Legislature that the concrete blocks used as vertical supports be required to be mechanically attached to the manufactured homes as mobilehomes and their footing.

ANALYSIS: Existing law:

1. Requires manufactured homes/mobilehomes installed in mobilehome parks to be installed according to specific vertical support load requirements of the California Building Standard Code (CBSC) and the roof snow-load requirements for specific jurisdictions.

2. Does not require, however, that double-wide and triple-wide mobilehomes be installed to resist any horizontal wind or seismic forces (the wind installation requirement is only required on single-wide homes installed in high-wind areas).

This bill:

1. Requires a manufactured home or mobilehome to be installed to meet 15-pound per foot horizontal wind loads with four additional tiedowns per section to resist the same wind forces in the longitudinal direction of the manufactured home or mobilehome as the total of those forces to be resisted in the transverse direction.

2. Requires concrete or steel piers, when used, to have mechanical connections to the home and their footings.

3. Authorizes a manufactured home or mobilehome to be installed in compliance with the wind and seismic provisions of the bill in accordance with either the manufacturer's installation instructions, Department of Housing and Community Development (HCD) regulations, or installations instructions signed by a licensed architect or engineer, as specified.

CONTINUED

4. Requires manufactured homes or mobilehomes which need to be reinstalled as a result of a natural disaster caused by wind or seismic forces to be installed in accordance with the requirements of this bill if federal funds are available to pay the increased costs.

5. Requires HCD to develop emergency regulations to implement the bill.

6. Requires the Department of Housing and Community Development to develop standards and mechanical connections for concrete block supports that connect the blocks to the manufactured homes or mobilehomes and their footing and resist the separation of the supports from the home and footing.

7. States that by adopting the above language, it is not the intent of the Legislature that the concrete blocks used as vertical supports be required to be mechanically attached to the manufactured homes as mobilehomes and their footing.

8. Exempts those manufactured homes or mobilehomes for which escrow is opened prior to the effective date of the bill.

9. Takes effect 60 days after date of being chaptered into law.

FISCAL EFFECT: Appropriation: No Fiscal Committee: Yes Local: Yes

SUPPORT: (Verified 6/23/94)

California Building Officials
California Manufactured Housing Institute
Golden State Mobilehome Owners league
Southern California Gas Company
Hal Bernson, Los Angeles City Council

ARGUMENTS IN SUPPORT: According to the author, this bill is necessary because current state earthquake standards regarding the installation of mobilehomes are not strong enough for areas such as Los Angeles. In addition, the author states that mobilehomes suffered significant damage in the Loma Prieta and Northridge Earthquakes and much of that damage could have been prevented if the homes had been installed correctly.

CONTINUED

Mobilehomes and earthquakes do not coexist well. Over the last several decades, news reports of significant earthquakes in California are shortly followed with pictures, news stories and live satellite feeds of toppled or, in some cases, burning mobilehomes. Why? Because a mobilehome is only required to be installed on a foundation consisting of either concrete cinder blocks stacked one on top of the other or a series of concrete or steel piers spaced at specific intervals which support the home with no required lateral bracing.

These block or pier foundations provide adequate vertical support for the weight of these homes; in fact, the foundations are required to meet vertical support standards of the CBSC. These foundations, however, are not required to meet any side-to-side or horizontal movement which may come from wind or seismic forces. (There is one narrow exception - single-wide homes in high wind areas must be tied to the ground to resist wind forces.)

According to the Department of Housing and Community Development, more than 4,400 mobilehomes fell off their foundations, 900 shifted from their supports, and 184 mobilehomes burned down as a result of the Northridge Earthquake.

ASSEMBLY FLOOR VOTE:

CONTINUED

CONFERENCE COMMITTEE VOTE: Senate Journal, 6/22/94, p. 5488

Absent or not voting: Senator Presley

DLW:lm 6/24/94 Senate Floor Analyses

Senate Bill No. 634

CHAPTER 175

An act to amend Sections 7158, 7159, and 7161 of the Business and Professions Code, and to add Section 667.16 to the Penal Code, relating to housing and construction, and declaring the urgency thereof, to take effect immediately.

[Approved by Governor July 9, 1994. Filed with Secretary of State July 11, 1994.]

LEGISLATIVE COUNSEL'S DIGEST

SB 634, Craven. Construction: crimes.

Existing law makes various actions in connection with work by contractors a misdemeanor, including receiving or accepting completion certificates when work is not complete, failing to comply with requirements for home improvement contracts, and making various misrepresentations or engaging in fraudulent activities.

This bill would require restitution and would increase the fines for a violation of those provisions in connection with a scheme to defraud an owner in connection with repairs to a structure damaged by a natural disaster.

Under existing law, forgery, grand theft, and false pretenses are crimes.

This bill would provide for a one-year enhancement if those crimes are in connection with a scheme to defraud an owner in connection with repairs to a structure damaged by a natural disaster.

This bill would incorporate additional amendments to Section 7159 of the Business and Professions Code proposed by AB 2719, contingent upon the prior enactment of that bill.

The bill would declare that it is to take effect immediately as an urgency statute.

The people of the State of California do enact as follows:

SECTION 1. This act shall be known and may be cited as the Disaster Fraud Protection Act of 1994.

SEC. 2. Section 7158 of the Business and Professions Code is amended to read:

7158. (a) Any person who shall accept or receive a completion certificate or other evidence that performance of a contract for a work of improvement, including but not limited to a home improvement, is complete or satisfactorily concluded, with knowledge that the document is false and that the performance is not substantially completed, and who shall utter, offer, or use the document in connection with the making or accepting of any assignment or negotiation of the right to receive any payment from

the owner, under or in connection with a contract, or for the purpose of obtaining or granting any credit or loan on the security of the right to receive any payment shall be guilty of a misdemeanor and subject to a fine of not less than five hundred dollars ($500) nor more than five thousand dollars ($5,000), or to imprisonment in the county jail for a term of not less than one month nor more than one year, or both.

(b) Any person who violates this section as part of a plan or scheme to defraud an owner of a residential or nonresidential structure, including a mobilehome or manufactured home, in connection with the offer or performance of repairs to the structure for damage caused by a natural disaster, shall be ordered by the court to make full restitution to the victim based on the person's ability to pay, as defined in subdivision (e) of Section 1203.1b of the Penal Code. In addition to full restitution, and imprisonment authorized by subdivision (a), the court may impose a fine of not less than five hundred dollars ($500) nor more than twenty-five thousand dollars ($25,000), based upon the defendant's ability to pay. This subdivision applies to natural disasters for which a state of emergency is proclaimed by the Governor pursuant to Section 8625 of the Government Code or for which an emergency or major disaster is declared by the President of the United States.

SEC. 3. Section 7159 of the Business and Professions Code is amended to read:

7159. This section shall apply only to home improvement contracts, as defined in Section 7151.2, between a contractor, whether a general contractor or a specialty contractor, who is licensed or subject to be licensed pursuant to this chapter with regard to the transaction and who contracts with an owner or tenant for work upon a residential building or structure, or upon land adjacent thereto, for proposed repairing, remodeling, altering, converting, modernizing, or adding to the residential building or structure or land adjacent thereto, and where the aggregate contract price specified in one or more improvement contracts, including all labor, services, and materials to be furnished by the contractor, exceeds five hundred dollars ($500).

Every home improvement contract and every contract the primary purpose of which is the construction of a swimming pool, shall be subject to the provisions of this section. Every contract and any changes in the contract subject to the provisions of this section shall be evidenced by a writing and shall be signed by all the parties to the contract thereto. The writing shall contain the following:

(a) The name, address, and license number of the contractor, and the name and registration number of any salesperson who solicited or negotiated the contract.

(b) The approximate dates when the work will begin and on which all construction is to be completed.

(c) A plan and scale drawing showing the shape, size, dimensions,

and construction and equipment specifications for a swimming pool and for other home improvements, a description of the work to be done and description of the materials to be used and the equipment to be used or installed, and the agreed consideration for the work.

(d) If the payment schedule contained in the contract provides for a downpayment to be paid to the contractor by the owner or the tenant before the commencement of work, the downpayment shall not exceed two hundred dollars ($200) or 2 percent of the contract price for swimming pools, or one thousand dollars ($1,000) or 10 percent of the contract price for other home improvements, excluding finance charges, whichever is the lesser.

(e) A schedule of payments showing the amount of each payment as a sum in dollars and cents. In no event shall the payment schedule provide for the contractor to receive, or shall the contractor actually receive, payments in excess of 100 percent of the value of the work performed on the project at any time, excluding finance charges, except that the contractor may receive an initial downpayment authorized by subdivision (d). With respect to a swimming pool contract, the final payment may be made at the completion of the final plastering phase of construction, provided that any installation or construction of equipment, decking, or fencing required by the contract is also completed. A failure by the contractor without lawful excuse to substantially commence work within twenty (20) days of the approximate date specified in the contract when work will begin shall postpone the next succeeding payment to the contractor for that period of time equivalent to the time between when substantial commencement was to have occurred and when it did occur. The schedule of payments shall be stated in dollars and cents, and shall be specifically referenced to the amount of work or services to be performed and to any materials and equipment to be supplied. With respect to a contract that provides for a schedule of monthly payments to be made by the owner or tenant and for a schedule of payments to be disbursed to the contractor by a person or entity to whom the contractor intends to assign the right to receive the owner's or tenant's monthly payments, the payments referred to in this subdivision mean the payments to be disbursed by the assignee and not those payments to be made by the owner or tenant.

(f) The contract shall state that upon satisfactory payment being made for any portion of the work performed, the contractor shall, prior to any further payment being made, furnish to the person contracting for the home improvement or swimming pool a full and unconditional release from any claim or mechanic's lien pursuant to Section 3114 of the Civil Code, for that portion of the work for which payment has been made.

(g) The requirements of subdivisions (d), (e), and (f) shall not apply when the contract provides for the contractor to furnish a performance and payment bond, lien and completion bond, bond equivalent, or joint control approved by the Registrar of Contractors

covering full performance and completion of the contract and the bonds or joint control is or are furnished by the contractor, or when the parties agree for full payment to be made upon or for a schedule of payments to commence after satisfactory completion of the project. The contract shall contain in close proximity to the signatures of the owner and contractor a notice in at least 10-point type stating that the owner or tenant has the right to require the contractor to have a performance and payment bond.

(h) No extra or change-order work shall be required to be performed without prior written authorization of the person contracting for the construction of the home improvement or swimming pool. Any change-order forms for changes or extra work shall be incorporated in, and become a part of the contract.

(i) If the contract provides for a payment of a salesperson's commission out of the contract price, that payment shall be made on a pro rata basis in proportion to the schedule of payments made to the contractor by the disbursing party in accordance with subdivision (e).

(j) The language of the notice required pursuant to Section 7018.5.

(k) What constitutes substantial commencement of work pursuant to the contract.

(*l*) A notice that failure by the contractor without lawful excuse to substantially commence work within twenty (20) days from the approximate date specified in the contract when work will begin is a violation of the Contractors' State License Law.

(m) If the contract provides for a contractor to furnish joint control, the contractor shall not have any financial or other interest in the joint control.

A failure by the contractor without lawful excuse to substantially commence work within 20 days from the approximate date specified in the contract when work will begin is a violation of this section.

This section shall not be construed to prohibit the parties to a home improvement contract from agreeing to a contract or account subject to Chapter 1 (commencing with Section 1801) of Title 2 of Part 4 of Division 3 of the Civil Code.

The writing may also contain other matters agreed to by the parties to the contract.

The writing shall be legible and shall be in a form that clearly describes any other document which is to be incorporated into the contract, and before any work is done, the owner shall be furnished a copy of the written agreement, signed by the contractor.

For purposes of this section, the board shall, by regulation, determine what constitutes "without lawful excuse."

The provisions of this section are not exclusive and do not relieve the contractor or any contract subject to it from compliance with all other applicable provisions of law.

A violation of this section by a licensee, or a person subject to be licensed, under this chapter, his or her agent, or salesperson is a

misdemeanor punishable by a fine of not less than one hundred dollars ($100) nor more than five thousand dollars ($5,000), or by imprisonment in the county jail not exceeding one year, or by both that fine and imprisonment.

(n) Any person who violates this section as part of a plan or scheme to defraud an owner of a residential or nonresidential structure, including a mobilehome or manufactured home, in connection with the offer or performance of repairs to the structure for damage caused by a natural disaster, shall be ordered by the court to make full restitution to the victim based on the person's ability to pay, as defined in subdivision (e) of Section 1203.1b of the Penal Code. In addition to full restitution, and imprisonment authorized by this section, the court may impose a fine of not less than five hundred dollars ($500) nor more than twenty-five thousand dollars ($25,000), based upon the defendant's ability to pay. This subdivision applies to natural disasters for which a state of emergency is proclaimed by the Governor pursuant to Section 8625 of the Government Code or for which an emergency or major disaster is declared by the President of the United States.

SEC. 3.5. Section 7159 of the Business and Professions Code is amended to read:

7159. This section shall apply only to home improvement contracts, as defined in Section 7151.2, between a contractor, whether a general contractor or a specialty contractor, who is licensed or subject to be licensed pursuant to this chapter with regard to the transaction and who contracts with an owner or tenant for work upon a residential building or structure, or upon land adjacent thereto, for proposed repairing, remodeling, altering, converting, modernizing, or adding to the residential building or structure or land adjacent thereto, and where the aggregate contract price specified in one or more improvement contracts, including all labor, services, and materials to be furnished by the contractor, exceeds five hundred dollars ($500).

Every home improvement contract and every contract the primary purpose of which is the construction of a swimming pool, shall be subject to the provisions of this section. Every contract and any changes in the contract subject to the provisions of this section shall be evidenced by a writing and shall be signed by all the parties to the contract thereto. The writing shall contain the following:

(a) The name, address, and license number of the contractor, and the name and registration number of any salesperson who solicited or negotiated the contract.

(b) The approximate dates when the work will begin and on which all construction is to be completed.

(c) A plan and scale drawing showing the shape, size dimensions, and construction and equipment specifications for a swimming pool and for other home improvements, a description of the work to be done and description of the materials to be used and the equipment

to be used or installed, and the agreed consideration for the work.

(d) If the payment schedule contained in the contract provides for a downpayment to be paid to the contractor by the owner or the tenant before the commencement of work, the downpayment shall not exceed two hundred dollars ($200) or 2 percent of the contract price for swimming pools, or one thousand dollars ($1,000) or 10 percent of the contract price for other home improvements, excluding finance charges, whichever is the lesser.

(e) A schedule of payments showing the amount of each payment as a sum in dollars and cents. In no event shall the payment schedule provide for the contractor to receive, or shall the contractor actually receive, payments in excess of 100 percent of the value of the work performed on the project at any time, excluding finance charges, except that the contractor may receive an initial downpayment authorized by subdivision (d). With respect to a swimming pool contract, the final payment may be made at the completion of the final plastering phase of construction, provided that any installation or construction of equipment, decking, or fencing required by the contract is also completed. A failure by the contractor without lawful excuse to substantially commence work within 20 days of the approximate date specified in the contract when work will begin shall postpone the next succeeding payment to the contractor for that period of time equivalent to the time between when substantial commencement was to have occurred and when it did occur. The schedule of payments shall be stated in dollars and cents, and shall be specifically referenced to the amount of work or services to be performed and to any materials and equipment to be supplied. With respect to a contract that provides for a schedule of monthly payments to be made by the owner or tenant and for a schedule of payments to be disbursed to the contractor by a person or entity to whom the contractor intends to assign the right to receive the owner's or tenant's monthly payments, the payments referred to in this subdivision mean the payments to be disbursed by the assignee and not those payments to be made by the owner or tenant.

(f) The contract shall state that upon satisfactory payment being made for any portion of the work performed, the contractor shall, prior to any further payment being made, furnish to the person contracting for the home improvement or swimming pool a full and unconditional release from any claim or mechanic's lien pursuant to Section 3114 of the Civil Code, for that portion of the work for which payment has been made.

(g) The requirements of subdivisions (d), (e), and (f) shall not apply when the contract provides for the contractor to furnish a performance and payment bond, lien and completion bond, bond equivalent, or joint control approved by the Registrar of Contractors covering full performance and completion of the contract and the bonds or joint control is or are furnished by the contractor, or when the parties agree for full payment to be made upon or for a schedule

of payments to commence after satisfactory completion of the project. The contract shall contain in close proximity to the signatures of the owner and contractor a notice in at least 10-point type stating that the owner or tenant has the right to require the contractor to have a performance and payment bond.

(h) No extra or change-order work shall be required to be performed without prior written authorization of the person contracting for the construction of the home improvement or swimming pool. Any change-order forms for changes or extra work shall be incorporated in, and become a part of the contract.

(i) If the contract provides for a payment of a salesperson's commission out of the contract price, that payment shall be made on a pro rata basis in proportion to the schedule of payments made to the contractor by the disbursing party in accordance with subdivision (e).

(j) The language of the notice required pursuant to Section 7018.5.

(k) What constitutes substantial commencement of work pursuant to the contract.

(*l*) A notice that failure by the contractor without lawful excuse to substantially commence work within 20 days from the approximate date specified in the contract when work will begin is a violation of the Contractors' State License Law.

(m) If the contract provides for a contractor to furnish joint control, the contractor shall not have any financial or other interest in the joint control.

A failure by the contractor without lawful excuse to substantially commence work within 20 days from the approximate date specified in the contract when work will begin is a violation of this section.

This section shall not be construed to prohibit the parties to a home improvement contract from agreeing to a contract or account subject to Chapter 1 (commencing with Section 1801) of Title 2 of Part 4 of Division 3 of the Civil Code.

The writing may also contain other matters agreed to by the parties to the contract.

The writing shall be legible and shall be in a form that clearly describes any other document which is to be incorporated into the contract, and before any work is done, the owner shall be furnished a copy of the written agreement, signed by the contractor.

For purposes of this section, the board shall, by regulation, determine what constitutes "without lawful excuse."

The provisions of this section are not exclusive and do not relieve the contractor or any contract subject to it from compliance with all other applicable provisions of law.

A violation of this section by a licensee, or a person subject to be licensed, under this chapter, his or her agent, or salesperson is a misdemeanor punishable by a fine of not less than one hundred dollars ($100) nor more than five thousand dollars ($5,000), or by imprisonment in the county jail not exceeding one year, or by both

that fine and imprisonment.

(n) Any person who violates this section as part of a plan or scheme to defraud an owner of a residential or nonresidential structure, including a mobilehome or manufactured home, in connection with the offer or performance of repairs to the structure for damage caused by a natural disaster, shall be ordered by the court to make full restitution to the victim based on the person's ability to pay, as defined in subdivision (e) of Section 1203.1b of the Penal Code. In addition to full restitution, and imprisonment authorized by this section, the court may impose a fine of not less than five hundred dollars ($500) nor more than twenty-five thousand dollars ($25,000), based upon the defendant's ability to pay. This subdivision applies to natural disasters for which a state of emergency is proclaimed by the Governor pursuant to Section 8625 of the Government Code or for which an emergency or major disaster is declared by the President of the United States.

(o) Notwithstanding any other provision of law to the contrary, an indictment or information shall be brought, or a complaint filed, for a violation of this section, within three years from the effective date of the contract.

SEC. 4. Section 7161 of the Business and Professions Code is amended to read:

7161. It is a misdemeanor for any person to engage in any of the following acts, the commission of which shall be cause for disciplinary action against any licensee or applicant:

(a) Using false, misleading, or deceptive advertising as an inducement to enter into any contract for a work of improvement, including, but not limited to, any home improvement contract, whereby any member of the public may be misled or injured.

(b) Making any substantial misrepresentation in the procurement of a contract for a home improvement or other work of improvement or making any false promise of character likely to influence, persuade or, induce any person to enter into such a contract.

(c) Any fraud in the execution of, or in the material alteration of any contract, trust deed, mortgage, promissory note, or other document incident to a home improvement transaction or other transaction involving a work of improvement.

(d) Preparing or accepting any trust deed, mortgage, promissory note, or other evidence of indebtedness upon the obligations of a home improvement transaction or other transaction for a work of improvement with knowledge that it specifies a greater monetary obligation than the consideration for the improvement work, which consideration may be a time sale price.

(e) Directly or indirectly publishing any advertisement relating to home improvements or other works of improvement which contains an assertion, representation or statement of fact which is false, deceptive, or misleading, or by any means advertising or purporting to offer to the general public any such improvement

work with the intent not to accept contracts for the particular work or at the price which is advertised or offered to the public, except that any advertisement which is subject to and complies with the existing rules, regulations or guides of the Federal Trade Commission shall not be deemed false, deceptive or misleading.

(f) Any person who violates subdivision (b), (c), (d), or (e) as part of a plan or scheme to defraud an owner of a residential or nonresidential structure, including a mobilehome or manufactured home, in connection with the offer or performance of repairs to the structure for damage caused by a natural disaster, shall be ordered by the court to make full restitution to the victim based on the person's ability to pay, as defined in subdivision (e) of Section 1203.1b of the Penal Code. In addition to full restitution, and imprisonment as authorized by this section, the court may impose a fine of not less than five hundred dollars ($500) nor more than twenty-five thousand dollars ($25,000), based upon the defendant's ability to pay. This subdivision applies to natural disasters for which a state of emergency is proclaimed by the Governor pursuant to Section 8625 of the Government Code or for which an emergency or major disaster is declared by the President of the United States.

SEC. 5. Section 667.16 is added to the Penal Code, to read:

667.16. (a) Any person convicted of a felony violation of Section 470, 487, or 532 as part of a plan or scheme to defraud an owner of a residential or nonresidential structure, including a mobilehome or manufactured home, in connection with the offer or performance of repairs to the structure for damage caused by a natural disaster, shall receive a one-year enhancement in addition and consecutive to the penalty prescribed. The additional term shall not be imposed unless the allegation is charged in the accusatory pleading and admitted by the defendant or found to be true by the trier of fact.

(b) This enhancement applies to natural disasters for which a state of emergency is proclaimed by the Governor pursuant to Section 8625 of the Government Code or for which an emergency or major disaster is declared by the President of the United States.

(c) Notwithstanding any other law, the court may strike the additional term provided in subdivision (a) if the court determines that there are mitigating circumstances and states on the record the reasons for striking the additional punishment.

SEC. 6. Section 3.5 of this bill incorporates amendments to Section 7159 of the Business and Professions Code proposed by both this bill and AB 2719. It shall only become operative if (1) both bills are enacted and become effective on or before January 1, 1995, but this bill becomes operative first, (2) each bill amends Section 7159 of the Business and Professions Code, and (3) this bill is enacted after AB 2719, in which case Section 7159 of the Business and Professions Code, as amended by Section 3 of this bill shall remain operative only until the operative date of AB 2719, at which time Section 3.5 of this bill shall become operative.

SEC. 7. This act is an urgency statute necessary for the immediate preservation of the public peace, health, or safety within the meaning of Article IV of the Constitution and shall go into immediate effect. The facts constituting the necessity are:

In order to deter persons from engaging in acts of fraud in connection with an offer or performance of repairs to a residential or nonresidential structure, including a mobilehome or manufactured home, that suffered damage as a result of the January 17, 1994, Northridge earthquake and related aftershocks, it is necessary that this act take effect immediately.

O

UNFINISHED BUSINESS

SB 634

Craven (R)

6/20/94

27 - Urgency

69-0, 6/21/94

SUBJECT: Housing and construction: crimes

SOURCE: Golden State Mobilehome Owners League

DIGEST: Assembly Amendments delete prior version of the bill relating to acquisition of mobilehome parks by residents.

The bill now requires restitution and increases the fines imposed for misdemeanor and felony violations committed as part of a scheme to defraud an owner of real property, including a mobilehome or manufactured home, damaged by a disaster.

This bill is double-joined with AB 2719 (Frazee) which relates to contractors.

CONTINUED

ANALYSIS: Existing law:

1. Establishes fines between $500 and $5,000 and/or various jail terms of up to one year for specified home fraud and schemes.

2. Requires all home improvement contracts which exceed $500 in value to be in writing, as specified.

3. Declares the following acts misdemeanors and cause for disciplinary action against any licensee or applicant using false, misleading or deceptive advertising; making any substantial misrepresentation; any fraud in the execution or alteration of a contract, trust deed, promissory note or other document; and other specified violations.

4. Establishes the penalty for felony violations of forgery, grand theft, and false pretenses as not more than one year in state prison or county jail.

This bill:

1. Establishes fines between $500 to $25,000 and/or authorizes imprisonment terms of up to six months for home improvement contractors who plan or scheme to defraud owners of residential or nonresidential structures in connection with structural repairs after a natural disaster.

2. Requires that any person convicted of a felony violation for forgery, grand theft or false pretenses receive a one-year sentence enhancement in addition and consecutive to the prescribed penalty.

3. Authorizes a court to strike the additional one-year enhancement if the court determines that there are mitigating circumstances and states those circumstances on the record.

4. Requires a court to order any person convicted of a violation to make full restitution payment to the victim based upon that person's ability to pay prior to imposing fines.

