

**CSMIP STRONG-MOTION RECORDS  
FROM THE  
SIERRA MADRE, CALIFORNIA  
EARTHQUAKE OF 28 JUNE 1991**

**CALIFORNIA DEPARTMENT OF CONSERVATION  
DIVISION OF MINES AND GEOLOGY  
OFFICE OF STRONG MOTION STUDIES  
REPORT OSMS 91-03**

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CSMIP STRONG-MOTION RECORDS FROM THE SIERRA MADRE,  
CALIFORNIA EARTHQUAKE OF 28 JUNE 1991

Introduction

Strong-motion records were recovered from 94 stations of the California Strong Motion Instrumentation Program (CSMIP) after the Sierra Madre earthquake of June 28, 1991 which occurred under the San Gabriel Mountains, approximately 20 km northeast of downtown Pasadena. These 94 stations include 48 ground-response stations and 46 extensively-instrumented structures. The 46 structures include 38 buildings, six dams, an airport control tower and a power plant. The epicentral distance of the stations triggered by the earthquake ranges from 4 km for the closest (Cogswell Dam) to about 80 km for the farthest (Neenach, north of the San Andreas fault in the Antelope Valley). About half of the stations triggered were within 40 km of the epicenter.

Although the area within which stations were triggered is smaller than that for the 1987 Whittier earthquake (Shakal et al., 1987), the number of stations triggered by both earthquakes is about the same. This is due to the fact that numerous new stations were installed by CSMIP in the Los Angeles region since the Whittier earthquake. This report includes all CSMIP data from this earthquake and supersedes the quick report distributed on July 1 (CSMIP, 1991).

The estimated earthquake location and magnitude are:

Epicenter: 34.262N, 118.002W. Depth: 11 km (Caltech)  
Origin Time: 14:43:54.5, 28 June 1991 GMT (7:43 am, 28 June 1991 PDT)  
Magnitude: 5.8 ML (Caltech)

Analysis by the USGS and Caltech indicates that the earthquake had a thrust mechanism with the San Gabriel mountains on the upthrown block. Damage was moderate in the Arcadia, Monrovia, Pasadena, and Sierra Madre areas.

Highlights of CSMIP Strong-Motion Data

A total of 120 records were recovered from the 94 CSMIP stations which recorded this event. These 120 records contain data from a total of 760 strong-motion sensors. The maximum acceleration values and the station parameters are presented in the tables at the beginning of this report for all 120 records. However, records with small amplitude, typically less than 5% g, are not reproduced in this report.

Some highlights of particular interest include:

- o The CSMIP station closest to the epicenter is Cogswell Dam, located about 4 km SE of the epicenter. A peak horizontal acceleration of 58% g was recorded at the center crest in the direction parallel to the dam crest; the

peak in the transverse direction was 44% g. The peak vertical acceleration recorded was 56% g at the right crest. No significant damage has been reported at the dam, although the access roads were closed by rockfalls during the earthquake. The response of this dam was much larger than that recorded during the 1987 Whittier earthquake (about 15% g).

- o Altadena and Mount Wilson. A peak acceleration of 46% g was recorded at the Altadena station, approximately 13 km SW of the epicenter, at the eastern edge of the San Gabriel valley and the Pasadena area, on the downthrown block. The station at Mount Wilson is closer to the epicenter (7 km), and is on the upthrown block, but has lower peak acceleration (30% g) than the Altadena station.
- o Pasadena area records. Peak horizontal accelerations of about 20% g were recorded at the base of three buildings in downtown Pasadena. These include a 6-story office building with unreinforced masonry (URM) walls built in 1907, a 9-story concrete building and a 12-story steel building. The duration of strong shaking in the Pasadena area was less than 2 seconds. The 9-story concrete building responded most strongly in the north-south direction with a fundamental period of about 1.2 seconds.
- o Digital records. Approximately 30% of the CSMIP records from this event were recorded on digital recorders. These instruments provide enhanced frequency response, improved resolution at low levels of motion, and a recording of the motion before the onset of earthquake shaking (pre-event memory). These digital records allow, for the first time, accurate determination of ground velocity and displacement, and thus better knowledge of the slope of the ground motion attenuation curve, at distant stations. (Since they are already digital, the records can be easily plotted at different scales, and in this report several records are presented a second time with 4x vertical exaggeration so that details of the records can be seen easily.)
- o Burbank area records. Records from a 6-story steel building and a nearby 10-story concrete building in Burbank had peak horizontal accelerations of about 12% g. The record from the 10-story concrete building shows clearly the free vibration of the structure with a period of about 0.6 second. Larger amplitude records were obtained from these two buildings during the 1987 Whittier earthquake.
- o Downtown Los Angeles records. Records were obtained from six buildings and two ground-response stations in downtown Los Angeles, about 34 km SW of the epicenter. A peak horizontal acceleration of 7% g was recorded at one of the ground-response stations. The buildings include two steel buildings (52-story and 17-story), a 17-story concrete building, and three unreinforced masonry (URM) buildings with load-bearing frames. The records from the three URM buildings, built before 1930, are important in providing better insight into the seismic response of this class of buildings which is very important in assessing California's earthquake hazard. The 52-story building, built in 1990, is the tallest building instrumented by CSMIP and uses a novel structural system for high-rise buildings in seismic zones.

- o Base-Isolated Buildings. Records were obtained at three base-isolated buildings:
  - 2-story Los Angeles Fire Command/Control Building. This is the first record from this recently constructed and instrumented building, approximately 28 km SW of the epicenter. An acceleration of 8% g was recorded at the foundation of the structure, 9% g above the isolators and 11% g at the roof. Because of the importance of this record, it has been re-plotted with 4x vertical exaggeration. This building was instrumented to measure not only the motion above and below the isolators, but also the vertical vibration of the floor slab (9% g) and the response of the roof diaphragm.
  - 7-story university hospital. This building is still under construction, and not all the sensors had been installed at the time of the earthquake. However, an important, low-amplitude record was obtained. It has also been re-plotted with 4x vertical exaggeration so the details can be seen easily. Peak acceleration at the foundation, above the isolators and at the roof level was 9% g, 5% g, and 9% g, respectively.
  - 4-story Rancho Cucamonga Law and Justice Center. A low amplitude record was obtained at this building, 43 km from the epicenter. A peak acceleration of 8% g was recorded at the roof, and 3% g at the base. This is the fifth set of records obtained from this building since 1985. The previous records were obtained during the 1985 Redlands, the 1986 Palm Springs, the 1987 Whittier, and the 1990 Upland earthquakes. These earlier records have been digitized and the processed data are available from CSMIP.
- o Retrofitted 8-story Office Building in Seal Beach. This is the first building retrofitted with seismic isolators in California. The concrete frame/waffle slab structure was constructed in 1967 and recently retrofitted. The retrofit includes a ductile concrete moment frame added to strengthen the exterior and isolators installed midway between the first and second floors. The building, approximately 57 km from the epicenter, recorded 2% g at the base. Although the amplitude was very small, the records are included in this report with both the 1x and 4x scales.
- o Other records. A peak acceleration of 10% g was recorded at the Tarzana site, which recorded an unusually large peak acceleration in the 1987 Whittier earthquake.

#### Additional Strong-Motion Data

Several agencies in addition to CSMIP have strong-motion instruments in the Los Angeles area. The University of Southern California maintains a network of 80 ground-response stations. The U.S. Geological Survey maintains instruments of its own and of other agencies in this area. In addition to these stations, smaller groups of stations are maintained by Caltech, Southern California Edison and other agencies. Finally, many private building owners in the City of Los Angeles have instruments in their buildings, as required by the City code.

## Order of Data Presentation - How to Use This Report

Three tables are included in this report to make cross-referencing stations and records as convenient as possible. The CSMIP strong-motion stations that recorded this earthquake are shown on the map of the greater Los Angeles area in Figure 1 and on the inset map of downtown Pasadena and Los Angeles in Figure 2. Each station is identified by a three-digit code on the map. This code and the corresponding station name are cross-referenced in Table 1, which, for convenience, appears on the page opposite the station map. Once the station name is known, Table 2, which lists the stations in alphabetical order, can be used to obtain station parameters such as coordinates and site geology. Finally, Table 3 lists earthquake- and station-dependent information, such as epicentral distance, sensor orientations, and peak acceleration values. Table 3 is arranged in roughly increasing epicentral distance. The number of the page on which the accelerogram is reproduced in this report is listed in all three tables.

The accelerograph records section of this report has three main groupings based on station type: ground-response stations, building stations and lifeline stations. The first section contains the records from selected ground-response stations, three records per page. In addition, at the end of the first section, some records from digital accelerographs have been replotted with a 4x vertical exaggeration so that details of the record can be easily seen. Note that some of the lowest amplitude records are not reproduced in this report.

The second section contains building response records. The presentation of the building records includes a picture of the building, a brief description of the structural system, and a schematic of the sensor layout. By convention, the orientation of sensors in a building is given by reference directions parallel to the principal building dimensions; the relationship of these directions to true geographic directions is given on the sensor layout and the building record. This introductory page is followed by one to four pages of records, depending on the number of sensors installed in the building. Selected records from digital recorders were also replotted with a 4x vertical exaggeration. Some buildings have a ground-response station nearby to provide reference ground motion information, and in those cases a copy of the reference-station record is included with the building records. Note that some of the lowest amplitude building records are not reproduced in this report.

The third section contains records from three instrumented lifeline structures, all dams. The presentation for lifeline structures follows the format used for building records including a schematic of the sensor layout.

## Acknowledgements

The California Strong Motion Instrumentation Program extends its appreciation to the individuals and organizations which have permitted and cooperated in the installation of seismic strong-motion equipment on their property. CSMIP also extends its appreciation to the members of the Strong Motion Instrumentation Advisory Committee and its subcommittees. Funding for the

instrumentation of some hospitals included in this report was provided by the Office of Statewide Health Planning and Development.

The records presented in this report were made possible through the efforts of many CSMIP technicians, both present and past, who installed and maintained the stations over the years. Record recovery following this earthquake was performed by S. Rider, R. Meneely, W. Stephan, K. Breitwieser, R. Land and D. Driver. A. Cramlet assisted in coordinating the record recovery. D. Eddy, S. Rowley and L. Rau assisted in the preparation of this report. The efforts of all those involved made the timely publication of these data possible.

#### References

- CSMIP (1991). Quick Report on CSMIP Strong Motion Records from the June 28, 1991 Sierra Madre Earthquake, 14 pp., 1 July 1991, and Addendum, 2pp., 10 July 1991, Report OSMS 91-02. [The present report supersedes this quick report.]
- Shakal, A., M. Huang, C. Ventura, D. Parke, T. Cao, R. Sherburne and R. Blazquez (1987). CSMIP Strong-Motion Records from the Whittier, California Earthquake of 1 October 1987, Calif. Dept. Conservation, Div. of Mines and Geology, Report OSMS 87-05.

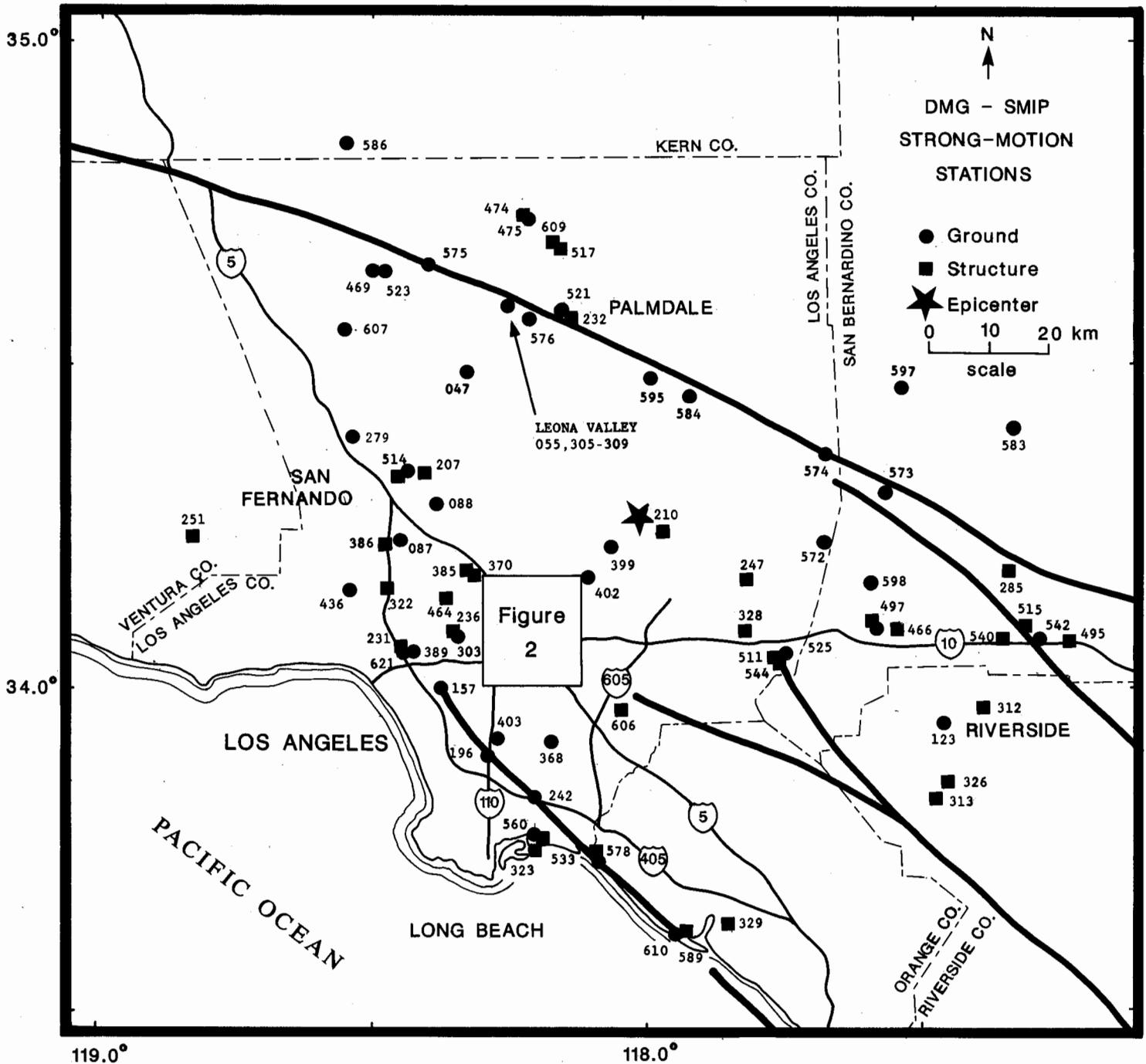


Figure 1. CSMIP stations that recorded the June 28, 1991 Sierra Madre earthquake. Major Quaternary faults are shown by heavy lines. Stations are identified by a 3-digit code cross-referenced to station names in Table 1. The inset section for downtown Los Angeles and Pasadena is shown in Figure 2.

TABLE 1  
Station-Code Reference Table

<u>Code</u>	<u>Station Name</u>	<u>Record on Page</u>	<u>Code</u>	<u>Station Name</u>	<u>Record on Page</u>
047	Vasquez Rocks Park	34	475	Lancaster - Airport FF	--
055	Leona Valley #5 - Ritter Ranch	--	495	Redlands - 1-story Warehouse	--
087	Arleta - Nordhoff Ave Fire Station	33	497	Rancho Cucamonga-4-story Law & Justice Cntr	82
088	Pacoima - Kagel Canyon	33	511	Pomona - 2-story Commercial Bldg.	--
123	Riverside - Airport	--	514	Sylmar - 6-story County Hospital	34
157	Los Angeles - Baldwin Hills	32	515	San Bernardino - 9-story Commercial Bldg.	--
196	Inglewood - Union Oil Yard	--	517	Lancaster - 3-story Office Bldg.	--
207	Pacoima Dam	--	521	Palmdale - 4-story Hotel FF	--
210	Cogswell Reservoir - Cogswell Dam	96	523	Lake Hughes #4B	--
231	Los Angeles-7-story UCLA Math-Science Bldg.	--	525	Pomona - 4th & Locust	31
232	Palmdale - 4-story Hotel	--	533	Long Beach-15-story Government Office Bldg.	--
236	Los Angeles-14-story Hollywood Storage Bldg.	--	540	Colton - 1-story High School Gym	--
242	Long Beach - Rancho Los Cerritos	--	541	Pasadena - 6-story Office Bldg.	40
247	Big Dalton Reservoir - Big Dalton Dam	98	542	San Bernardino - Highway 10/215 FF	--
251	Wood Ranch Reservoir - Dam and Dikes	--	544	Pomona - 6-story Commercial Bldg.	--
279	Newhall - Los Angeles County Fire Station	--	560	Long Beach - City Hall Grounds	--
285	San Bernardino - 5-story CSUSB Library	--	566	Pasadena - 12-story Office Bldg.	44
303	Los Angeles - Hollywood Storage Bldg. FF	27	567	Los Angeles - 13-story Office Bldg.	70
305	Leona Valley #1	--	569	Los Angeles-15-story Government Office Bldg.	72
306	Leona Valley #2	--	571	Pasadena - 9-story Commercial Bldg.	42
307	Leona Valley #3	--	572	Mt. Baldy - Elementary School	31,38
308	Leona Valley #4	--	573	Wrightwood - Nielson Ranch	30,37
309	Leona Valley #6	--	574	Wrightwood - Swarthout Valley	30,37
312	Riverside-13-story Government Office Bldg.	--	575	Elizabeth Lake	--
313	Lake Mathews - Main Dam	--	576	Anaverde Valley - City Ranch	29,36
322	Sherman Oaks - 13-story Commercial Bldg.	--	578	Seal Beach - 8-story Office Bldg.	32,38,90
323	Long Beach - 7-story Office Bldg.	--	579	Los Angeles - 9-story Office Bldg.	64
326	Lake Mathews - Dike 1	--	580	Los Angeles-2-story Fire Command/Ctrl. Bldg.	50
328	Puddingstone Reservoir - Puddingstone Dam	100	581	Los Angeles-12-story Commercial/Office Bldg.	66
329	Irvine - 8-story UCI Engineering Bldg.	--	583	Hesperia - 4th and Palm	--
368	Downey - County Maint. Bldg.	32	584	Pearblossom - Pallet Creek	29,36
370	Burbank - 6-story Commercial Bldg.	46	586	Neenach - Sacatara Creek	--
385	Burbank - 10-story Residential Bldg.	48	589	Newport Beach - 11-story Hospital	--
386	Van Nuys - 7-story Hotel	--	592	Los Angeles - City Terrace	28,35,52
389	Century City - LACC North	--	595	Little Rock - Brainard Canyon	29,36
399	Mt. Wilson - Caltech Seismic Station	26	597	Phelan - Wilson Ranch Road	30,37
400	Los Angeles- Obregon Park	27	598	Rancho Cucamonga - Deer Canyon	31,38
401	San Marino - Southwestern Academy	26	601	Los Angeles - 17-story Residential Bldg.	74
402	Altadena - Eaton Canyon Park	26	602	Los Angeles - 52-story Office Bldg.	76
403	Los Angeles - 116th St. School	--	605	Los Angeles - 7-story University Hospital	56
436	Tarzana - Cedar Hill Nursery	33	606	Whittier - 8-story Hotel	80
461	Alhambra - Fremont School	27	607	Lake Hughes 12A	--
464	North Hollywood - 20-story Hotel	--	609	Lancaster - 5-story Hospital	86
466	Etiwanda - Power Plant	--	610	Newport Beach - Newport Blvd. & Coast Hwy	--
468	Los Angeles-8-story CSULA Admin. Bldg.	62	611	Los Angeles - Temple & Hope	28,35
469	Lake Hughes #4	--	612	Los Angeles - Pico & Sentous	28,35
474	Lancaster - Airport Control Tower	--	621	Los Angeles - UCLA Manning & Circle	--

Footnote: Peak accelerations for all stations which recorded the Sierra Madre earthquake are listed in Table 3. However, certain records with small amplitude are not reproduced in the report.

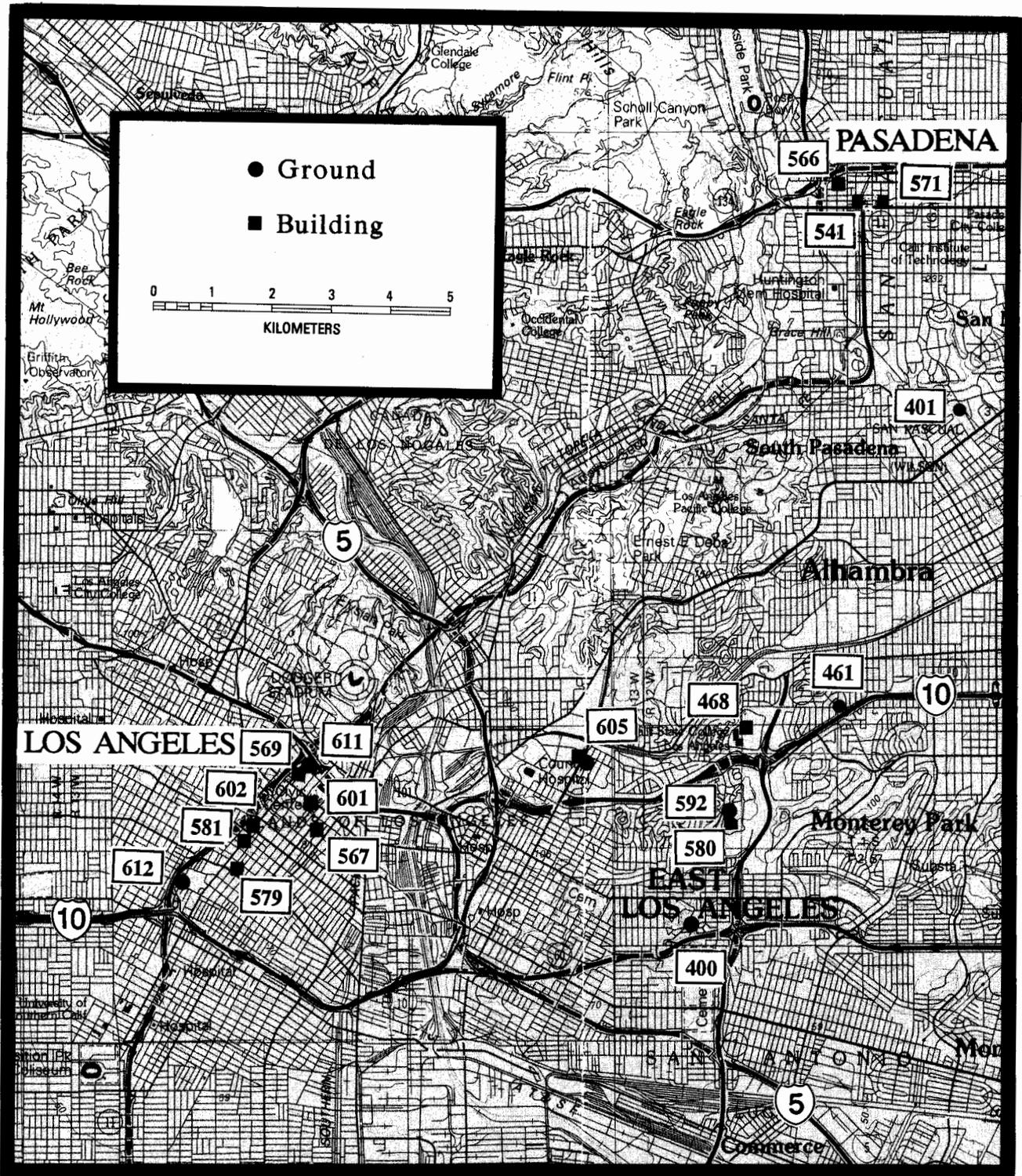


Figure 2. Inset section of Figure 1 for downtown Los Angeles and Pasadena. 3-digit code identifies stations as follows:

- |     |                                     |     |                                       |
|-----|-------------------------------------|-----|---------------------------------------|
| 400 | LA - Obregon Park                   | 579 | LA - 9-story Office Bldg.             |
| 401 | San Marino - SW Academy             | 580 | LA - 2-story Fire Command/Ctrl. Bldg. |
| 461 | Alhambra - Fremont School           | 581 | LA - 12-story Commercial/Office Bldg. |
| 468 | LA - 8-story CSULA Admin. Bldg.     | 592 | LA - City Terrace                     |
| 541 | Pasadena - 6-story Office Bldg.     | 601 | LA - 17-story Residential Bldg.       |
| 566 | Pasadena - 12-story Office Bldg.    | 602 | LA - 52-story Office Bldg.            |
| 567 | LA - 13-story Office Bldg.          | 605 | LA - 7-story Univ. Hospital           |
| 569 | LA - 15-story Govt. Office Bldg.    | 611 | LA - Temple & Hope                    |
| 571 | Pasadena - 9-story Commercial Bldg. | 612 | LA - Pico & Sentous                   |