5. Is double-joined to AB 2719 (Frazee), pending in the Senate, to avoid a chaptering problem.

CONTINUED

According to the author, this bill results from a number of calls and complaints from mobilehome owners who were allegedly defrauded in the re-installation or repair of their mobilehomes subsequent to the Northridge Earthquake.

According to Contractors' State License Board staff, although natural disasters tend to create a "target rich" environment for fraudulent repair schemes, the amount of incidents of shady contractors preying on homeowners with various schemes and fraudulent practices after natural disasters has declined somewhat in recent years due, in part, to increased efforts by the board to educate the public at disaster assistance centers and check contractors' licenses at disaster-related job sites.

Currently, the board receives approximately 30,000 complaints per year. One-third of the complaints involve unlicensed contractors. Although misrepresentation is a common allegation, the charge is often difficult to substantiate; the board is usually able to establish cases based upon the lack of a required written contract, requiring too high of a deposit, and other violations. The board issues between 1,000 and 1,200 administrative citations to licensees per year regarding poor workmanship, suspends or revokes approximately 300 licenses per year, and files various charges against approximately 2,200 unlicensed contractors per year.

Although this bill allows a court to impose additional jail time for various violations, few violators actually serve jail time (e.g., most are sentenced to community service).

This bill contains similar provisions to that of SB 1840 (Petris) of 1992, which was vetoed. In his veto message, the Governor indicated his support for the provisions combating fraudulent schemes relating to construction and other home improvement services, but vetoed the bill due to other rent control provisions. This year, SB 1588 (Roberti) was introduced and is virtually identical to this bill, but also contains the SB 1840 rent control provisions. SB 1588 is currently pending in the Assembly.

FISCAL EFFECT: Appropriation: No Fiscal Committee: Yes Local: No

According to the Assembly Ways and Means Committee analysis, potential costs to the General Fund of $100,000, which may possibly be offset by

CONTINUED

increased revenue - less than $100,000 - to the General Fund in fines.

SUPPORT: (Verified 6/20/94)

Golden State Mobilehome Owners League

DLW:jk 6/22/94 Senate Floor Analyses

Manufactured Housing Institute
1745 Jefferson Davis Hwy., Suite 511
Arlington, Virginia 22202
Tel: (703) 413-6620
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MEMORANDUM

RECEIVED MAR 1 5 1994

To: Manufacturer Certified Representatives
State Association Executives
Technical Activities Committee

From: Frank Walter, P.E. Frank Walter

Date: March 14, 1994

Subject: HUD Research Report on Lateral Load Restraint Devices for Manufactured Homes

---

We have obtained a copy of the 217-page HUD research report, "Full-Scale Laboratory Testing of Manufactured Housing Lateral Load Restraint Devices." It was prepared by the firm of Wiss, Janney, Elstner Associations, Inc., Northbrook, Illinois, dated September 30, 1993. It is available from HUD USER, document 006360, at a cost of $20. Phone orders using Visa or Mastercard will be accepted at telephone 800/245-2691, or a check may be mailed to HUD USER, P.O. Box 6091, Rockville, Maryland 20850.

An extract of the test report is enclosed, including the table of contents, introduction, and conclusions and recommendations. We recommend that you review this material, particularly the conclusions concerning the use of ground anchors in various soil conditions. The study also includes an analysis of two commercially available earthquake resistant bracing systems "ERBS" and draws some conclusions regarding their use in seismically active areas.

A troublesome part of the recommendations includes the statement that based on results of laboratory and field testing, present requirements for auger anchor capacity (4,725 lbs.) should be reduced by at least 50 percent. It also suggests that guidelines could indicate that, in seismically active areas, manufactured homes need to be anchored and that concrete block pier supports are preferred over jackstands; and, that where jackstands are used, they should be clamped to the main undercarriage beam.

When you have had the chance to review the conclusions and recommendations, if you have any questions do not hesitate to contact us.

Enclosure

FULL-SCALE LABORATORY TESTING OF MANUFACTURED HOUSING LATERAL LOAD RESTRAINT DEVICES FOR U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT WASHINGTON, D.C.

WJE NO. 921913

September 30, 1993

John E. Pearson
Project Engineer

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September 30, 1993

FULL-SCALE LABORATORY TESTING OF MANUFACTURED HOUSING LATERAL LOAD RESTRAINT DEVICES FOR U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT WASHINGTON, D.C.

WJE NO. 911783 and 921913

1.0 INTRODUCTION

This report summarizes work performed on WJE Project Nos. 911783 and 921913 for the Manufactured Housing and Construction Standards Division of the U.S. Department of Housing and Urban Development (HUD), Washington, D.C. under Task Order Nos. 002 and 003 of HUD Contract Number DU100C90000015794. Work on this project was initiated in November 1991 with the laboratory test program completed in June 1993. This laboratory test program is an extension of work performed for HUD under contract HC-157943, Task Order 001.

The objective of Task Order 001 testing was to perform laboratory and field tests on auger anchors and laboratory tests on steel strapping typically used to attach manufactured housing to auger anchors. Auger anchors from different manufacturers were laboratory tested for ultimate strength and failure mode. Auger anchors were also tested in the field under conditions which simulate both actual installation and the loading expected by an anchor tying down manufactured housing. Strapping was tested in the laboratory to determine breaking strength, percent elongation, and base metal ductility. The findings of Task Order 001 tests are reported in "Testing of Soil Anchors and Strapping for U.S. Department of Housing and Urban Development Washington, D.C."[1]

1.1 SCOPE OF WORK

The scope of work for this project consisted of conducting laboratory tests on several different lateral load restraint systems used in the manufactured housing industry to transfer lateral loads from wind and earthquake induced motions on the unit to the foundation materials.

1.1.1 General Description of Test Facility

The tests were performed in the Northbrook, Illinois laboratories of Wiss, Janney, Elstner Associates, Inc. A portion of a 14 ft single wide manufactured housing unit was simulated. A model of the undercarriage was designed and constructed. To account for the load effects of the shell of the unit and its partitions and fixtures, a concrete slab was added to the top of the undercarriage and floor system.

Foundation materials were simulated in the laboratory by using a box filled with sand. The box was constructed using standard concrete forming equipment. Sand was deposited and compacted in regular layers to fill the box with sufficient material to install a typical 4 ft long soil anchor. General views of the test facility are shown in Fig. 1.1.

1.1.2 General Test Specimen Parameters

The behavior of a manufactured housing unit bearing on a sandy soil was described in the task order statements. Generally, few problems have occurred due to gravity loading on manufactured housing unit foundations; however, lateral loading on manufactured housing units caused by high winds and earthquakes has caused significant damage. Damage to manufactured homes as a result of high winds has been more extensively investigated than damage due to seismic events. Parameters in the test series included investigating the behavior of various commercially available devices to anchor a manufactured housing unit to the ground to resist lateral loads. A total of five different restraint schemes were investigated in this test program.

1.2 PROJECT OBJECTIVE

The objective of this study was to generate experimental data which may be used to develop design criteria for foundation/tie down systems for manufactured housing units located in seismic regions and/or regions of high intensity wind

anchors and strapping can keep the chassis from falling off the concrete block piers, this system can absorb considerable energy. This comment applies to the pier when loaded with a lateral force that causes bending about the strong axis of the pier. Weak axis loading of the pier is expected to be significantly different because of the decrease in width of the pier.

Test results did not indicate any discernible differences between the performance of components, i.e., jackstands and auger anchors produced by different manufacturers. This may be due to the fact that all the components tested have essentially the same geometric dimensions and material properties. Components with different geometrical and physical properties may perform differently.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 GENERAL CONCLUSIONS

- The lateral load resistances of the systems tested in this study are relatively low and have ultimate capacities often well below that required for the HUD wind design load requirements. The average loads measured in these tests were well below the design values assumed for auger anchors in designing support and anchoring systems to resist wind forces specified by HUD standards.
- The results of these tests indicate that when auger anchors with stabilizer plates and strapping are added to a simple jack stand support system, the lateral resistance increases. Substituting concrete block piers for jack stands and using auger anchors with stabilizer plates and strapping also increased the lateral resistance capacity.
- Energy absorbing capabilities of support systems appear to be most effective when friction between the framework and support or support and the soil is activated. One of the ERBS systems was found to activate friction between the footing and soil which resulted in an increase in the lateral load capacity. In many of the tests conducted, particularly with jack stands, the behavior was dominated by the back and forth rocking of the jack stands. This rocking mode is very ineffective in dissipating energy.
- All tests conducted showed some degradation of resistance capacity as the number of cycles and the magnitude of lateral displacement increased. Less degradation of capacity occurred when the

support systems could activate friction between parts of the support system or the soil.

- Auger anchors loaded laterally or with an inclined load at their top, generally have capacities significantly less than their direct tension capacity. The lateral load resistance is highly dependent on the type of soil and the size of the stabilizer plate.
- These tests did not consider uplift loads due to wind suction or vertical ground motions. Application of uplift or significant overturning moment together with the lateral load is expected to result in an even lower resistance behavior than that reported here.
- The behavior of auger anchors with stabilizer plates as installed and loaded in this study (See Fig. 3.6) is dominated by the low passive resistance/shear strength of the soil since the anchor does not have the opportunity to respond in tension.
- Test results have demonstrated that the lateral and resultant anchor deflections were essentially equivalent. This implies that the tension resistance of the anchor was never mobilized.
- The field tests of anchors resulted in higher capacities and deflections for the same type of anchor and support condition as was used in the laboratory.
- Horizontal anchor deflections were smaller in the laboratory tests as compared to field tests due to the added friction from the dead weight of the model. Vertical (upward) deflections were offset by the dead weight of the model.

6.2 CONCLUSIONS FROM CONVENTIONAL SUPPORT SYSTEMS

6.2.1 Contribution from Auger Anchors

- Table 5.1 indicates that anchors and strapping are capable of increasing the lateral load resisting capacity of an unanchored manufactured housing unit which is supported on conventional piers, that is, jack stands or concrete masonry units.

  The average lateral load resistance of the model for tests without auger anchors and stabilizer plates was 1230 lbs at an average frame deflection of 1.0 in. The average lateral load resistance of the model for tests with anchor restraints was 1875 lbs at an average frame deflection of 1.84 in. On the average therefore, a value of 645 lbs may be attributed to the lateral resistance of the auger anchor/strapping system.

Tests which were conducted in the field on auger anchors utilizing stabilizer plates indicate an average load of 800 lbs at an average horizontal deflection of 1.84 in.

- Auger anchors can assist in restraining the manufactured housing unit from falling off the jack stands as compared to an unanchored support condition.
- Auger anchors and strapping were effective in increasing lateral load resistance during the first cycle of loading. However, during reverse cycling, the same auger anchor becomes completely ineffective until the motion reverses and it is able to again bear against the stabilizer plate. Because of the low yielding characteristics of the sand soil, the auger anchors always had a large permanent displacement when unloaded.
- Because the anchor was oriented mostly vertically and the load mostly horizontal, the stabilizer plate bearing against the soil provided the only resistance against lateral loads for horizontal deflections on the order of four inches. The tension capacity of the anchor could not be mobilized because this would require large horizontal deflections of the anchor to bring it in line with the direction of the load.
- There does not appear to be any influence of anchor manufacturer on these test results.
- The strapping functioned well during the tests. However, the strapping was not loaded to near its rated capacity so no overall conclusions can be made on its performance. There was no breakage in any of the strapping or any significant slipping at the buckle where the strapping was wrapped around the chassis beam.

6.2.2 Jack Stands, Clamps and Foundations

- Jack stands experienced no damage as the result of being cycled under load. However, some of the clamps that connected to the flange of the undercarriage support beams were found to be bent after the completion of the deflection control cycles.
- The clamps did not improve nor hinder jackstand performance. One advantage of the clamps is that they keep the jackstands attached to the undercarriage. There is little chance of the undercarriage sliding off the jackstand support due to lateral loads with the clamps installed. The bending of the bearing plate contributed to the reduction of the available bearing area but

had no apparent consequences on the vertical load carrying ability of the jack stand.

- The manufacturer of the jack stand, when the jackstands were not anchored to the wood footing, does not appear to influence jackstand behavior or its lateral load resistance.
- It was not possible to clearly quantify the effect of having the jack stands clamped to the lower flange of the main chassis support beams. However, observations of the test specimens during the tests with and without such clamping devices indicate that the clamps would keep the chassis beam from sliding off the jack stand when the lateral displacements are large.
- Load reversal tests conducted on the frame supported on jackstands but without anchors providing lateral resistance did not absorb much energy during the load cycling and had less resistance than comparably tested systems with concrete block piers (see Section 6..2.3).
- Behavior of the unrestrained frame supported on jackstands and subjected to lateral loads or motions could be typified as one of back and forth rocking.

6.2.3 Concrete Block Piers

- Concrete block supports developed a larger lateral load resistance than corresponding tests using jack stands, strapping and anchors. The increase in lateral resistance is attributed to the friction developed between the undercarriage beam flange and the wood shims on top of the concrete block piers.

6.2.4 Influence of Manufacturer

- Test results did not indicate any discernible differences between the performance of components, that is, jack stands and auger anchors, produced by different manufacturers.

6.2.5 Energy Absorbing Ability

- Tests on conventional support systems were useful in providing an insight into the behavior of manufactured housing units in a "long period" alternating load environment. Some of the tested components such as anchors/strapping tiedown system are very poor in absorbing the energy from lateral forces.

6.3 CONCLUSIONS FROM TESTS ON TWO COMMERCIALLY AVAILABLE ERBS

6.3.1 Resistance to Earthquake Forces

- The two commercially developed Earthquake Restraint Bracing System (ERBS) tested performed very differently. The system supplied by Sure Safe Industries, Inc. was found to resist the largest lateral load of all systems tested in this series. The performance of the Hedra-X System was equivalent in lateral load capacity to the undercarriage frame supported on jack stands only.
- Both systems were found to be useful in having the ability to catch and/or stabilize the manufactured home unit when other support systems such as jack stands fail.

6.3.2 Energy Absorbing Ability of ERBS

- The ability of the system to absorb energy in the test conducted was greatly influenced by the jack stand rotation behavior. If the jack stands would not rotate but slide on the soil, as intended for the components, the energy absorbing characteristics of this system would change significantly. As currently configured, the behavior of the Hedra-X supports used in combination with jack stands is dictated by the jack stand. Resistance of the Hedra-X System could be enhanced by embedding the wood footing in the soil.
- The Sure Safe Industry ERBS was found to slide on the soil and apparently develop frictional resistance even though there was minimal vertical load on this ERBS. Sure Safe also specifies that the jack stands be anchored to their wood footings. The additional anchorage of the jack stands influenced both the lateral resistance capacity and energy absorbing capabilities.
- Tests conducted in this series indicate that an ERBS can influence the lateral load resistance and energy absorbing characteristics if the foundation for the ERBS remains in contact with the soil.

6.3.3 Design Guideline Implications

- The essential objective of the ERBS is to "catch" the manufactured housing unit if it falls off its main frame supports. Observations from the two tests conducted indicate that this objective would be met.
- Based on observations from two ERBS tests, the ERBS can stabilize the foundation system of

a manufactured home when the manufactured home is subjected to large inelastic ground motions. The ERBS evaluated in the testing program would be beneficial to the support of the manufactured home because they can catch the unit if the lateral displacements or other earthquake motions cause other support piers to rotate and topple over.

6.4 RECOMMENDATIONS

6.4.1 List of Recommendations

1. The study performed and reported herein should be extended to include other anchoring schemes and a more complete representation of a manufactured housing unit in terms of the height of the unit's walls, the corresponding distribution of weight within the unit, and to multiple section units.
2. An analytic study should be initiated to evaluate the behavior of manufactured housing units in earthquake and wind environments. Simplified methods developed and used in this study would form the basis. The results of such an analytical study would be useful as a basis for developing guidelines for the design of load resisting systems for manufactured housing units.
3. Additional variables and/or anchoring schemes should be investigated to develop an effective alternative tie-down system for manufactured housing units located in seismically active zones in poor soils. Behaviors measured in these tests were often dictated by the resistance of the soil to lateral loads. This future study should give particular emphasis to anchors other than auger anchors.
4. Anchor installation improvements can be made by preboring a hole half the length of the anchor and then installing it. The removed soil is to be reconsolidated or compacted around the anchor or the hole is to be filled with grout or concrete. This will reduce the chance of yielding the anchor shaft in torsion when the soil conditions provide significant resistance to anchor installation.
5. A larger diameter shaft (>3/4 in.) should be used for the auger anchor. This change in the auger anchor will increase the anchors resistance to lateral loading and torsional yielding during installation.
6. Use of stabilizer plates increases the lateral resistance of the system. The larger the stabilizer

plate width, the greater the passive soil resistance and thus the greater the lateral load resistance of the system.

7. A study should be conducted to compare the monotonic capacity of anchor systems in the laboratory to the capacities found in the load reversal tests and the one-directional load resistance determined in the field tests (i.e.-anchor installed in a direction which is opposite to the load). In addition, the monotonic anchor capacity should also be determined for loads which are applied in-line with the anchor.
8. A study should be conducted on auger anchor system performance in saturated soils. This soil type is often encountered during hurricane conditions.
9. A study should be conducted on resistance of auger anchor and support systems to forces parallel to the longitudinal axis of the manufactured housing unit. The study conducted under Task Order 003 considered only loads which act normal to the longitudinal axis of the manufactured housing unit.
10. A study should be conducted on the combined lateral and vertical resistance of an auger anchor system when subjected to longitudinal or lateral and vertical applied forces to the manufactured housing unit. It is expected that the application of combined loading will reduce the resistance capacity of the auger anchors. Under such a study two different cases should be considered. The first case would consist of applying a net overturning and uplift force. The forces would be resisted by anchors with two sets of strapping attached to one anchor. A vertical strap would be connected to resist the uplift forces and a diagonal strap, as in this project, to resist overturning and uplift. The second case would be similar to the first except that the vertical and diagonal strapping would be attached to separate anchors.
11. If anchor components are tested individually and not as a system assembly, loads should be applied that cause maximum resistance to be achieved by the anchor or the anchor should be loaded until the vertical or horizontal deflections cause failure of the anchoring soil. Based on results of laboratory and field testing, present requirements for auger anchor capacity (3150 lbs- design, 4725 lbs - ultimate) should be reduced by at least 50 percent.
12. Results of this study are capable of being used to set preliminary guidelines for the installation

of manufactured housing in seismically active zones. For example, guidelines could indicate that in seismically active areas, manufactured homes need to be anchored and that concrete block pier supports are preferred over jackstands and that where jackstands are used, they should be clamped to the main undercarriage beam.

13. It is recommended that jackstands be anchored to their foundations. A higher lateral load capacity may result if the jack stands are anchored to the wood foundation. Experience with Test No. 6 shows that anchoring the jack stands to the wood footing changes the behavior of the jack stand and may increase the lateral load resistance by some small amount.

7.0 SUMMARY CONCLUSIONS

- Anchor resistance capacities found in the field and laboratory tests are significantly lower than the design values assumed for anchoring equipment required by the HUD Standards for resistance to wind loads.
- Anchor system resistance is limited by the size of the stabilizer plate; passive resistance of the soil; and the size and depth of embedment of the anchor shaft and auger and the depth to which the anchor can be installed.
- Anchor performance in sandy soils (when anchors are installed opposite to the direction of the pull) is primarily influenced by the low lateral shear resistance of the soil and little by the tensile resistance of the anchor.
- Monotonic or one directional load tests provide larger anchor capacities and relative horizontal deflections than can be obtained from load reversal tests under similar soil conditions.
- Lower anchor and ERBS systems resistance capacities and larger deflections than reported from the field tests and by this study would be anticipated under actual installation conditions. These tests did not consider the simultaneous uplift wind or vertical ground motion forces or overturning affects from lateral earthquake and wind loads.
- Anchored systems as compared to unanchored systems with conventional supports (jackstands, concrete block piers) can increase load resistance to wind and earthquake.

- Concrete block pier support systems are more effective than jackstands in energy absorption characteristics and therefore provide greater resistance to load reversals caused by earthquake ground motions.
- Properly designed ERBS can enhance resistance to ground motions, and thereby be effective in preventing the toppling of manufactured housing units.
- Energy absorbing capabilities of the ERBS or conventional support systems are most effective when friction between the main undercarriage beams or framework of the manufactured home structure and the support system and the soil are activated.

JEP:DFM:AL:nh:meh

25593

NORTHRIDGE EARTHQUAKE EFFECT ON MANUFACTURED HOUSING IN CALIFORNIA

DRAFT

Prepared by the
National Conference of States
on Building Codes and Standards, Inc.

Under Contract with the
The Department of Housing and Urban Development

February 4, 1994

Northridge Earthquake, January 17, 1994
Effect on Manufactured Housing in California

INTRODUCTION

Title VI of The Housing and Community Development Act of 1974 states in part that the Congress declares that the purposes of Title VI are to reduce the number of personal injuries and deaths and the amount of insurance costs and property damage resulting from manufactured home accidents and to improve the quality and durability of manufactured homes. To evaluate the performance of manufactured homes effected by the Northridge earthquake, a team of engineers and building officials inspected manufactured home developments around Los Angeles.

On January 17, 1994 at 4:30 a.m., a violent earthquake shook Los Angeles. The quake, which measured 6.6 on the Richter scale, shook building in San Diego, 125 mile south, and Las Vegas, 275 miles to the northeast, and disrupted electrical power as far away as Oregon, Wyoming and Canada, according to Associated Press. The epicenter of the quake was reported to be in the Northridge section of Los Angeles. Fifty eight earthquake related deaths were reported by the Los Angeles and San Bernardino County Coroner's Offices.

During the week of January 17, 1994, a team of five engineers and building officials from the U.S. Department of Housing and Urban Development (HUD), the National Conference of States on Building Codes and Standards, Inc. (NCSBCS), Wiss, Janney, Elstner Association, Inc. (WJE), and California Department of Housing and Community Development (HCD) conducted an investigation into the nature and causes of manufactured home failures that resulted from the Northridge earthquake. The purpose of the investigation was to:

a) assess the performance of manufactured home construction, foundation and anchoring systems, and the home's connection to the gas service;

b) assess damage to manufactured homes and compare this to damage experienced by site-built, single-family homes in the same area;

c) provide recommendations to minimize the effects of an earthquake on manufactured homes.

In order to collect a broad base of data on the performance of manufactured homes, the team inspected homes in eight manufactured home developments within ten miles of the epicenter of the earthquake.

FOUNDATION AND ANCHORING SYSTEMS

a) Steel Piers

Approximately eighty percent of the homes inspected in the eight parks were supported with steel piers. The piers varied in size and construction but all consisted of a square base with four vertical members of steel angle. The vertical members connected at the top of the pier where a threaded rod was placed through the pier. This threaded rod was adjusted with a bolt to level and support the chassis of the home on a steel plate or short channel welded to the top of the threaded rod (see Illustration 1).