TABLE 2  
CSMIP Strong-Motion Stations - Sierra Madre Earthquake

<u>Station Name</u>	<u>N.Lat.</u>	<u>W.Long.</u>	<u>Station No.</u>	<u>Code</u>	<u>Site Geology</u>	<u>Record on Page*</u>
Alhambra - Fremont School	34.070	118.150	24461	461	Alluvium	27
Altadena - Eaton Canyon Park	34.177	118.096	24402	402	Alluvium	26
Anaverde Valley - City Ranch	34.580	118.199	24576	576	Alluvium	29,36
Antelope Buttes	34.758	118.361	24310	310	Weathered crystalline rock (granite)	nt
Arleta - Nordhoff Ave. Fire Station	34.236	118.439	24087	087	Alluvium	33
Big Dalton Reservoir- Big Dalton Dam	34.170	117.808	23247	247	Crystalline rock (diorite)	98
Burbank - 6-story Commercial Bldg.	34.185	118.308	24370	370	Alluvium	46
Burbank - 10-story Residential Bldg.	34.187	118.311	24385	385	Alluvium	48
Castaic - Halsey Canyon	34.459	118.650	24277	277	Alluvium	nt
Castaic - Old Ridge Route	34.564	118.642	24278	278	Sedimentary rock	nt
Century City - LACC North	34.063	118.418	24389	389	Terrace Deposits	--
Century City - LACC South	34.062	118.416	24390	390	Terrace Deposits	nt
Cogswell Reservoir - Cogswell Dam	34.245	117.964	23210	210	Weathered crystalline rock	96
Colton - 1-story High School Gym	34.072	117.335	23540	540	Alluvium	--
Downey - County Maint. Bldg.	33.924	118.167	14368	368	Alluvium	32
Elizabeth Lake	34.662	118.387	24575	575	Lake & fluvial deposits	--
Etiwanda - Power Plant	34.091	117.527	23466	466	Alluvium	--
Fairmont Reservoir - Fairmont Dam	34.704	118.426	24270	270	Crystalline rock (granite)	nt
Featherly Park - Park Maint. Bldg.	33.869	117.709	13122	122	Alluvium	nt
Hesperia - 4th and Palm	34.405	117.311	23583	583	Alluvium	--
Huntington Beach - Lake Street Fire Station	33.662	117.997	13197	197	Sand (~4m) over alluvium	nt
Inglewood - Hollywood Park Racetrack	33.946	118.330	14537	537	Alluvium	nt
Inglewood - Union Oil Yard	33.905	118.279	14196	196	Terrace deposits	--

TABLE 2  
CSMIP Strong-Motion Stations (Continued)

<u>Station Name</u>	<u>N.Lat.</u>	<u>W.Long.</u>	<u>Station No.</u>	<u>Code</u>	<u>Site Geology</u>	<u>Record on Page*</u>
Irvine - 8-story UCI Engineering Bldg.	33.645	117.840	13329	329	Soil (~1m) over sandstone	--
Lake Hughes #1 - Fire Station #78	34.674	118.430	24271	271	Alluvium (~300m) over crystalline rock	nt
Lake Hughes #4 - Camp Mendenhall	34.650	118.478	24469	469	Weathered crystalline rock (granite)	--
Lake Hughes #4B - Camp Mendenhall	34.650	118.477	24523	523	Weathered crystalline rock (granite)	--
Lake Hughes #9	34.608	118.558	24272	272	Crystalline rock (gneiss)	nt
Lake Hughes 12A	34.571	118.560	24607	607	Stream channel deposits	--
Lake Mathews - Dike 1	33.854	117.444	13326	326	Fill	--
Lake Mathews - Main Dam	33.836	117.461	13313	313	Fill	--
Lake Piru - Santa Felicia Dam	34.460	118.753	24280	280	Sandstone, shale	nt
Lancaster - Airport Control Tower	34.739	118.214	24474	474	Alluvium	--
Lancaster - Airport FF	34.739	118.214	24475	475	Alluvium	--
Lancaster - 3-story Office Bldg.	34.688	118.157	24517	517	Alluvium	--
Lancaster - 3-story Office Bldg. FF	34.688	118.156	24526	526	Alluvium	nt
Lancaster - 5-story Hospital	34.688	118.158	24609	609	Alluvium	86
Leona Valley #1	34.594	118.242	24305	305	Alluvium (~5m) over crystalline rock	--
Leona Valley #2	34.595	118.243	24306	306	Alluvium	--
Leona Valley #3	34.596	118.243	24307	307	Crystalline rock (gneiss)	--
Leona Valley #4	34.598	118.242	24308	308	Alluvium	--
Leona Valley #5 - Ritter Ranch	34.600	118.241	24055	055	Alluvium	--
Leona Valley #6	34.604	118.244	24309	309	Alluvium	--
Littlerock - Brainard Canyon	34.486	117.980	23595	595	Crystalline rock (granodiorite)	29,36
Long Beach - City Hall Grounds	33.768	118.196	14560	560	Terrace deposits	--
Long Beach - Rancho Los Cerritos	33.840	118.194	14242	242	Alluvium	--

TABLE 2  
CSMIP Strong-Motion Stations (Continued)

<u>Station Name</u>	<u>N.Lat.</u>	<u>W.Long.</u>	<u>Station No.</u>	<u>Code</u>	<u>Site Geology</u>	<u>Record on Page*</u>
Long Beach - Recreation Park	33.778	118.133	14241	241	Terrace deposits	nt
Long Beach - 5-story CSULB Engineering Bldg.	33.783	118.112	14311	311	Alluvium	nr1
Long Beach - 7-story Office Bldg.	33.755	118.200	14323	323	Alluvium	--
Long Beach - 7-story Office Bldg. FF	33.754	118.200	14395	395	Alluvium	nt
Long Beach - 15-story Government Office Bldg.	33.768	118.195	14533	533	Terrace deposits	--
Los Angeles - Baldwin Hills	34.009	118.361	24157	157	Fill (~1m) over shale, sandstone	32
Los Angeles - City Terrace	34.053	118.171	24592	592	Siltstone	28,35,52
Los Angeles - Obregon Park	34.037	118.178	24400	400	Alluvium	27
Los Angeles - Pico & Sentous	34.043	118.271	24612	612	Alluvium	28,35
Los Angeles - Temple & Hope	34.059	118.246	24611	611	Siltstone	28,35
Los Angeles - Manning and Circle	34.068	118.40	24621	621	Terrace deposits	--
Los Angeles - Vincent Thomas Bridge	33.750	118.271	14406	406	Alluvium	nt
Los Angeles - 116th St. School	33.929	118.260	14403	403	Terrace deposits	--
Los Angeles - 2-story Fire Command/Control Bldg.	34.053	118.171	24580	580	Siltstone	50
Los Angeles - 3-story Commercial Bldg.	34.058	118.417	24332	332	Terrace deposits	nt
Los Angeles - 5-story Warehouse	34.028	118.223	24463	463	Alluvium	nt#
Los Angeles - 7-story UCLA Math-Science Bldg.	34.069	118.442	24231	231	Terrace deposits	--
Los Angeles - 7-story University Hospital	34.062	118.198	24605	605	Siltstone	56
Los Angeles - 8-story CSULA Admin. Building	34.067	118.168	24468	468	Siltstone	62
Los Angeles - 9-story Office Bldg.	34.044	118.261	24579	579	Alluvium	64
Los Angeles - 12-story Commercial/Office Bldg.	34.048	118.260	24581	581	Alluvium	66
Los Angeles - 13-story Office Bldg.	34.050	118.247	24567	567	Alluvium (5m) over sedimentary rock	70
Los Angeles - 14-story Hollywood Storage Bldg.	34.090	118.338	24236	236	Alluvium (~600m) over sandstone, shale	--

TABLE 2  
CSMIP Strong-Motion Stations (Continued)

<u>Station Name</u>	<u>N.Lat.</u>	<u>W.Long.</u>	<u>Station No.</u>	<u>Code</u>	<u>Site Geology</u>	<u>Record on Page*</u>
Los Angeles - Hollywood Storage Bldg. FF	34.090	118.339	24303	303	Alluvium (~600m) over sandstone, shale	27
Los Angeles - 15-story Government Office Bldg.	34.058	118.249	24569	569	Siltstone	72
Los Angeles - 17-story Residential Bldg.	34.053	118.248	24601	601	Siltstone	74
Los Angeles - 52-story Office Bldg.	34.051	118.259	24602	602	Alluvium (7m) over sedimentary rock	76
Malibu - Point Dume School	34.077	118.800	24396	396	Soil (~0.5m) over alluvium	nt
Moorpark - Ventura County Fire Dept.	34.288	118.881	24283	283	Alluvium	nt
Mt. Baldy - Elementary School	34.233	117.661	23572	572	Soil (~1m) over stream channel deposits	31,38
Mt. Wilson - Caltech Seismic Station	34.224	118.057	24399	399	Crystalline rock (quartz diorite)	26
Neenach - Sacatara Creek	34.848	118.536	24586	586	Alluvium	--
Newhall - Los Angeles County Fire Station	34.390	118.530	24279	279	Alluvium	--
Newport Beach - 11-story Hospital	33.624	117.929	13589	589	Sedimentary rock	--
Newport Beach - Irvine Ave. Fire Station	33.634	117.902	13160	160	Alluvium	nt
Newport Beach - Newport Blvd. & Coast Highway	33.623	117.931	13610	610	Sedimentary rock	--
North Hollywood - 20-story Hotel	34.138	118.359	24464	464	Sandstone, shale	--
Pacoima Reservoir - Pacoima Dam	34.334	118.396	24207	207	Crystalline rock (diorite gneiss)	--
Pacoima - Kagel Canyon	34.288	118.375	24088	088	Sandstone	33
Palmdale - Black Butte	34.586	117.728	23585	585	Crystalline rock (quartz monzonite)	nt
Palmdale - 4-story Hotel	34.581	118.134	24232	232	Alluvium	--
Palmdale - 4-story Hotel FF	34.581	118.135	24521	521	Alluvium	--
Pasadena - 6-story Office Bldg.	34.146	118.147	24541	541	Terrace deposits	40
Pasadena - 9-story Commercial Bldg.	34.146	118.143	24571	571	Terrace deposits	42
Pasadena - 12-story Commercial/Office Bldg.	34.146	118.146	24546	546	Terrace deposits	nr2
Pasadena - 12-story Office Bldg.	34.149	118.151	24566	566	Terrace deposits	44

TABLE 2  
CSMIP Strong-Motion Stations (Continued)

<u>Station Name</u>	<u>N.Lat.</u>	<u>W.Long.</u>	<u>Station No.</u>	<u>Code</u>	<u>Site Geology</u>	<u>Record on Page*</u>
Pearblossom - Pallet Creek	34.458	117.909	23584	584	Crystalline rock (quartz diorite)	29,36
Phelan - Wilson Ranch Road	34.467	117.520	23597	597	Alluvium	30,37
Piru	34.389	118.795	24276	276	Alluvium	nt
Pomona - 2-story Commercial Bldg.	34.056	117.749	23511	511	Alluvium	--
Pomona - 4th & Locust	34.056	117.748	23525	525	Alluvium	31
Pomona - 6-story Commercial Bldg.	34.057	117.752	23544	544	Alluvium	--
Puddingstone Reservoir - Puddingstone Dam	34.091	117.808	23328	328	Crystalline rock, shale	100
Rancho Cucamonga - Deer Canyon	34.169	117.579	23598	598	Crystalline rock (granite)	31,38
Rancho Cucamonga - 4-story Law & Justice Center	34.104	117.574	23497	497	Alluvium(~250m) over crystalline rock	82
Rancho Palos Verdes - Hawthorne Blvd.	33.746	118.396	14404	404	Crystalline rock (basalt), shale	nt
Redlands - 1-story Warehouse	34.066	117.214	23495	495	Alluvium	--
Redlands - 7-story Commercial Bldg.	34.056	117.178	23481	481	Alluvium	nt
Riverside - Airport	33.951	117.446	13123	123	Alluvium	--
Riverside - 13-story Government Office Bldg.	33.978	117.373	13312	312	Alluvium	--
Rolling Hills Estates - Rancho Vista School	33.787	118.356	14405	405	Shale	nt
Rosamond - Godde Ranch	34.827	118.265	24274	274	Alluvium	nt
San Bernardino - Highway 10/215 FF	34.065	117.292	23542	542	Alluvium	--
San Bernardino - 2nd & Arrowhead	34.103	117.289	23522	522	Alluvium	nt#
San Bernardino - 5-story CSUSB Library	34.183	117.323	23285	285	Alluvium	--
San Bernardino - 3-story Office Bldg.	34.065	117.289	23516	516	Alluvium	nt#
San Bernardino - 6-story Hotel	34.065	117.279	23287	287	Alluvium	nt
San Bernardino - 9-story Commercial Bldg.	34.104	117.292	23515	515	Alluvium	--
San Marino - Southwestern Academy	34.115	118.130	24401	401	Terrace deposits	26

TABLE 2  
CSMIP Strong-Motion Stations (Continued)

<u>Station Name</u>	<u>N.Lat.</u>	<u>W.Long.</u>	<u>Station No.</u>	<u>Code</u>	<u>Site Geology</u>	<u>Record on Page*</u>
San Pedro - 25th St. Fire Station	33.722	118.309	14159	159	Sandstone	nt
Santa Monica - City Hall Grounds	34.011	118.490	24538	538	Terrace deposits	nt
Sawmill Mountain - Caltech Seismic Station	34.719	118.581	24082	082	Crystalline rock (granite)	nt
Seal Beach - 8-story Office Bldg.	33.757	118.084	14578	578	Alluvium	32,38,90
Sherman Oaks - 13-story Commercial Bldg.	34.154	118.465	24322	322	Alluvium	--
Sylmar - 6-story County Hospital	34.326	118.444	24514	514	Alluvium	34
Tarzana - Cedar Hill Nursery	34.160	118.534	24436	436	Alluvium (10m) over siltstone	33
Van Nuys - 7-story Hotel	34.221	118.471	24386	386	Alluvium	--
Vasquez Rocks Park	34.490	118.320	24047	047	Alluvium (~3m) over sandstone	34
Whittier - 8-story Hotel	33.975	118.036	14606	606	Alluvium	80
Wood Ranch Reservoir-Dam and Dikes	34.240	118.820	24251	251	Sandstone	--
Wrightwood - Jackson Flat	34.381	117.737	23590	590	Crystalline rock (schist)	nt#
Wrightwood - Nielson Ranch	34.314	117.545	23573	573	Alluvium	30,37
Wrightwood - Swarthout Valley	34.369	117.658	23574	574	Alluvium	30,37

Footnotes: nt - Instrument not triggered, though operational  
nt# - Instrument not triggered, probable instrument malfunction  
nr1 - Record not recovered - instrument not accessible due to asbestos abatement work in building  
nr2 - Instrument not operational due to construction in building

TABLE 3 - CSMIP Strong-Motion Data - Sierra Madre Earthquake

Station <u>Name</u>	Station <u>No.</u>	Structure <u>Type, Size*</u>	Epicenter <u>Dist. **</u>	Trigger <u>Time#</u>	<u>Max. Acceleration</u>			Record on <u>Pg.</u>
					<u>Comp.</u>	<u>Grnd. (g)</u>	<u>Struct. (g)</u>	
Cogswell Reservoir Cogswell Dam	23210	Earth dam (9 sensors)	4	43:56.5	155	0.32	0.58	96
					Up	0.33	0.56	
					65	0.34	0.44	
Mt. Wilson Caltech Seismic Station	24399	Seismic vault	7	43:58.7	90	0.21		26
					Up	0.24		
					360	0.30		
Altadena Eaton Canyon Park	24402	1-story bldg.	13	---	90	0.18		26
					Up	0.17		
					360	0.46		
Pasadena 9-story Commercial Bldg.	24571	9-story concrete bldg. (15 sensors)	18	43:57.5	90	0.11	0.18	42
					Up	0.14	---	
					180	0.24	0.43	
Pasadena 6-story Office Bldg.	24541	6-story steel/URM bldg. (16 sensors)	19	43:58.9	90	0.14	0.22	40
					Up	0.13	---	
					360	0.20	0.26	
Pasadena 12-story Office Bldg.	24566	12-story steel bldg. (15 sensors)	19	43:59.0	180	0.21	0.33	44
					Up	0.23	---	
					270	0.14	0.17	
San Marino Southwestern Academy	24401	1-story bldg.	20	44:00.3	90	0.14		26
					Up	0.15		
					360	0.19		
Big Dalton Reservoir Big Dalton Dam	23247	Concrete dam (9 sensors)	21	43:58.7	20	---	0.12	98
					Up	---	0.08	
					110	---	0.17	
Pearblossom Pallet Creek	23584	Instr. shltr. H	23	43:56.8	90	0.13		29,36
					Up	0.06		
					180	0.14		
Littlerock Brainard Canyon	23595	Instr. shltr. H	25	---	90	0.04		29,36
					Up	0.04		
					180	0.06		
Alhambra Fremont School	24461	1-story bldg.	25	44:02.1	90	0.09		27
					Up	0.06		
					360	0.08		
Puddingstone Reservoir Puddingstone Dam	23328	Earth dam (15 sensors)	26	---	333	0.06	0.19	100
					Up	0.04	0.07	
					243	0.04	0.06	

TABLE 3 - CSMIP Strong-Motion Data (Continued)

<u>Station Name</u>	<u>Station No.</u>	<u>Structure Type,Size*</u>	<u>Epicenter Dist.**</u>	<u>Trigger Time#</u>	<u>Max. Acceleration</u>			<u>Record on Pg.</u>
					<u>Comp.</u>	<u>Grnd. (g)</u>	<u>Struct. (g)</u>	
Los Angeles 8-story CSULA Admin. Bldg.	24468	8-story concrete bldg. (16 sensors)	27	---	180 Up 90	0.09 0.04 0.18	0.13 0.10 0.15	62
Los Angeles 2-story Fire Command Control Bldg.	24580	2-story isolated steel bldg. (16 sensors)	28	43:58.2	40 Up 310	0.08 0.05 0.08	0.06 0.09 0.11	50
Los Angeles City Terrace	24592	Instr. shltr. H	28	43:58.2	90 Up 180	0.12 0.06 0.09		28,35,52
Los Angeles 7-story University Hospital	24605	7-story isolated steel bldg. (24 sensors)	29	43:58.4	5 Up 95	---- 0.04 0.09	0.07 ---- 0.09	56
Los Angeles University Hospital Free Field	24605	Instr. shltr. D	29	43:58.4	5 Up 95	0.13 0.07 0.16		58,60
Los Angeles Obregon Park	24400	1-story bldg.	30	44:02.2	90 Up 360	0.23 0.08 0.24		27
Burbank 6-story Commercial Bldg.	24370	6-story steel Bldg. (13 sensors)	30	---	135 Up 45	0.07 0.05 0.11	0.11 ---- 0.16	46
Burbank 10-story Residential Bldg.	24385	10-story concrete bldg. (16 sensors)	30	---	45 Up 315	0.12 0.03 0.08	0.35 ---- 0.18	48
Los Angeles Temple & Hope	24611	Instr. shltr. H	32	44:00.1	83 Up 173	0.06 0.03 0.07		28,35
Los Angeles 15-story Government Office Bldg.	24569	15-story steel bldg. (15 sensors)	32	---	43 Up 313	0.06 0.02 0.04	0.06 ---- 0.06	72
Los Angeles 17-story Residential Bldg.	24601	17-story concrete bldg. (14 sensors)	32	---	220 Up 130	0.07 0.03 0.06	0.19 ---- 0.15	74
Los Angeles 13-story Office Bldg.	24567	13-story steel/ concrete/URM bldg. (15 sensors)	33	44:00.1	223 Up 313	0.17 0.06 0.14	0.15 ---- 0.18	70

TABLE 3 - CSMIP Strong-Motion Data (Continued)

Station Name	Station No.	Structure Type,Size*	Epicenter Dist.**	Trigger Time#	Max. Acceleration			Record on Pg.
					Comp.	Grnd. (g)	Struct. (g)	
Los Angeles 52-story Office Bldg.	24602	52-story steel bldg. (20 sensors)	33	43:59.5	355	0.09	0.23	76
					Up	0.04	----	
					85	0.08	0.17	
Los Angeles 12-story Commercial/Office Bldg.	24581	12-story concrete/URM bldg. (16 sensors)	34	43:59.7	40	0.09	0.16	66
					Up	0.03	----	
					130	0.09	0.12	
Los Angeles Pico & Sentous	24612	Instr. shltr. H	35	43:59.7	89	0.03		28,35
					Up	0.02		
					179	0.05		
Los Angeles 9-story Office Bldg.	24579	9-story concrete/URM bldg. (18 sensors)	35	43:59.6	40	0.10	0.13	64
					Up	0.05	----	
					310	0.08	0.23	
Whittier 8-story Hotel	14606	8-story reinf. masonry bldg. (12 sensors)	32	43:59.4	90	0.03	0.05	80
					Up	0.02	----	
					360	0.04	0.08	
Mt. Baldy Elementary School	23572	Instr. shltr. H	32	44:01.0	90	0.05		31,38
					Up	0.03		
					180	0.05		
Pomona 6-story Commercial Bldg.	23544	6-story concrete/URM bldg. (12 sensors)	32	44:01.1	270	0.04	0.10	--
					Up	0.02	----	
					180	0.03	0.08	
Pomona 2-story Commercial Bldg.	23511	2-story concrete bldg. (10 sensors)	33	44:01.1	360	0.02	0.06	--
					Up	0.02	----	
					270	0.05	0.07	
Pomona 4th & Locust	23525	Instr. shltr. H	33	44:01.1	90	0.05		31
					Up	0.02		
					360	0.02		
Rancho Cucamonga Deer Canyon	23598	Instr. shltr. H	40	44:00.9	90	0.05		31,38
					Up	0.02		
					180	0.05		
Rancho Cucamonga Law & Justice Center	23497	4-story base- isolated bldg. (16 sensors)	43	44:02.8	360	0.03	0.08	82
					Up	0.02	0.02	
					90	0.03	0.08	
Rancho Cucamonga Law & Justice Center Free Field	23497	Instr. shltr. D	43	44:02.8	360	0.04		84
					Up	0.03		
					90	0.04		

TABLE 3 - CSMIP Strong-Motion Data (Continued)

Station <u>Name</u>	Station <u>No.</u>	Structure <u>Type, Size*</u>	Epicenter <u>Dist. **</u>	Trigger <u>Time#</u>	<u>Max. Acceleration</u>			Record on <u>Pg.</u>
					<u>Comp.</u>	<u>Grnd. (g)</u>	<u>Struct. (g)</u>	
Wrightwood Swarthout Valley	23574	Instr. shltr. H	34	43:59.3	90 Up 180	0.06 0.03 0.06		30,37
Wrightwood Nielson Ranch	23573	Instr. shltr. H	43	44:05.5	90 Up 180	0.02 0.02 0.04		30,37
Phelan Wilson Ranch Road	23597	Instr. shltr. H	50	44:06.6	90 Up 180	0.04 0.01 0.03		30,37
Pacoima Kagel Canyon Fire Sta. #74	24088	1-story bldg.	35	44:03.0	90 Up 360	0.06 0.03 0.05		33
Pacoima Reservoir Pacoima Dam	24207	Concrete arch dam (20 sensors)	37	44:06.6	205 Up 115	0.04 0.02 0.03	----	--
North Hollywood 20-story Hotel	24464	20-story concrete bldg. (16 sensors)	36	44:02.1	90 Up 360	0.04 0.03 0.04	0.09 ----	--
Los Angeles Hollywood Storage Bldg.	24236	14-story concrete bldg. (12 sensors)	36	---	90 Up 360	0.04 0.02 0.03	0.13 ----	--
Los Angeles Hollywood Storage Bldg. FF	24303	Instr. shltr. H	36	44:05.9	90 Up 360	0.07 0.02 0.08		27
Downey County Maint. Bldg.	14368	1-story bldg.	41	---	90 Up 360	0.07 0.03 0.06		32
Arleta Nordhoff Ave Fire Sta.	24087	1-story bldg.	40	---	90 Up 360	0.06 0.03 0.08		33
Sylmar 6-story County Hospital	24514	6-story steel/ concrete bldg. (13 sensors)	41	44:09.0	356 Up 86	0.03 0.02 0.04	0.11 ----	--
Sylmar 6-story County Hospital Free Field	24514	Small 1-story bldg.	41	44:03.1	356 Up 86	0.06 0.02 0.05		34

TABLE 3 - CSMIP Strong-Motion Data (Continued)