ILLUSTRATION 1
Chassis beam shifted off steel pier

ILLUSTRATION 2
Concrete pier support

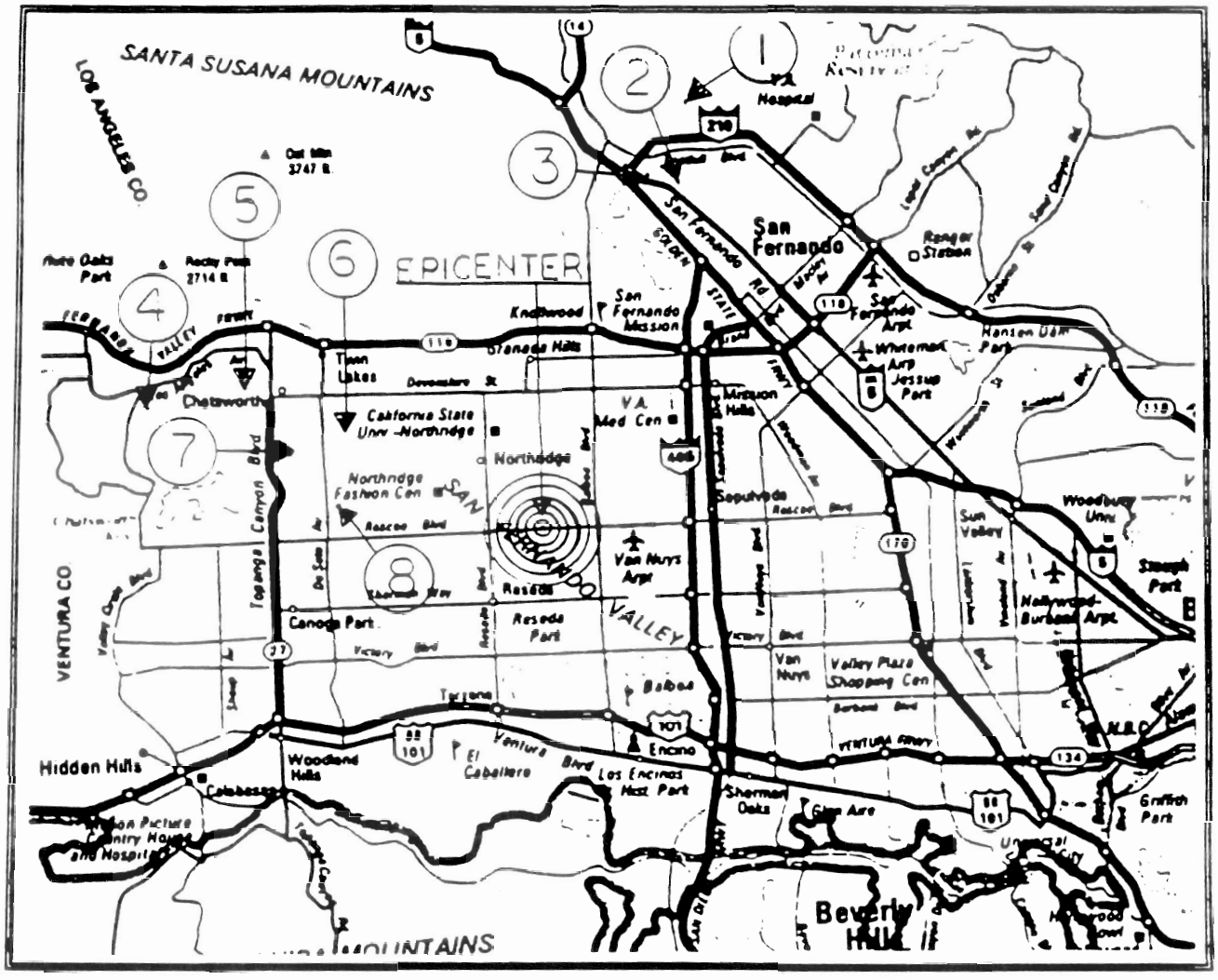
The California Code of Regulations, Title 25, Chapter 2, Article 7.5, requires Department of Housing and Community Development certification of earthquake resistant bracing systems (ERB systems) for manufactured homes. A list of certified earthquake resistant bracing systems as of December 20, 1993, is provided in Appendix C.

Appendix A

California Department of Housing and Community Development
Earthquake Response Report

Park Name	City	Spaces	Down	Shifted	Burned
Blue Star	San Fernando	186	96	53	0
Orange Grove TP	San Fernando	76	9	0	0
Sky Terrace	San Fernando	63	41	11	2
Granada Villa MP	Santa Clarita	179	158	0	2
Royal Oaks MP	Saugus	87	80	0	1
Oasis Park	Saugus	60	1	0	0
Parklane ME	Saugus	406	395	0	1
Sand Canyon MP	Saugus	70	14	0	0
Sierra park	Saugus	76	63	0	1
Lilly of the Valley	Saugus	181	20	0	0
Hasley Canyon MP	Saugus	113	36	0	0
Canyon Palms MP	Saugus	45	38	0	0
Susana Woods ME	Sun Valley	139	71	0	0
Garden Grove TP	Sun Valley	16	14	0	0
Sun Country MP	Sun Valley	274	151	0	0
Friendly Village	Sun Valley	221	189	0	0
Trade Winds MP	Sun Valley	100	44	50	0
Crest M/H Village	Sun Valley	41	40	0	0
Laurel Canyon ME	Sun Valley	60	10	0	0
Oakdale MP	Sunland	78	10	7	0
Sunland TP	Sunland	52	37	0	0
Sherman Grove MP	Sunland	75	6	4	0
Rancho Hermoso	Sylmar	93	85	5	3
Lumark TP	Sylmar	104	60	13	0
Los Olivos	Sylmar	81	43	16	22
Sylmar Manor	Sylmar	66	48	15	0
Wards Mobile Homes	Sylmar	38	6	1	0
Tahitian MP	Sylmar	236	157	16	50
Top-O-Topanga MP	Topanga	224	13	15	2
Six Parks in	Van Nuys	586	151	27	0
Woodland Park ME	Woodland Hills	199	3	0	0
SUBTOTALS		4,225	2,089	233	84
TOTAL		9,191	4,457	956	184

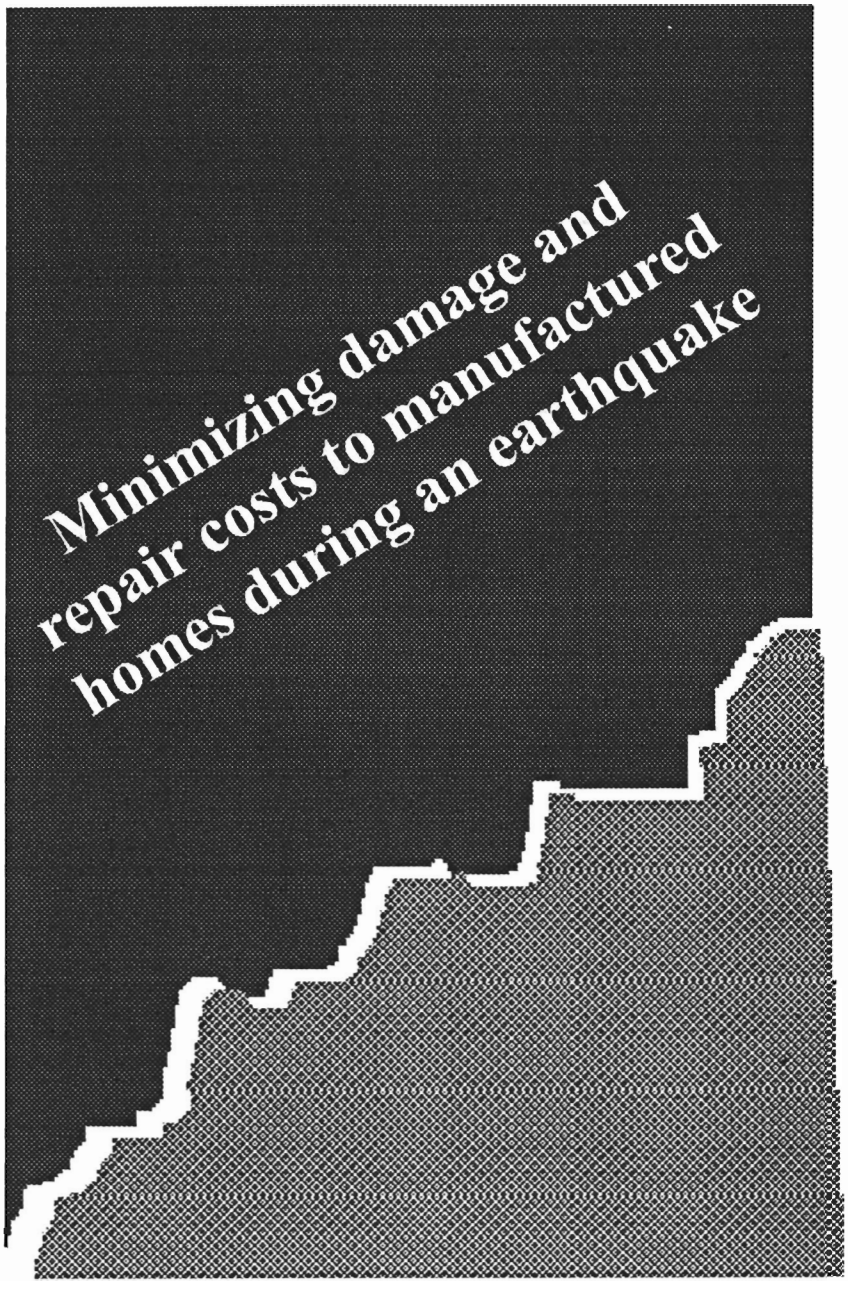
INSPECTED SITES



Park Name	Spaces	Homes with ERBS	Burned	% Multi-sections
1) Oakridge	600	100%	66	100%
2) Los Olivos	81	40%-50%	22	100%
3) Rancho Hermoso	93	30%-40%	3	95%
4) Simi Country	274	15%-20%	0	60%
5) Indian Hills	138	30%-40%	0	90%
6) Chatsworth Imperial	164	10%-15%	2	80%
7) Chatsworth MH Park	198	15%-20%	2	90%
8) Sunburst	115	20%-30%	2	90%

U.S. Department of Housing and Urban Development
Office of Policy Development and Research

PD&R

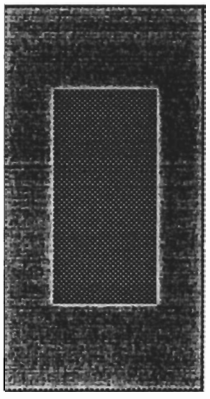


U.S. Department of Housing and Urban Development
Office of Policy Development and Research

This brochure was prepared for the U.S. Department of Housing and Urban Development, Office of Policy Development and Research by the Housing and Building Technology division of the National Conference of States on Building Codes and Standards under Contract with Steven Winter Associates
1995

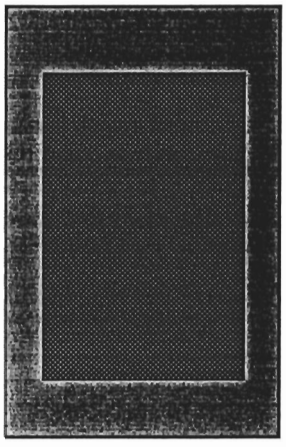
EARTHQUAKES AND MANUFACTURED HOMES

Although manufactured homes were installed to resist earthquakes, many did sustain damage during a number of recent earthquakes in California. Many homes were damaged by falling or otherwise being moved from their foundation systems. Much of the damage was to the support systems of the homes, or to structures attached to the homes. Porches, awnings, and garages attached to homes were often separated as the homes moved from their support systems.



The Northridge, California, earthquake of 1994 reportedly caused considerable disruption to manufactured home owners in both loss of use and cost to reinstall the home on a support system. One extensive report on nearly 9000 manufactured homes in 69 manufactured home parks revealed that approximately 49 percent of the homes slid off their support systems onto the ground. Another 10 percent shifted but remained on their support system, while two percent of all homes studied were destroyed by fire. Manufactured homes experienced structural and fire damage because standard support systems (piers and pads) were not able to resist the shaking and lifting of homes due to earthquake related movement.

Fires that damaged two percent of the manufactured homes after the Northridge earthquake of 1994 were fueled by broken natural gas lines inside, or leading to, the homes. Broken gas lines inside the home were often caused by gas water heaters that toppled out of the home through an exterior door or access panel to the water heater compartment. Other fires were fueled by natural gas leaking from broken gas meters or from piping located near the manufactured home. As homes fell from their foundation and support systems, they sometimes broke the gas meter or pipe leading to the home. Better installation of the home and better methods to secure appliances, such as water heaters, to prevent movement could have prevented many of the fires.

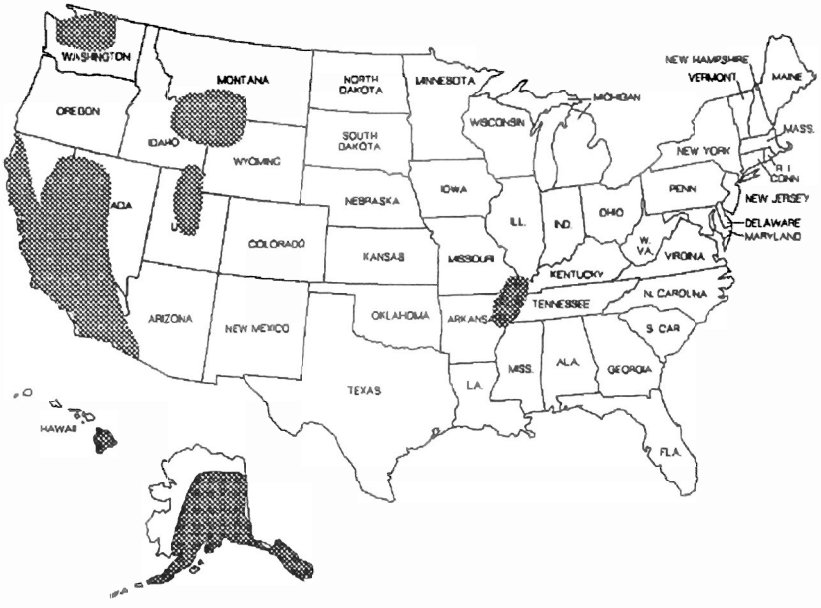


CAN HOME DAMAGE BE PREVENTED OR REDUCED?

Yes. This brochure outlines several suggestions for the manufactured home owner, or park owner, to reduce or prevent damage to the home. The suggestions are presented for both new and existing homes. While these suggestions do increase the cost of home installation they can - if implemented properly - provide significant savings if the home survives an earthquake undamaged.

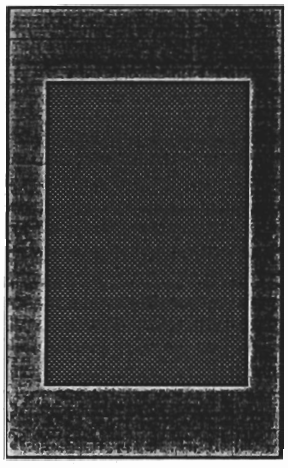
IS MY HOME AT RISK?

While California has experienced many of this country's most memorable earthquakes, there are several other states where earthquakes of significant magnitude are anticipated. The map below shows areas most likely to experience damaging earthquakes.



SUGGESTIONS TO REDUCE DAMAGE FROM AN EARTHQUAKE

No level of earthquake preparedness can guarantee that an earthquake will not damage a home. However, there are a number of ways you can reduce or prevent damage to a home during an earthquake. The suggestions listed on the next page can minimize damage to your home and the attached structures by reducing movement of the home during an earthquake. The least expensive suggestions are listed first:

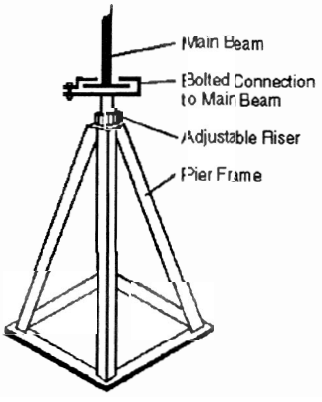


1 Keep the axles and hitch under the home after installation.

The axles and hitch alone will not prevent movement of the home during an earthquake and, therefore, will provide only minimal protection from earthquake damage. The axles and hitch may prevent the home from falling completely to the ground, thereby making reinstallation easier. The axles and hitch may also be removed from under the home if an earthquake resistant bracing system or specially designed foundation system is used to resist earthquakes.

2 Use concrete block piers or steel piers secured to the main beams of the home.

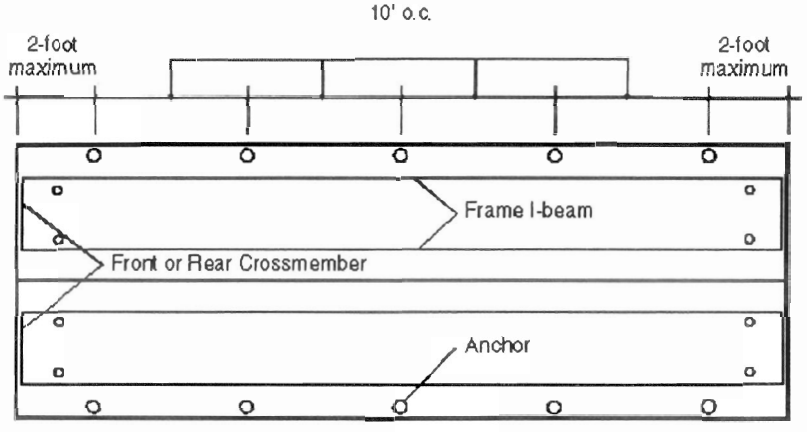
An investigation after the 1989 Loma Prieta earthquake found that fewer homes that were supported on concrete block piers fell off their piers than homes that were supported on steel piers. Steel piers are easy to install and adjust, but provide little bearing surface to support the home. Therefore, when steel piers are used they need to be secured to the main beam of the home. Also use stronger steel piers as they will be less likely to fail (buckle) if the home does move during an earthquake.



3 Anchor the home to the ground according to the manufacturer's instructions for wind.

Install ground anchors and tiedown straps according to the manufacturer's installation instructions. Ground anchors will help stabilize a home during both wind storms and earthquakes. Generally, anchors are recommended on two long sides of the homes. For earthquakes, additional anchors should be added to the two ends of the home (four anchors per home section).

If instructions are not available, use the following calculations. Anchors should be installed a minimum of 10 feet on center on the sides of the home, but not more than the minimum state installation requirements. Also, anchors should be installed on the ends of each home section near each frame I-beam.



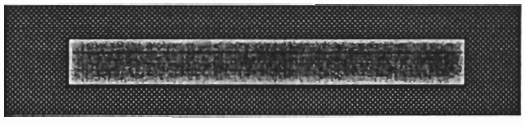
Anchor Minimum Load Capacity 4725 lbs.

4 Install earthquake resistant bracing systems to minimize movement of the home.

Some bracing systems simply provide a frame that catches the home if, during an earthquake, the home falls off its piers. These bracing systems are designed to reduce damage to the home by limiting the movement of the home. Other more elaborate bracing systems actually minimize movement of the home through connections between the bracing system, the home, and the footing or foundation. California has a list of certified earthquake resistant bracing systems and requires that each installation be inspected by the state. You may obtain a list from the following agency: **State of California, Department of Housing and Community Development, Division of Codes and Standards, 1800 Third Street, P.O. Box 1407, Sacramento, CA, 95812-1407.**

5 Install an earthquake resistant bracing system specifically designed to support the home and resist all earthquake forces.

The support piers for an earthquake resistant system will generally be larger than conventional piers and will be secured to the main frame and to the footing. An earthquake foundation system or permanent foundation may be designed and built similar to foundations for conventional housing.



New earthquake resistant installations:

Alternate 1:

- Use concrete block piers or other types of piers fastened to the home and footing
- Install ground anchors around the home
- Secure water heater to the walls
- Use looped 6 foot long flexible line connector at gas inlet (see illustration on page 16 of this brochure)

Alternate 2:

- Use specially designed pier and foundation system for earthquake loads or permanent foundation
- Secure water heater (gas flex connector to home is not necessary as the foundation system will limit the move ment of the home)

Retrofitting existing installations for earthquakes:

Alternate 1:

- Install ground anchors all around the house
- Secure water heater to the walls
- Use looped 6 foot long flexible connector at gas inlet (see illustration on page 16 of this brochure)

NOTE: If steel piers were used, fasten the steel piers to the home and footing or install concrete block piers next to the steel piers.

Alternate 2:

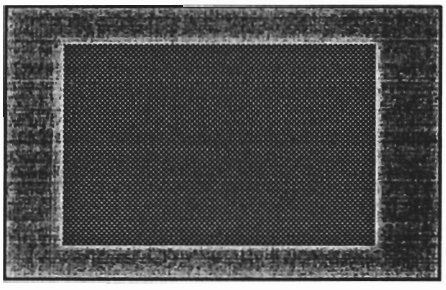
- Install earthquake bracing system to limit home movement
- Secure water heater to the walls
- Use looped 6 foot long flexible connector at gas inlet (see illustration on page 12 of this brochure)

UTILITY SYSTEM CONNECTIONS

Damage to utility systems will be minimized if the home is prevented from moving. However, many homes currently installed in areas likely to experience earthquakes are installed on support systems inadequate to resist earthquake forces. Earthquake resistant bracing systems installed under the home often minimize movement of the home, but may not be designed to prevent movement in all directions.

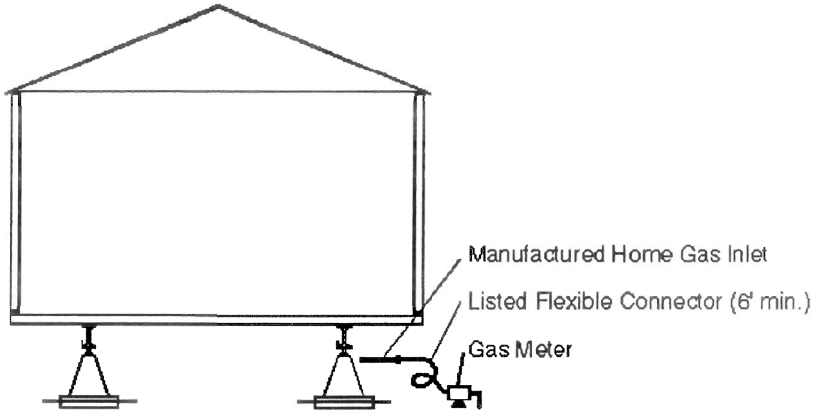
Gas leaks and fires attributable to earthquakes were traced to two general sources. Gas connections to the home were damaged where the home fell from its foundation system and landed on the gas meter. Gas connections to the water heater were damaged or severed where the water heater fell from its compartment, landing outside the home.

Electrical, water, and drainage connections to a home were also damaged when the home shifted from its foundation system. Damage to a home's electrical system can cause fires. Damage to water and drainage systems do pose risk of serious injury. While utility damage from the Northridge earthquake caused disruption of electrical, water and drainage service to some homes, little other damage was attributable to the disruption of this utility service.



In most installations, the home gas system must be connected to the gas meter through an approved flexible gas connector. This flexible gas connector allows significant movement of a manufactured home without damage to the gas system. However, the length of the flexible connector and the location of the gas meter limit allowable movement of a home before damage occurs. If the gas meter is three feet from the home's gas system inlet, the home can move three feet toward or away from the meter without significant risk of damage to the flexible connector.

Where possible, position the home half the length of the flexible connector away from the gas meter connection in order to minimize damage to the flexible gas connector, the meter, or its connections should the home move or fall from its foundation.



Lot size and offset requirements may not always allow three feet between the meter and the home. Further, the flexible connector may be damaged by lawn mowers or children playing around the home and must, therefore, be protected from damage.

Seismic motion detectors and gas detectors are available for consumer use to minimize the potential hazard of gas leaks. These devices will stop gas flow when either a gas leak is sensed or during seismic ground motion. These devices are currently not required for residential construction in most parts of the United States. Three different devices are currently being tested in California. A seismic shut-off device is installed in the gas line leading to a manufactured home. This shut-off device will stop gas flow when a predetermined level of seismic ground motion is encountered. A free-flow gas sensor essentially monitors pressure differential between the supply and line side of the sensor. Significant pressure drop on the line side of the sensor, typically caused by a rupture in the gas system, will result in the sensor stopping gas flow. Finally, gas sensors installed in the home detect gas vapors in the air and transmit a signal to an electrically operated valve that can stop gas flow using the home's electrical current or a battery backup in the event of power failure.

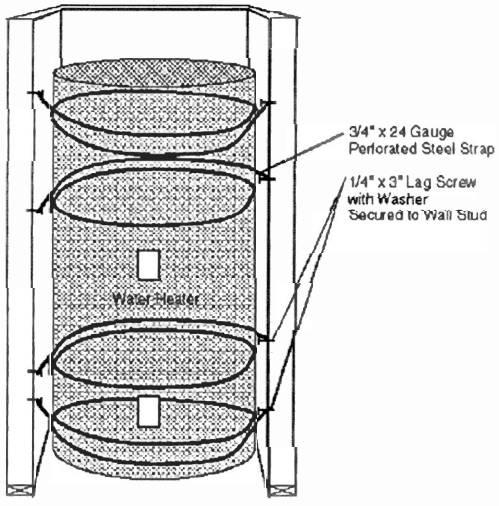
Do not operate electrical switches if you smell gas. Natural gas is not itself a source of ignition, but is relatively easy to ignite especially in confined spaces. Natural gas is easily ignited by open flames that exist in a standing pilot light and by sparks from switches and other electrical devices. If you should smell gas, leave all switches in their current position to avoid the possibility of electrical sparks.

Following an earthquake, visually inspect piers, anchors, and utility connections to the manufactured home. If problems with the support system or the utility connections exist, do not attempt to correct these problems yourself. Contact a home installer for the necessary repairs to either the support system or to utility connections of the home.

EQUIPMENT CONNECTIONS TO THE HOME

A filled water heater may weigh as much as five hundred pounds. Therefore, the water heater needs to be secured to the walls using steel straps or some other method so that it does not fall over during an earthquake.

One good design concept is to wrap the top and bottom of the water heater with two loops of 3/4" 24 gauge steel plumber's tape and to secure the steel tape to a wall stud. (See illustration below for the suggested method of securing the water heater in its compartment).



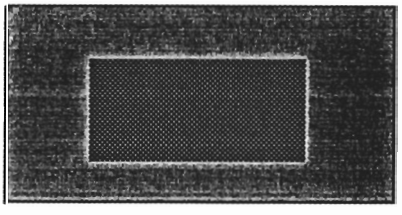
*Because flexible gas connectors are not d*esigned for movement after installation, the connector should be tested for leaks if there is significant movement of the connector due to movement of an appliance or of the home during an earthquake.