<u>Station Name</u>	<u>Station No.</u>	<u>Structure Type.Size*</u>	<u>Epicenter Dist.**</u>	<u>Trigger Time#</u>	<u>Max. Acceleration</u>			<u>Record on Pg.</u>
					<u>Comp.</u>	<u>Grnd. (g)</u>	<u>Struct. (g)</u>	
Palmdale 4-story Hotel	24232	4-story reinf. masonry bldg. (9 sensors)	37	---	140	0.03	0.05	--
					Up	0.04	0.04	
					50	0.02	0.04	
Palmdale 4-story Hotel FF	24521	Instr. shltr. H	37	---	272	0.03	--	
					Up	0.03		
					2	0.03		
Vasquez Rocks Park	24047	Instr. shltr. A	39	44:01.8	90	0.13	34	
					Up	0.04		
					360	0.12		
Anaverde Valley City Ranch	24576	Instr. shltr. H	40	43:58.8	90	0.03	29,36	
					Up	0.04		
					180	0.04		
Leona Valley #1	24305	Instr. shltr. H	43	44:02.5	90	0.05	--	
					Up	0.02		
					360	0.03		
Leona Valley #2	24306	Instr. shltr. H	43	44:02.6	90	0.06	--	
					Up	0.03		
					360	0.03		
Leona Valley #3	24307	Instr. shltr. H	43	44:02.6	90	0.05	--	
					Up	0.04		
					360	0.05		
Leona Valley #4	24308	Instr. shltr. H	43	---	90	0.04	--	
					Up	0.02		
					360	0.04		
Leona Valley #5 Ritter Ranch	24055	Instr. shltr. H	44	44:02.8	90	0.04	--	
					Up	0.03		
					360	0.04		
Leona Valley #6	24309	Instr. shltr. H	44	44:02.9	90	0.05	--	
					Up	0.04		
					360	0.04		
Los Angeles Baldwin Hills	24157	Instr. shltr. A	43	---	90	0.09	32	
					Up	0.03		
					360	0.07		
Los Angeles 116th St. School	14403	1-story bldg.	44	---	90	0.05	--	
					Up	0.02		
					360	0.04		

TABLE 3 - CSMIP Strong-Motion Data (Continued)

<u>Station Name</u>	<u>Station No.</u>	<u>Structure Type.Size*</u>	<u>Epicenter Dist.**</u>	<u>Trigger Time#</u>	<u>Max. Acceleration</u>			<u>Record on Pg.</u>
					<u>Comp.</u>	<u>Grnd. (g)</u>	<u>Struct. (g)</u>	
Los Angeles UCLA Manning & Circle	24621	Instr. shltr. H	46	---	110 Up 20	0.02 0.02 0.02		--
Los Angeles 7-story UCLA Math-Science Bldg.	24231	7-story steel/ concrete bldg. (12 sensors)	46	---	90 Up 360	0.02 0.02 0.02	0.02 ----	--
Van Nuys 7-story Hotel	24386	7-story concrete bldg. (16 sensors)	43	---	360 Up 270	0.06 0.03 0.07	0.10 ----	--
Century City Los Angeles Country Club-North	24389	Instr. shltr. H	44	44:10.3	90 Up 360	0.03 0.01 0.02		--
Sherman Oaks 13-story Commercial Bldg.	24322	13-story concrete bldg. (15 sensors)	44	---	105 Up 15	0.02 0.02 0.03	0.04 ----	--
Tarzana Cedar Hill Nursery	24436	Instr. shltr. H	50	44:10.4	90 Up 360	0.09 0.05 0.10		33
Inglewood Union Oil Yard	14196	Instr. shltr. A	47	44:12.2	90 Up 360	0.03 0.02 0.05		--
Etiwanda Power Plant	23466	Steam gener- ating plant (12 sensors)	48	44:03.8	180 Up 90	0.03 0.03 0.06	0.06 0.07 0.07	--
Lancaster 3-story Office Bldg.	24517	3-story reinf. masonry bldg. (13 sensors)	49	44:04.6	115 Up 25	0.02 0.01 0.02	0.07 ----	--
Lancaster 5-story Hospital	24609	5-story steel bldg. (12 sensors)	49	44:01.3	25 Up 295	0.02 0.02 0.02	0.05 ----	86
Lancaster Fox Airfield Airport Control Tower	24474	Control Tower (9 sensors)	56	44:05.0	60 Up 330	0.02 0.02 0.01	0.03 ----	--
Lancaster Fox Airfield Airport FF	24475	Instr. shltr. H	56	44:05.9	90 Up 360	0.01 0.01 0.01		--

TABLE 3 - CSMIP Strong-Motion Data (Continued)

<u>Station Name</u>	<u>Station No.</u>	<u>Structure Type, Size*</u>	<u>Epicenter Dist.**</u>	<u>Trigger Time#</u>	<u>Max. Acceleration</u>			<u>Record on Pg.</u>
					<u>Comp.</u>	<u>Grnd. (g)</u>	<u>Struct. (g)</u>	
Newhall LA County Fire Sta.	24279	1-story bldg.	51	---	90 Up 360	0.02 0.02 0.02		--
Elizabeth Lake	24575	Instr. shltr. H	57	44:13.3	90 Up 180	0.04 0.02 0.03		--
Lake Hughes #4 Camp Mendenhall (near water tank)	24469	Instr. shltr. A	61	44:13.1	90 Up 360	0.02 0.02 0.02		--
Lake Hughes #4B Camp Mendenhall	24523	Instr. shltr. A	61	44:12.7	90 Up 360	0.01 0.01 0.01		--
Lake Hughes 12A	24607	Instr. shltr. H	62	44:05.0	91 Up 181	0.02 0.01 0.02		--
Long Beach Rancho Los Cerritos	14242	Instr. shltr. H	50	44:05.6	90 Up 360	0.04 0.02 0.03		--
Long Beach 15-story Government Office Bldg.	14533	15-story steel bldg. (16 sensors)	58	44:11.6	135 Up 45	0.02 0.01 0.02	0.02 0.03 0.02	--
Long Beach City Hall Grounds	14560	Instr. shltr. H	58	44:11.6	90 Up 360	0.02 0.01 0.02		--
Long Beach 7-story Office Bldg.	14323	7-story steel bldg. (18 sensors)	59	44:20.5	90 Up 360	0.02 0.01 0.02	0.06 --- 0.05	--
Seal Beach 8-story Office Bldg.	14578	8-story isolated concrete bldg. (28 sensors)	57	44:06.7	90 Up 360	0.02 0.01 0.01	0.03 0.05 0.03	90
Seal Beach 8-story Office Bldg. FF	14578	Instr. shltr. H	57	44:06.7	90 Up 360	0.02 0.01 0.02		32,38,91
Riverside Airport	13123	1-story bldg.	62	44:13.4	270 Up 180	0.03 0.02 0.03		--

TABLE 3 - CSMIP Strong-Motion Data (Continued)

<u>Station Name</u>	<u>Station No.</u>	<u>Structure Type,Size*</u>	<u>Epicenter Dist.**</u>	<u>Trigger Time#</u>	<u>Max. Acceleration</u>			<u>Record on Pg.</u>
					<u>Comp.</u>	<u>Grnd. (g)</u>	<u>Struct. (g)</u>	
Riverside 13-story Government Office Bldg.	13312	13-story steel/concrete (15 sensors)	66	---	30 Up 120	0.01 0.01 0.01	0.04 ---- 0.03	--
Hesperia 4th & Palm	23583	Instr. shltr. H	66	44:12.5	90 Up 180	0.01 0.01 0.02		--
Colton 1-story School Gym	23540	1-story tilt-up bldg. (13 sensors)	65	44:06.2	5 Up 95	0.02 0.02 ----	0.05 ---- 0.15	--
San Bernardino 5-story CSUSB Library	23285	5-story concrete bldg. (10 sensors)	63	---	215 Up 125	0.02 0.01 0.02	0.05 ---- 0.08	--
San Bernardino 9-story Commercial Bldg.	23515	9-story steel bldg. (13 sensors)	68	---	180 Up 90	0.02 0.01 0.02	0.02 ---- 0.03	--
San Bernardino Highway 10/215 Free Field	23542	Instr. shltr. H	69	44:05.8	270 Up 360	0.03 0.02 0.03		--
Lake Mathews Dike 1	13326	Earth dam (9 sensors)	69	44:15.2	75 Up 345	0.02 0.01 0.02	0.04 0.03 0.03	--
Lake Mathews Main Dam	13313	Earth dam (6 sensors)	69	44:16.3	350 Up 260	---- ---- ----	0.03 0.02 0.02	--
Irvine 8-story UCI Engineering Bldg.	13329	8-story steel/ concrete bldg. (12 sensors)	70	---	225 Up 135	0.01 0.01 0.02	0.02 ---- 0.09	--
Newport Beach 11-story Hospital	13589	11-story concrete bldg. (18 sensors)	71	44:14.8	335 Up 65	0.01 0.01 0.01	0.02 0.01 0.04	--
Newport Beach Newport Blvd. & Coast Highway	13610	Instr. shltr. H	71	44:14.6	91 Up 181	0.02 0.01 0.02		--
Redlands 1-story Warehouse	23495	1-story concrete titlt-up bldg. (12 sensors)	76	44:17.4	360 Up 90	0.02 0.01 0.02	0.11 ---- 0.06	--

TABLE 3 - CSMIP Strong-Motion Data (Continued)

<u>Station Name</u>	<u>Station No.</u>	<u>Structure Type,Size*</u>	<u>Epicenter Dist. **</u>	<u>Trigger Time#</u>	<u>Max. Acceleration</u>		<u>Record on Pg.</u>	
					<u>Comp.</u>	<u>Grnd. (g)</u>		<u>Struct. (g)</u>
Wood Ranch Reservoir Main Dam and Dikes	24251	Earth dam (12 sensors)	75	---	335	----	0.01	--
					Up	----	0.01	
					245	----	0.01	
Neenach Sacatara Creek	24586	Instr. shltr. H	81	44:21.0	90	0.01		--
					Up	0.00		
					180	0.01		

-----  
Footnotes:

\* - Instrument shelter types:

Instr. shltr. A - small prefabricated metal or wood frame building

Instr. shltr. D - small metal box

Instr. shltr. H - small fiberglass shelter

\*\* - Distance (in km) relative to the presently estimated epicenter at 34.262N, 118.002W.

# - Accelerograph trigger time, when present, in minutes and seconds after 14:00:00 GMT on 28 June 1991.



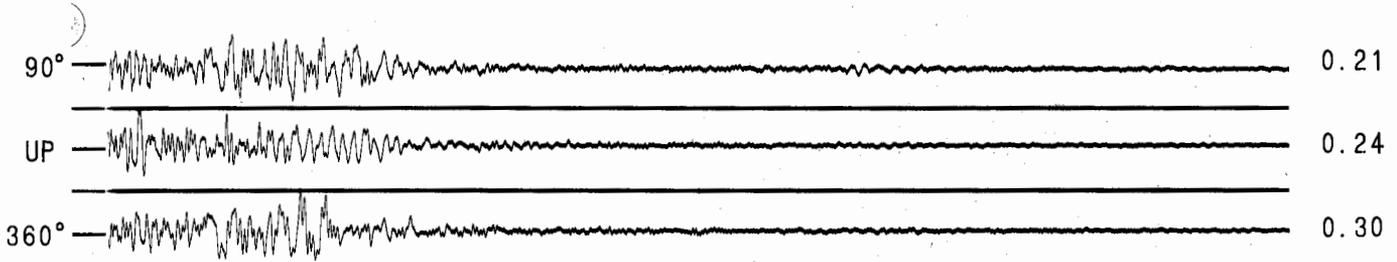
## INDEX TO GROUND-RESPONSE RECORDS

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Los Angeles - Hollywood Storage Bldg. FF	27
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Mt. Wilson - Caltech Seismic Station  
(CSMIP Station 24399)

Record 24399-S0416-91180.01

Max.  
Accel.  
(g)



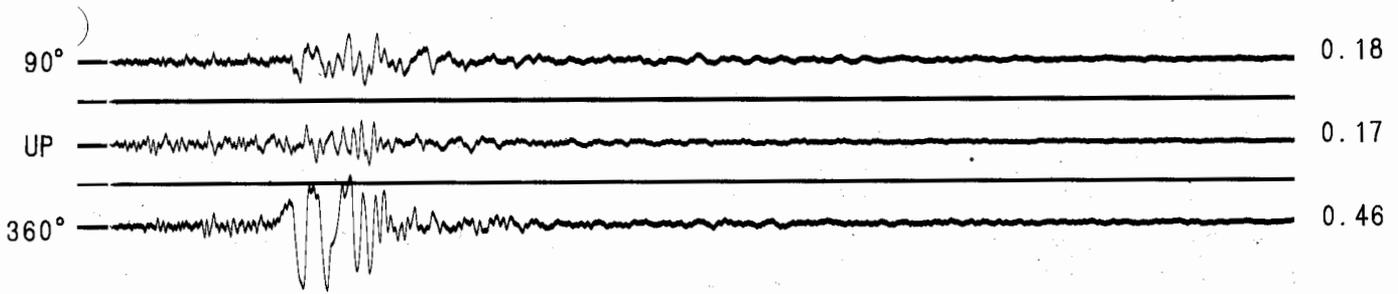
Trigger Time: 14:43:58.7 GMT

0 1 2 3 4 5 10 15 Sec.

Altadena - Eaton Canyon Park  
(CSMIP Station 24402)

Record 24402-S0758-91179.01

Max.  
Accel.  
(g)

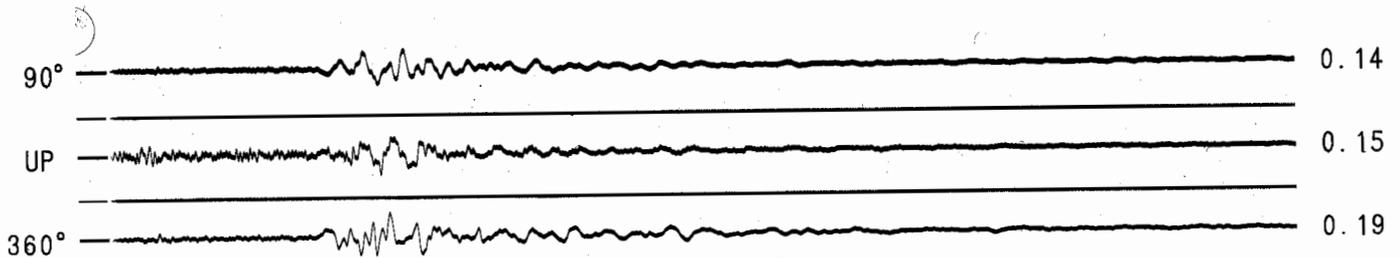


0 1 2 3 4 5 10 15 Sec.

San Marino - Southwestern Academy  
(CSMIP Station 24401)

Record 24401-S0760-91179.01

Max.  
Accel.  
(g)

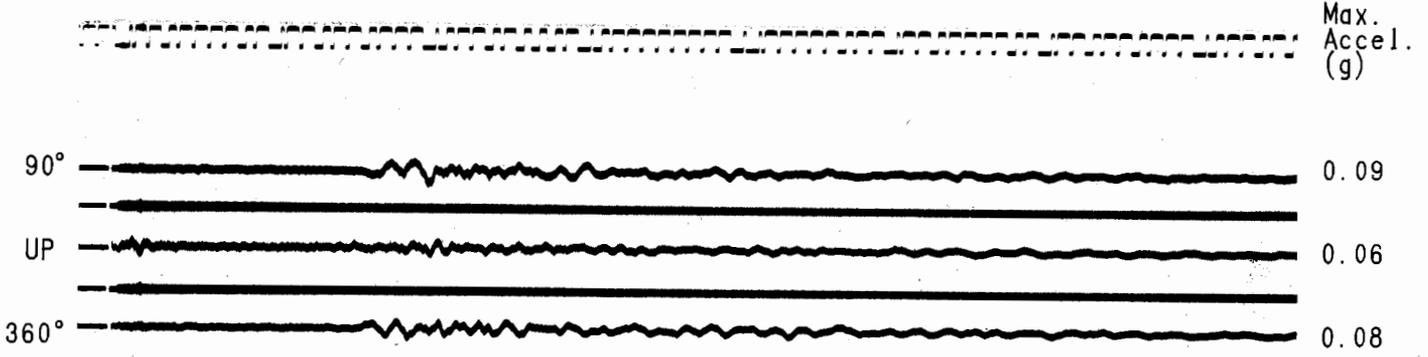


Trigger Time: 14:44:00.3 GMT

0 1 2 3 4 5 10 15 Sec.

Alhambra - Fremont School  
(CSMIP Station 24461)

Record 24461-S3498-91182.01

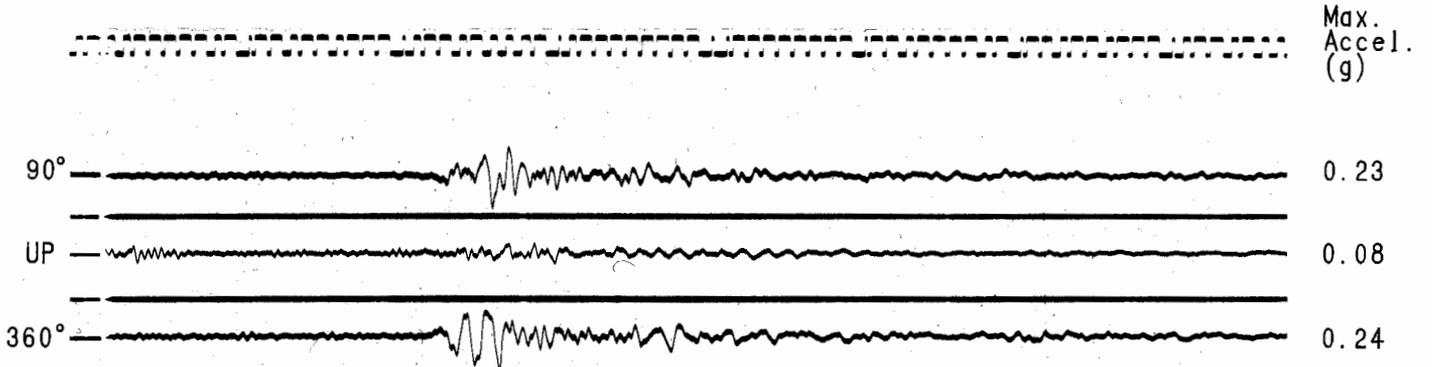


Trigger Time: 14:44:02.1 GMT



Los Angeles - Obregon Park  
(CSMIP Station 24400)

Record 24400-S1606-91182.01

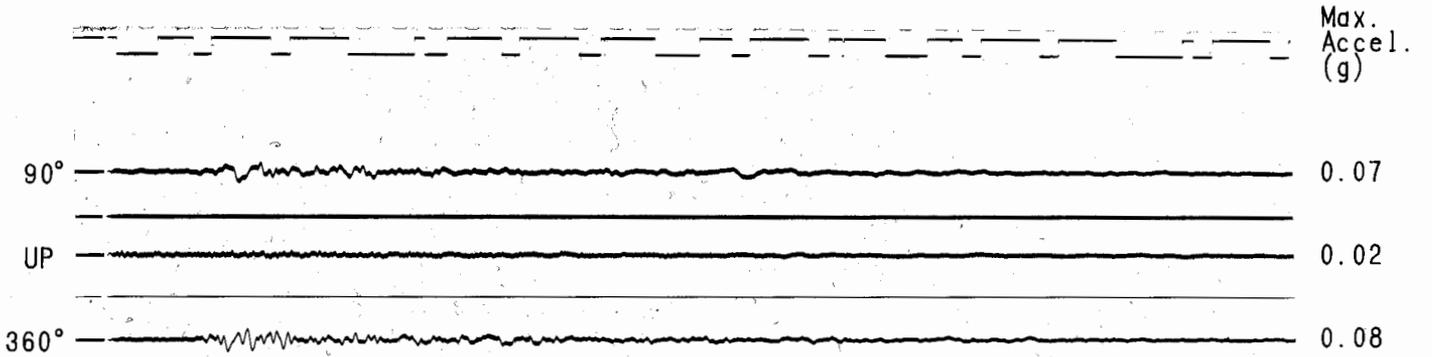


Trigger Time: 14:44:02.2 GMT



Los Angeles - Hollywood Storage Bldg. FF  
(CSMIP Station 24303)

Record 24303-S2774-91183.04



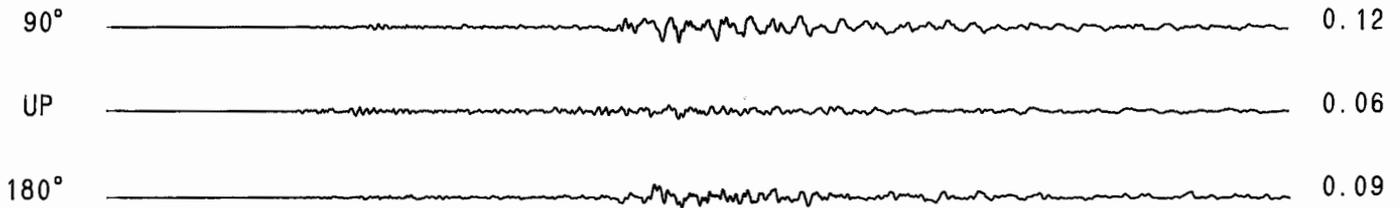
Trigger Time: 14:44:05.9 GMT



Los Angeles - City Terrace  
(CSMIP Station 24592)

Record 24592-E0248-91180.02

Max.  
Accel.  
(g)



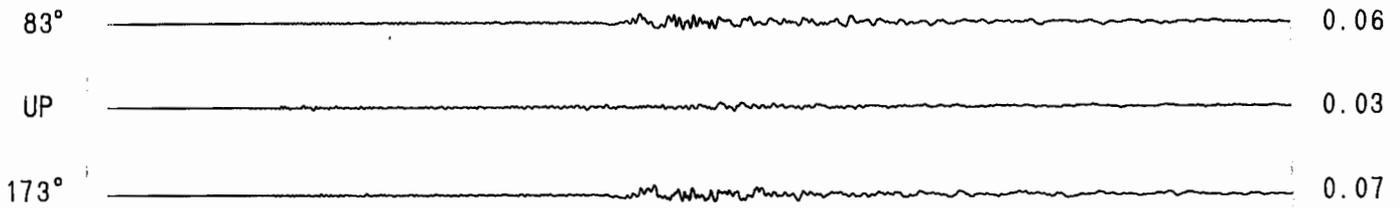
Trigger Time: 14:43:58.2 GMT

0 1 2 3 4 5 10 15 Sec.

Los Angeles - Temple & Hope  
(CSMIP Station 24611)

Record 24611-E0275-91184.02

Max.  
Accel.  
(g)



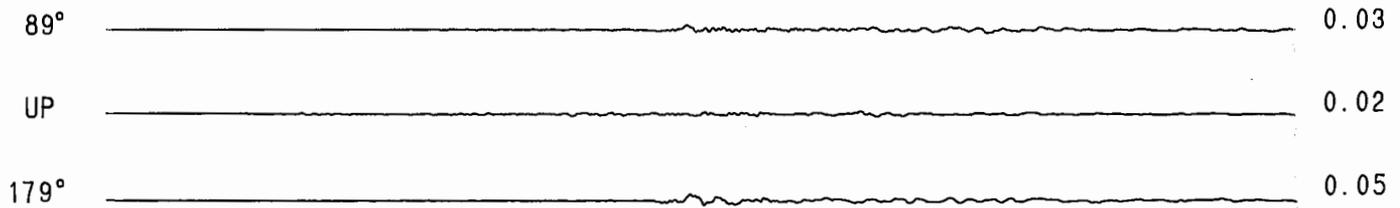
Trigger Time: 14:44:00.1 GMT

0 1 2 3 4 5 10 15 Sec.

Los Angeles - Pico & Sentous  
(CSMIP Station 24612)

Record 24612-E0276-91184.14

Max.  
Accel.  
(g)



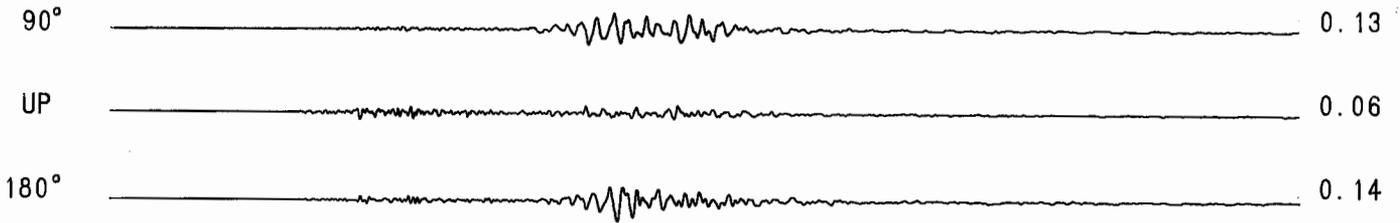
Trigger Time: 14:43:59.7 GMT

0 1 2 3 4 5 10 15 Sec.