UTILITY SERVICE AT PARKS

Some manufactured home communities (parks) are designed so that certain utilities can be turned off from one location. A "master meter" installation is one where a park owner or manager purchases utility service, such as natural gas, in bulk from the supplier. The supplier owns and maintains the gas pipe up to the master meter. All gas pipe from the master meter to the individual home sites is owned and maintained by the park. Each home site has a meter by which each home owner pays the park owner for the amount of gas used.

Where a master meter installation is used, gas supply to the entire park can be disconnected by the park manager in an emergency. Likewise, gas supply can generally be disconnected by the gas utility company before the gas supply enters the park. However, disconnecting supply to a large area or manufactured home park should be done only in an emergency. Once the gas supply is disconnected, each home must be tested for gas leaks before the supply for that home is reconnected. Pilot lights will also have to be relit when the gas supply is returned.

Water and electrical supply can generally be disconnected by the appropriate utility. Reconnection of these utilities does not generally, require retesting of the systems inside the homes.



DRAFT

The Effect of Earthquakes on Manufactured Home Installations

Prepared for
The Department of Housing and Urban Development

by
Housing and Building Technology Division
National Conference of States on Building Codes and Standards

under contract with
Steven Winter Associates

Table of Contents

Introduction

The effect of earthquakes on manufactured homes has become a growing concern since the 1994 Northridge, California earthquake, which damaged a large number of manufactured homes located in several home parks near the earthquake epicenter. Some homes sustained structural damage by being shifted or toppled from their support systems. A large number of homes, however, were destroyed by natural gas-fed fires that started when one or more homes shifted or toppled and, as a result, severed gas supply pipes. Other fires were caused when gas water heaters toppled and severed their gas supply pipes.

The purpose of this report is to identify and compare ways to decrease damage to manufactured homes during earthquakes. This study was prepared for the U.S. Department of Housing and Urban Development (HUD) under contract with Steven Winter Associates.

To decrease damage to manufactured homes during earthquakes, the following issues were investigated:

1. How new manufactured home installations can be improved to better resist seismic forces.

2. How designs of foundations and utility connections can be improved to resist damage caused by earthquakes.

3. How existing manufactured home installations can be retrofitted to reduce damage caused by seismic forces.

4. How earthquake damage to accessories and equipment inside the manufactured home can be mitigated.

As a result of this study, the following items were developed:

1. Pamphlets for owners of manufactured homes and manufactured home parks that contain recommended precautions and techniques used to minimize damage to homes and home accessories.

2. Proposed changes to manufactured home construction and installation standards that will mitigate damage from earthquakes by improving installation of manufactured homes in seismically active areas.

3. Test procedures to validate the findings and recommendations developed in this study.

The contractor was required to review the seismic requirements of ANSI/ASCE 7-93 and model building codes with respect to the installation of manufactured homes. After selecting the appropriate code as a basis, the contractor evaluated the impact of seismic activity on one single-section and one double-section home foundation and developed recommendations for installing homes to mitigate damage due to seismic activity. Recommendations were developed and were based on a review of existing technical data and reports.

To ensure that the findings of the study and its conclusions and recommendations are appropriate, the contractor was required to present its findings and recommendations to an advisory panel. Based on the comments received, HUD is to evaluate and propose changes for the final report.

Background

HUD has responsibility for the administration of the Federal Manufactured Housing program, which falls under Title VI of the Housing and Community Development Act of 1974. Under this Act, HUD is required to: 1) effect a reduction in the number of deaths and injuries resulting from manufactured housing failures; 2) reduce the amount of damages and the number of insurance claims filed due to such failures; and 3) improve the overall quality and durability of manufactured housing across the United States. Each state, not the federal government, has primary responsibility for setting and implementing installation standards. This report can be used by HUD and states to establish standards for manufactured home installations.

On January 17, 1994, an earthquake measuring 6.8 on the Richter Scale struck southern California. This earthquake resulted in nearly 50 deaths and billions of dollars in property damage. The earthquake, whose epicenter was located in the Northridge section of Los Angeles, could be felt as far away as San Diego and Las Vegas.

In the aftermath of the earthquake, HUD sent teams of experts to the stricken areas to evaluate the extent and causes of damage to housing, and to render assistance to those people suffering dislocation. One of these

teams, consisting of engineers and building officials, was sent, specifically, to investigate the nature and extent of the earthquake's damage to manufactured homes.

The Manufactured Housing Team's investigation included: 1) observation of structural damage to several hundred manufactured homes within a 10 mile radius of the epicenter; and 2) an analysis of the performance of support structures including foundations, piers, fastening techniques, earthquake-resistent bracing (ERB) systems, and utility connections. [An earthquake resistant bracing system is a system designed to reduce damage to a manufactured home in the event of an earthquake.] While the team did not examine in detail damages to site-built homes, the team concluded that the foundation systems of manufactured homes sustained greater damage than the foundation systems that supported single family site-built homes. However, the amount of structural damage to manufactured homes varied depending upon the type and the amount of support and anchorage used to stabilize the home.[1]

[1]***Northridge Earthquake Effect on Manufactured Housing in California, National Conference of States on Building Codes and Standards, June 17, 1994.***

Seismically Active Zones

The following map identifies geographical areas affected by seismic activity. (For detailed zone maps see Appendix A.)

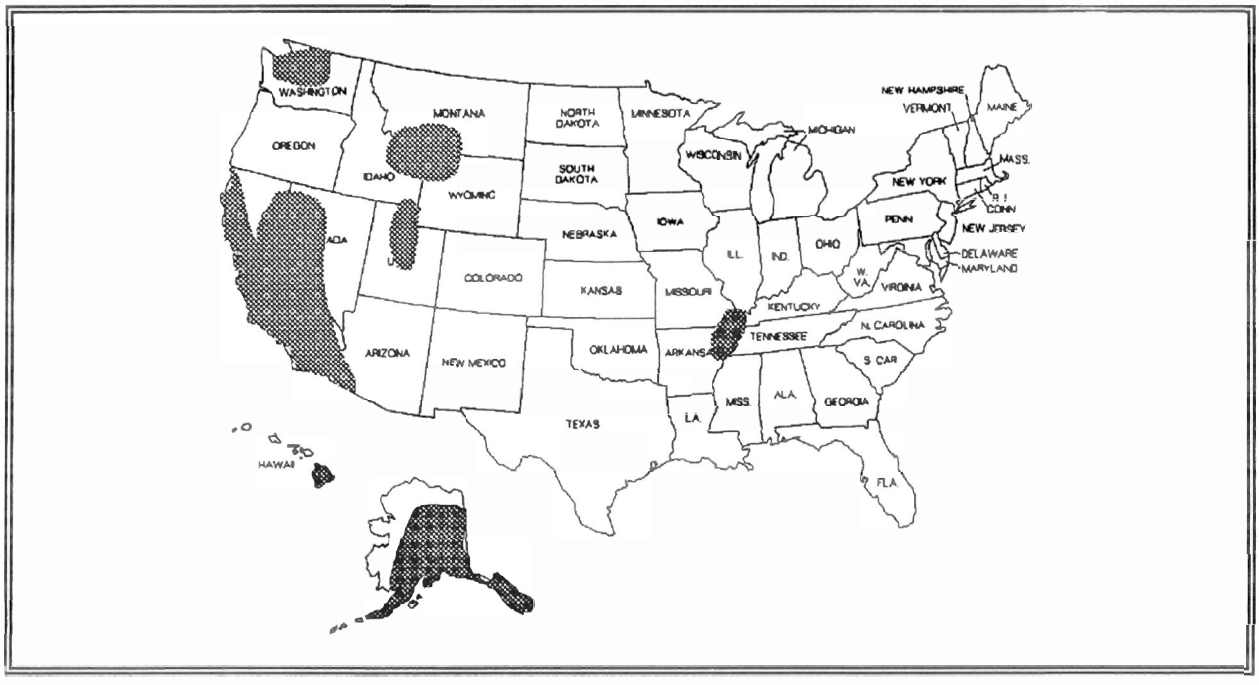


Figure 1. Areas with High Occurrence of Seismic Activity

Existing Homes in Seismically Active Zones

Because no data was available on the vulnerability of the current manufactured housing stock, a rough estimate was made based on shipments from 1976 to 1994 and on available census data. The estimate indicates that between 300,000 and 350,000 manufactured homes may be situated in seismic prone areas. It is further estimated that nearly half of these homes are pre-1976 (or pre-HUD coded) homes. A substantial percentage of homes (over 50 percent) are located in clusters such as manufactured home communities or mobile home parks. Less than 10 percent of the manufactured homes may have perimeter foundations. No data was available on the number of homes in California that were retrofitted with earthquake resistant bracing systems.

Use of Earthquake Resistant Bracing Systems in California

In 1994, California established and has since been enforcing rules for manufactured home installations that consider the effect of earthquakes on the support system. California's consumer protection rules currently require approval of earthquake-resistant bracing systems installed under a home. These bracing systems are typically installed in addition to the home's support and wind resistant systems and are designed to minimize damage to the home during seismic activity. The California rules are intended to protect consumers from the unscrupulous sale of ineffective bracing systems. Other states do not have requirements to ensure that manufactured home installations are earthquake resistant.

Effect of Earthquakes on Manufactured Home Foundations

When an earthquake occurs, the earth shakes both laterally and vertically. Thus, the current method of resting the home on steel jack stands or masonry piers results in the home jumping off the supports and falling down or toppling sideways. This, in some instances, causes structural damage that results in the rupture of utility connections, including gas connections. In the presence of a source of ignition, fire results. Most manufactured homes in California are not anchored to the ground. Consequently, when homes move, the support piers puncture through the floor at a number of locations. Accessories such as attached screened porches, carports, and stairways become damaged. Costs for repairs were as high as $17,000 for a multi-section home as shown in California state studies[2].

Analysis in this report shows that homes anchored for wind resistance are able to resist horizontal seismic loads. An anchored home is kept on its piers during an earthquake because the home does not move enough to escape contact with the piers.

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[2]***The Effectiveness of Manufactured Home Support Systems during Earthquakes, California Department of Housing and Community Development, April 1992.***

A 1990 California study[3] indicated that homes on concrete block piers performed better than homes on steel or other manufactured piers.

Comparison of Earthquake Loads with Wind Loads

While there are some similarities between wind and earthquake loads, differences between the two do exist. While both cause lateral and vertical loading, the main differences between wind and earthquake loads are as follows:

1. Earthquake loads are harmonic in motion (reversal of loads generally occurs); wind loads are usually in one direction at a time.

2. Earthquake loads are proportional to the weight (mass) of the home; wind loads are proportional to the area exposed to the wind.

3. Earthquake loads are greater when there is snow on the roof; wind loads are not affected by snow.

4. Earthquake loads are caused by the movement of the earth and foundations; wind loads originate in the superstructure and are transferred to the foundation.

5. Earthquake loads are affected by soil type and the depth of rocks at the location; wind loads are affected by ground surface roughness, but not by soil type or depth.

Because of these differences, home designs for resistance to earthquakes need to be approached differently from the approach used for home designs for resistance to wind loads. For example, a single-wide section home supported and anchored to the ground to resist wind loads will also be adequate to resist seismic forces in the transverse direction in 20 pounds per square foot (psf) roof live load; however, anchors must be added to the front and rear (longitudinal direction) of each home section to resist seismic forces in that direction.

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[3]***Evaluation of Manufactured Housing Support System Performance in the Loma Prieta Earthquake, California Department of Housing and Community Development, 1990.***

Conclusions and Recommendations

Conclusions

This study resulted in the following conclusions about the seismic forces acting on manufactured homes and the resulting damage to the homes.

1. **Comparison between ANSI/ASCE 7-93, BOCA-93, and UBC-94 earthquake requirements**

Earthquake design provisions for single story detached housing (including manufactured housing) according to ANSI/ASCE 7-93 and two model building codes, BOCA-93 and UBC-94, result in nearly the same forces to assess the capacity of the structure, its securement to the foundations and the design of the foundations themselves. The three Standards evaluated for seismic forces provide substantially equal forces for manufactured homes (see Appendix A).

2. **Comparison between wind and earthquake loads**

The design wind forces from Wind Zone I, (the least intense winds) as stated in the Federal Manufactured Home Construction and Safety Standards (24 CFR Ch. XX Part 3280), are of greater magnitude than seismic design forces on single-wide section of manufactured housing in the most severe seismic zones of the model building codes for homes located in 20 psf roof live load. However, seismic loads are greater in magnitude than design wind forces in the longitudinal direction for single and double-section homes. For houses located in high snow loads, seismic loads may be higher than the wind loads (see Appendix B).

3. **Special foundation requirements for earthquakes**

Because earthquakes produce dynamic, reversing forces on building foundations and their anchorage, special attention needs to be given to the design of the attachments and the foundations of manufactured housing even though the magnitude of the forces were less than the forces required for wind resistance. For example: a) attachment between the foundation pier and steel I beams of manufactured homes is required to prevent the home from jumping off the piers during an earthquake, and b) stronger attachments between two halves of the multi-section homes are required

as the attachments must resist differential movement of both halves of the home during an earthquake.

4. **Prevention of fire due to gas leaks from broken gas pipes/connections**

One of the main causes of damage following earthquakes is the outbreak of fire fed by gas from broken pipes and fittings. This could be prevented by connecting the home's gas inlet to the gas supply with a six foot flexible gas connector. In addition, seismic motion detectors or gas-flow monitors could be installed at the gas inlet of the home which would stop gas flow and thereby further reduce the possibility of a gas leak during an earthquake.

5. **Prevention of damage to water heaters and other appliances**

Appliances, such as water heaters, ranges, refrigerators, washers, and dryers, in homes designated to be sited in seismic prone areas need to be anchored to resist movement during earthquakes. Securing the appliance to prevent movement is particularly important when the appliance is supplied by gas.

6. **Prevention of damage by securing the home (anchoring the home)**

Damage is caused due to significant movement of the home, or by separation of home from its supports. This results in broken utility pipes and punctured floors. This damage could be prevented by anchoring the home in all directions using ground anchors or by using a foundation system specifically designed to resist earthquake loads and movements.

Recommendations

Recommendations of this study are classified into two groups. The first group deals with changes and improvements for new home installations. The second group deals with improvements and retrofits that can be done to existing home installations.

New Home Installations

1. HUD should revise construction standards for manufactured homes to require manufacturers that build homes for seismically active areas to provide one acceptable method of installing homes in these areas. Manufacturer's recommendations should be based on the requirements of ANSI/ASCE 7-93 or the loads specified in Table 2-2 of this report.

2. HUD and state building agencies should perform tests and collect performance data during future earthquakes to determine to what extent conventional manufactured housing pier and anchor systems can be relied upon to stabilize homes in earthquakes.

3. State or local building agencies should require installation of new manufactured homes on support systems that are designed and installed to prevent movement of these homes during an earthquake. The following should be required:

   a) Manufactured homes should be anchored or secured to the ground according to the manufacturer's recommended installation instructions for the Wind Zone where the home is installed. Additional anchors should be added on the front and rear of the home (hour anchors per home section), two in the front and two in the back.

   b) The steel or other piers should be secured to the main beam of the home and to the footing.

   c) Piers should be specifically designed to resist horizontal and vertical movement of the home.

   Note: In the absence of Items a, b, and c, earthquake resistant bracing systems should be used in addition to the support system for added protection should the home move from its supports.

   d) Secure the water heaters to wall studs to resist lateral movement of the water heater.

   e) Measures need to be taken at the gas inlet to prevent gas leakage due to broken joints.

4. State or local building agencies should require use of a six foot looped flexible gas connector between the gas supply and the gas inlet on the home.

5. State or local building agencies should require that homes sited in areas that are both seismic prone and subject to snow loads in excess of 30 psf be installed on permanent foundations.

6. Home owners should consider installation of gas detectors or gas shut off devices that can stop gas flow to the home when a gas leak is detected or during an earthquake.

Retrofitting Existing Homes for Earthquakes

Because of the vast number and variety of existing manufactured homes sited in seismic prone areas, a general and simple solution or recommendation to improve the existing support system of a manufactured home is not feasible. Each individual home needs its own improvement plan. The condition of the home and its support system is an important consideration for the designer in choosing a cost effective solution which balances protection from earthquakes with the cost of the improvement.

If existing conditions permit, the following recommendations will provide additional protection for existing homes located in seismically active areas:

1. Install earthquake resistant bracing systems in addition to the support (pier, etc.) system. Install bracing systems designed to be secured to the main beams of each home section and to the footings.

- OR -

Manufactured homes should be anchored or secured to the ground according to the manufacturer's recommended installation instructions for the Wind Zone where the home is installed. Most manufacturers recommend ground anchors be installed only on the transverse side of the home. For earthquakes, additional anchors should be added on the front and rear of the home (four anchors per home section), two in the front and two in the back.

Where instructions are not available, anchors should be installed a maximum of ten feet on center along the transverse sides of the home, but no more than the maximum anchor spacing permitted by state or local installation standards.

2. Secure the water heaters to wall studs to resist lateral movement of the water heater.

3. Install a six foot flexible looped gas connector between the gas supply and the gas inlet on the home.

4. Home owners should consider installation of gas detectors or gas shut off devices that can stop gas flow to the home when a gas leak is detected or during an earthquake.

1.0 Summary of Code Requirements

1.1 Introduction

For the purpose of this study and in accordance with the tasks of the contract, three national seismic standards are selected:

1. American Society of Civil Engineers Standard: ANSI/ASCE 7-93;

2. Building Officials & Code Administrators International, Inc.: The BOCA National Building Code/1993, Twelfth Edition; Chapter 16 "Structural Loads"(1990 Article 11); Section 1612.0 Earthquake Loads;

3. Uniform Building Code: UBC 1994 Volume 2; Chapter 16, Structural Forces (1991 UBC Chapter 23), Revision I, Section 1603-Design Methods; Revision III, Earthquake Design.

In addition, this study identifies the parts of the Standards that apply to manufactured homes, and compares the applicable provisions of each Standard with the applicable provisions of the others.

1.2 Seismic Standards Comparison

Comparison of earthquake requirements and seismic lateral force analyses of the three selected Standards (ANSI/ASCE 7-93; BOCA 1993; and UBC 1994) reveals the following:

1. For manufactured homes (one story "light wood frame walls with wood shear panels"), the seismic design requirements of all three standards are similar.

2. The variation in the seismic force factor, for structural components in all three Standards for low rise manufactured homes, is small. The BOCA-93 and ANSI/ASCE 7-93 seismic factor is 7 percent lower than UBC-94 in seismic zone 3 and 10 percent higher in seismic zone 4 (see Appendix A).

3. The design methods and load combinations of UBC 1994 differ from ANSI/ASCE 7-93 and BOCA 1993. ANSI/ASCE 7-93 and BOCA 1993 load analysis and load combinations are based on ultimate strength design method. UBC 1994 is based on allowable working stress design method.

4. The seismic force factor (C_p) for non-structural, mechanical, and electrical components of UBC 1994 differs with ANSI/ASCE 7-93 and BOCA 1993. For manufactured homes the difference of these seismic factors is not significant; therefore, in Appendix A, tables for C_p are provided only for ANSI/ASCE 7-93 and BOCA.

1.3 Design Requirements

The seismic design requirements of evaluated standards provide a degree of protection for the public and building occupants against the potential hazards resulting from the effects of earthquake motions on buildings.

These seismic design requirements vary depending on: 1) the location of buildings in the United States; 2) the classification of buildings; and 3) the seismic performance of the buildings.

Location of Buildings in the United States

The probability of earthquake and its magnitude varies throughout the United States. The U.S. Geological Survey has prepared a number of maps for the Federal Emergency Management Agency (FEMA), and National Earthquake Hazards Reduction Program (NEHRP), Recommended Provisions for the Development of Seismic Regulations for New Building. These maps divide the United States into different seismic areas or zones.

UBC 1994 numbers the areas in 0 to 4 zones with zone 4 being the area with the highest incidence and the highest intensity of seismic activity. ANSI/ASCE 7-93 and BOCA 1993 define seismic areas in Seismic Ground Acceleration Contour Maps, which identify the effective peak acceleration (A_a) and the effective peak velocity-related acceleration (A_v). These maps can be found in Appendix A, Map 1 and Map 2 respectively. Manufactured homes that are located in seismic zones 1 and 2, or in the seismic map area having an effective peak velocity-related acceleration (A_v) value less than 0.20, are exempt from the earthquake design requirements.

UBC Zone 2-B corresponds to A_v = 0.15 to 0.20
UBC Zone 3 corresponds to A_v = 0.20 to 0.40
UBC Zone 4 corresponds to A_v > 0.40.

Classification of the Buildings

Buildings are generally classified in one of three major Seismic Hazard Exposure Groups: I, II, and III. Group I requires the lowest protection. Manufactured homes and all single family detached dwellings belong to Group I. Buildings in Group III, the highest level of protection, generally are those buildings that have a substantial public hazard due to occupancy or use. This group includes buildings with large occupant loads or with essential functions for post earthquake recovery such as fire, rescue, and police stations and hospitals with emergency treatment facilities.

Seismic Performance of the Buildings

The performance of a building in response to an earthquake is classified in one of five Seismic Performance Categories: A, B, C, D, and E. Category A has the lowest seismic performance and Category E has the highest seismic performance. The designation of the seismic performance category for a building is based on a combination of effective peak velocity acceleration (location on the Zone Map) and the Seismic Hazard Group (Importance Factor) for the building.

1.4 Equivalent Lateral Force Procedure

In the design of a building built to resist earthquake motions, the designer works within certain constraints, such as the architectural configuration of the building, the foundation and soil conditions, the possibility of earthquake, the nature and extent of earthquake, possible intensity of earthquake in the region, and construction costs.

A basis for the selection of the strength of the building and its components is found in the Seismic Standards. The required strength depends on factors such as the intensity of earthquake motions to be expected (Zone), the flexibility of the structure, and its ductility or reserve strength before damage occurs. Because of the interrelations among flexibility and strength of a structure, and the forces generated in it by earthquake motions, the design procedure must take all these various factors into account.

For the designer to determine the horizontal earthquake forces of a building or structure, the Seismic Standards have adapted and developed equations for analysis of the "Equivalent Lateral Force" or "Seismic Design Base Shear" (V).

$$V = C\,W$$

V = Seismic Design Base Shear

C = Seismic Design Coefficient
where $C = C_s$ (ANSI/ASCE 7-93 and BOCA 1993)
$C = C_f$ (UBC 1994)

W = total weight of the building plus applicable portion of other loads.

Appendix A includes a detailed analysis and tables of Seismic Design Coefficient C_s for ANSI/ASCE 7-93 and BOCA 1993 and C_f for UBC 1994 method as well as Seismic Design Base Shear calculations for manufactured homes.

2.0 Load Analysis

2.1 Introduction

In accordance with the Code Requirements and Equivalent Lateral Force Procedures mentioned in Chapter 1.0, seismic loads for any particular type of manufactured home in any given area and condition can be determined.

As a guideline for the designers, the most common type of manufactured home (single section 14′ by 66′) has been selected for the calculations of the seismic loads including the seismic base shear force of the foundation system. The seismic loads are also compared with wind load in the Manufactured Home Construction and Safety Standards.

The seismic load analysis for a multi-section home can be obtained using the assumption that each unit is designed independently with its weight being transferred to its own chassis and into its own foundation. These loads are also calculated per linear foot of home.

Because the magnitude of the seismic shear force is a direct product of the seismic coefficient and the unit weight, extra care should be used for calculating the actual total weight of the unit plus applicable portions of other loads including snow load.

Appendix B provides detailed load analysis for a model manufactured home (14′ by 66′) . The analysis shows that wind load combinations are more critical than seismic combinations in the transverse direction of a single-section home in 20 psf roof snow load. Accordingly, installers in seismic prone areas need to be sure to install homes in accordance with the manufacturer's instructions for wind resistance. Additional anchorage of the home in the longitudinal direction is also required.

2.2 Model Home Selection

In a preliminary seismic load analysis of the foundation supporting system of the manufactured home, the conclusion is that the performance of seismic load analysis of a common single-section home is sufficient to draw conclusions for most manufactured homes.

The home selected for this analysis is a 14 by 66-foot single-wide home, with 7 feet-6 inch ceiling and 78 inch main beam spacing. This unit size was chosen to represent the most critical conditions. See Appendix B for a detailed seismic load analysis and its comparison with the wind loads in the Manufactured Home Construction and Safety Standards.

2.3 Load Calculations

In accordance with the seismic code ANSI/ASCE 7-93 and BOCA 1993, the Equivalent Lateral Force or the Seismic Base Shear $V = C_s W$ (ANSI/ASCE 7-93 (2.4.2), BOCA 1612.4.1) can be used for any seismic zone, snow live load, and site conditions of any manufactured home.

The above codes do not require snow loads below 30 psf to be added to the weight of the roof. Therefore, the amount of seismic base shear force, as well as the earthquake-induced vertical loads for homes in areas with 20 psf snow load, are significantly lower than for homes in areas with snow loads of 30 psf and above. This is a major factor in calculating critical vertical load on the support system.