Pearblossom - Pallet Creek  
(CSMIP Station 23584)

Record 23584-E0244-91184.03

Max.  
Accel.  
(g)



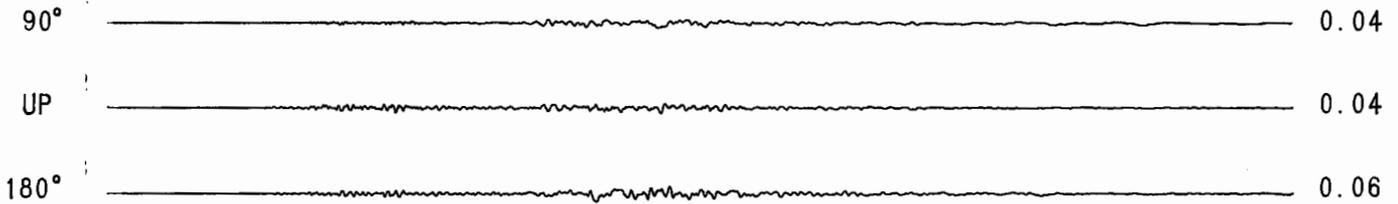
Trigger Time: 14:43:56.8 GMT

0 1 2 3 4 5 10 15 Sec.

Liittlerock - Brainard Canyon  
(CSMIP Station 23595)

Record 23595-E0250-91184.02

Max.  
Accel.  
(g)

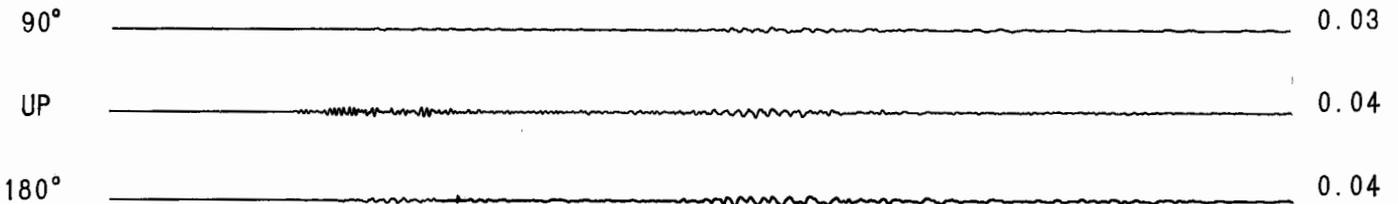


0 1 2 3 4 5 10 15 Sec.

Anaverde Valley - City Ranch  
(CSMIP Station 24576)

Record 24576-E0408-91182.02

Max.  
Accel.  
(g)



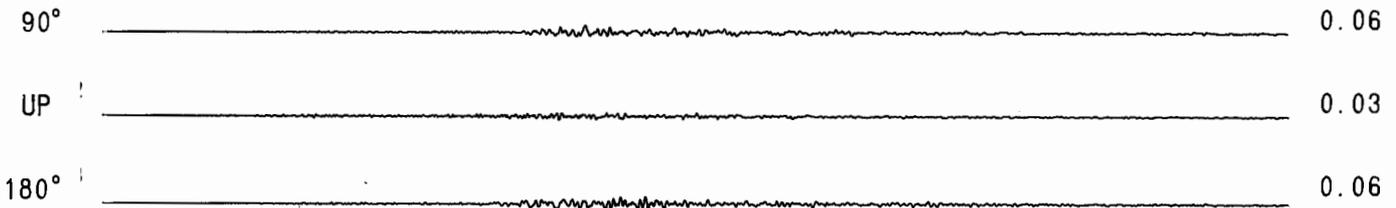
Trigger Time: 14:43:58.8 GMT

0 1 2 3 4 5 10 15 Sec.

Wrightwood - Swarthout Valley  
(CSMIP Station 23574)

Record 23574-E0411-91184.02

Max.  
Accel.  
(g)



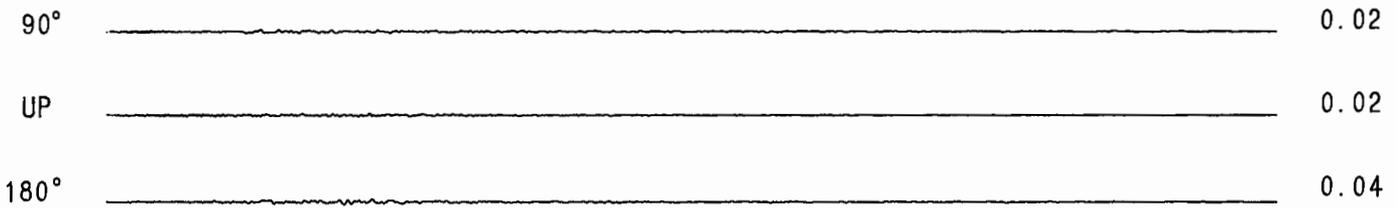
Trigger Time: 14:43:59.3 GMT

0 1 2 3 4 5 10 15 Sec.

Wrightwood - Nielson Ranch  
(CSMIP Station 23573)

Record 23573-E0413-91184.02

Max.  
Accel.  
(g)



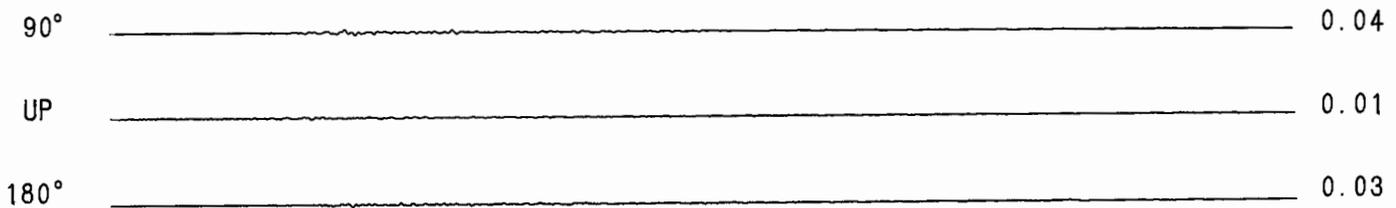
Trigger Time: 14:44:05.5 GMT

0 1 2 3 4 5 10 15 Sec.

Phelan - Wilson Ranch Road  
(CSMIP Station 23597)

Record 23597-E0251-91190.02

Max.  
Accel.  
(g)



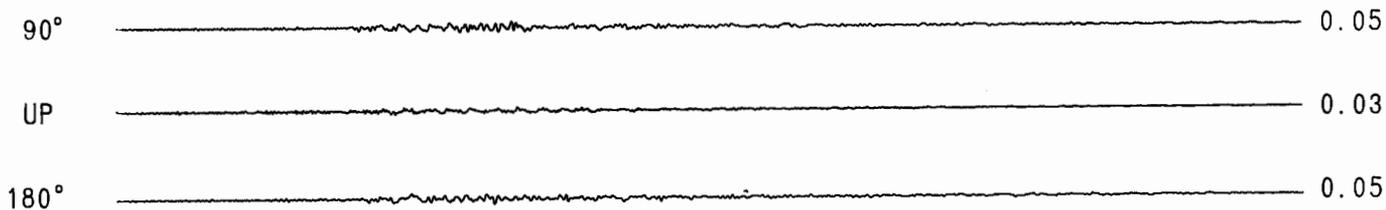
Trigger Time: 14:44:06.6 GMT

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Mt. Baldy - Elementary School  
(CSMIP Station 23572)

Record 23572-E0412-91183.06

Max.  
Accel.  
(g)



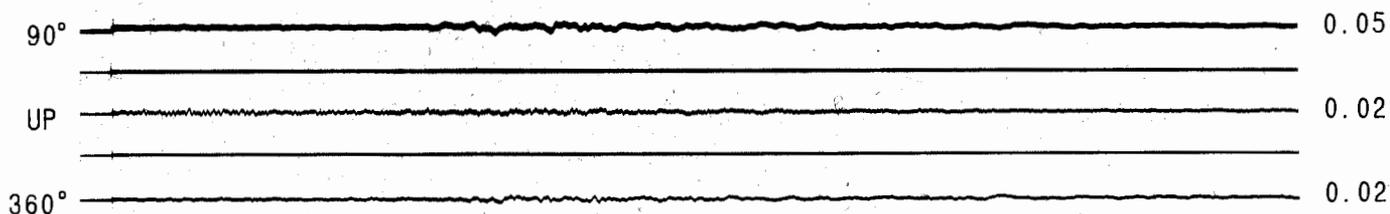
Trigger Time: 14:44:01.0 GMT

0 1 2 3 4 5 10 15 Sec.

Pomona - 4th & Locust  
(CSMIP Station 23525)

Record 23525-S2785-91182.01

Max.  
Accel.  
(g)



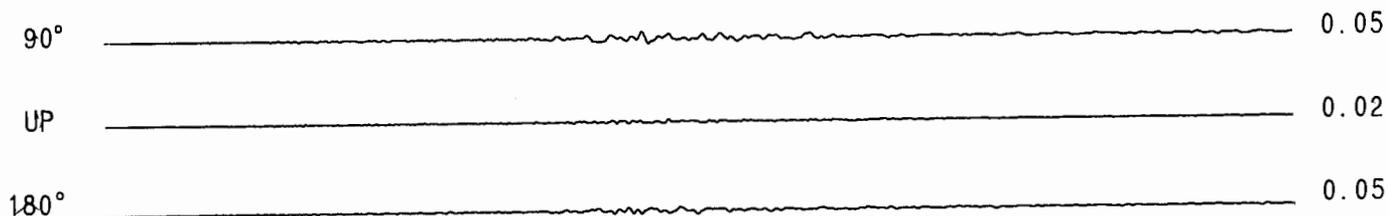
Trigger Time: 14:44:01.1 GMT

0 1 2 3 4 5 10 15 Sec.

Rancho Cucamonga - Deer Canyon  
(CSMIP Station 23598)

Record 23598-E0253-91183.02

Max.  
Accel.  
(g)

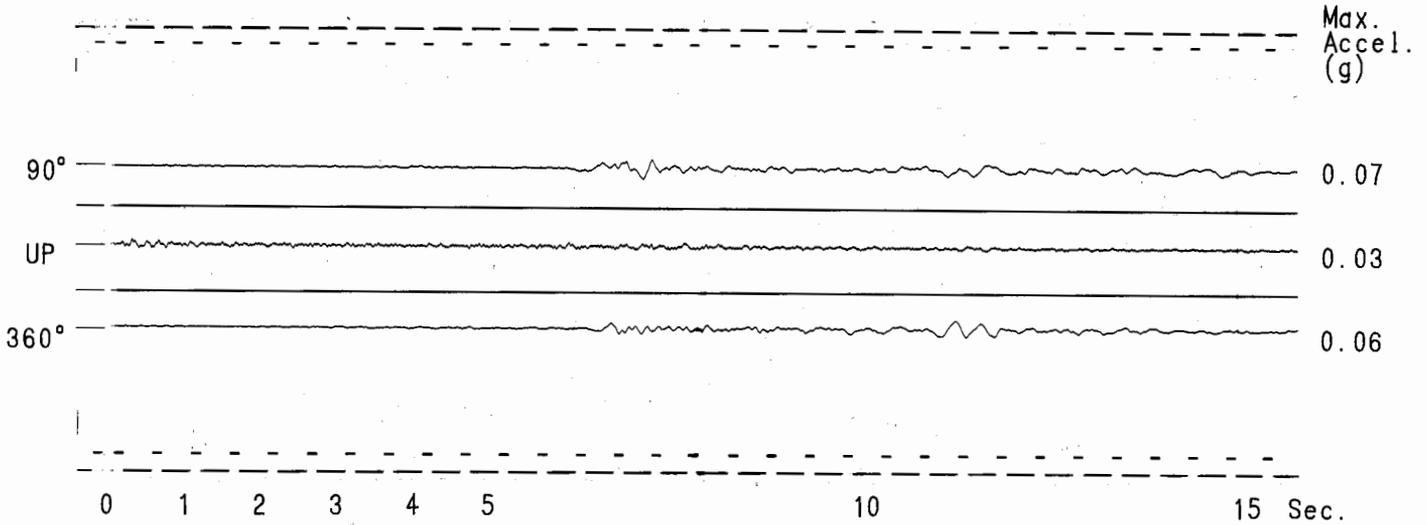


Trigger Time: 14:44:00.9 GMT

0 1 2 3 4 5 10 15 Sec.

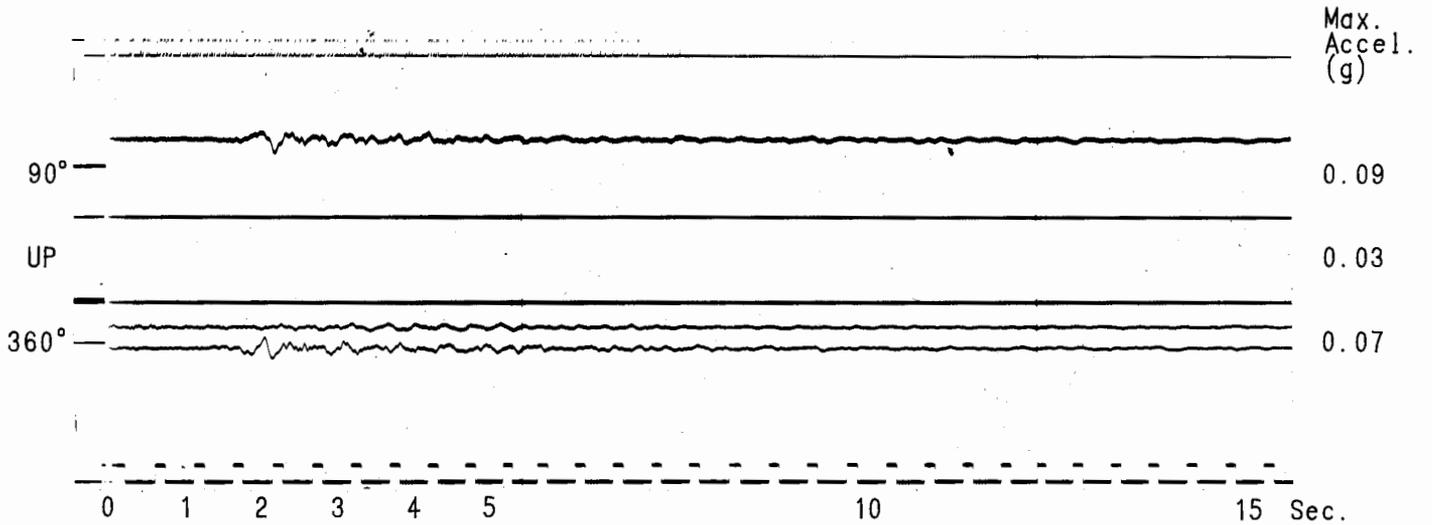
Downey - County Maint. Bldg.  
(CSMIP Station 14368)

Record 14368-S1607-91184.01



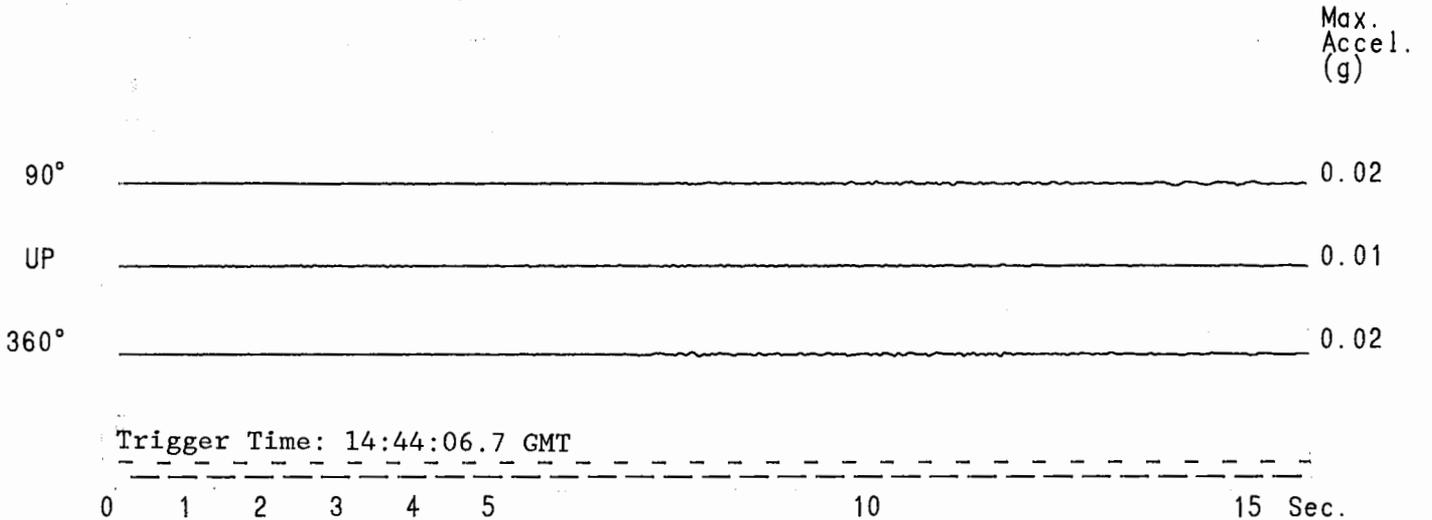
Los Angeles - Baldwin Hills  
(CSMIP Station 24157)

Record 24157-S1687-91183.01



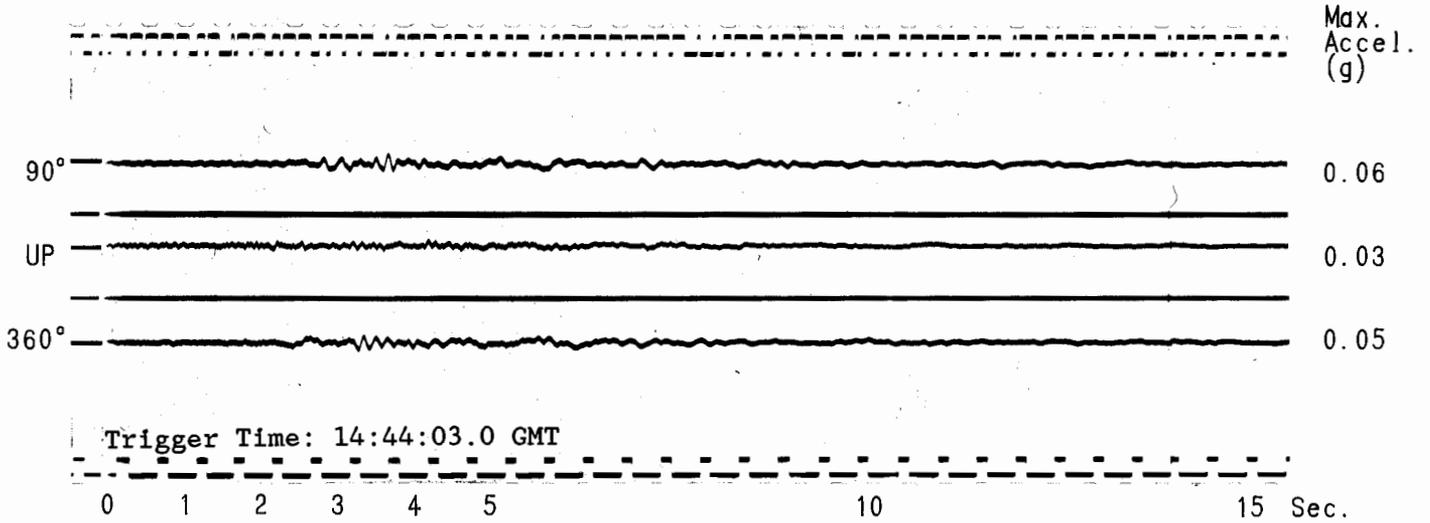
Seal Beach - 8-story Office Bldg. FF  
(CSMIP Station 14578)

Record 14578-CS101-91183



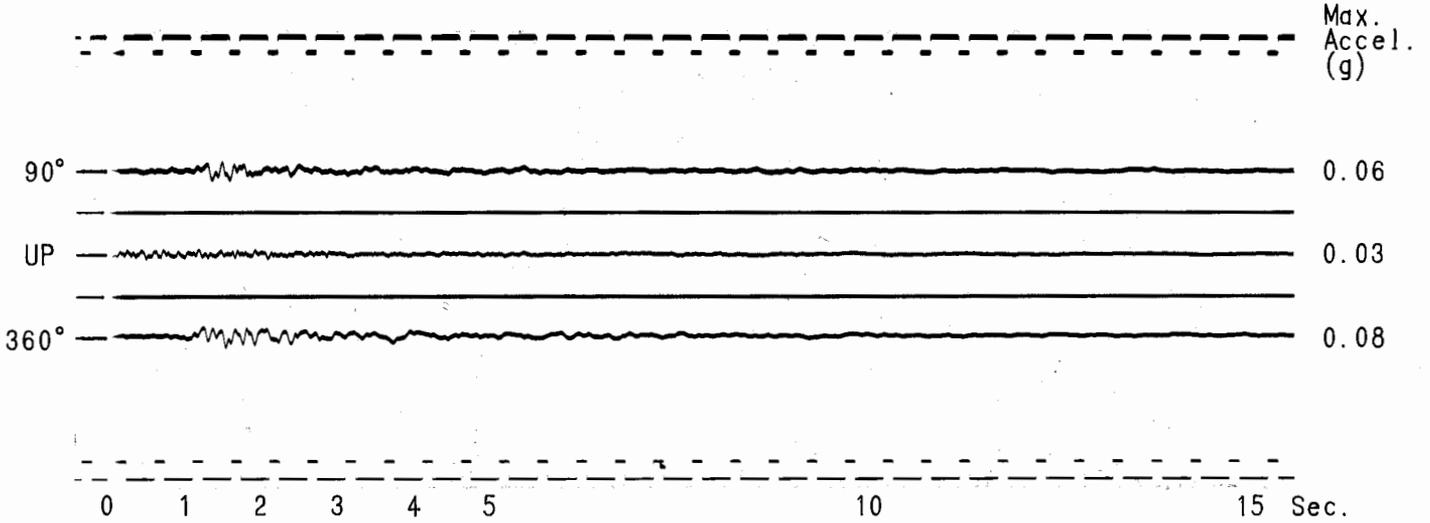
Pacioma - Kagel Canyon  
(CSMIP Station 24088)

Record 24088-S1618-91183.01



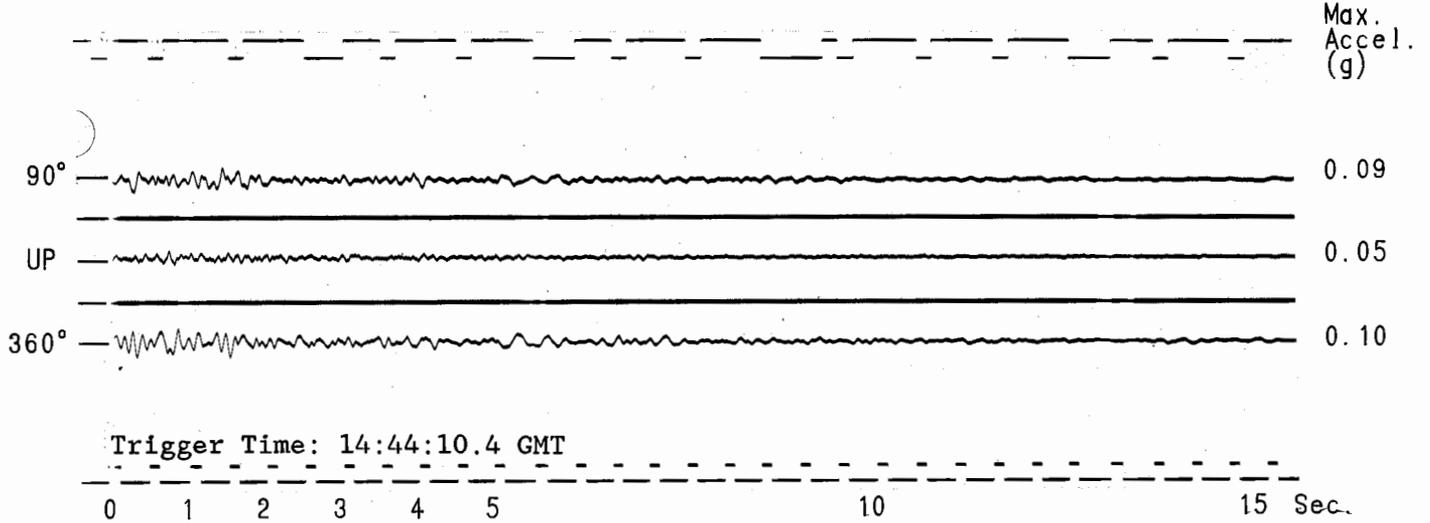
Arleta - Nordhoff Ave Fire Station  
(CSMIP Station 24087)

Record 24087-S1594-91182.01



Tarzana - Cedar Hill Nursery  
(CSMIP Station 24436)

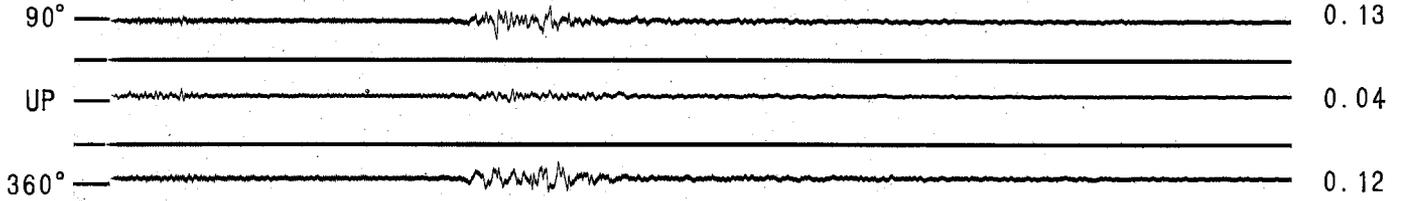
Record 24436-S1614-91180.01



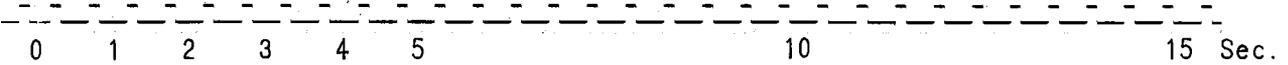
Vasquez Rocks Park  
(CSMIP Station 24047)

Record 24047-S1820-91190.01

Max.  
Accel.  
(g)



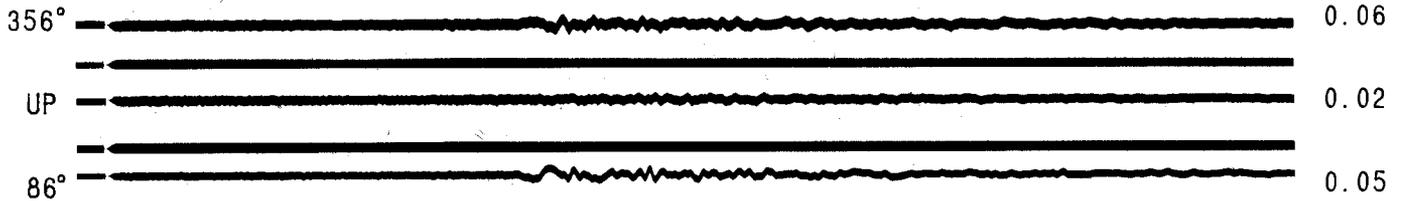
Trigger Time: 14:44:01.8 GMT



Sylmar - 6-story County Hospital FF  
(CSMIP Station 24514)

Record 24514-S5254-91182.01

Max.  
Accel.  
(g)



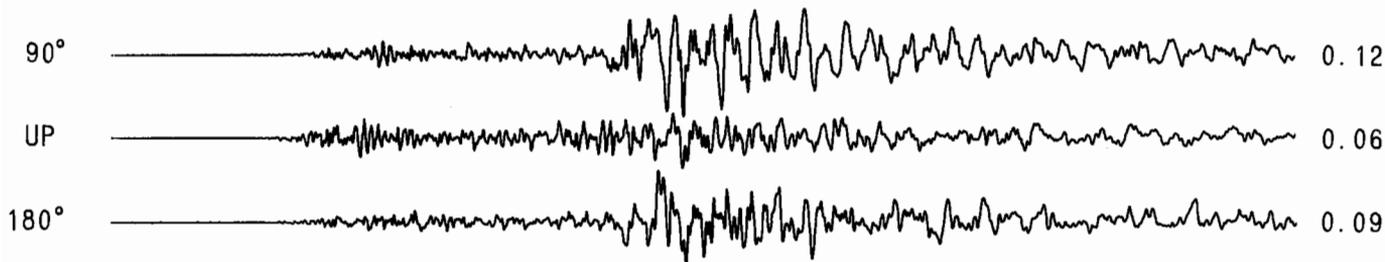
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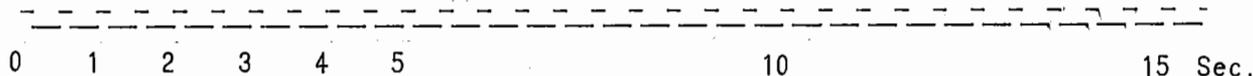
Los Angeles - City Terrace  
(CSMIP Station 24592)

Record 24592-E0248-91180.02

Max.  
Accel.  
(g)



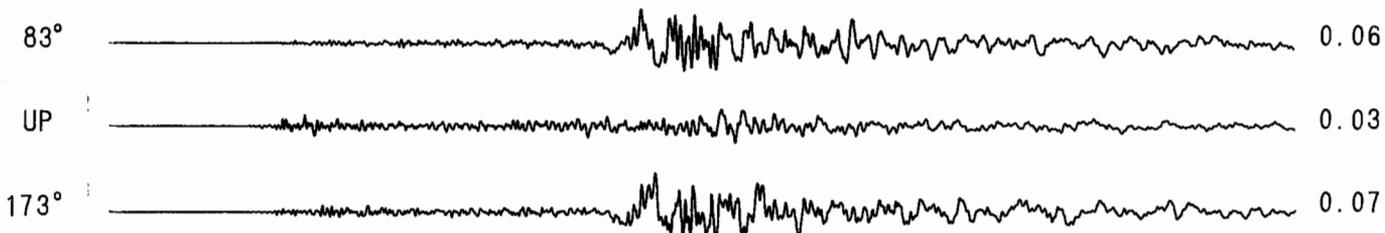
Trigger Time: 14:43:58.2 GMT



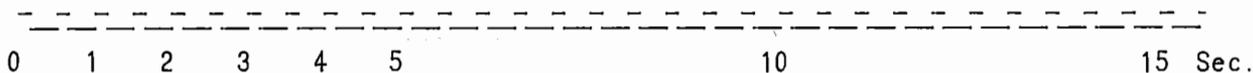
Los Angeles - Temple & Hope  
(CSMIP Station 24611)

Record 24611-E0275-91184.02

Max.  
Accel.  
(g)



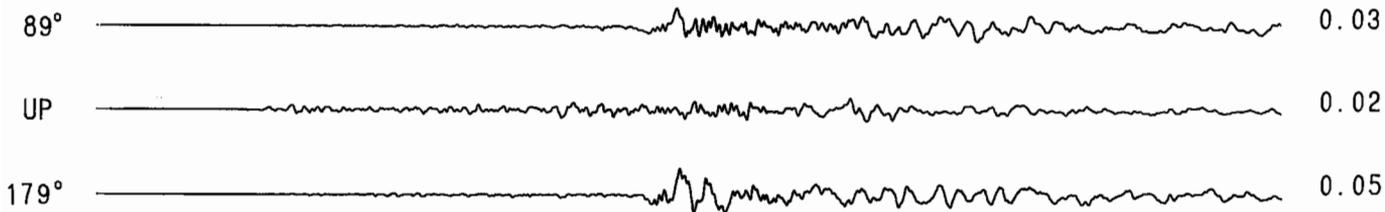
Trigger Time: 14:44:00.1 GMT



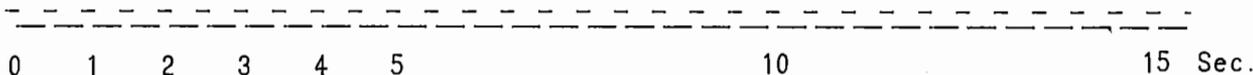
Los Angeles - Pico & Sentous  
(CSMIP Station 24612)

Record 24612-E0276-91184.14

Max.  
Accel.  
(g)



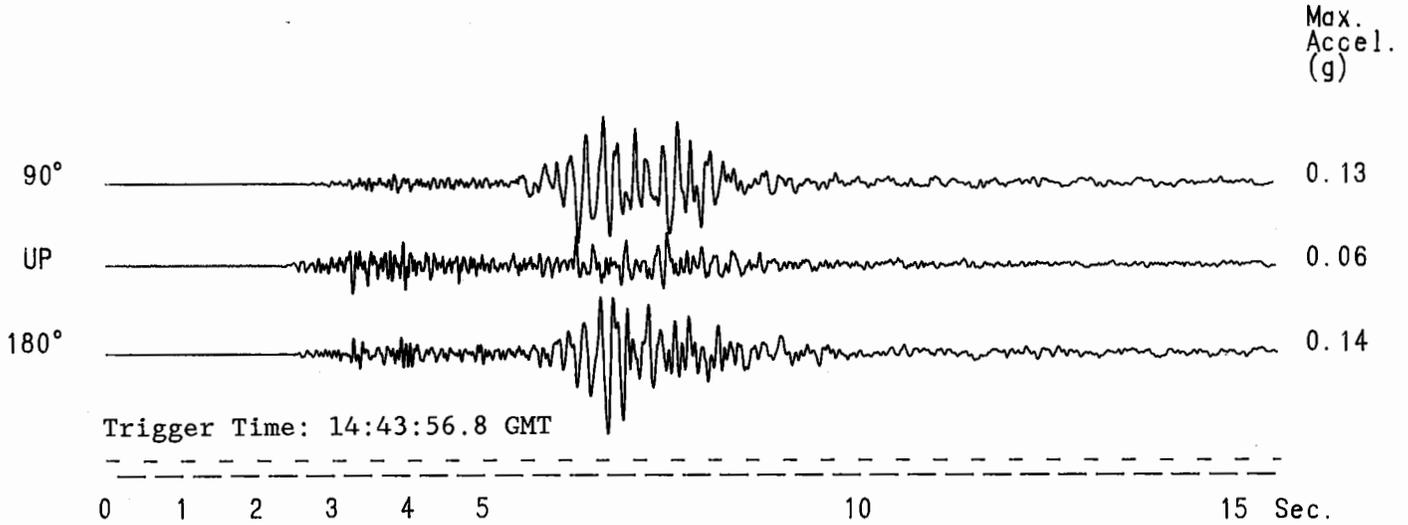
Trigger Time: 14:43:59.7 GMT



**This page plotted with 4x vertical exaggeration.**

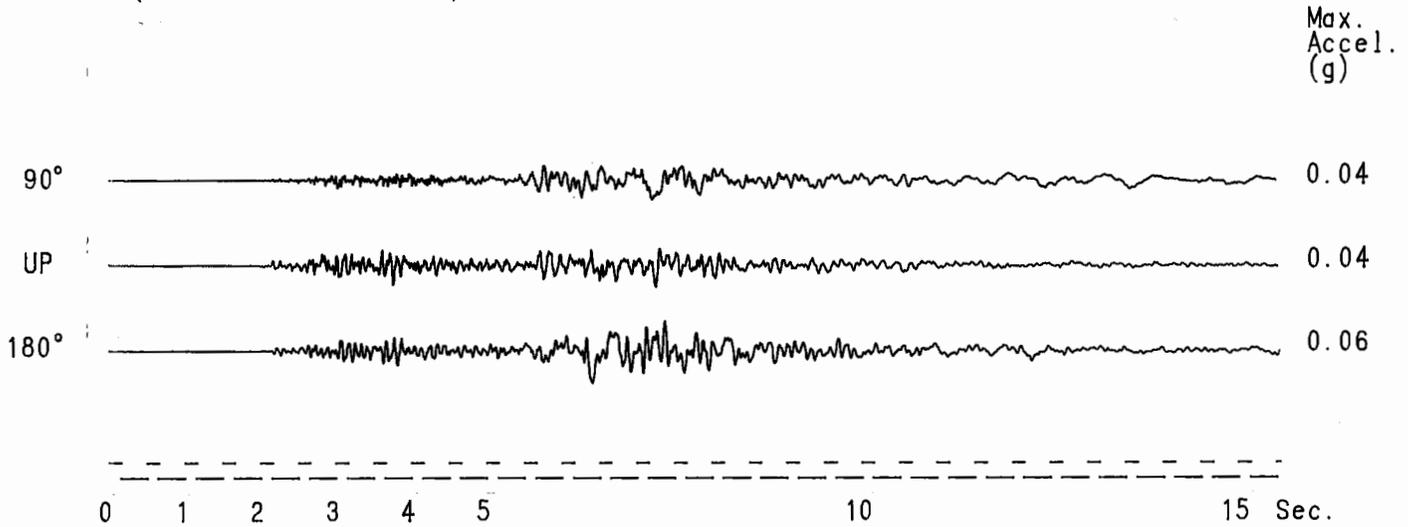
Pearblossom - Pallet Creek  
(CSMIP Station 23584)

Record 23584-E0244-91184.03



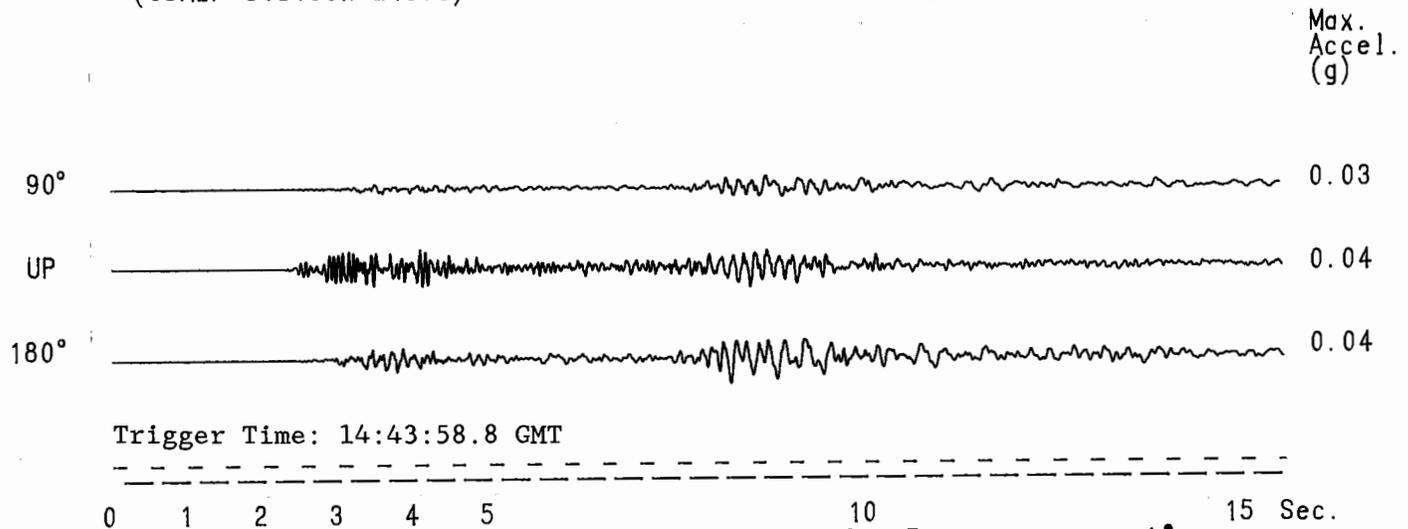
Liittlerock - Brainard Canyon  
(CSMIP Station 23595)

Record 23595-E0250-91184.02



Anaverde Valley - City Ranch  
(CSMIP Station 24576)

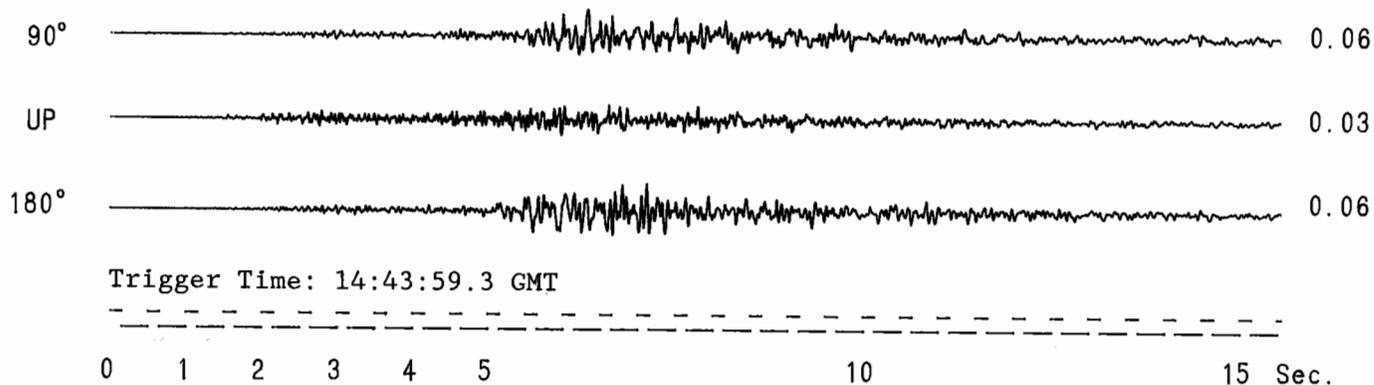
Record 24576-E0408-91182.02



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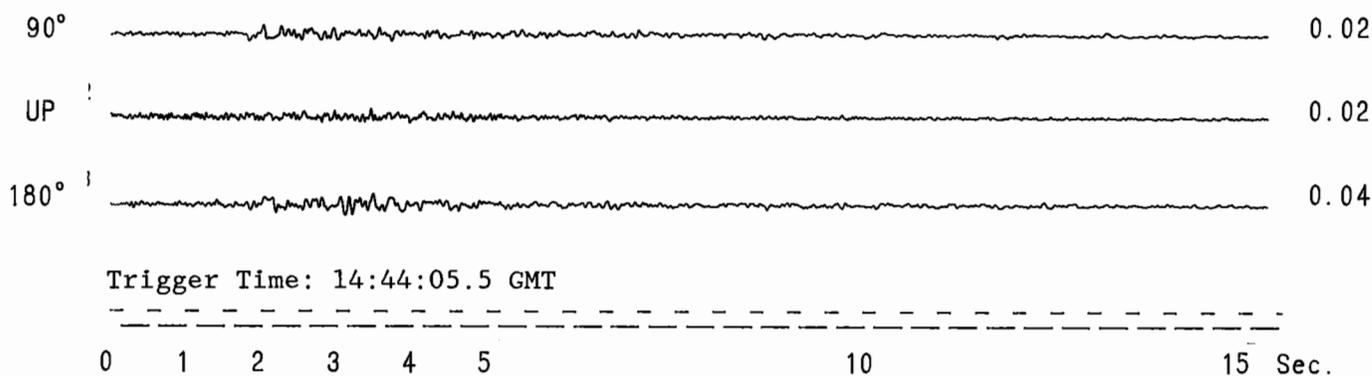
Wrightwood - Swarthout Valley  
(CSMIP Station 23574)

Record 23574-E0411-91184.02

Max.  
Accel.  
(g)

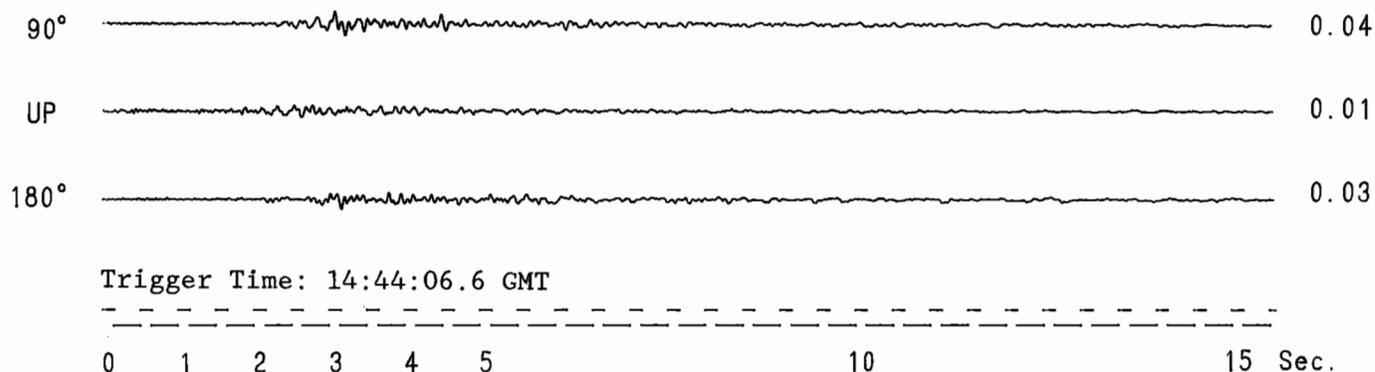
Wrightwood - Nielson Ranch  
(CSMIP Station 23573)

Record 23573-E0413-91184.02

Max.  
Accel.  
(g)

Phelan - Wilson Ranch Road  
(CSMIP Station 23597)

Record 23597-E0251-91190.02

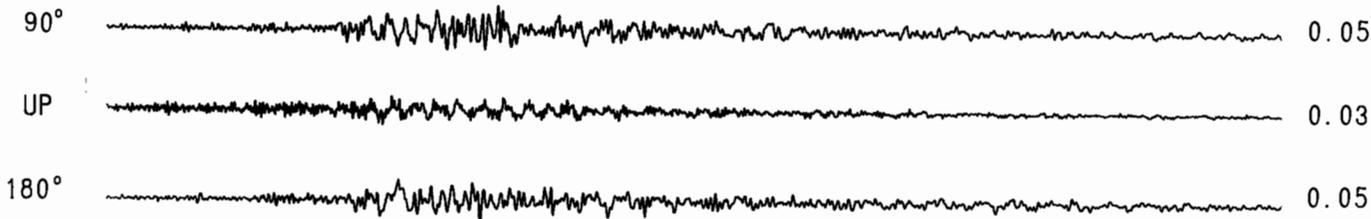
Max.  
Accel.  
(g)

**This page plotted with 4x vertical exaggeration.**

Mt. Baldy - Elementary School  
(CSMIP Station 23572)

Record 23572-E0412-91183.06

Max.  
Accel.  
(g)



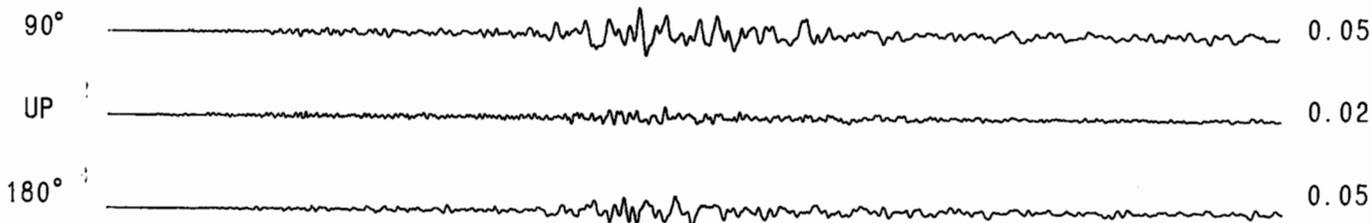
Trigger Time: 14:44:01.0 GMT

0 1 2 3 4 5 10 15 Sec.

Rancho Cucamonga - Deer Canyon  
(CSMIP Station 23598)

Record 23598-E0253-91183.02

Max.  
Accel.  
(g)



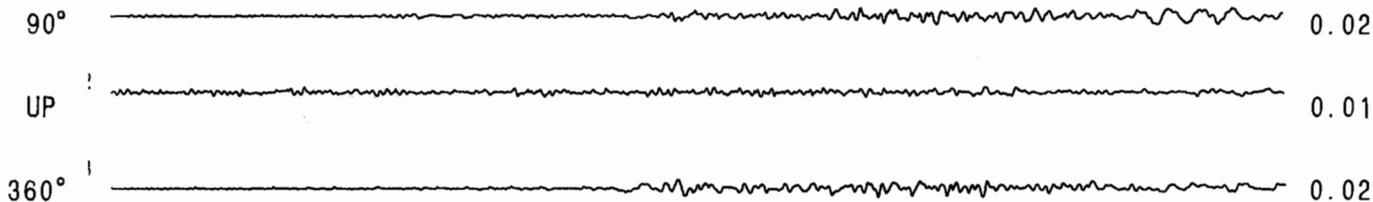
Trigger Time: 14:44:00.9 GMT

0 1 2 3 4 5 10 15 Sec.

Seal Beach - 8-story Office Bldg. FF  
(CSMIP Station 14578)

Record 14578-CS101-91183

Max.  
Accel.  
(g)



Trigger Time: 14:44:06.7 GMT

0 1 2 3 4 5 10 15 Sec.