Table 2-1 shows the amount of seismic vertical loads P_p, horizontal loads V_p and turning moment M_p imposed to the top of each supporting system (for the assumed 6 foot on center spacing of supports) for seismic zones 3 and 4 and the minimum snow load of 20 psf. Footings and supports for manufactured homes should be designed to sustain seismic vertical, horizontal, and moment loads shown in Table 2-1. The seismic loads in Appendix B of this report are calculated in pounds per linear foot. Pier spacing will not effect the seismic loads calculated in pounds per linear foot. Figure 2-1 shows the location of these forces in both directions of the manufactured home.

Table 2-1[4]
Seismic Design Loads for Foundation System of Manufactured Homes in Seismic Zones 3 (A_v = 3.0) and 4 (A_v = 4.0), Snow Load 20 psf

LOADS FOR EACH SUPPORTING DEVICE					
Seismic Zone		Pier Spacing	Vertical Loads	Horizontal Load	Moment
UBC	ASCE A_v	(ft.)	P_p (lbs.)	V_p (lbs.)	M_p (lbs.-ft.)
3	0.30	6	4,146	126	693
4	0.40	6	4,290	201	1,106

The seismic load using ANSI/ASCE 7-93 in both the transverse and longitudinal direction of a manufactured home was calculated. These loads were compared with the wind load required of HUD Standards in Wind Zone I for single and double-section homes. Figures 2-2, 2-3, and 2-4 show the result of seismic and wind loads in both transverse and longitudinal directions.

Horizontal loads can be resisted by properly designed piers, anchors and straps, or a foundation system. This report recommends an anchor and strap system as one method of resisting the horizontal seismic loads. Recommendations in this report are based on an anchor working load equal to 3,150 pounds plus a 50 percent overload (4,725 pounds total). Anchor testing conducted for HUD[5] provided a recommendation that the maximum allowable working design for ground anchors should be limited to 1,000 pounds.

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[4]***See Appendix B for detailed analysis of P_p, V_p, and M_p.***

[5]***Laboratory Testing of Soil Anchors for U.S. Department of Housing and Urban Development, Washington, DC, WJE No. 931299, Wiss, Janney, Elstner Associates, Inc., January 13, 1995.***

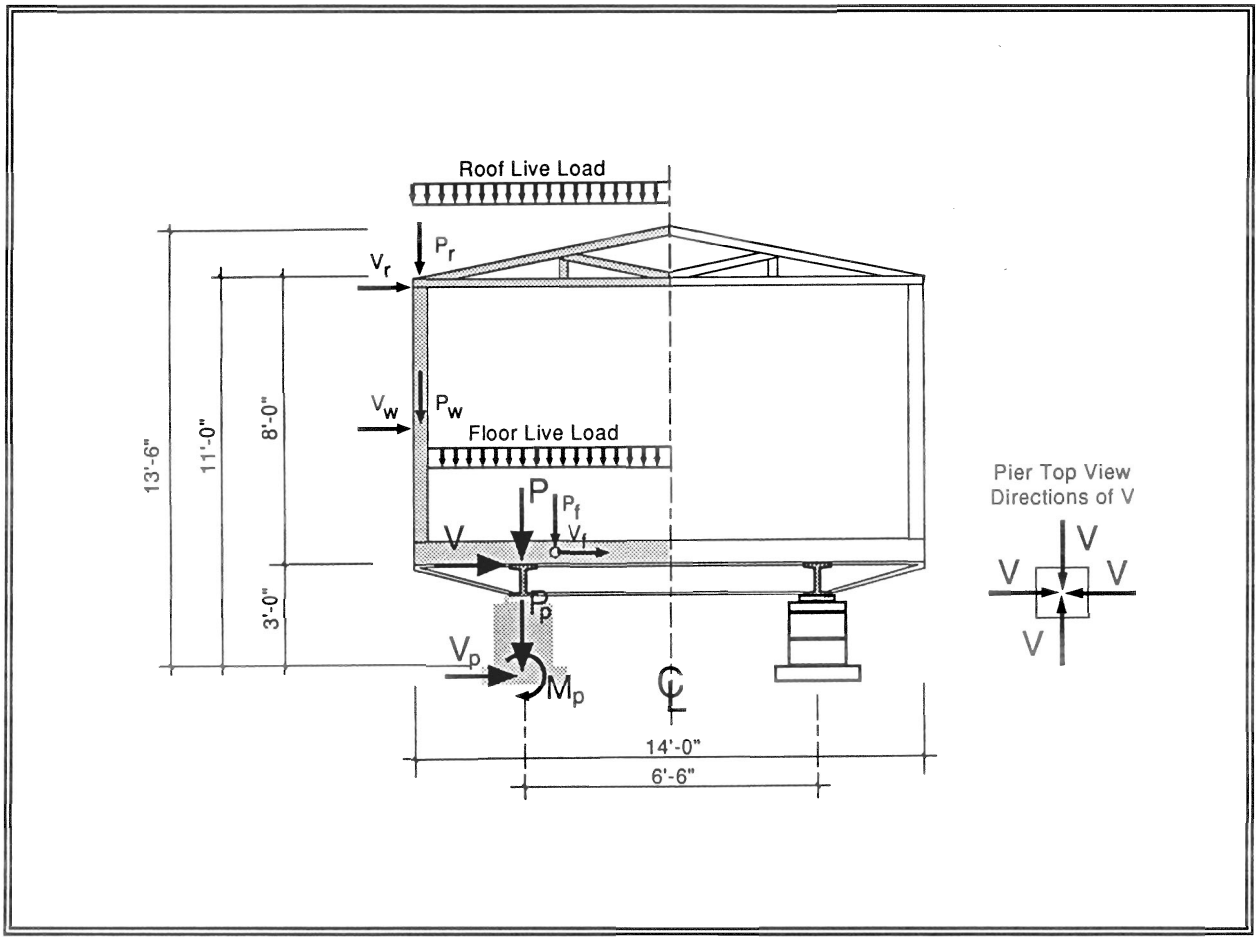


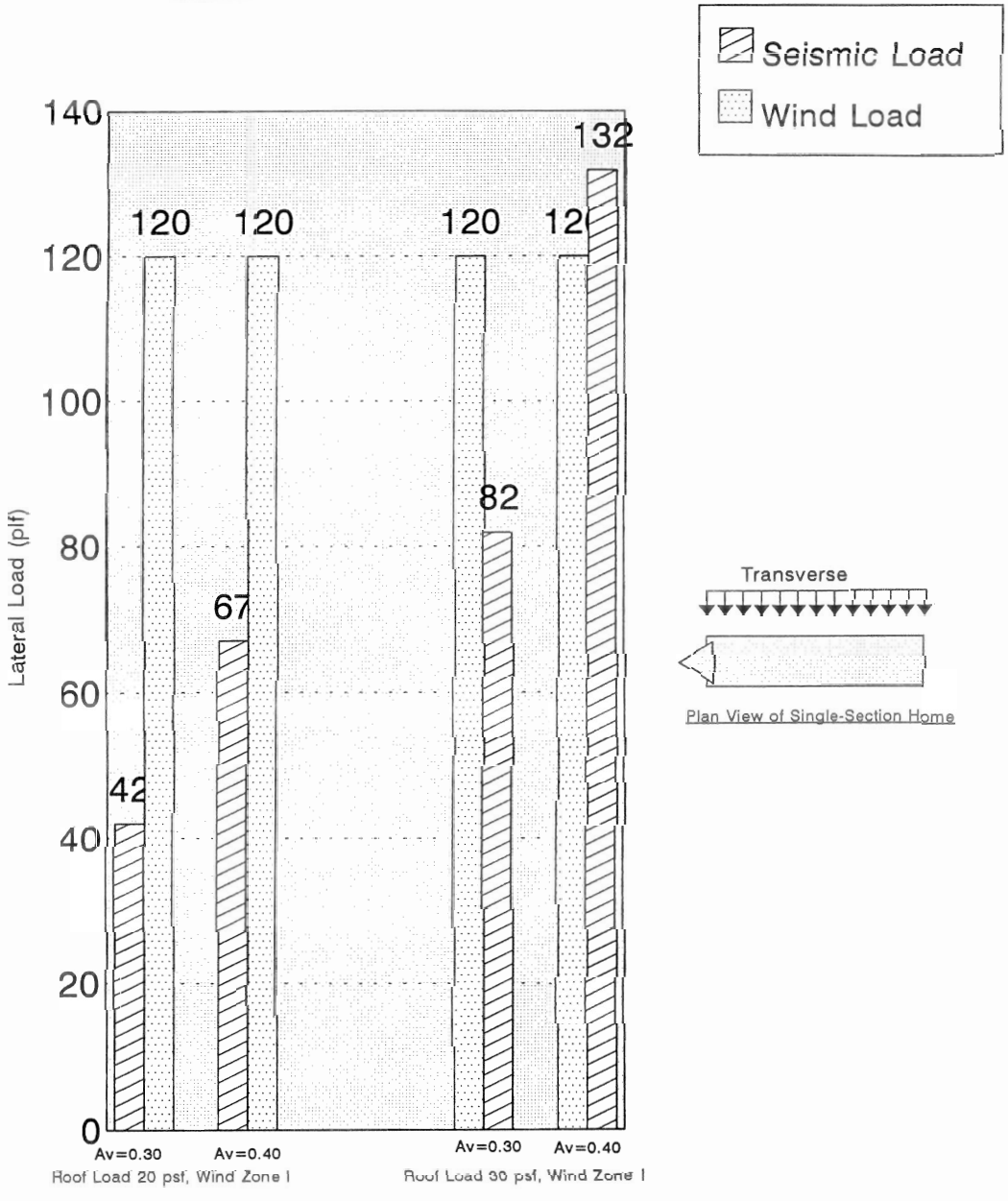
Figure 2-1. Load Configuration on a Typical Single-wide Section of Manufactured Home

P_r = Vertical roof loads at the top of each exterior wall on each side
V_r = Horizontal seismic load applied at the top of each exterior wall
P_w = Exterior wall weight
V_w = Horizontal seismic load of each exterior wall
P_f = Floor dead load + storage + equipment
V_f = Horizontal seismic load of floor
P_p = Vertical seismic load at base of the pier
V_p = Horizontal seismic load at base of the footing
M_p = Seismic moment at base of the footing

Figure 2-2. Lateral Seismic and Wind Load Comparison

Transverse Direction for Single-Section Homes

8 ft Exterior sidewall

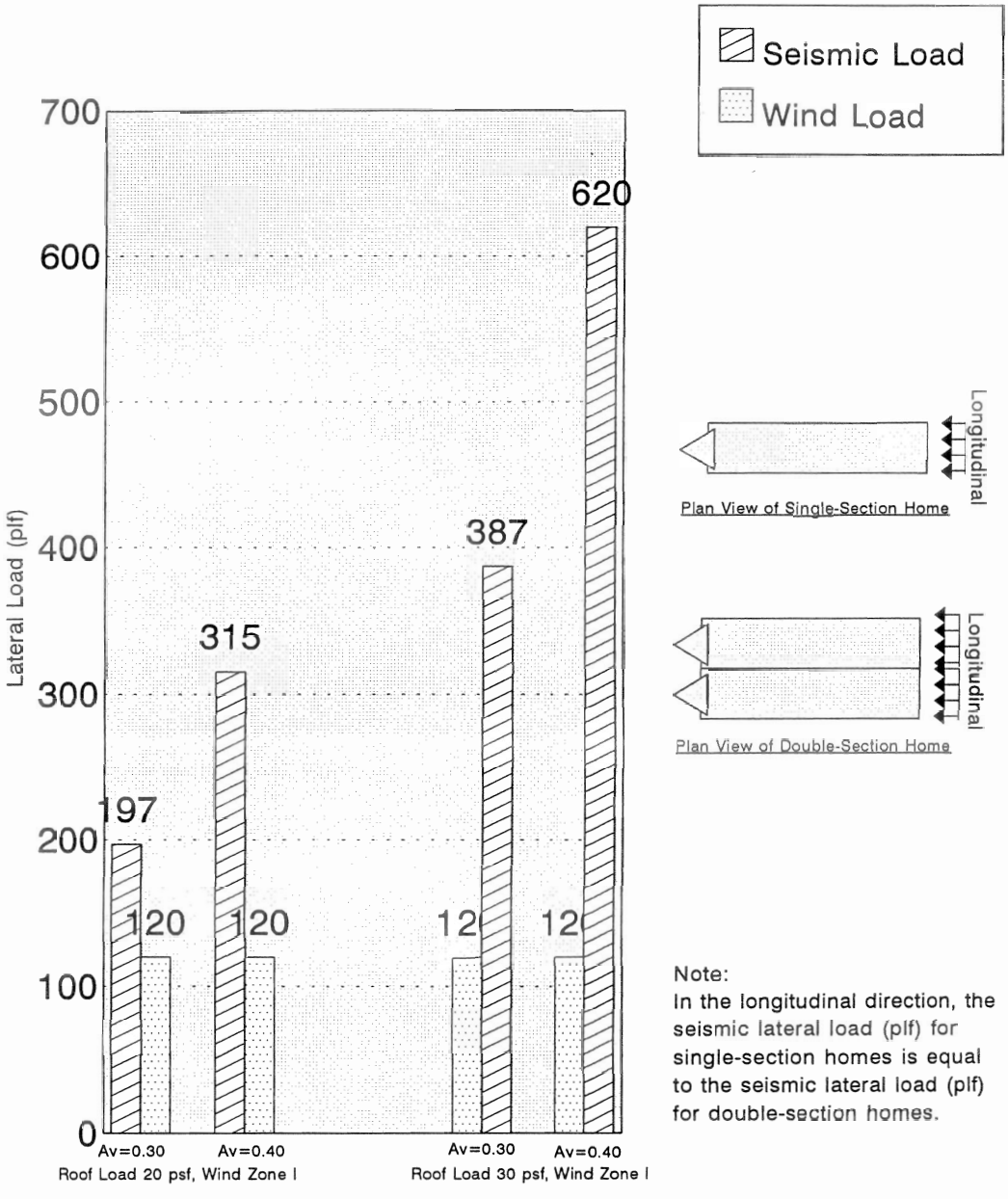


CONCLUSION: Lateral wind load exceeds seismic load in the transverse directions in all cases except for roof load 30 psf and *Av* 0.40.

Figure 2-3. Lateral Seismic and Wind Load Comparison

Longitudinal Direction For Single-Section and Double-Section Homes

8 ft Exterior sidewall



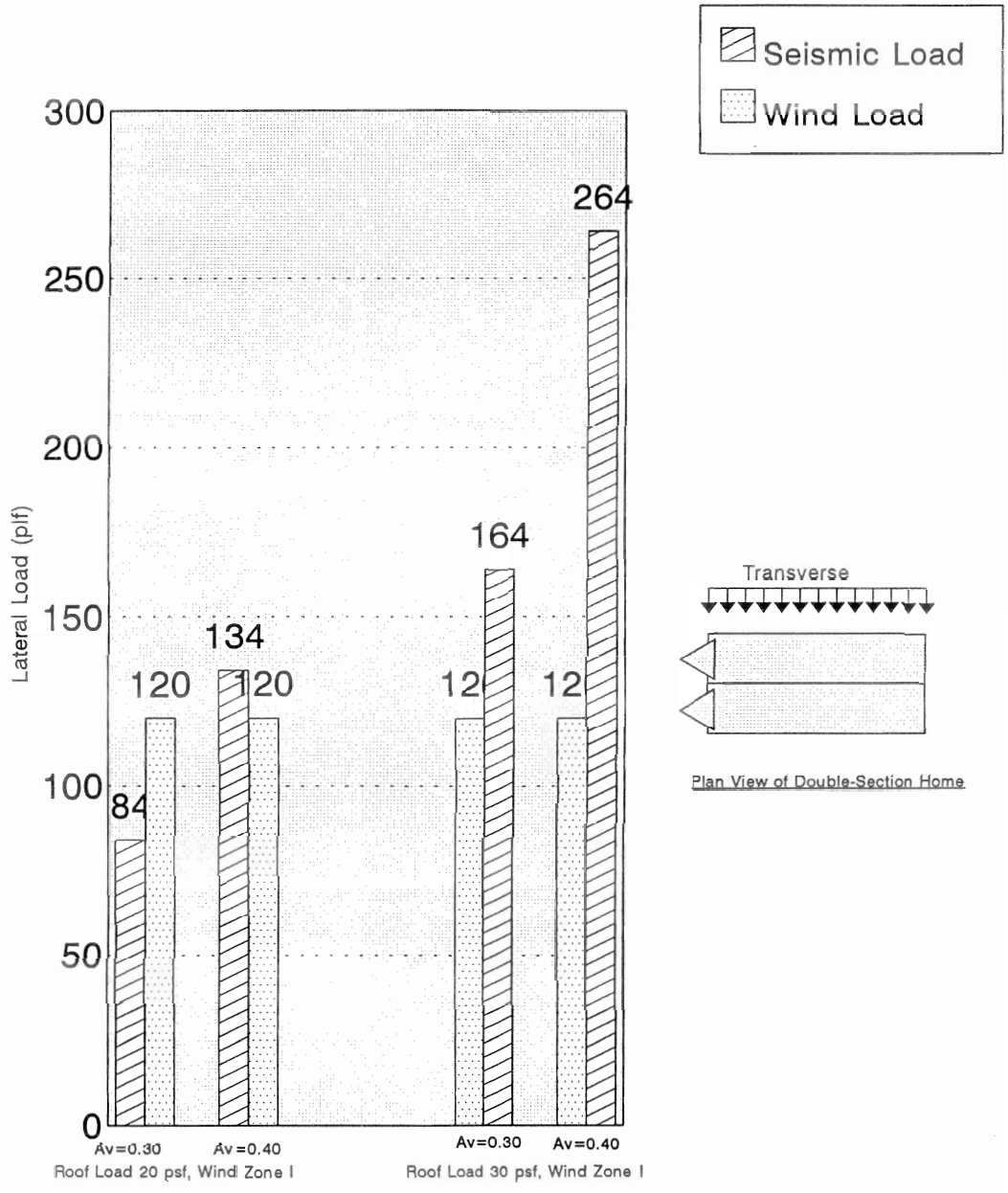
Note:
In the longitudinal direction, the seismic lateral load (plf) for single-section homes is equal to the seismic lateral load (plf) for double-section homes.

CONCLUSION: Seismic lateral load exceeds wind load in the longitudinal direction in all cases.

Figure 2-4. Lateral Seismic and Wind Load Comparison

Transverse Direction for Double-Section Homes

8 ft Exterior sidewall



CONCLUSION: Seismic lateral load exceeds wind load in the transverse direction except for roof load 20 psf and $A_v = 0.30$.

The following are the conclusions of ANSI/ASCE 7-93 Seismic Load and HUD Standard wind load in Zone I for single section home.

1. Roof snow load is the major factor in calculations of seismic load and these loads are higher for roof snow load of 30 psf and higher.

2. In roof snow load of 20 psf, seismic load is less than the wind load in the transverse direction and is more than the wind load in the longitudinal direction of a single-section manufactured home.

$A_v = 0.30$ (Seismic Zone 3)

- Transverse: Seismic = 0.40 × wind
- Longitudinal: Seismic = 1.60 × wind

$A_v = 0.40$ (Seismic Zone 4)

- Transverse: Seismic = 0.60 × wind
- Longitudinal: Seismic = 2.60 × wind

2.4 Foundation Recommendations

The conclusion of the seismic load calculations in paragraph 2.3 show that most existing support systems have not been designed and constructed to eliminate any toppling or sliding of manufactured homes during an earthquake. This conclusion is supported by study of numerous publications[1,2,5,6].

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[1] ***Northridge Earthquake Effect on Manufactured Housing in California, NCSBCS, June 17, 1994.***

[2] ***The Effectiveness of Manufactured Home Support Systems During Earthquakes, Department of Housing and Community Development, April 1992.***

[5] ***The State of California is certifying the support systems of manufactured homes installed in California, according to "California Code of Regulations Title 25, Division 1, Chapter 2, Mobile home parks.***

[6] ***1994 Northridge Earthquake Performance of Structures, Lifelines & Fire Protection Systems, US Department of Commerce, National Institute of Standards & Technology (NIST), March 1994; ICSSC TR-14, NIIR 5396 page 32, chapter 3.2.4 Manufactured Housing.***

Two of the most significant foundation design deficiencies are:

1. *Lack of connection of the homes to the support system.* Prior to September 20, 1994, a home installed in California was not required to have piers connected to the home or the pier footing[7]. A large number of existing manufactured homes are installed on support devices less than 36 inches high, and their support systems are not laterally braced. As a result, during significant seismic events manufactured homes may become separated from their supports. When this occurs the home can, and often does, slip off its support system and falls to the ground.

   When a home falls from its support system, damage is likely to occur. The piers can puncture the floor and cause significant damage to the floor structure. Damage to accessory structures, such as awning, cabanas, skirting, and decks, often occurs when a home falls from its supports. Because of the extent of the damage to these accessories, expensive replacement is usually required.

2. *Lack of horizontal force or base shear force design requirements.* Currently, most support devices for manufactured homes are designed and manufactured to resist vertical forces only. There are no mandated design requirements for resisting lateral forces. Ungrouted masonry piers may separate from their footing or separate between blocks under seismic load. Steel piers may translate, tip, and fall to the ground.

Recommendations

New Home Installations

1. HUD should revise construction standards for manufactured homes to require manufacturers that build homes for seismically active areas to provide one acceptable method of installing homes in these areas. Manufacturer's recommendations should be based on the requirements of ANSI/ASCE 7-93 or the loads specified in Table 2-2 below.

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[7] ***Mobile Home Installation Guide, State of California, August 1994***

Table 2-2
Seismic Loads at Chassis based on ASCE 7-93
(for 14′ x 66′ home)

Site Factors				Loads at Top of Chassis Beam			
Seismic Zone	Seismic Factor	Wind Load	Snow Load	Seismic Load			
				Transverse		Longitudinal	
UBC	ASCE BOCA A_v	psf	psf	Per Linear Ft.		Per Linear Ft.	
				Vertical plf	Shear plf	Vertical plf	Shear plf
3	0.30	15	20	1,382	42	6,515	197
			30	1,684	82	7,940	387
4	0.40	15	20	1,429	67	6,739	315
			30	1,813	132	8,546	620

2. HUD and state building agencies should perform tests and collect performance data during future earthquakes to determine to what extent conventional manufactured housing pier and anchor systems can be relied upon to stabilize homes in earthquakes. Tests should be conducted considering installation of homes on steel or masonry block piers. Tests should identify the allowable deflection limit for each support system.

3. State or local building agencies should require installation of new manufactured homes on support systems that are designed and installed to prevent movement of these homes during an earthquake. The following should be required:

   a) Manufactured homes should be anchored or secured to the ground according to the manufacturer's recommended installation instructions for the Wind Zone where the home is installed. Additional anchors should be added on the front and rear of the home (hour anchors per home section), two in the front and two in the back.

   b) The steel or other piers should be secured to the main beam of the home and to the footing.

c) Piers should be specifically designed to resist horizontal and vertical movement of the home.

Note: In the absence of Items a, b, and c, earthquake resistant bracing systems should be used in addition to the support system for added protection should the home move from its supports.

d) Secure the water heaters to wall studs to resist lateral movement of the water heater.

e) Measures need to be taken at the gas inlet to prevent gas leakage due to broken joints.

4. State or local building agencies should require use of a six fool flexible looped gas connector between the gas supply and the gas inlet on the home.

5. State or local building agencies should require that homes sited in areas that are both seismic prone and subject to snow loads in excess of 30 psf be installed on permanent foundations.

6. Home owners should consider installation of gas detectors or gas shut off devices that can stop gas flow to the home when a gas leak is detected or during an earthquake.

Retrofitting Existing Homes for Earthquakes

Because of the vast number and variety of existing manufactured homes sited in seismic prone areas, a general and simple solution or recommendation to improve the existing support system of a manufactured home is not feasible. Each individual home needs its own improvement plan. The condition of the home and its support system is an important consideration for the designer in choosing a cost effective solution which balances protection from earthquakes with the cost of the improvement.

If existing conditions permit, the following recommendations will provide additional protection for existing homes located in seismically active areas:

1. Install earthquake resistant bracing systems in addition to the support (pier, etc.) system. Install bracing systems designed to be

secured to the main beams of each home section and to the footings.

- OR -

Manufactured homes should be anchored or secured to the ground according to the manufacturer's recommended installation instructions for the Wind Zone where the home is installed. Most manufacturers recommend ground anchors be installed only on the transverse side of the home. For earthquakes, additional anchors should be added on the front and rear of the home (four anchors per home section), two in the front and two in the back.

Where instructions are not available, anchors should be installed a minimum of ten feet on center along the transverse sides of the home, but no more than the minimum state installation requirements.