**This page plotted with 4x vertical exaggeration.**

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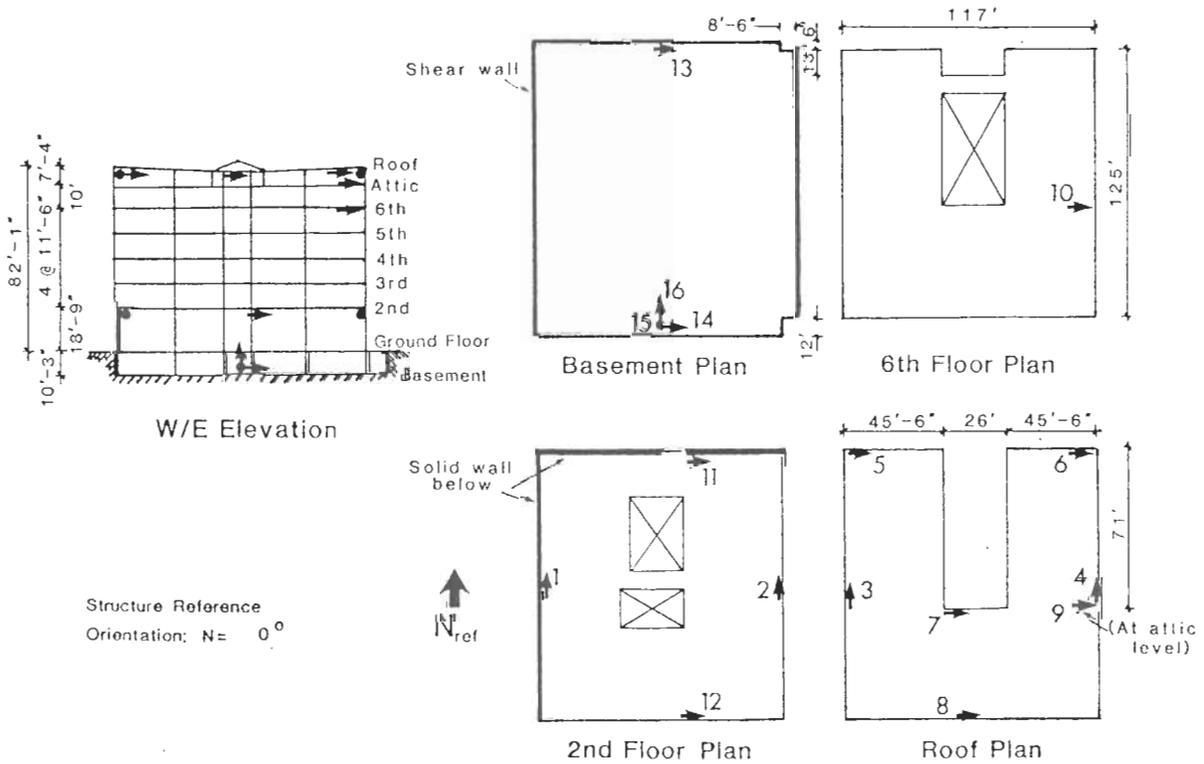
**Pasadena - 6-story Office Bldg.**  
(CSMIP Station No. 24541)



No. of Stories above/below ground: 6/1  
 Plan Shape: "U" shaped  
 Base Dimensions: 126' x 143'  
 Typical Floor Dimensions: 117' x 125'  
 Design Date: 1906  
 Construction Date: 1907

Vertical Load Carrying System:  
 Steel frames with unreinforced masonry infill walls. Floors consist of hollow clay tile covered with concrete.  
 Lateral Force Resisting System:  
 Unreinforced masonry walls on the perimeter.  
 Foundation Type:  
 Spread footings.

**SENSOR LOCATIONS**

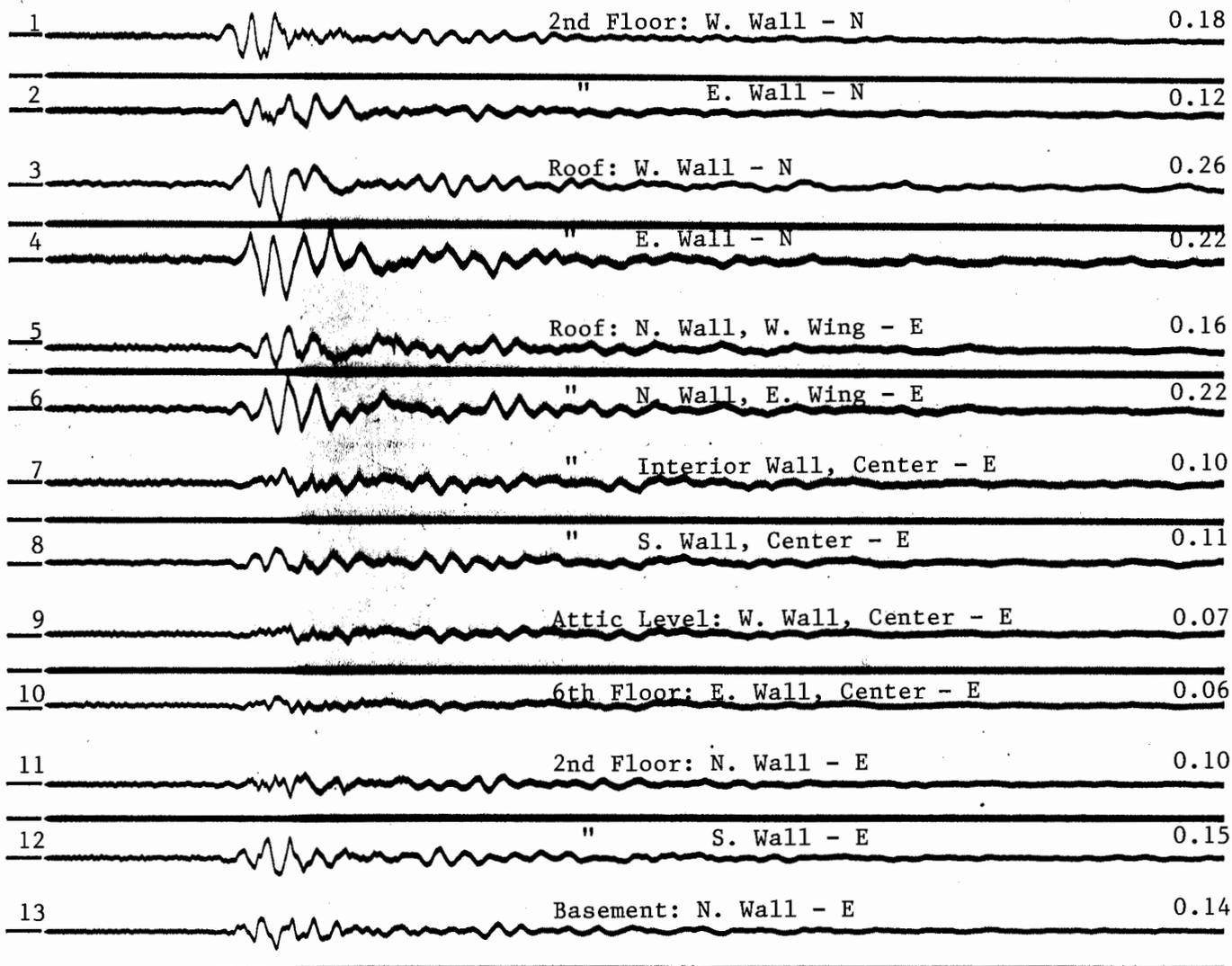


Pasadena -- 6--story Office Bldg.

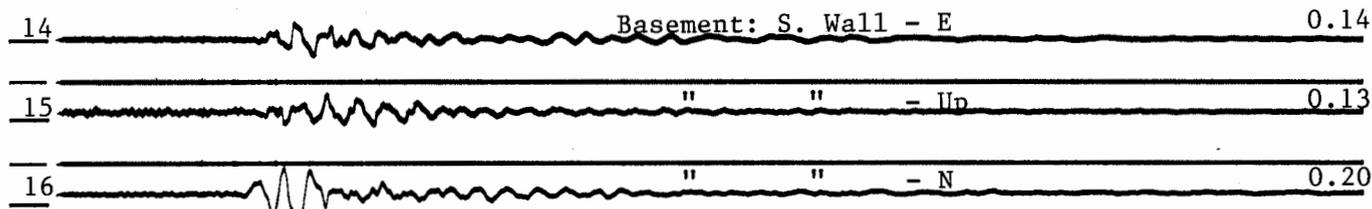
(GSMIP Station 24541)

Record 24541-C0281-91179.01

Max. Accel. (g)



Record 24541-S1869-91179.01



Trigger Time: 14:43:58.9 GMT

Structure Reference Orientation: N=0°

0 1 2 3 4 5

10

15 Sec.

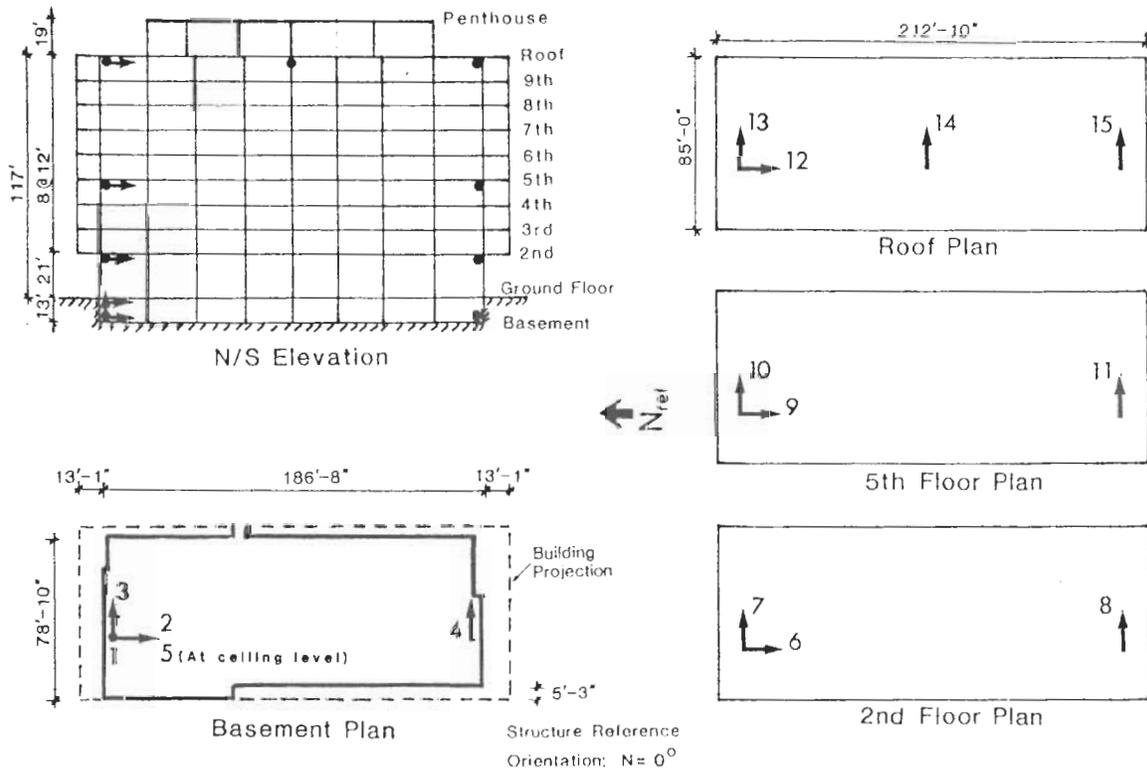
**Pasadena - 9-story Commercial Bldg.**  
(CSMIP Station No. 24571)



No. of Stories above/below ground: 9/1  
 Plan Shape: Rectangular  
 Base Dimensions: 187' x 79'  
 Typical Floor Dimensions: 213' x 86'  
 Design Date: 1963  
 Construction Date: 1964

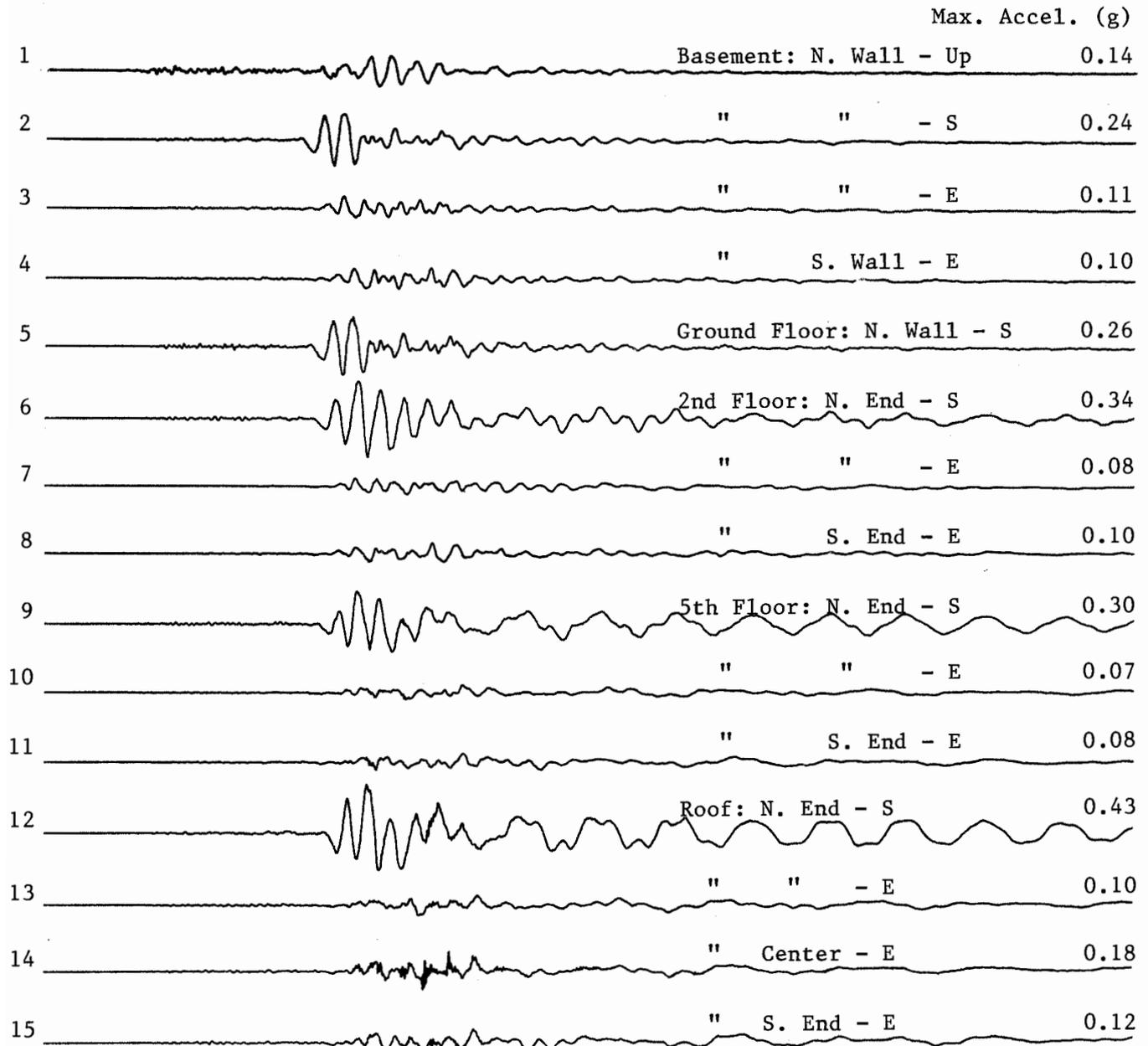
Vertical Load Carrying System:  
 11" concrete flat slabs with drop panels supported by concrete columns.  
 Lateral Force Resisting System:  
 Concrete slab-column system throughout the building and beam-column system at the core.  
 Foundation Type:  
 Spread footings.

**SENSOR LOCATIONS**



Pasadena - 9-story Commercial Bldg.  
(CSMIP Station 24571)

Record 24571-CD112-91184.01



Trigger Time: 14:43:57.5 GMT

Structure Reference Orientation: N=0°

0 1 2 3 4 5 10 15 Sec.

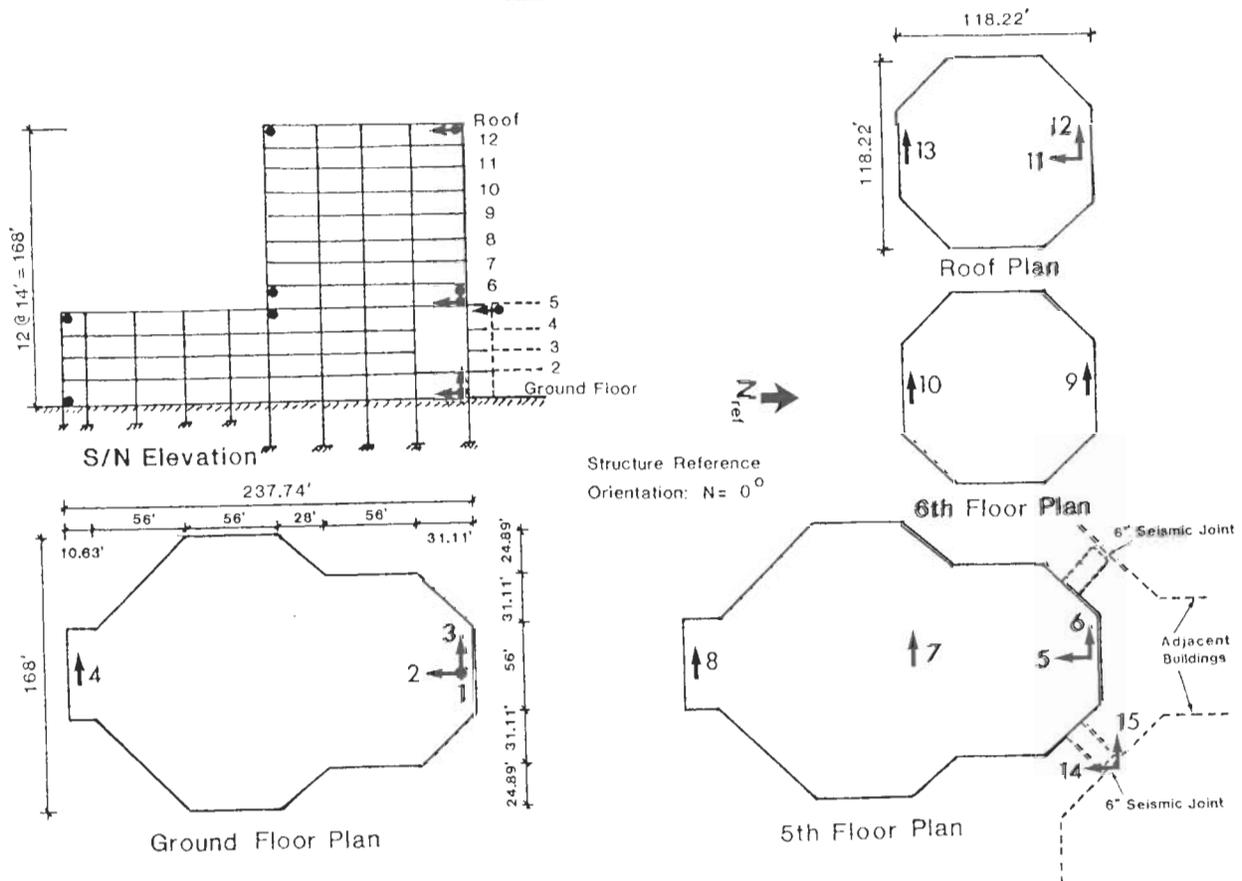
**Pasadena - 12-story Office Bldg.**  
(CSMIP Station No. 24566)



No. of Stories above/below ground: 12/0  
 Plan Shape: Octagonal  
 Base Dimensions: 238' x 168'  
 Typical Floor Dimensions: 118' x 118'  
 Design Date: 1972  
 Construction Date: 1974

Vertical Load Carrying System:  
 3" concrete slabs over metal decking supported  
 by steel frames.  
 Lateral Force Resisting System:  
 Moment resisting steel frames.  
 Foundation Type:  
 Spread footings.

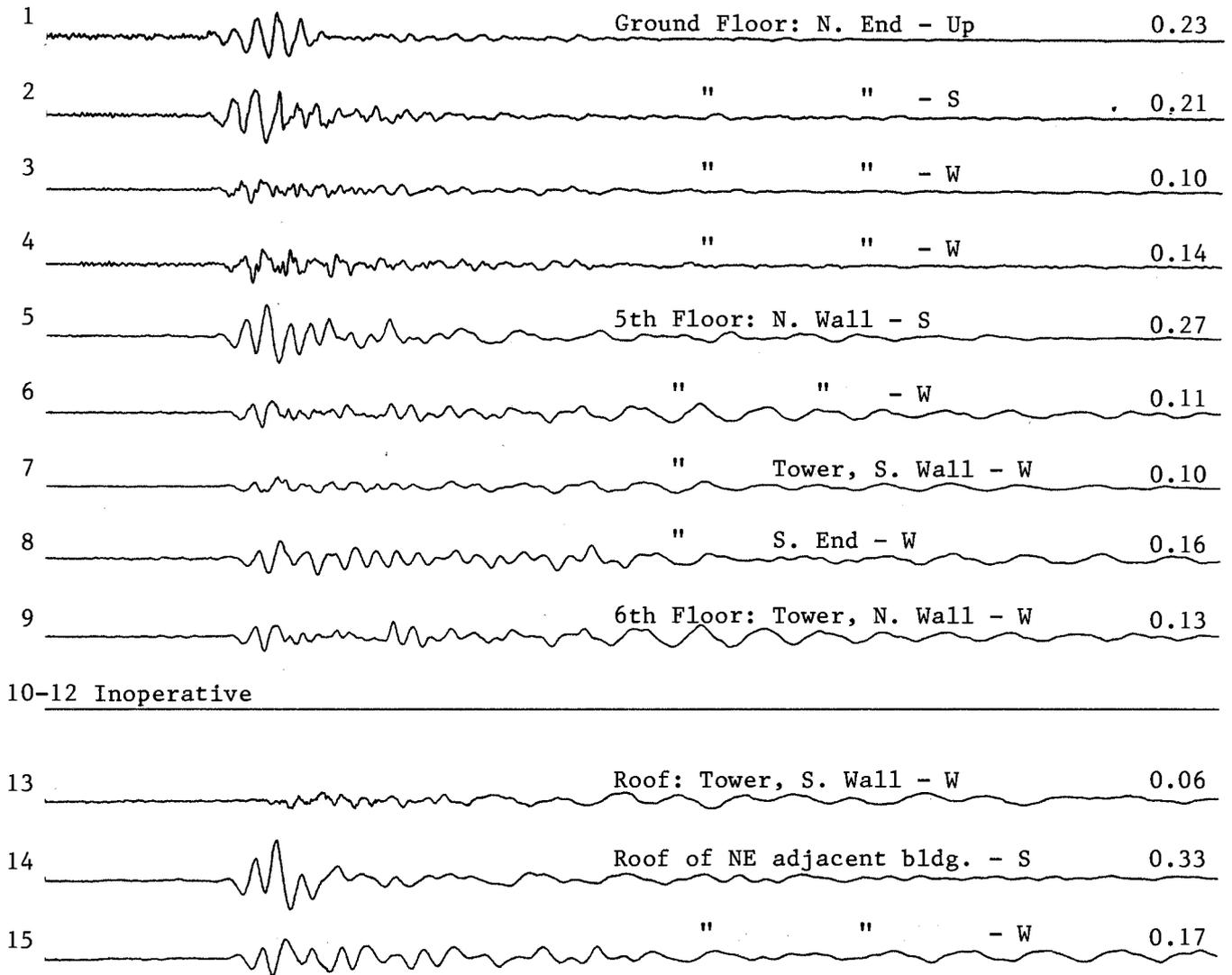
**SENSOR LOCATIONS**



Pasadena - 12-story Office Bldg.  
 (CSMIP Station 24566)

Record 24566-CD110-91180.01

Max. Accel.(g)



Trigger Time: 14:43:59.0 GMT

Structure Reference Orientation: N=0°

0 1 2 3 4 5 10 15 Sec.