2. Secure the water heaters to wall studs to resist lateral movement of the water heater.

3. Install a six foot flexible looped gas connector between the gas supply and the gas pipe inlet on the home.

4. Home owners should consider installation of gas detectors or gas shut off devices that can stop gas flow to the home when a gas leak is detected or during an earthquake.

2.5 Cost Impact Analysis

Cost impact analysis for the foundation system of the manufactured home requires a detailed design and knowledge of the individual site conditions. However, based on the above recommendations, the cost of an improved support system to reduce or eliminate the damage resulting from future earthquakes will be below the total cost of any permanent foundation for a manufactured home. Also, the total cost of improvements will be below the cost to repair, raise, and reset an earthquake damaged manufactured home.

3.0 Effect of Earthquakes on Accessory Structures

In the event of a significant earthquake, manufactured homes may fall, slide or become separated from their accessory structures including decks, skirting, awnings and cabanas. If this occurs, the home and its accessory structures can sustain major damages.

To reduce damage to manufactured home accessory structures in the event of earthquakes, the following is recommended:

1. As it was discussed in chapter two of this report, the support system and the foundation of a manufactured home should be able to withstand all seismic forces in all directions. If the home is prevented from falling or sliding off the support system to the ground, damage to the home itself or its accessories is prevented.

2. All the accessory structures of a manufactured home should have their own independent support and foundation system. These support and foundation systems should be able to withstand all seismic forces.

3. In order to reduce or prevent movement of the homes and their accessory structures, it is recommended that the concrete footings of the accessories and the manufactured home be connected.

4.0 Methods to Prevent Earthquake Damage to Utility Connections

4.1 Introduction

Earthquake damage to utility connections, such as gas, electric, water, and drainage, can cause severe damage to manufactured homes. The most significant damage can be from severed or leaking natural gas connections. In the 1994 Northridge, California earthquake, damaged gas connections resulted in fires at several manufactured home parks. In some parks, the fire started in one home and, driven by a light wind, spread to other units. Fortunately, there was no loss of life from these fires. A California Department of Housing and Community Development report identified 184 homes damaged by fire directly attributable to the earthquake. More than 80 percent of these damaged homes occurred in just four manufactured home parks. Post-earthquake interviews with residents of several manufactured home parks revealed that the smell of natural gas permeated the air immediately after the earthquake.

Gas leaks and fires attributable to the earthquake were traced to two general sources: 1) main gas connections to homes were damaged when homes fell from their foundations and landed on the gas meters; and 2) gas connections to water heaters were damaged or severed when the heaters fell from their compartments and landed outside the homes.

Electrical, water, and drainage connections were also damaged when the homes shifted from their foundations. Damage to these utility systems generally did not appear to pose risk of serious injury. While utility damage caused disruption of these services to several homes, little other damage attributable to these systems was evident.

Damage to a home and its attachments will be minimized by preventing movement of the home. In addition, damage to utility systems will be minimized. However, many current homes in areas likely to experience earthquakes are installed on support systems inadequate to resist seismic forces. Earthquake-resistant bracing (ERB) systems may be installed under homes and often minimize movement of the homes, but these systems may not be designed to prevent movement in all directions.

The following paragraphs examine contributing factors that cause damage to the utility connections and appliances in manufactured homes. The discussion applies to the majority of currently sited manufactured homes where some movement of the homes from their support systems is unavoidable. The cause of fires in manufactured homes is also examined and recommendations are made to minimize the occurrence of natural gas-fed fires.

4.2 Gas Utility Connection to the Home

Movement of homes from their support systems and movement of appliances caused a number of gas leaks and fires after the earthquake. Main gas connections to homes were damaged when homes fell from their foundations and landed on the gas meters. Gas connections to water heaters were damaged or severed when the heaters fell from their compartments and landed outside the homes.

While natural gas requires a source of ignition to explode or burn, it is relatively easy to ignite, especially in confined areas where concentrations are high. Natural gas can be ignited by pilot lights in appliances and by sparks from switches or electrical devices. Electrical switches or devices can spark when turned on or off; therefore, when gas is believed to be present, it is advisable to leave switches in their current position to avoid the possibility of electrical sparks.

Homes that fall from their foundation systems can damage gas piping under the homes in addition to the main gas connections. The most damage to piping and connections is likely to occur when homes fall so that the chassis and floor rest directly on the ground. Because many gas systems are designed and installed with gas pipes crossing under the chassis beams of homes, these pipes and joints are likely to fail under the weight of the falling homes.

At Northridge, California, however, the most significant hazards and spectacular fires were caused by damage to gas meters, flexible connections, and main connections caused when homes shifted, fell, and then broke the meter or its main connections.

Two factors limit the movement of a manufactured home before damage to the gas meter or main connection occurs: 1) the length of the flexible connection from the meter to the home gas system inlet; and 2) the location of the meter with respect to the home.

In most installations, the home gas system must be connected to the gas meter through an approved flexible gas connector pipe. This flexible connector allows significant movement of the manufactured home before damage to the gas system occurs. For example, the California Department of Housing and Community Development allows a flexible gas connector to be a maximum of 6 feet long. A gas meter located 3 feet from the home's gas inlet pipe will permit the home to move 3 feet toward or away from the meter without significant risk of damage to the flexible connector.

The location of the gas meter relative to the manufactured home also limits the allowable movement of the home. In this case, a meter located close to the home is susceptible to damage from being struck by the home or from the home falling on the meter. Few model or state codes, however, address location of meters with respect to the home. The National Fuel Gas Code states that the gas meter cannot be located under the home nor within 3 feet of an ignition source, but it does not identify how far from the perimeter of the home the gas meter should be located. The safe distance a home can fall toward the meter, therefore, is limited by the location of the meter and not the length of the flexible connector.

Positioning the home so that the gas inlet is half the length of the flexible connector away from the gas meter connection will minimize damage to the flexible gas connector, the meter, or its connections. Figure 4.1 shows installation of a home 3 feet from the gas meter. The connection between the gas meter and the gas piping inlet on the home is made with a 6-foot long flexible connector.

Positioning the home 3 feet from the gas meter has some drawbacks. First, lot size and offset requirements may not allow such space between the meter and the home. Second, the flexible connector may be damaged by lawn mowers or children playing around the home. Someone could also trip over the exposed flexible connector.

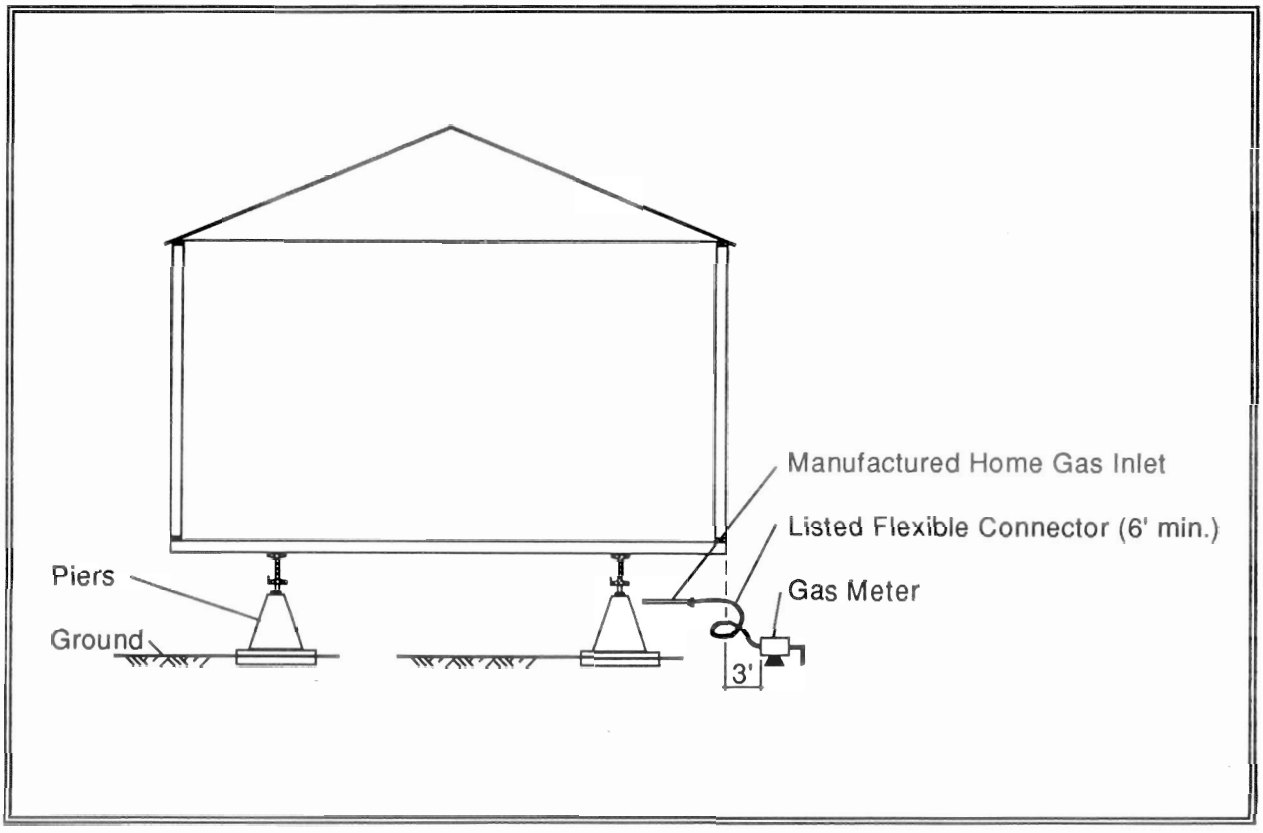

Figure 4-1. Gas Meter Installation

Gas utilities in California have been experimenting with devices that will stop gas flow either when a gas leak is sensed or during seismic ground motion. These devices currently are not required for residential construction in most parts of the United States. Three different devices are being tested in California. A seismic shutoff device, which is installed in the gas line leading to a manufactured home, will stop gas flow when a predetermined level of seismic ground motion is encountered. A free-flow gas sensor essentially monitors pressure differential between the supply and line side of the sensor. Significant pressure drop on the line side of the sensor, typically caused by a rupture in the gas system, will result in the sensor stopping gas flow. Finally, gas sensors installed in the home detect gas vapors in the air and transmit a signal to an electrically operated valve that can stop gas flow using the home's electrical power or a battery backup in the event of power failure.

4.3 Equipment Connections to the Home Structure

The Federal Standards for manufactured home construction currently require that appliances such as water heaters be secured in all homes to withstand transportation of the home from its production facility. However, securement for transportation may not be adequate to resist earthquake forces. The effect of an earthquake on an appliance is directly proportional to the weight of the appliance. During construction and transportation of a home, the water heater is usually not filled with water. The empty weight of a water heater is generally less than 100 pounds. A filled water heater may weigh as much as 500 pounds. The following equation from ANSI/ASCE 7-93 identifies the lateral force that must be resisted during an earthquake for adequate support of a water heater.

The Component Seismic Lateral Force F_p is
$F_p = C_p \times W_c$
Where:
C_p (component seismic force) = 0.4 for manufactured homes

Water heater operating weight is assumed to be 500 pounds.
Calculation assumes that home will be installed in Seismic Zone 4 ($A_v = 0.40$).
W_c = 500 pounds
$F_p = 0.4 \times 500$ pounds = 200 pounds

The lateral force of 200 pounds can be resisted by constructing connections and supports designed to resist 200 pounds. One acceptable design that is being implemented for new and existing construction in California requires wrapping the top and bottom of the water heater with two loops of 3/4 inch × 24 gauge steel plumber's tape and securing the steel tape to a wall stud. Figure 4-2 shows one acceptable method of securing the water heater in its compartment.

A second consideration for water heater securement is that the water heater will have to be periodically replaced. In many homes more than 10 years old, the water heater will probably be replaced by the home owner or a plumbing contractor. The home owner or plumbing contractor must be informed of the importance of securement of the water heater to resist earthquake forces.

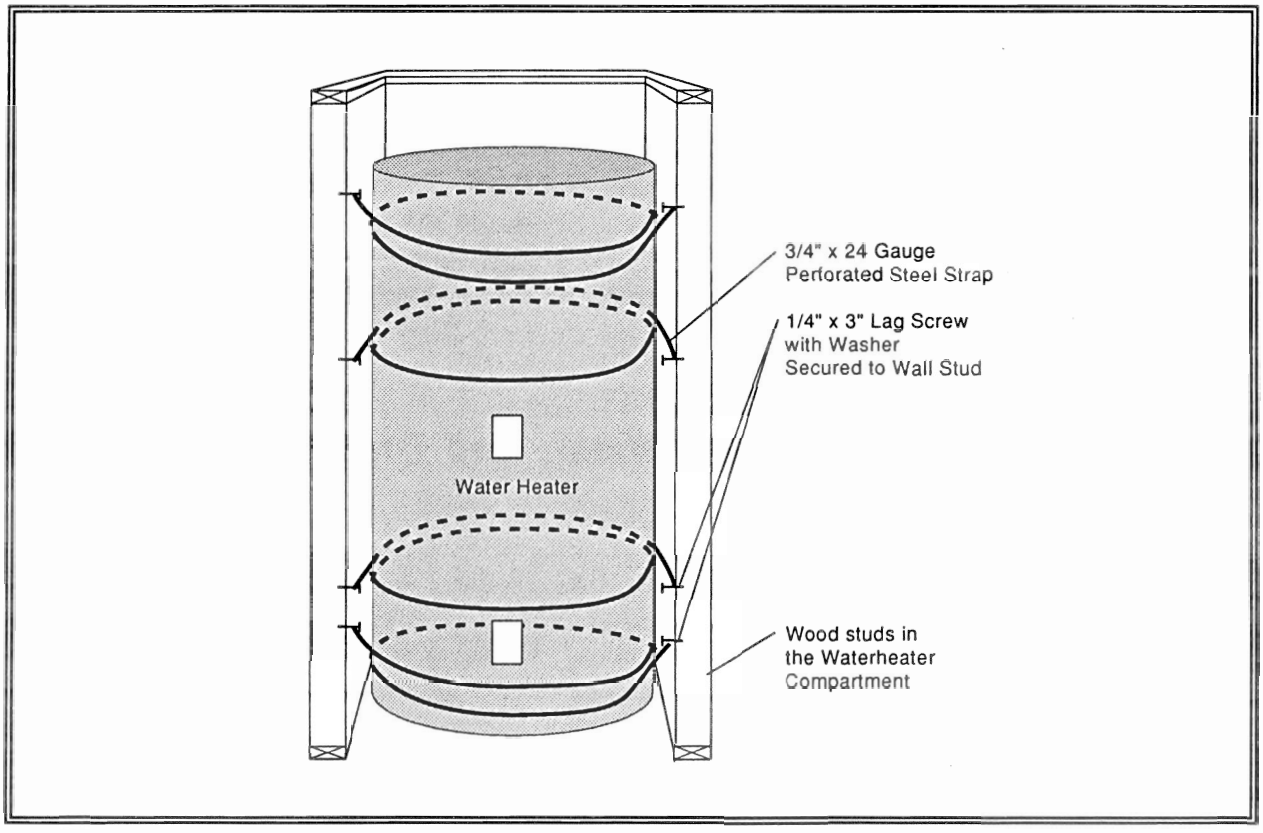

Figure 4-2. Securement of Water Heaters to Wall Studs

Other appliances including the range, refrigerator, washer, and dryer should also be secured to resist earthquake forces. Theses appliances will experience less earthquake force because their weight is less than a filled water heater. Appliances other than water heaters should be secured to wall or floor framing members resist a lateral force of 50 pounds.

Listed flexible gas appliance connectors are often used for connection of gas appliances in manufactured homes. ANSI Z21.24-1987 states that a gas appliance connector is not for vibration isolation and that the connector is not designed for movement after installation. However the use of flexible connectors between the house piping system and the appliance piping probably averted more serious damage to the gas system by allowing some movement of gas appliances without damage to the gas system. Because the flexible gas connectors are not designed for movement after installation, the connector should be tested for leaks if there is movement of the home during an earthquake.

In cases where movement of the home or appliance was significant after the Northridge earthquake, the gas connector or gas pipe was often damaged. Water heaters installed in compartments accessible from outdoors were observed toppled outside the home, suspended only by the elongated flexible gas connector itself. Some toppled water heaters caused the gas connector to sever or caused the gas pipe to break at the joint before or after the appliance shutoff valve. One of two fires in Oakridge Mobile Home Park, where 66 homes burned, is believed to have been fueled by gas from a pipe ruptured from a water heater falling from a home.

4.4 Electric, Water, and Drain Connections to the Home

Connection of the electric, water, and drainage systems to the manufactured homes performed well, provided that the home did not move far from its original position. However, when a home shifted more that a few inches or fell even one or two inches, rigid connections were often damaged. Damage to the electrical utility connections to a manufactured home are potentially dangerous and can generate sparks that lead to fires. Disruption of the water and drainage systems can result in tangible economic loss to society, but will not necessarily result in loss of life.

4.5 Utility Service at Parks

Some manufactured home communities (parks) are designed so that certain utilities can be turned off from one location. A "master meter" installation is where a park owner or manager purchases utility service, such as natural gas, in bulk from the supplier. The supplier owns and maintains the gas pipe up to the master meter. All gas pipe from the master meter to the individual home sites is owned and maintained by the park. Each home site has a meter by which each home owner pays the park owner for the amount of gas used.

Where a master meter installation is used, gas supply to the entire park can be disconnected by the park manager in an emergency. Likewise, gas supply can generally be disconnected by the gas utility company before the gas supply enters the park. Disconnecting supply to a large area or manufactured home park is, however, done with caution. Once the gas supply is disconnected, each home must be tested for gas leaks before the

supply for that house can be safely reconnected. Pilot lights will also have to be relit when the gas supply is returned.

Water and electrical supply can generally be disconnected by the appropriate utility. Reconnection of these utilities generally does not require testing of the water or electrical systems inside each home.

4.6 Recommendations to Minimize Damage

Damage to utilities under the manufactured home will be significantly reduced if the home is prevented from moving from its foundation. A properly designed and installed foundation system will distribute earthquake forces through its connections without failure of the connections or movement of the home. Damage to utilities can also be minimized by limiting the movement of a home. Earthquake resistant bracing (ERB) systems that catch a home before it falls to the ground can prevent damage to the gas meter. ERB systems that minimize horizontal movement of the home protect the flexible gas connector by not allowing excessive displacement of the flexible connector.

To reduce damage to manufactured home utilities in the event of an earthquake, the following is recommended:

1. Where practicable, a manufactured home should be installed so that its gas inlet is 3 feet from the gas meter. Connect the gas meter to the gas piping system with a 6-foot long flexible gas connector to allow up to 3 feet of horizontal movement of the home toward or away from the gas meter with little risk of damage to the gas meter.

2. Home manufacturers should brace the water heater and other appliances, primarily gas appliances, to structural supports to resist earthquake forces. Earthquake bracing of the water heater or other appliances is not currently required by the Federal Standards for manufactured home construction. Earthquake bracing of these appliances can be done by the home manufacturer at very little cost to assure proper bracing for the life of the appliance.

3. Because flexible gas connectors are not designed for movement after installation, the connector should be tested for leaks if there

is movement of an appliance or movement of the home during an earthquake.

4. Seismic shut-off devices can be installed on the gas system to the home to stop gas flow when seismic activity is experienced.

5. Free-flow monitors, or gas sensors can be installed on the gas system to stop gas flow should a leak be detected.

5.0 Testing and Research Recommendations

5.1 Introduction

The contractor was required to identify the areas of testing and research that will validate the recommendations made in this report, particularly if there is no current technical or historical data available.

Recommendations for testing and research:

5.2 Performance of anchors during earthquakes

Very limited test or experience data is available to verify how the ground anchors used in manufactured housing perform during earthquakes. There are many factors that may affect the performance of the ground anchors:

- The affect of reversal of loads on the anchors. The reversal of loads may reduce the capacity of the anchors.[8]

- Deflection of the ground anchor in earthquake loads. Because the vibration loads have a short frequency, the anchors may deflect differently than under static loads. An anchor test report conducted for HUD[8], showed that tested anchors experienced horizontal deflections up to five inches without reaching the anchor's minimum allowable working load as defined in the standards. During earthquakes, it will be necessary to keep the deflection to a minimum to reduce the damage to the home so that it does not fall off the piers or the utility connections do not break.

- Performance of anchors in different soils. It is anticipated that anchors in different types of soil will perform differently in earthquakes. For instance, anchors placed in sandy soils may not perform well during earthquakes as the vibration during earthquakes may reduce the friction or cohesion between sand particles and may reduce the capacity of the ground anchors. The anchors in clay soil, on the other hand, may have less reduction in the capacity of the ground anchors.

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[8]***Laboratory Testing of Soil Anchors for U.S. Department of Housing and Urban Development, Washington, DC, WJE No. 931299, Wiss, Janney, Elstner Associates, Inc., January 13, 1995.***

- Performance of ground anchors in saturated soil. The presence of moisture in the soil may impact on how the ground anchors may perform during earthquakes.[8]

In 1994, California started requiring use of ground anchors for manufactured home installations. However, very few homes installed in the past had ground anchors. Therefore, no data was available regarding performance of the homes with anchors in California.

Recommendations for testing performance of ground anchors:

The department should consider testing performance of ground anchors in three or four main different types of soils with varying degree of saturation. The test should also evaluate the affect of different frequency of vibrations caused due to earthquakes.

Recommendations for collecting historical performance data:

During future earthquakes, the department should consider collection of data on how the manufactured homes with anchors have performed differently than those homes that were not anchored. The inspector should try to identify the type of soil at each location and make any observation about the moisture content in the soil to facilitate a better understanding of the field condition.

5.3 Performance of multi-section of homes during earthquakes

The department should consider collecting data on how the multi- section homes have performed under the earthquake, particularly, an observation should be made if there have been any separation between the two halves at the floor and roof levels. Currently, the two sections are required to be designed to resist only wind loads. The earthquake loads are harmonic in nature and may cause the two sections to vibrate at different frequencies. This will result in the two sections being pulled in the opposite direction with significant amount of forces. The current designs

[8]***Laboratory Testing of Soil Anchors for U.S. Department of Housing and Urban Development, Washington, DC, WJE No. 931299, Wiss, Janney, Elstner Associates, Inc., January 13, 1995.***

do not consider this condition. Therefore, a field inspection will evaluate the performance of the connections between the two halves. The field inspector should also identify the type of installation method used for connection of the two halves if it is possible. This will help provide additional information on how to strengthen these connections.

5.4 Anchoring of equipment to structural members

The department should consider collecting data on how various methods of securing equipment to the structure (such as water heater, gas ranges, heating systems, clothes washer and dryer, etc) has helped reduction in damage. Primarily, the concern is about the gas equipment since the shaking may damage the flexible connections. Specific attention should be given to review the stability of water heaters as the water heaters are filled with water and have fallen down.

5.5 Performance of various types of earthquake resistant bracing (ERB) systems

A number of ERB systems are available in the market. Investigation was conducted for HUD after the Northridge earthquake to evaluate different types of ERB systems. A report prepared by Wiss, Janney, Elstner Associates[9] concluded that the most effective ERB systems were those which are inherently stable in the horizontal plane, i.e., those capable of remaining vertical when subjected to horizontal motions.

5.6 Performance of seismic motion detectors or gas-flow monitors

These types of devices have recently become available in the market. They are being improved upon and made inexpensive. The Department should consider collecting research data, in partnership with utilities, to determine if there is a need to establish a minimum performance criteria

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[9]***Manufactured Housing Earthquake-Resistant Bracing Systems Subjected to the Northridge Earthquake, WJE No. 931299, Wiss, Janney, Elstner Associates, Inc., February 8, 1994.***

and to determine the effectiveness of these systems to prevent fire damage during future earthquakes.

The above testing and research will help verify and improve recommendations made in this report in reducing damage to the manufactured housing due to earthquakes and in mitigating such damages in a cost effective manner.

6.0 Standard Change Recommendations

6.1 Introduction

Based on the load analysis for manufactured homes in seismically active areas, a recommendation is made to revise standards for the construction and installation of these homes. The Federal Manufactured Home Construction and Safety Standards (Standards) are standards for the design and construction of manufactured homes built for installation in the United States. NCSBCS/ANSI A225.1-1994 (ANSI A225.1) - Manufactured Home Installations, is a voluntary standard for the installation of manufactured homes. ANSI A225.1 has been adopted by states and local jurisdictions primarily for installation of used manufactured homes where the manufacturer's instructions are not available.

6.2 Recommendations

The Federal Manufactured Home Construction and Safety Standards should be revised:

1. To require that water heaters be factory anchored to the structure to resist 200 pounds of lateral load. Other factory installed appliances should be anchored to the structure to resist 50 pounds of lateral load, primarily where the appliances are supplied by gas. Alternately, manufacturers can determine actual working load of appliances and calculate seismic lateral load from Appendix A of this report or ANSI/ASCE 7-93.