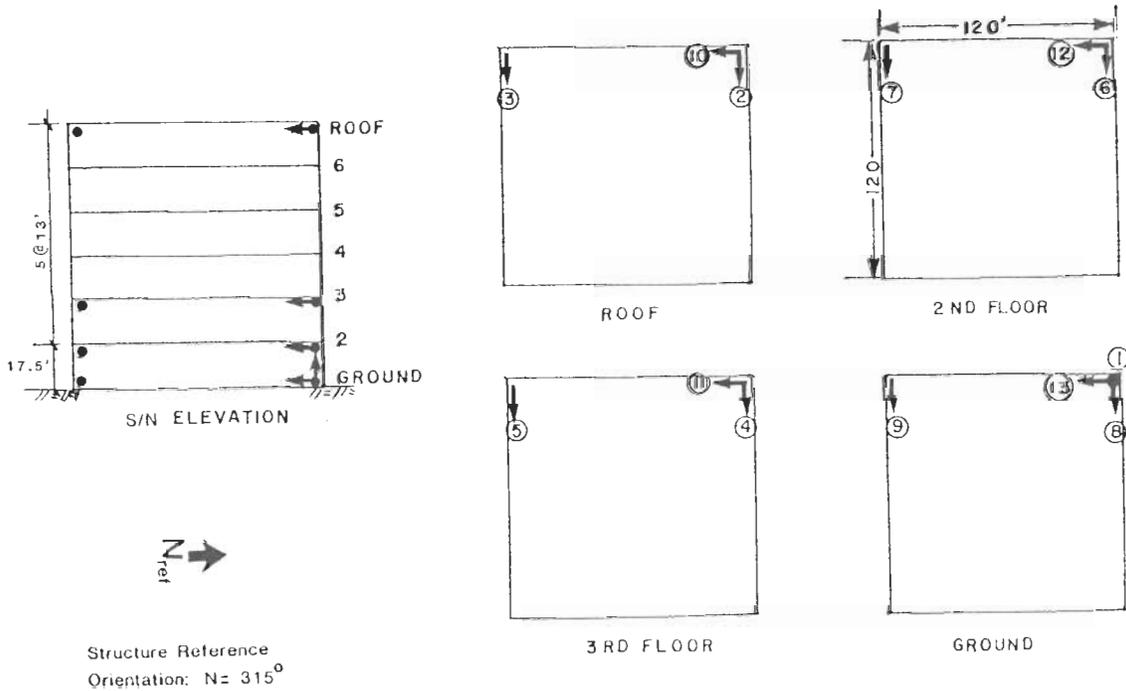
**Burbank - 6-story Office Bldg.**  
 (CSMIP Station No. 24370)



No. of Stories above/below ground: 6/0  
 Plan Shape: Rectangular  
 Base Dimensions: 120' x 120'  
 Typical Floor Dimensions: 120' x 120'  
 Design Date: 1976  
 Construction Date: 1977

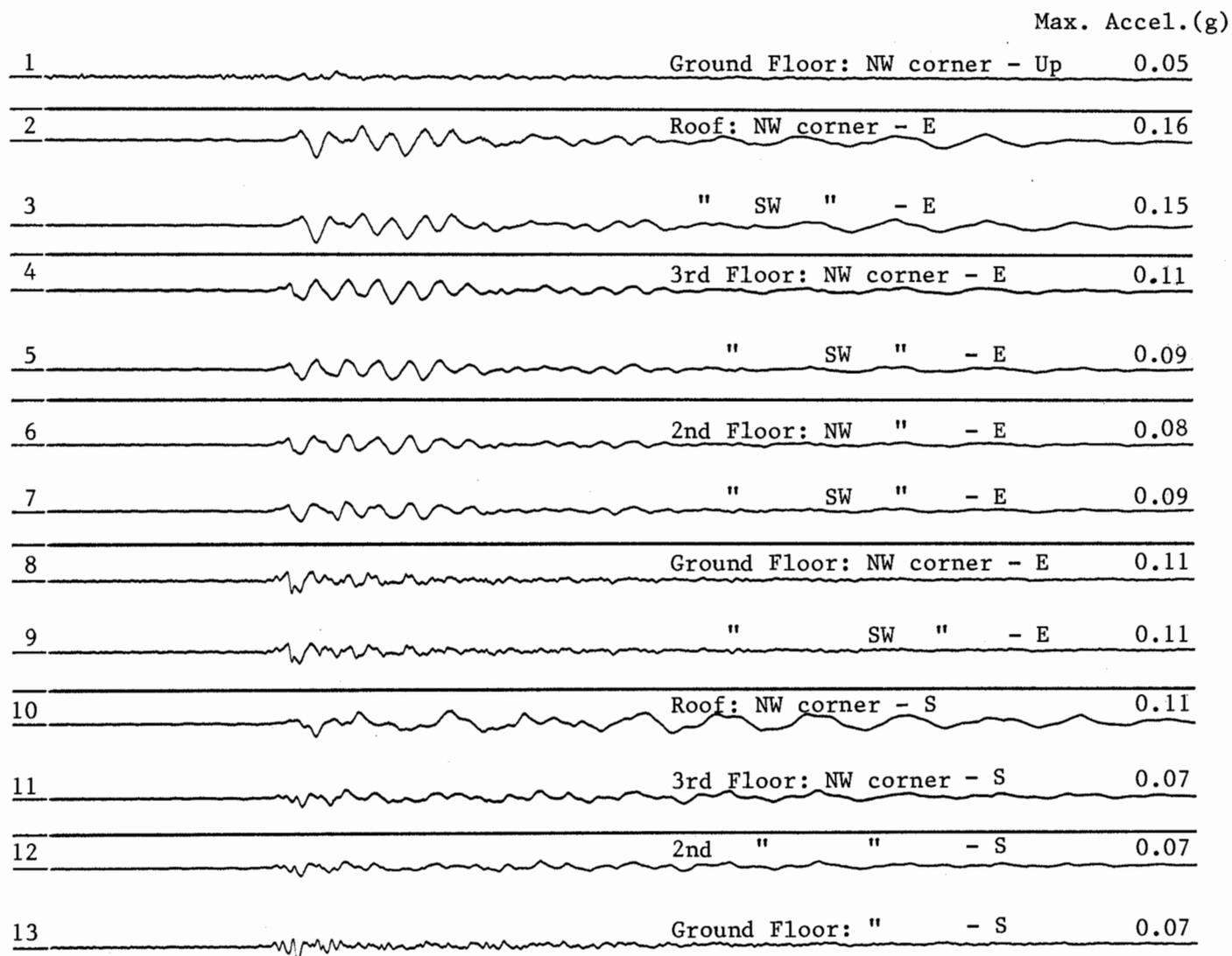
Vertical Load Carrying System:  
 3" concrete slabs over metal deck supported by steel frames.  
 Lateral Force Resisting System:  
 Perimeter moment resisting steel frames.  
 Foundation Type:  
 Concrete caissons (approx. 32' deep)

**SENSOR LOCATIONS**



Burbank - 6-story Commercial Bldg.  
(CSMIP Station 24370)

Record 24370-C0196-91182.01



Structure Reference Orientation: N=315°

0 1 2 3 4 5 10 15 Sec.

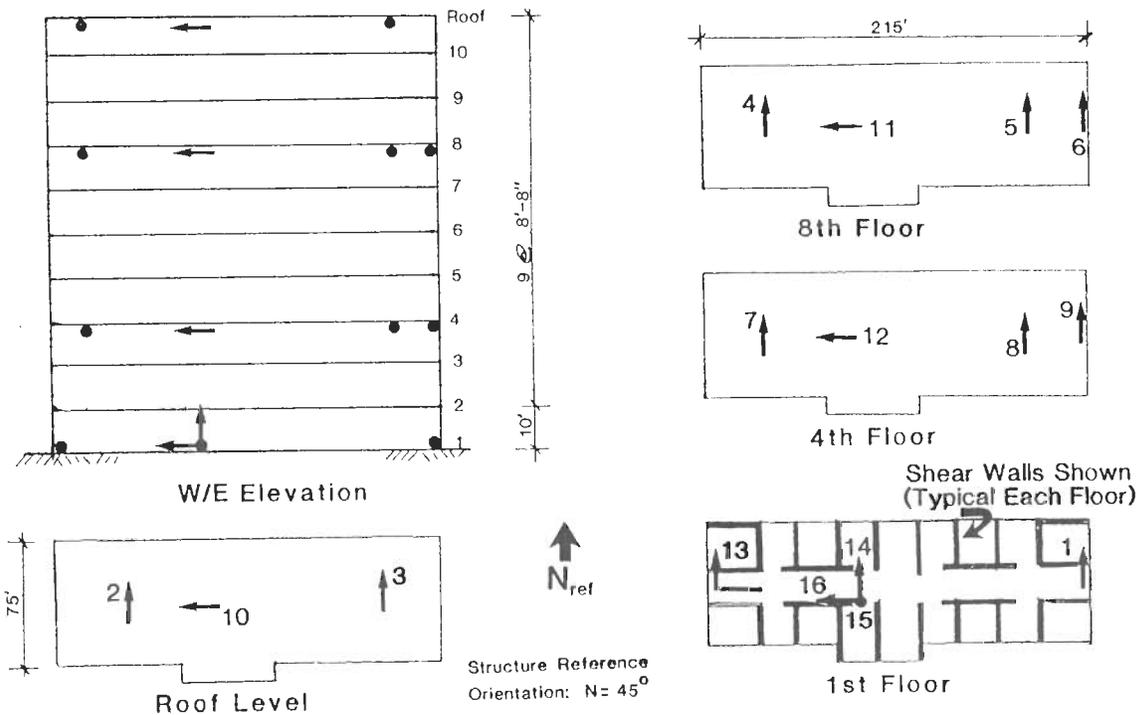
**Burbank - 10-story Residential Bldg.**  
(CSMIP Station No. 24385)



No. of Stories above/below ground: 10/0  
 Plan Shape: Rectangular  
 Base Dimensions: 215' x 75'  
 Typical Floor Dimensions: 215' x 75'  
 Design Date: 1974  
 Construction Date: 1974

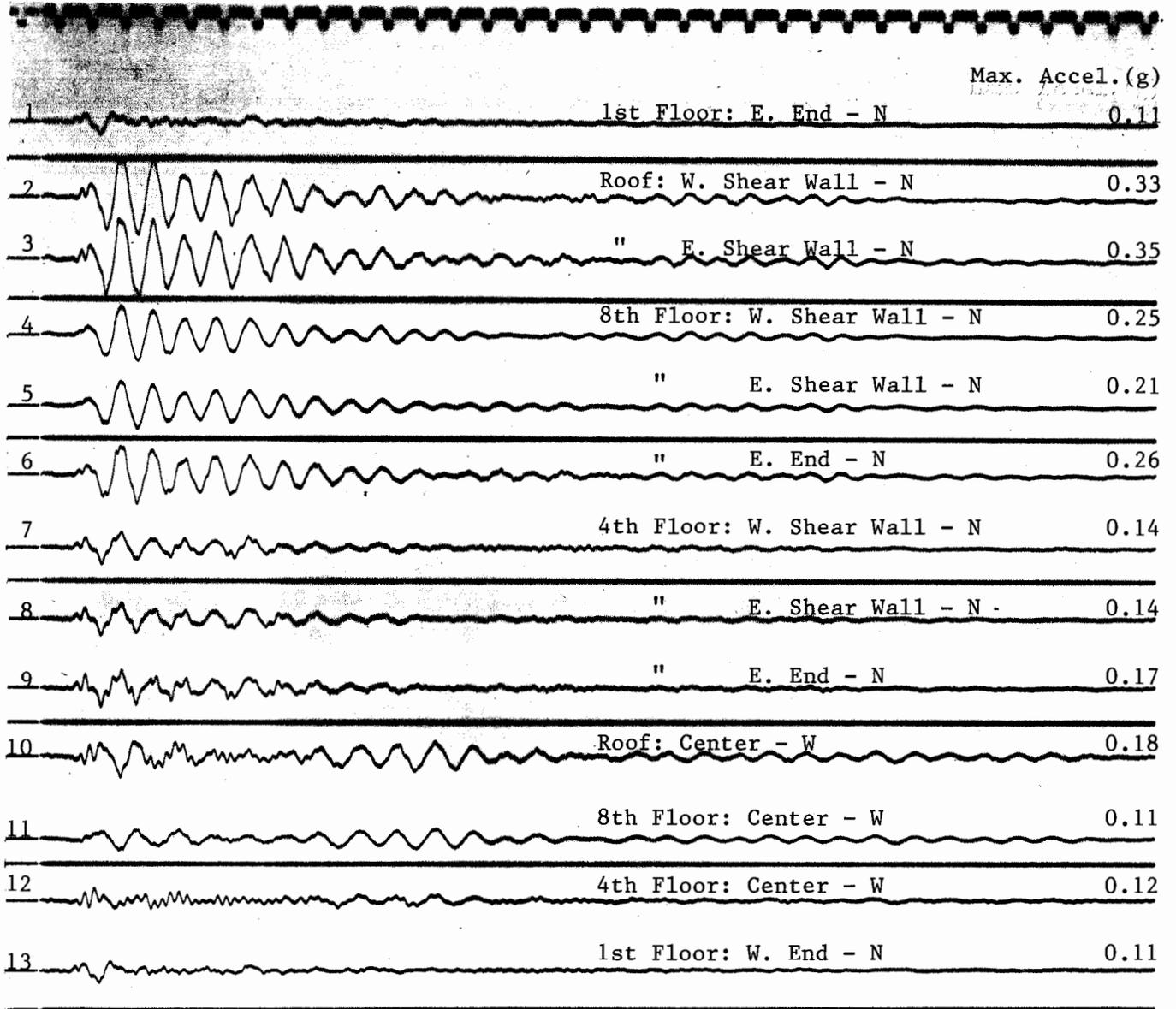
Vertical Load Carrying System:  
 Precast and poured-in-place concrete slabs supported by precast concrete bearing walls.  
 Lateral Force Resisting System:  
 Precast concrete shear walls in both directions.  
 Foundation Type:  
 Concrete caissons (25' to 35' deep).

**SENSOR LOCATIONS**

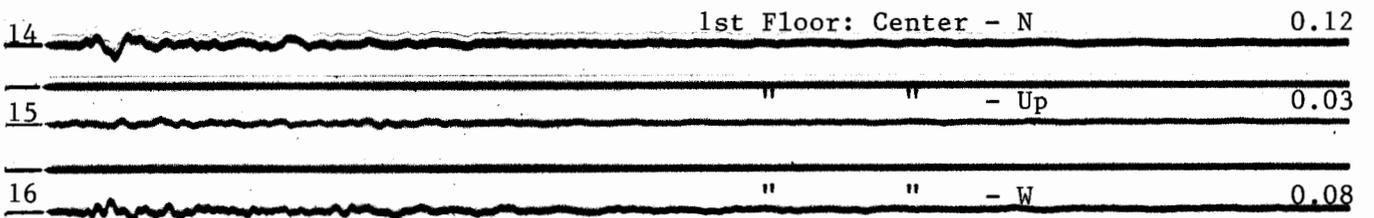


Burbank - 10-story Residential Bldg.  
(CSMIP Station 24385)

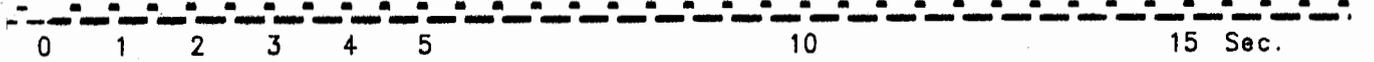
Record 24385-C0193-91179.01



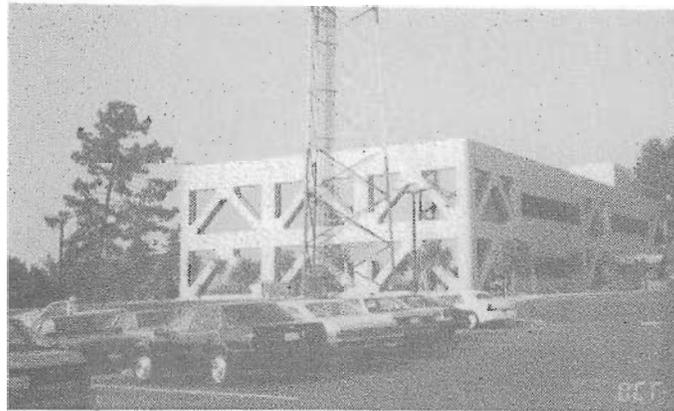
Record 24385-S3486-91180.01



Structure Reference Orientation: N=45°



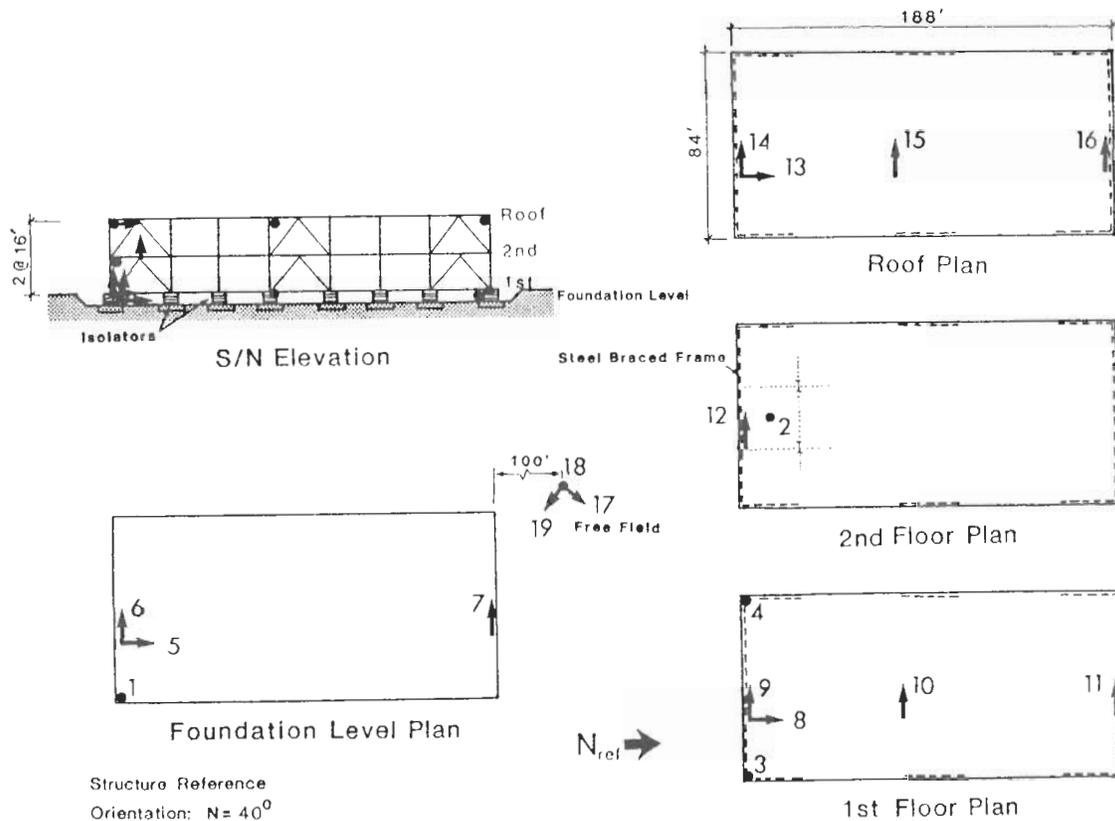
**Los Angeles - 2-story Fire Command/Control Bldg.**  
 (CSMIP Station No. 24580)



No. of Stories above/below ground: 2/0  
 Plan Shape: Rectangular  
 Base Dimensions: 188' x 84'  
 Typical Floor Dimensions: 188' x 84'  
 Design Date: 1988  
 Construction Date: 1989-90

Vertical Load Carrying System:  
 steel vented roof decking and steel decking with  
 3"-4" concrete fill at 1st & 2nd floors, supported  
 by steel frames and natural rubber bearings.  
 Lateral Force Resisting System:  
 Perimeter braced (Chevron) steel frames isolated  
 on laminated steel and rubber bearings.  
 Foundation Type:  
 Spread footings.

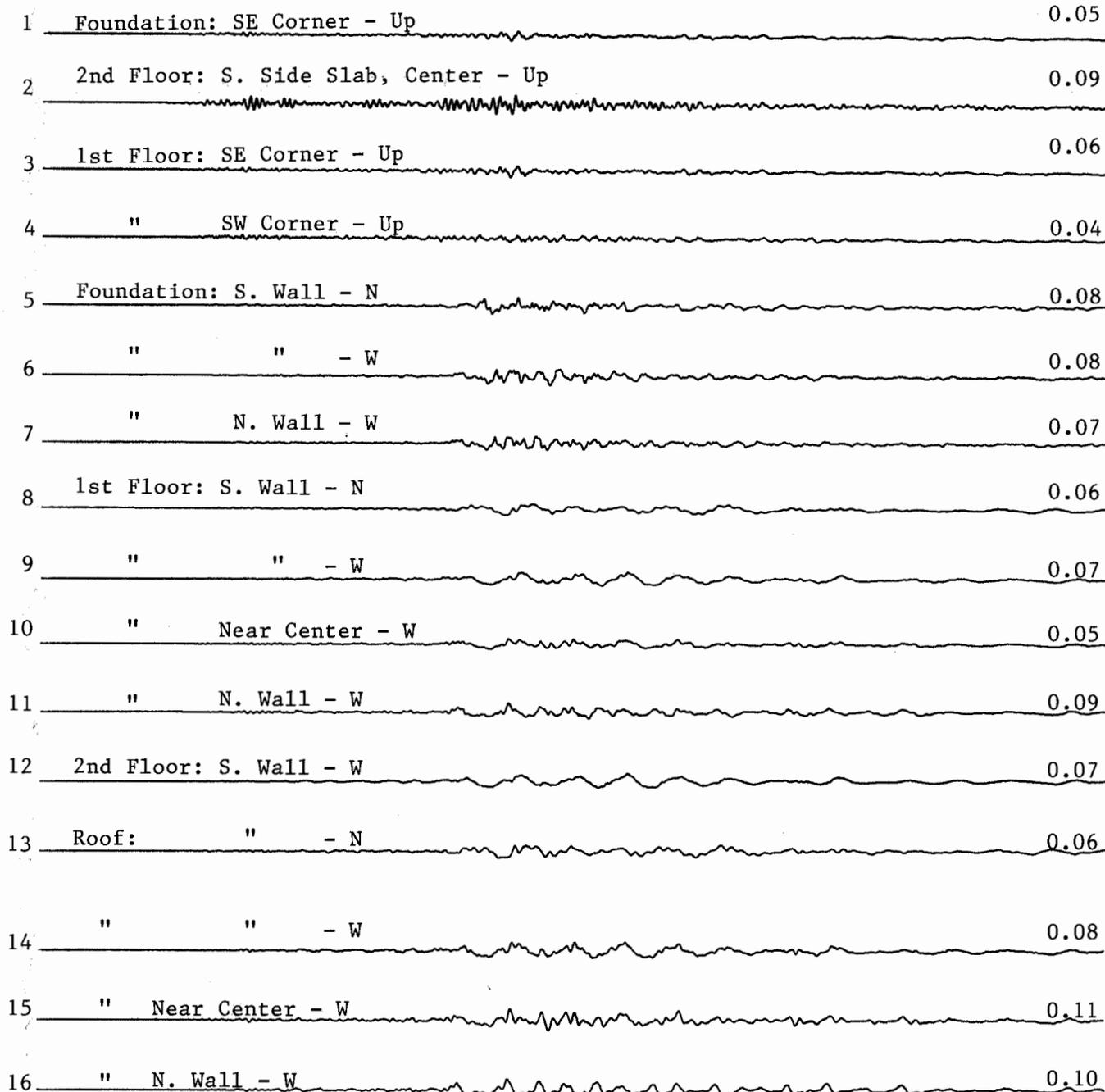
**SENSOR LOCATIONS**



Los Angeles - 2-story Fire Command/Control Bldg.  
(CSMIP Station 24580)

Record 24580-CS104-91180.02

Max. Accel.(g)



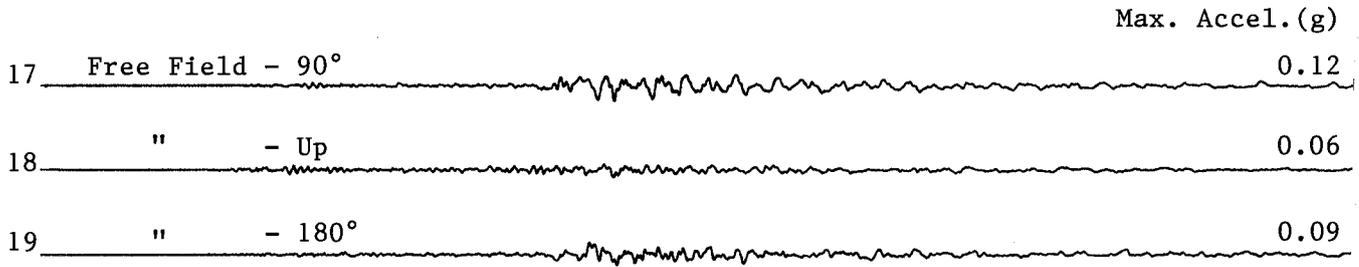
Trigger Time: 14:43:58.2 GMT

Structure Reference Orientation: N=40°

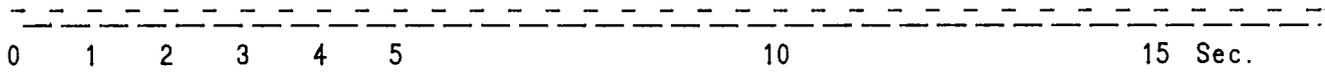
0 1 2 3 4 5 10 15 Sec.