2. To require use of a six foot flexible looped gas connector between the gas supply and the gas inlet on the home when the home is installed in seismically active areas.

3. To require home manufacturers to provide one acceptable method of installing homes in seismically active areas. Manufacturer's recommendations should be based on the requirements of ANSI/ASCE 7-93 for areas with $A_v = 0.20$ or greater or the loads specified in Appendix B of this report.

NCSBCS/ANSI A225.1 should be revised to address installation of manufactured homes in areas subject to seismic activity. This section should:

1. Identify seismic areas that would require special installation procedures.

2. Require installation of manufactured homes on support systems designed and installed to prevent movement of the home during an earthquake when the home is installed in the defined seismic area. The following existing support systems are capable of significantly resisting movement of a home provided that a home is also anchored to prevent front to back movement:

   - Concrete block piers and ground anchors installed in all directions.

   - Steel, concrete, or other manufactured piers and ground anchors as recommended above provided that the steel, concrete or other manufactured pier is secured to the main beam of the home and to the footing.

   - Piers specifically *designed* to resist horizontal and vertical movement of the home. The piers will be connected to a continuous poured concrete footing under each home section and to the main beam of the home.

   - Earthquake resistant bracing systems can be used in addition to the support system for added protection should the home move from its supports.

3. Require that homes sited in areas that are both seismic prone and subject to snow loads in excess of 30 psf be installed on permanent foundations.

4. Require that water heaters installed in compartments accessible from outside be inspected for securement to structural members. Water heaters and other heavy appliances should be secured at the top and bottom of the appliance to prevent movement during an earthquake.

Appendix A: Analysis of Seismic Code Requirements

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A-1 Introduction

The criteria for the design and construction of manufactured homes in earthquake prone areas, Section 9 of ASCE Standards ANSI/ASCE 7-93 ANSI Approved May 12, 1994, Section 1612.0 of the BOCA National Building Code/1993 Twelfth Edition, and Chapter 16 Division III of UBC Uniform Building Code 1994, hereafter collectively referred to as "Standards," present criteria for the design and construction of buildings and similar structures subject to earthquake ground motions.

The earthquake provisions and analysis of lateral forces of ASCE-7-93/5/12/94 and BOCA 1993 are almost identical for manufactured housing. The calculations of seismic forces of UBC 1994 differ with the above mentioned two standards; therefore, both methods of calculation are explained below.

A-2 Equivalent Seismic Lateral Force Analysis According to ASCE and BOCA

Seismic Base Shear

The seismic base shear (V) in a given direction shall be determined in accordance with the following equation.

$$V = C_s W$$

Reference: ANSI/ASCE 7-93
BOCA-93: 1612.4.1

Where:

C_s = The seismic design coefficient.
W = The total dead load and applicable portions of other loads listed below:

1. In areas used for storage a minimum of 25 percent of the floor live load which for manufactured housing is $0.25 \times 40 = 10$ psf.
2. The actual partition weight or a minimum weight of 10 psf of floor area.
3. Total operating weight of permanent equipment (hot water heater, dishwasher, washing machine, sink, bath tub, whirlpool, etc.).
4. For roofs with snow load 30 psf or more, the snow load shall (Re: ANSI/ASCE 7-93, 9.4-2; BOCA-93: 1612.4.1.1) be included in total dead load CW.

$$C_s = \frac{1.2\ A_v\ S}{R\ T^{2/3}} \leq \frac{2.5\ A_a}{R}$$

Reference ANSI/ASCE 7-93
9.4.2 and 9.4.3;
BOCA-93, 1612.4.1

Where:

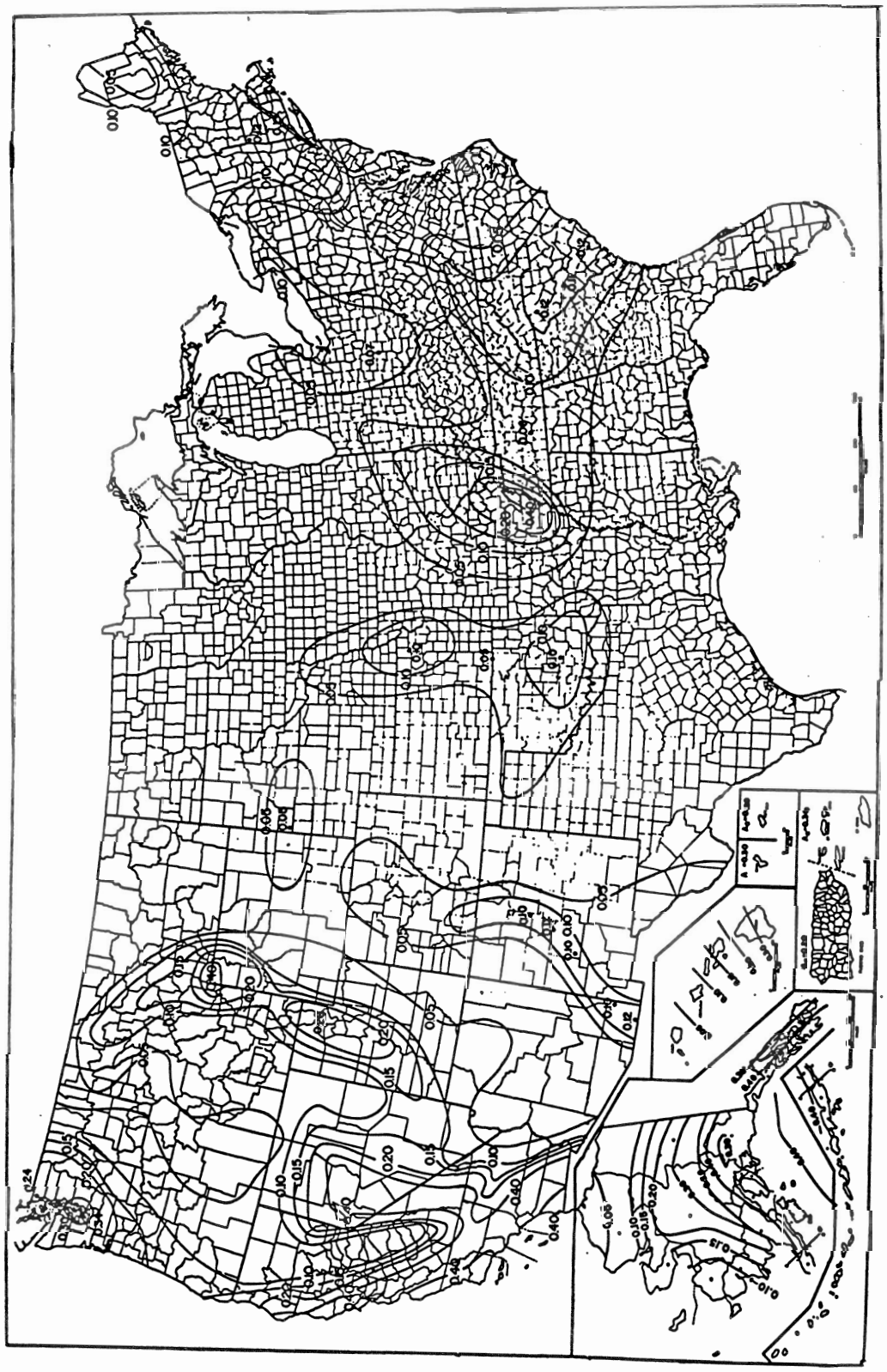
A_a = Seismic coefficient for effective peak acceleration from Map 1.
A_v = Seismic coefficient for effective peak velocity-related acceleration from Map 2.
S = Coefficient for the soil profile characteristics of the site.
R = 6.5 = the response modification factor for manufactured homes (light frame walls with shear panels).
T = The fundamental period of the building.

$$T_a = C_t\ h_n^{3/4}$$

$$T \leq T_a\ C_a$$

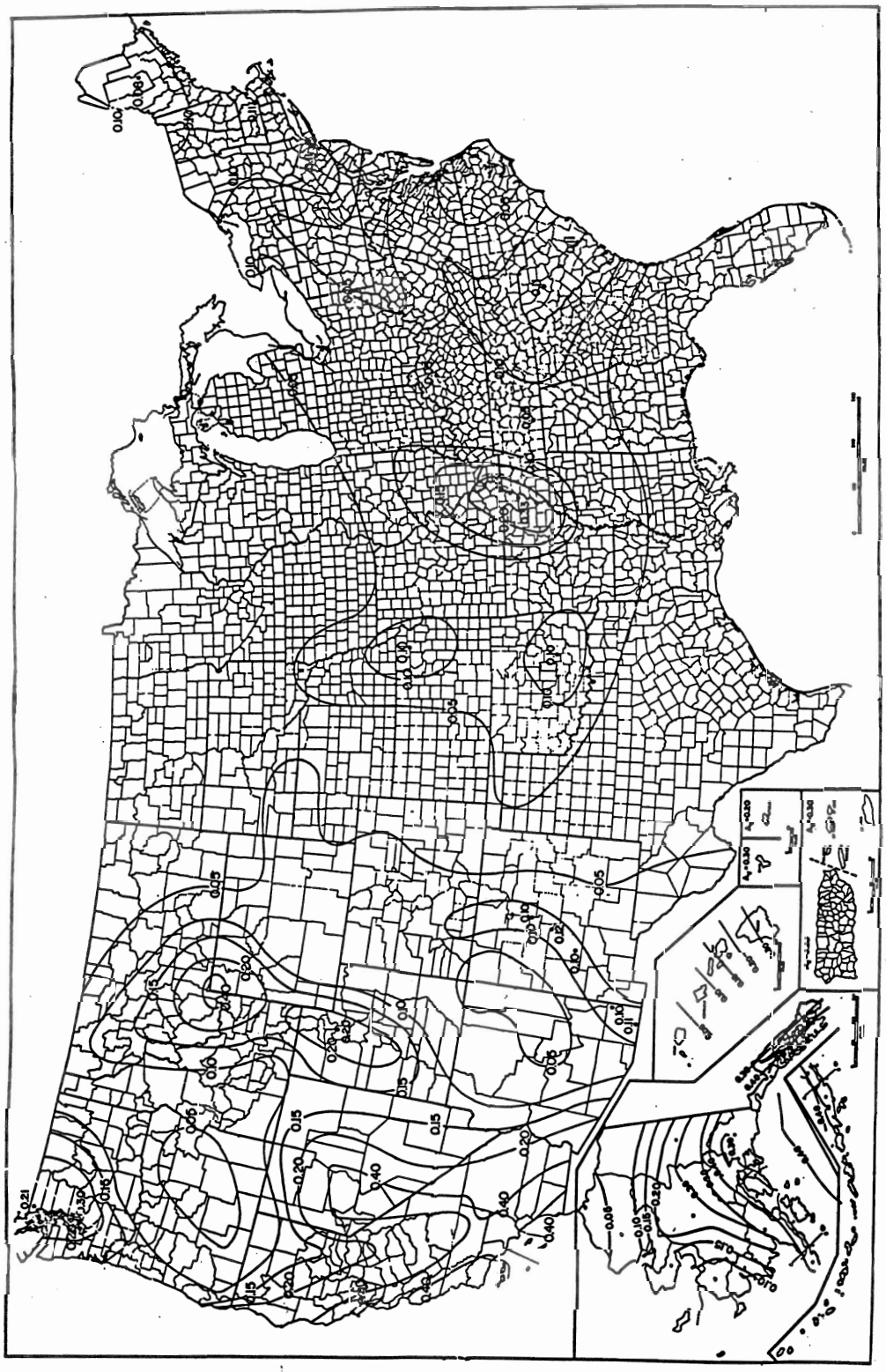
Where:

C_t = 0.02; for manufactured housing in which the lateral force-resisting system consists of light wood panels.
h_n = 13.5; the assumed highest level above the base of manufactured housing in feet.
C_a = Coefficient for upper limit on calculated period (C_a = 1.3 for A_v = 0.3 and C_a = 1.2 for A_v = 0.4).
T_a = 0.1N; the approximate fundamental period of home, N= number of stories.



MAP 1

Contour Map for Coefficient A_h



MAP 2

Contour Map for Coefficient A_v

Table A-1. The Seismic Coefficient C_s for One Story Wood-Framed Manufactured Housing Based on BOCA-93 & ANSI/ASCE 7-93

A_a	A_v	S	R	C_t	h_n	C_a	T	$C_{s\text{-}1}$	2.5 A_a	C_s
0.25	0.3	1.5 2.0	6.5	0.02	13.5	1.3	0.13	0.323 0.431	0.625	0.096
0.40	0.4	1.5 2.0	6.5	0.02	13.5	1.2	0.12	0.462 0.615	1.000	0.154

The C_s is calculated based on the limitation of the 2.5 A_a/R for both seismic zones 3 and 4 for manufactured homes. The soil profile S, respond modification factor R, and fundamental period of the building T are not the major factors in obtaining seismic coefficient C_s using ANSI/ASCE 7-93 and BOCA-93 in low rise manufactured home design.

A-3 Equivalent Seismic Lateral Force Analysis According to UBC

Seismic Design Base Shear

The total seismic base shear (V) in a given direction shall be determined from the following formula.

$$V = \frac{ZIC}{R} \times W$$ Ref: UBC-94: 28-1

$$V = C_f W$$

$$C_f = \frac{ZIC}{R_w}$$

$$C = \frac{1.25\,S}{T^{2/3}} < 2.75$$

$$T = C_t (h_n)^{3/4}$$

Where:

C_f = A coefficient used in this report to compare code loads.
W = The total seismic dead load and applicable portions of other loads listed below.
1. In storage areas a minimum of 25 percent of the floor live load, which is $0.25 \times 40 = 10$ psf for manufactured housing.
2. Where a partition load is used in the floor design, a load of not less than 10 pounds per square foot (psf) shall be included.
3. Total weight (operating weight) of permanent equipment shall be included.
4. Where design snow loads exceed 30 psf the design snow load shall be included.

Z = Seismic zone factor. Z = 0.30 for zone 3 and Z = 0.40 for Zone 4.
I = 1.0 = importance factor for manufactured housing. (Ref: UBC-94: Table 16-K)
R_w = 8.0 = numerical coefficient for one story light-framed walls with wood shear panels. (Ref: UBC-94: Table 16-N)
C = Numerical coefficient
S = Site coefficient for soil characteristics. (Ref: UBC-94: Table 16-J)
T = Fundamental period of vibration, in seconds, of the structure in the direction under consideration. (Ref: UBC-94: 1628-(28-3)
C_t = 0.02 = numerical coefficient for manufactured housing with wood panel system. (Ref: UBC-94: 1628.2.2)
h_n = 13.5 feet= the manufactured housing height above ground level.

Table A-2. The Seismic Design Factor C_f and C_f vs. C_s for One Story Wood-Framed Manufactured Housing in Seismic Zone 3 and 4 using UBC-94

Seismic Zone	S	Z	I	C_t	$h_n^{3/4}$	T	$T^{2/3}$	C_1	C	ZIC	R_w	C_f
3	1.5 2.0	0.30	1.00	0.02	7.04	0.14	0.27	6.944 9.259	2.75	0.825	8.0	.103
4	1.5 2.0	0.40	1.00	0.02	7.04	0.14	0.27	6.944 9.259	2.75	1.100	8.0	.138

The C_f coefficient is calculated based on the limitation of the 2.75 for both seismic zones 3 and 4 for manufactured home. The soil profile S, and fundamental period of the building T are not the major factors in obtaining coefficient C using UBC-94.

Table A-3. Summary of Coefficient of Seismic Lateral Force in Three Different Standards

Standard	Seismic Zone 3	Seismic Zone 4
ANSI/ASCE 7-93 & BOCA-93	0.096	0.154
UBC-94	0.103	0.138

The variation in the result of coefficient of design seismic force in all three standards for low rise manufactured homes are small. The BOCA-93 and ANSI/ASCE 7-93 coefficient is 7 percent lower than UBC-94 in seismic zone 3 and 10 percent higher in seismic zone 4. The soil profile, respond modification factor, and fundamental period of the building are not the major factors in obtaining seismic coefficient in manufactured home design.

A-4 Architectural, Mechanical, and Electrical Components

A-4.1 General

This section establishes minimum design levels for architecture, mechanical, and electrical components and systems.

All architectural, mechanical, and electrical systems and components shall be designed and constructed to resist seismic forces determined in accordance with this Section, except houses assigned to Seismic Performance Category A, B and C.

The interrelationship of systems or components and their effect on each other shall be considered so that the failure of an architectural, mechanical, or electrical systems or component shall not cause the failure of an architectural, mechanical, or electrical system and component with a higher performance criteria factor (P). The effect on the response of the structural system and deformational capacity of architectural, electrical, and mechanical systems or components shall be considered where these systems or components interact with the structural system.

The component seismic force shall be applied at the center of gravity of the component nonconcurrently in any horizontal direction. Mechanical and electrical components and systems shall be designed for an additional vertical force of 33 percent of the horizontal force acting up or down.

Components shall be attached such that the component forces are transferred to the structural system of the house. Component seismic attachments shall be positive connections without consideration of frictional resistance.

The design documents shall include sufficient information relating to the attachments to verify compliance with the requirements of this section.

A-4.2 Mechanical and Electrical Component Design

Components listed in Table A-4 and their attachments shall be designed and detailed in accordance with the requirement of Section 4. The design criteria for components or systems shall be included as part of the design documents.

A-4.2.1 Forces

Components and their means of attachment shall be designed for seismic forces (F_p) determined in accordance with the following equations:

Reference ANSI/ASCE 7-93
9.8-2

$$F_p = C_p W_c$$

$$C_p = A_v C_c P a_c$$

Where:

F_p = Seismic force applied to a component of a building or equipment at its center of gravity.
C_p = Seismic component force-factor.
A_v = Seismic coefficient representing effective peak velocity-related acceleration from MAP 2.
C_c = Seismic coefficient for architectural components from Table A-4.
P = Performance criteria factor.
a_c = Amplification factor = 1 (ASCE Table 9.8-3).
W_c = Weight of components.

The force (F_p) shall be applied independently vertically, longitudinally, and laterally in combination with the static load of the element.

Table A-4
Mechanical and Electrical Component Seismic Coefficient (C_c) and Performance Criteria Factor (P)

Mechanical and Electrical Component or System	Component or System Seismic Coefficient C_c	Performance Criteria Factor (for Seismic Hazard Exposure Group I) P
Fire protection equipment and systems	2.0	1.5
General Equipment: Furnaces, incinerators, water heaters and other equipment using combustible energy sources Chimneys, flues, smokestacks and vents Reciprocating or relating equipment, heat exchanger Utility and service interfaces	2.0	0.5
Pipe Systems: Gas and high hazard piping Other pipe systems	2.0 0.67	1.5 0.5
HVAC and service ducts	0.67	0.5
Electrical panel boards and dimmers	0.67	0.5
Lighting Fixtures	0.67	0.5

Table A-5
Mechanical and Electrical Component Seismic Force-Factor (C_p) for Manufactured Housing

Mechanical and Electrical Components or Systems	C_c	P	A_v	C_p
Fire protection equipment and systems	2.0	1.5	0.2 0.3 0.4	0.60 0.90 1.20
General Equipment	2.0	0.5	0.2 0.3 0.4	0.20 0.30 0.40
Gas and High Hazard Piping	2.0	1.5	0.2 0.3 0.4	0.60 0.90 1.20
Other Pipe Systems	0.67	0.5	0.2 0.3 0.4	0.07 0.10 0.14
HVAC and Service Ducts	0.67	0.5	0.2 0.3 0.4	0.07 0.10 0.14
Electrical Panel Boards and Dimmers	0.67	0.5	0.2 0.3 0.4	0.07 0.10 0.14
Lighting Fixtures	0.67	0.5	0.2 0.3 0.4	0.07 0.10 0.14

Appendix B: Seismic Loads Analysis

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B-1 Seismic Force Analysis

B-1.1 Introduction

Appendix A of this report compares the equivalent lateral force procedure of the seismic provisions of ANSI/ASCE 7-93, BOCA-93, and UBC-94.

The requirements and the lateral force calculations of ASCE and BOCA are almost identical. The structural requirements of UBC 1994 are similar to the ASCE and BOCA, but the procedure for calculating the lateral force differs from the ASCE and BOCA.

All seismic forces and load combinations are calculated in this Appendix based on ANSI/ASCE 7-93 and BOCA 1993. Design forces are tabulated for Seismic Zones 3 and 4 in Tables B-1, B-2, and B-3 of this Appendix.

The seismic base shear $V = C_s W$ has been analyzed in the following tables for a typical 14 by 66-foot home and compared with wind load in the manufactured home standard.

The loads in this table are calculated for the longitudinal half of the 14 by 66-foot home. Because of symmetrical form, the loads for the other half are identical.

The weight of all interior walls and appliances are distributed evenly through the whole floor as part of the floor dead load. The shear and vertical loads in the tables are shown in pounds per linear foot of home and can be used for other home models including multi-section homes.

Figure B-1 shows the seismic shear forces and turning moment are shown in one direction. These forces are the same for the opposite and perpendicular directions.

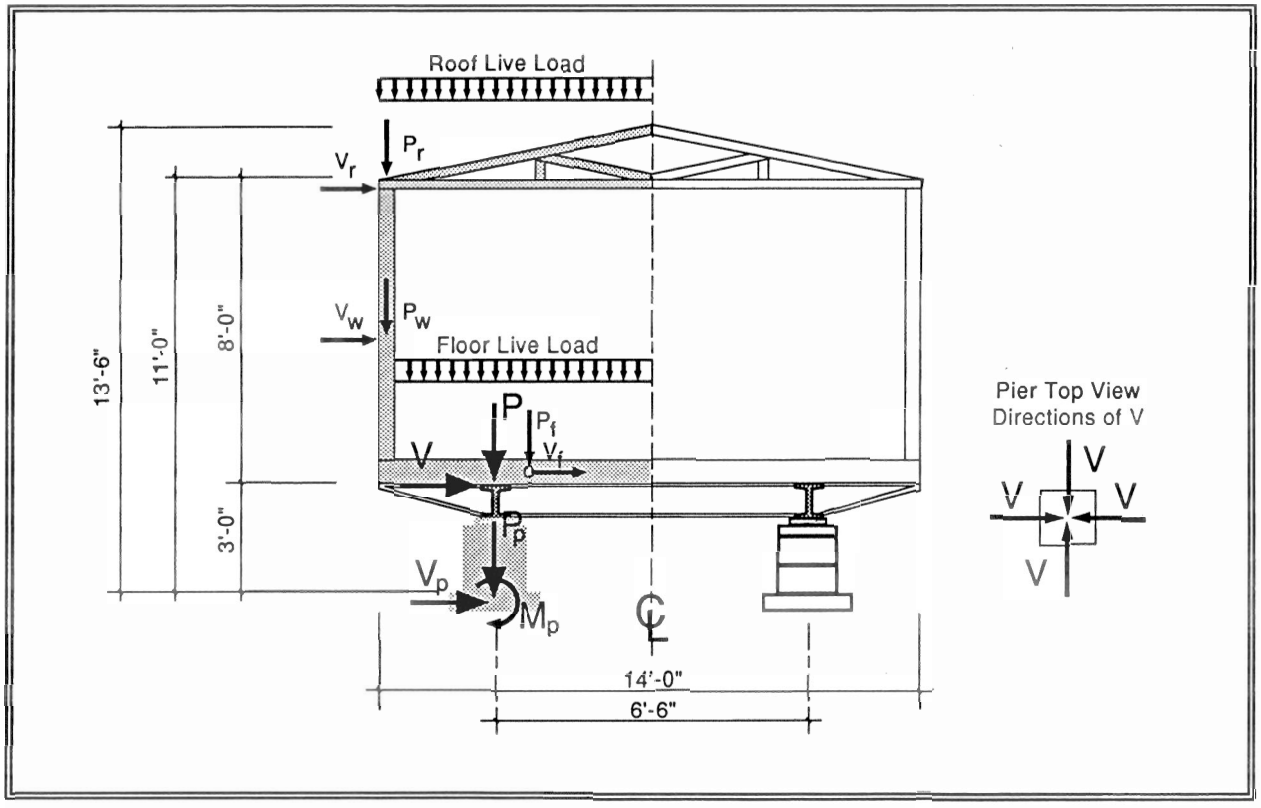

Figure B-1. Load Configuration on a Typical Single-wide Section of Manufactured Home

B-1.2 Load Assumptions and Combinations:

Typical 14 by 66-foot single-section home with 7.5 foot side wall height and 78 inch I-beam spacing was assumed in load calculation.

Dead Loads

1. Roof dead load = 10 psf
   (Including the weight of wood trusses, sheeting, roof cover, insulation, gypsum board. electrical wiring and ceiling fixtures). The roof dead load varies from 8 psf to 12 psf.

2. Floor dead load = 10 + 3 psf[10]
   (Including the weight of floor joists, decking, floor covering, insulation, plumbing and duct work, permanent fixtures, interior partitions). Higher floor dead load is considered to obtain the most critical seismic loads.

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[10] *24 CFR Ch. XX Part 3280, Manufactured Home Construction and Safety Standards, Subpart J, April 1, 1994 Edition*

3. Exterior walls = 4.5 psf
   (Including wood framing, interior gypsum boards, insulation. exterior sheeting and siding, electrical wiring). 7′-6″ sidewall height was assumed.

Live Loads

1. Roof live load = 20 psf
2. Roof snow load = 30 psf
3. Floor live load = 40 psf
4. Zone I Wind load lateral 15 psf, uplift = 9 psf. Uplift load was not included in the seismic load calculation for most critical load combination.

Additional Load Assumptions

1. 10% of the floor area used for storage; 25% of the floor live load added as storage extra load evenly distributed throughout the entire floor area.
2. Operating weight of all equipment 1000 lbs (including water heater, water tub, etc.) evenly distributed throughout the entire floor area.

Load Combinations

Structures and structural components to resist seismic forces must be designed based on the most critical load combinations. The following summarizes the different load combination in three different standards for both working stress design and ultimate strength design.

Combining Loads Using Allowable Working Stress Design

BOCA: **Reference: BOCA-93, 1616.1.1**

1. Dead + floor live + roof live (or snow)
2. Dead + floor live + wind (or seismic)
3. Dead + floor live + wind + ½ snow
4. Dead + floor live + snow + ½ wind
5. Dead + floor live + snow + seismic
6. Dead + seismic

ASCE: Reference: ANSI/ASCE 7-93, 2.3.1

1. Dead
2. Dead + floor live + (roof live or snow or rain)
3. Dead + (wind or earthquake)
✓ 4. Dead + floor live + (roof live or snow or rain) + (wind or earthquake)
   This load combination is the most critical loading condition in manufactured home foundation design.

UBC: Reference: UBC-91, 1603.6

1. Dead + floor live + roof live (or snow)
2. Dead + floor live + wind (or seismic)
3. Dead + floor live + wind + ½ snow
4. Dead + floor live + snow + ½ wind
5. Dead + floor live + snow + seismic

Combining Loads Using Ultimate Strength Design

BOCA: Reference: BOCA-93, 1616.1.1

7. (1.1 + 0.5 A_v) dead + floor live + (.07) snow + seismic
8. (0.9 - 0.5 A_v) dead + seismic
9. (0.9 - 05 A_v) dead + (2R/5) seismic
10. (1.1 + 0.5 A_v) dead + 1.0 live + 0.7 snow ± (2R/5) seismic

Where:

A_v = The seismic coefficient representing effective peak velocity-related acceleration (Appendix A, Map 2)
R = The response modification factor of the seismic-resisting system (Appendix A)

ASCE: Reference: ASCE 7-93, 2.4.2

1. 1.4 Dead
2. 1.2 Dead + 1.6 live + 0.5 (roof live or snow or rain)
3. 1.2 Dead + 1.6 (roof live or snow or rain) + (0.5 live or 0.8 wind)
4. 1.2 Dead + 1.3 wind + 0.5 live + 0.5 (roof live or snow or rain)
5. 1.2 Dead + 1.0 earthquake + 0.5 live + 0.2 snow
6. 0.9 Dead − 1.3 wind or + 1.0 earthquake

The most critical loading combination with working stress design method is used in the following tables to obtain seismic lateral and vertical loads. The working stress design is the current design method used in manufactured home construction.

B-1.3 Table of Load Analysis

The following tables with a sample calculation indicate the seismic vertical and shear loads on 14 by 66 foot typical manufactured homes. These loads are also compared with wind load requirements of HUD Standard in Wind Zone I (15 psf lateral and 9 psf uplift).

Table B-1 shows the total seismic vertical and shear loads on main I-beam of single section home. Table B-2 shows same load from Table B-1 per linear foot of home on both transverse and longitudinal directions, and compare them with wind load.

Table B-3 shows seismic and wind load on each pier spaced at 6′-0″ o.c. under manufactured home.

Table B-1. Seismic vertical Load (P) and Shear Load (V) Analysis at the Chassis using ANSI/ASCE 7-93 & BOCA-93 (14′ by 66′ Home)

SITE FACTORS					ROOF		WALL		FLOOR		TOTAL LOAD AT EACH CHASSIS BEAM						
Seismic Factors					Vert.	Horz.	Vert.	Horz.	Vert.	Horz.	Load Combination						
Zone	A_a	A_v	C_s	SL	P_r lbs.	V_r lbs.	P_w lbs.	V_w lbs.	P_f lbs.	V_f lbs.	DL lbs.	Q_E lbs.	E lbs.	FLL lbs.	RLL lbs.	P lbs.	V lbs.
#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16	#17	#18
3	0.25	0.3	0.096	20	4,620	444	2,700	259	7006	673	14,326	1,412	3,561	18,480	9,240	45,607	1,376
				30	18,480	1,774	2,700	259	7006	673	28,186	4,686	8,914	18,480	13,860	55,580	2,706
4	0.4	0.4	0.154	20	4,620	711	2,700	416	7006	1,079	14,326	2,262	5,127	18,480	9,240	47,173	2,206
				30	18,480	2,846	2,700	416	7006	1,079	28,186	7,518	13,155	18,480	13,860	59,821	4,341

Seismic Vertical Load $(P) = DL + FLR + RLL + E$
Seismic Shear Load $(V) = V_r + V_w + V_f$

The roof snow load is a major factor in calculating seismic forces. The 20 psf roof snow load is not considered in seismic load analysis.

The explanation of Table B-1 design loads are as follows:

Column #	Explanation
#1	UBC Seismic Zone
#2	A_a = The effective peak acceleration (see Map 1 in Appendix A)
#3	A_v = The effective peak velocity-related acceleration (see Map 2 in Appendix A)
#4	C_s = The seismic design coefficient (ANSI/ASCE 7-93, BOCA 93)
#5	SL = Roof snow load, psf
#6	P_r = Vertical roof loads at top of each exterior wall on each side, lbs. (If $SL \geq 30$ psf, snow load is included)
#7	V_r = Horizontal seismic force applied at the top of each exterior wall = P_r x C_s (#4) × (#6), lbs.
#8	P_w = Exterior wall weight = (4.5 psf) × (7.5′) × (66′ + 2 × 7′) = 2,700 lbs.
#9	V_w = Horizontal seismic force of each exterior wall = $P_w \times C_s$ (#4) × (#8), lbs.
#10	P_f = Floor dead load + storage + equipment
#11	V_f = Horizontal seismic force on one chassis beam = $P_f \times C_s$ (#4) × (#10), lbs.
#12	DL = Dead load + snow load (if $SL \geq 30$ psf) = (#6) + (#8) + (#10), lbs.
#13	Q_E = The vertical effect of horizontal seismic induced forces
#14	E = Earthquake Load = $\pm Q_E \pm 0.5\ A_v\ (DL) + SN$ = $\pm$(#13) $\pm$ 0.5 A_v (#12),lbs Ref. ANSI/ASCE 7-93, 9.3-1 & 9.3-2
#15	FLL = Floor live load lbs.
#16	RLL = Roof live load lbs.
#17	$P = DL + FLL + RLL + E$ (#12 + #14+ #15 + #16)
#18	V = Horizontal seismic force of the top of each chassis beam = $V_r + V_w + V_f$ (#7 + #9 + #11), lbs.

The following is a sample of Table B-1. This example is based on 20 psf roof load for half of 14 by 66 foot single section on one chassis using ANSI/ASCE 7-93 and BOCA-93 Standards, $A_v = 0.40$. See Figure B-1 in this Appendix for detailed load configuration.

P_r = (14′/2 × 66′) 10 psf + no roof live load = 4,620 lbs. (#6)

$V_r = C_s \times P_r = 0.154 \times 4{,}620\# = 711$ lbs. (#7)

P_w = 4.5 psf × (66′ + 14′/2 × 2) × 7.5′ = 2,700 lbs. (#8)

$V_w = C_s \times P_w = 0.154 \times 2{,}700\# = 416$ lbs. (#9)

P_f = (14′/2 × 66′) × 13 psf + 500# + 500# = 7,006 lbs. (#10)

$V_f = C_f \times P_f = 0.154 \times 7{,}006\# = 1{,}079$ lbs. (#11)

$V = V_r + V_w + V_f = 711\# + 416\# + 1{,}079\# = 2{,}206$ lbs. (#18)

$P = DL + FLL + RLL + E$

$DL = P_r + P_w + P_f = 4{,}620\# + 2{,}700\# + 7{,}006\# = 14{,}326$ lbs. (#12)

FLL = (14′/2 × 66′) × 40 psf = 18,480 lbs. (#15)

RLL = (14′/2 × 66′) × 20 psf = 9,240 lbs. (#16)

$E = \pm Q_E \pm 0.5\, A_v\, DL$

To obtain Q_E, take moment at one pier support.

$6.5'\ Q_E = [V_r \times 8' + V_w \times 8'/2] \times 2$

$Q_E = (2/6.5') \times (8' \times 711\# + 4' \times 416\#)$

$Q_E = 2{,}262$ lbs. (#13)

$E = \pm\ 2{,}262\# \pm 0.5 \times 0.4 \times 14{,}326$

$E = 5{,}127\#$ (#14)

$P = 14{,}326\# + 18{,}480\# + 9{,}240\# + 5{,}127\#$

$P = 47{,}173$ lbs. (#17)

$V = 711\# + 416\# + 1{,}079\# = 2{,}206$ lbs. (#18)

Table B-2. Comparison of Wind and Seismic Loads at the top of main chassis beams using ANSI/ASCE 7-93 and BOCA-93 (14′ x 66′ home)

SITE FACTORS				LOADS AT TOP OF CHASSIS BEAMS PER LINEAR FOOT OF HOME							
				Seismic				Wind			
Seismic Zone	Seismic Factor	Wind Load	Snow Load	Transverse		Longitudinal		Transverse		Longitudinal	
UBC	ASCE BOCA A_v	WL psf	SL psf	Per Linear ft.		Per Linear ft.		Per Linear ft.		Per linear ft.	
				Vertical P_{ST} plf	Shear V_{ST} plf	Vertical P_{SL} plf	Shear V_{SL} plf	Vertical P_{WT} plf	Shear V_{WT} plf	Vertical P_{WL} plf	Shear V_{WL} plf
#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12
3	0.30	15	20	1,382	42	6,515	197	1,348	120	6,007	120
			30	1,684	82	7,940	387	1,488	120	6,667	120
4	0.40	15	20	1,429	67	6,739	315	1,348	120	6,007	120
			30	1,813	132	8,546	620	1,488	120	6,667	120

Note: The seismic loads on double-wide section are twice as single-wide section.

In 20 psf snow zone [wind zone I and A_v = 0.30 (Seismic Zone 3)]
Seismic shear load in transverse direction = 0.40 x wind load
Seismic shear load in longitudinal direction = 1.60 x wind load
In 20 psf snow zone, wind zone I, and A_v = 0.40 (Seismic Zone 4)
Seismic shear load in transverse direction = 0.60 x wind load
Seismic shear load in longitudinal direction = 2.6 x wind load
Figures B-2 and B-3 show the graphic illustration of seismic and wind loads in 20 psf and 30 psf.

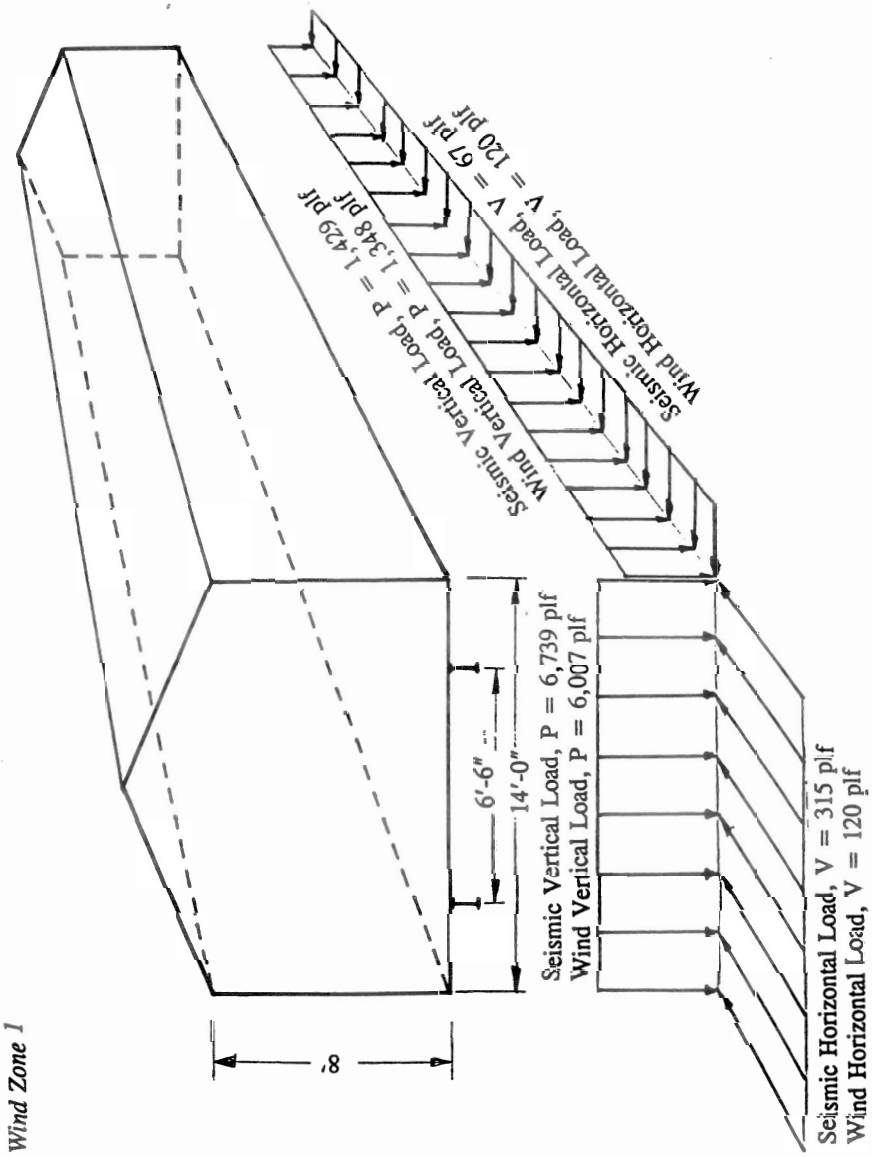
The explanation of Table B-2 design loads are as follows:

Column No.	Explanation
#1	UBC Seismic zone number
#2	A_v = The effective peak velocity-related acceleration (see map 2)
#3	WL = Design wind load
#4	SL = Roof snow load
#5	P_{ST} = Transverse vertical seismic force per linear foot
#6	V_{ST} = Transverse seismic base shear per linear foot
#7	P_{SL} = Longitudinal vertical seismic force per linear feet of home
#8	V_{SL} = longitudinal seismic base shear per linear foot
#9	P_{WT} = Transverse vertical wind load per linear foot in Wind Zone I = Dead load + floor live load + W Where: W = vertical effect of lateral wind load
#10	V_{WT} = Transverse wind base shear per linear foot
#11	P_{WL} = Longitudinal vertical wind load per linear foot
#12	V_{WL} = Longitudinal wind base shear per linear foot

FIGURE B-2 Comparison of Seismic and Wind Loads on Manufactured Homes Based on ASCE 7-93 and BOCA-93

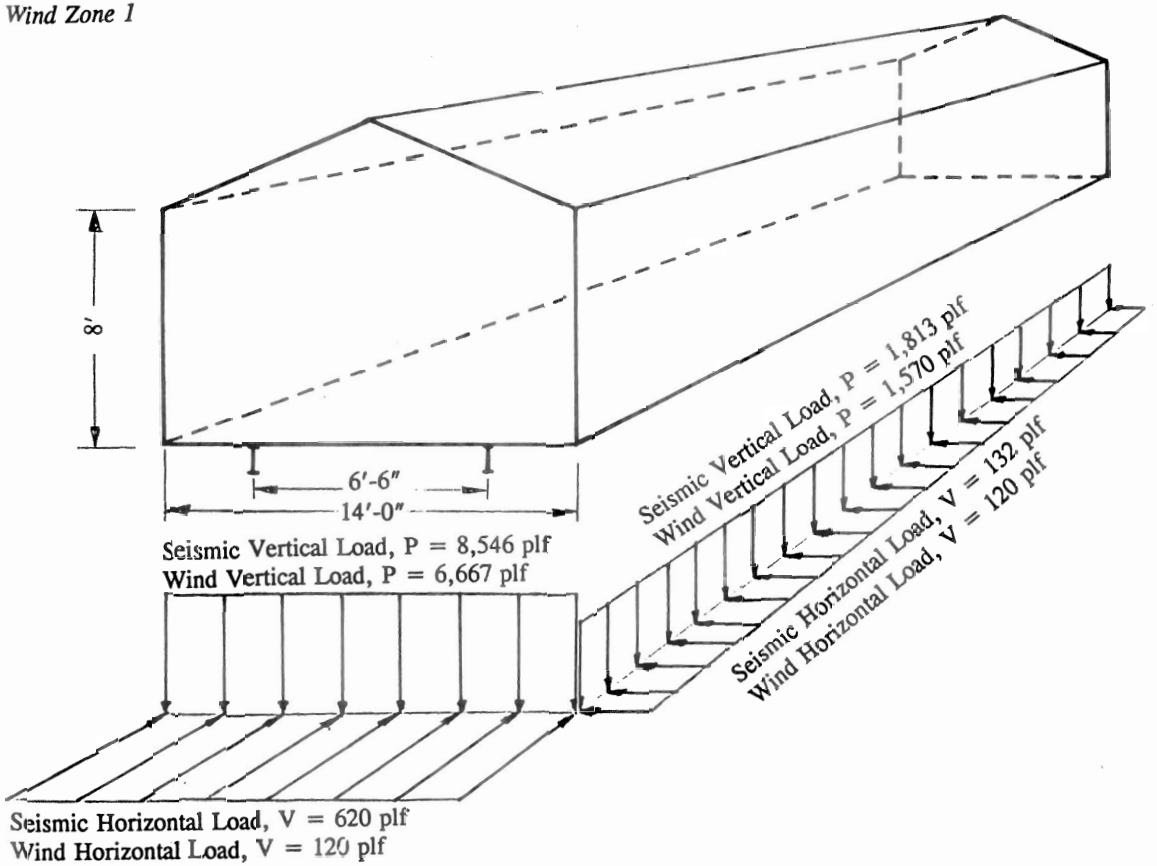
A_v = 0.40 (Seismic Zone 4)
Wind Zone 1

Roof Snow Load = 20 psf



A_v = 0.40 (Seismic Zo...
Wind Zone 1

1 = 30 psf



The following is a sample of Table B-2. This example is based on 20 psf roof line load for typical 14 by 66 foot home per linear foot using ANSI/ASCE 7-93 and BOCA-93; A_v = 0.40. See Figure B-1 in this Appendix for detailed load configuration.

All loads are multiplied by two to represent the whole house rather than half house as shown in Table B-1.

P_{ST} = P x 2/66′

P_{ST} = 47,173# x 2/66′ = 1,429 plf (#5)

V_{ST} = 2,206# x 2/66′ = 67 plf (#6)

P_{SL} = 47,173# x 2/14′ = 6,739 plf (#7)

V_{SL} = 2,206 x 2/14′ = 315 plf (#8)

P_{WT} = (DL + FLL + RLL + W)

To obtain RW, take moment at one pier support

6.5′W = (15 psf x 8′) x 8′/2 x 66

W = 4,874 lbs.

DL = 14,326 lbs. (Table B-1, #12)

FLL = 18,480 lbs. (Table B-1, #15)

RLL = 9,240 lbs. (Table B-1, #16)

P_{WT} = 2 x (14,326 lbs. + 18,480 lbs. + 9,240 lbs.) + 4,874 lbs.

P_{WT} = 88,966 lbs./66′ = 1,348 plf (#9)

In 30 psf roof load, RLL should be excluded in obtaining P_{WT}

V_{WT} = 8′ x 15 psf = 120 plf (#10)

P_{WL} = DL + FLL + RLL

= 2 x (14,326 lbs. + 18,480 lbs. + 9,240 lbs.)/14 = 6,007 lbs. (#11)

V_{WL} = 8′ x 15 psf = 120 plf (#12)

Table B-3. Comparison of Wind and Seismic Loads at the Footing of 14 by 66 foot Home

SITE FACTORS					FORCES AT EACH PIER								
					SEISMIC			WIND					
					Transverse or Longitudinal			Transverse			Longitudinal		
Seismic Zone	Seismic Factor	Wind Load	Snow Load	Pier Spacing	Vertical P lbs.	Shear V lbs.	Moment M lbs-ft.	Vertical P_T lbs.	Shear V_T lbs.	Moment M_T lbs-ft.	Vertical P_L lbs.	Shear V_L lbs.	Moment M_L lbs-ft.
UBC	ASCE/ BOCA A_v	WL psf	SL psf	O.C. ft									
#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14
3	0.30	15	20	6	4,146	126	792	4,044	360	2,520	3,823	76	532
			30	6	5,052	246	2,123	5,724	360	2,520	4,243	76	532
4	0.40	15	20	6	4,287	201	1,269	4,044	360	2,520	3,823	76	532
			30	6	5,439	396	3,406	5,724	360	2,520	4,243	76	532

Note: The seismic loads on double-wide section are twice as single-wide section.

In 20 psf roof snow zone, Wind Zone I (Seismic Zone 3):
Seismic vertical load for A_v 0.30 = 0.30 x wind load
Seismic vertical load for A_v 0.40 = 0.50 wind load

The explanations of Table B-3 design load are as follows:

Column No.	Explanation
#1	UBC Seismic zone number
#2	A_v = The effective peak velocity-related acceleration. (See Map 2.)
#3	***WL*** = Design wind load, psf
#4	***SL*** = Roof snow load, psf
#5	Pier spacing, ft.
#6	***P*** = Seismic vertical force per pier
#7	*V* = Seismic base shear for each pier in four directions
#8	***M*** = Seismic base moment for each pier in four directions
#9	P_T = Transverse vertical wind load per pier
#10	V_T = Transverse wind base shear per pier
#11	M_T = Transverse wind moment per pier
#12	P_L = Longitudinal vertical wind load per pier
#13	V_L = Longitudinal wind base shear per pier
#14	M_L = Longitudinal wind moment per pier

The following is a sample calculation of Table B-3. This example is based on 20 psf roof live load for a typical 14′ by 66′ home per linear foot using ANSI/ASCE 7-93 and BOCA-93, A_v = 0.40, pier spacing of 6′-0″ o.c. See Figure B-1 in this Appendix for detailed load configuration.

$$P = P_{ST} \text{ x } 1/2 \text{ x } 6' = 1{,}429 \text{ lbs./2 x } 6 = 4{,}287 \text{ lbs.} \quad (\#6)$$

$$V = V_{ST} \text{ x } 1/2 \text{ x } 6' = 201 \text{ lbs.} \quad (\#7)$$

To obtain M, transverse seismic moment per pier, the moment of seismic horizontal load needs to be calculated. Take summation of moments at base of footing.

(Moment arm) x $(V_r+V_w+V_f) = 11'\ V_r + 7'\ V_w + 3'\ V_f$

Moment arm = [11′ x 711 lbs. +(7′ x 416 lbs.) + (3′ x 1,079 lbs.)]/(711 lbs. + 416 lbs. + 1,079 lbs.)

Moment arm = 6.33 ft.

In 30 psf roof load, moment arm = 8.63 ft.

$$M = V \text{ x } 6.33 = 2{,}206 \text{ lbs. x } 6.33' \text{ x } (6'/66') = 1{,}269 \text{ lb-ft.} \quad (\#8)$$

$$P_T = P_{WT} \text{ x } 6'/2 = 1{,}348 \text{ lbs. x } 6'/2 = 4{,}044 \text{ lbs.} \quad (\#9)$$

$$V_T = V_{WT} \text{ x } 6'/2 = 120 \text{ lbs. x } 3' = 360 \text{ lbs.} \quad (\#10)$$

Wind moment arm is 4′ + 3′ = 7′ from the base of footing.

$$M_T = V_T \text{ x } 7'$$
$$= 360 \text{ lbs. x } 7' = 2{,}520 \text{ lb-ft.} \quad (\#11)$$

$$P_L = P_{WL} \text{ x } 14'/2 \text{ x } 6'/66'$$
$$6{,}007 \text{ x } 7 \text{ x } 1/11 = 3{,}823 \text{ lbs.} \quad (\#12)$$

$$V_L = V_{WL} \text{ x } 14'/2 \text{ x } 6'/66'$$
$$120 \text{ lbs. x } 7 \text{ x } 1/11 = 76 \text{ lbs.} \quad (\#13)$$

$$M_L = V_L \text{ x } (4' + 3')$$
$$76 \text{ lbs. x } 7' = 532 \text{ lb-ft.} \quad (\#14)$$

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