Los Angeles - City Terrace (On the grounds of the Fire Command/Control Bldg.)  
(CSMIP Station 24592) Record 24592-E0248-91180.02

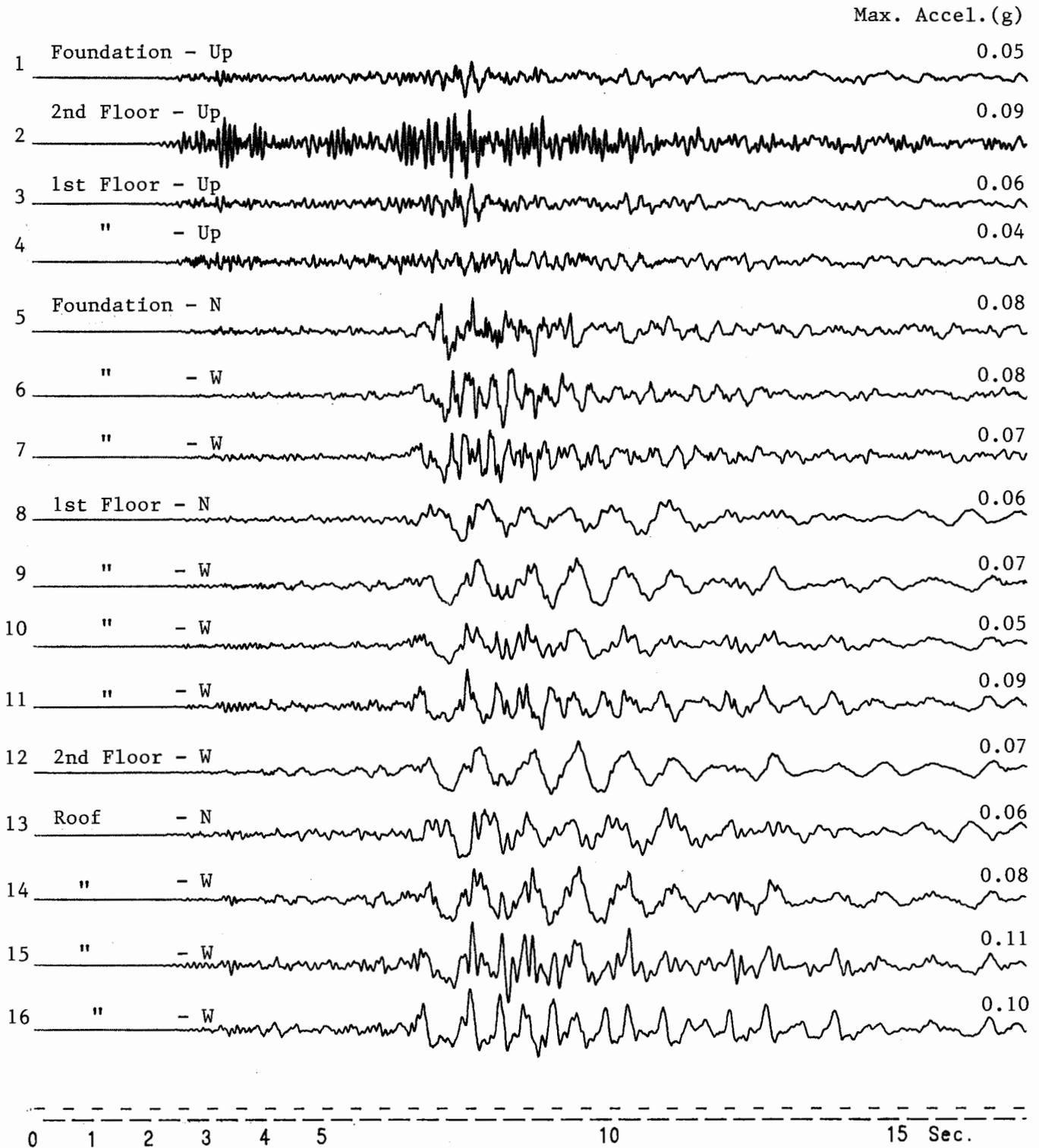


Trigger Time: 14:43:58.2 GMT



Los Angeles - 2-story Fire Command/Control Bldg.  
 (CSMIP Station 24580)

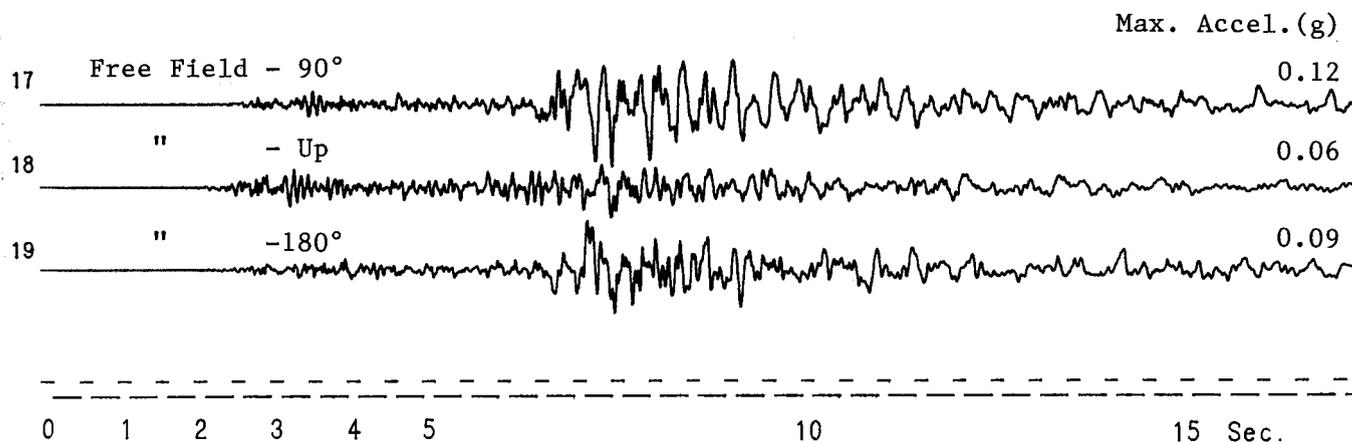
Record. 24580-CS104-91180.02



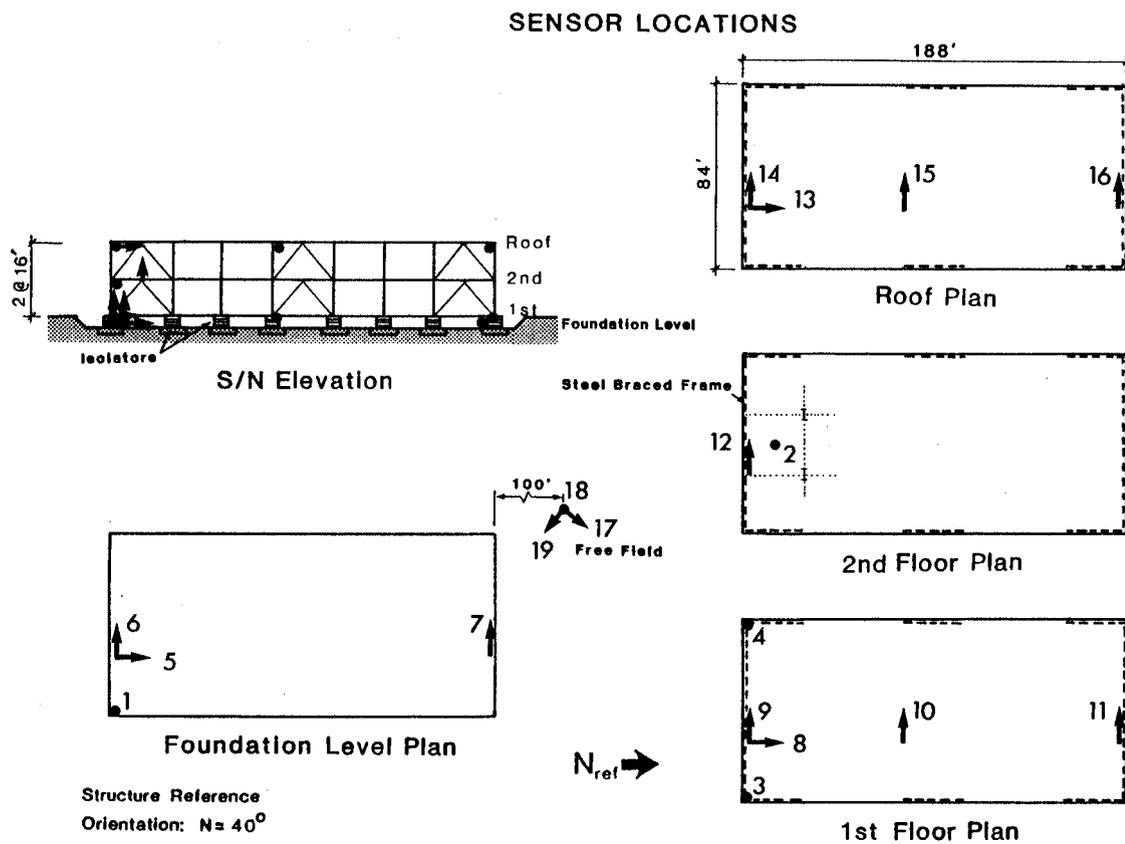
**This page plotted with 4x vertical exaggeration.**

Los Angeles - City Terrace  
(CSMIP Station 24592)

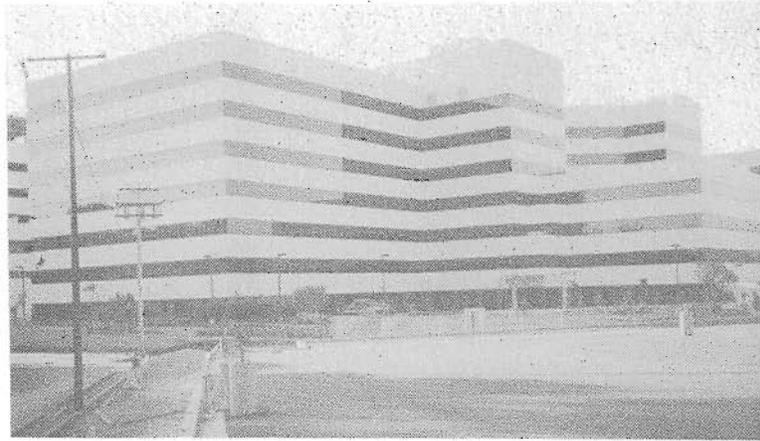
(Reference Free Field for Los Angeles - 2-story Fire  
Command/Control Bldg.) Record 24592-E0248-91180.02



**This page plotted with 4x vertical exaggeration.**



## Los Angeles - 7-story University Hospital (CSMIP Station No. 24605)



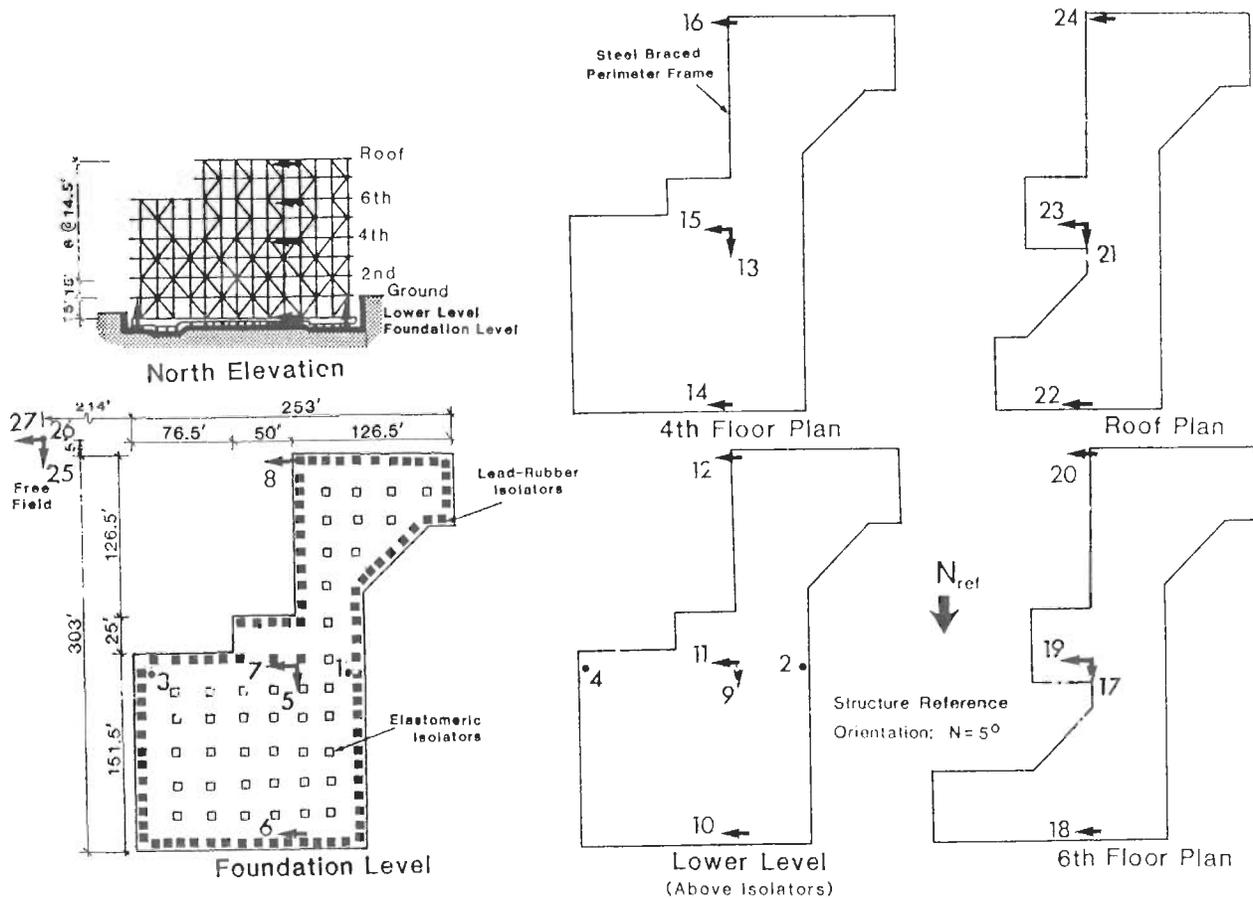
No. of Stories above/below ground: 7/1  
 Plan Shape: "S" shaped  
 Base Dimensions: 363' x 253'  
 Typical Floor Dimensions: 303' x 253'  
 Design Date: 1988  
 Construction Date: 1989-91

**Vertical Load Carrying System:**  
 Concrete slabs over steel deck supported by steel frames and rubber isolators.

**Lateral Force Resisting System:**  
 Diagonally braced perimeter steel frames isolated on laminated steel and rubber isolators with lead cores.

**Foundation Type:**  
 Continuous and spread footings.

### SENSOR LOCATIONS



Los Angeles - 7-story University Hospital  
(GSMIP Station 24605)

Record 24605-CS115-91180.04

Max. Accel.(g)

1	Foundation: W. Wall - Up	0.04
2	Lower Level: W. Wall - Up	0.04
3	To be installed	
4	Lower Level: E. Wall - Up	0.06
5	To be installed	
6	Foundation: N. Wall - E	0.09
7-8	To be installed	
9	Lower Level: Center - N	0.03
10	" N. Wall - E	0.04
11	" Center - E	0.04
12	" S. Wall - E	0.05
13	4th Floor: Center - N	0.04
14	" N. Wall - E	0.05
15	" Center - E	0.05
16	" S. Wall - E	0.06
17	Inoperative	
18	" N. Wall - E	0.06
19	" Center - E	0.06
20	" S. Wall - E	0.06
21	Roof: Center - N	0.07

Trigger Time: 14:43:58.4 GMT

Structure Reference Orientation: N=5°

0 1 2 3 4 5

10

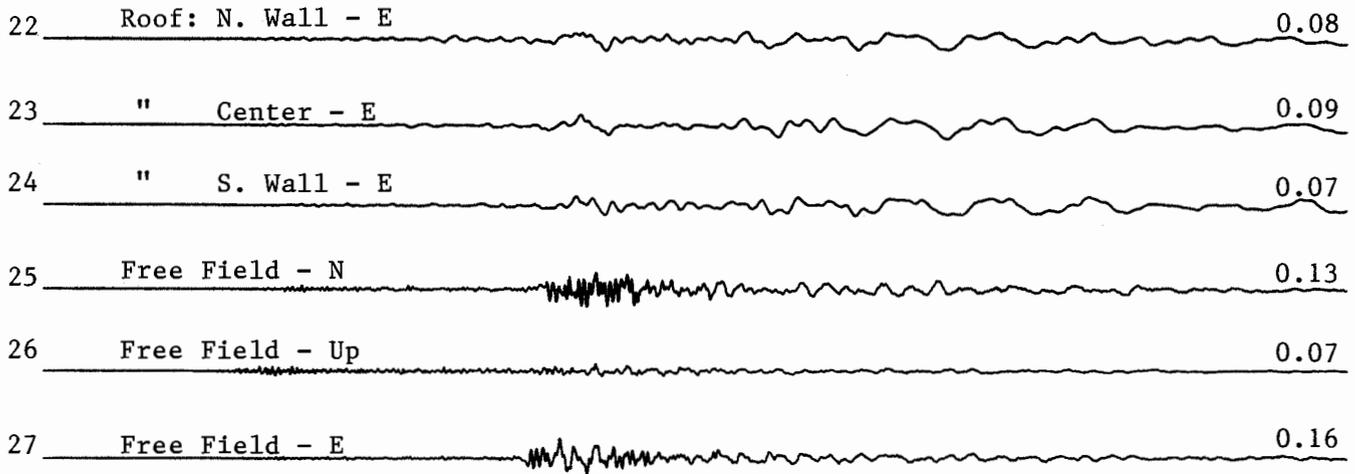
15 Sec.



Los Angeles - 7-story University Hospital  
(CSMIP Station 24605)

Record 24605-CS115-91180.04

Max. Accel.(g)

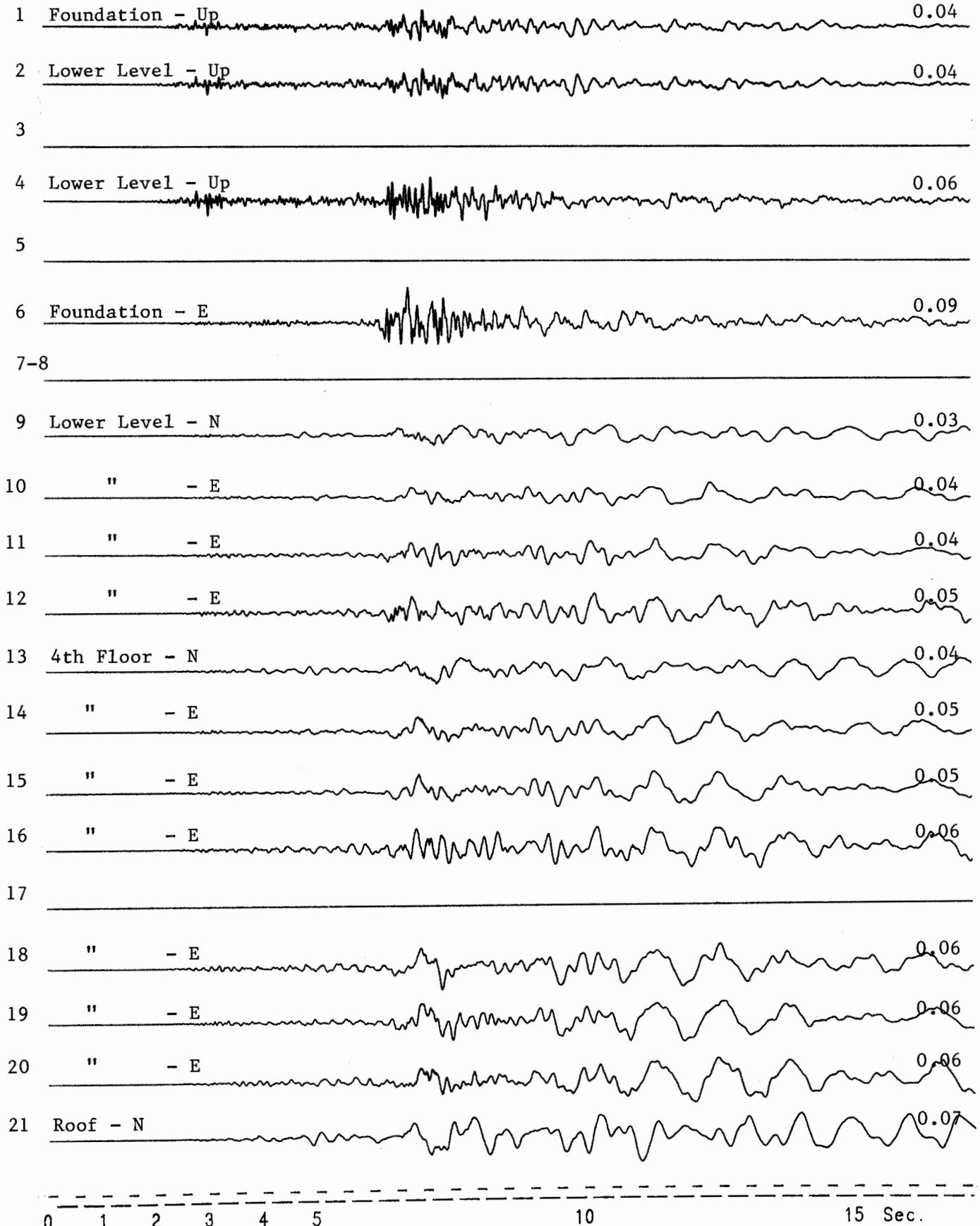


Trigger Time: 14:43:58.4 GMT

Structure Reference Orientation: N=5°

-----  
0 1 2 3 4 5 10 15 Sec.

Max. Accel.(g)

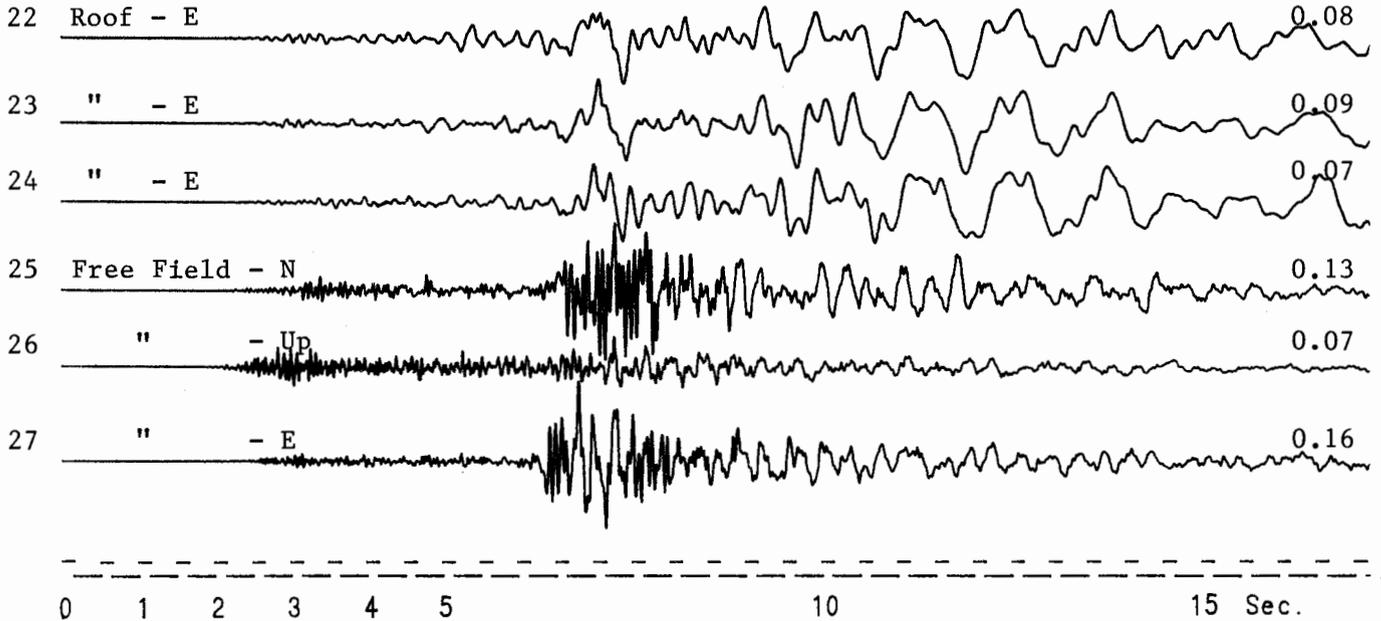


**This page plotted with 4x vertical exaggeration.**

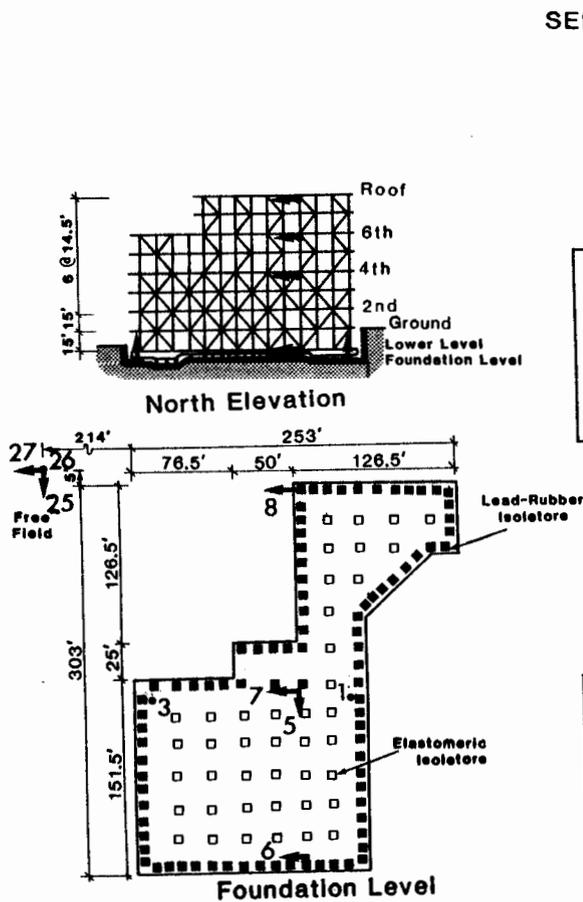
Los Angeles - 7-story University Hospital  
(CSMIP Station 24605)

Record 24605-CS115-91180.04

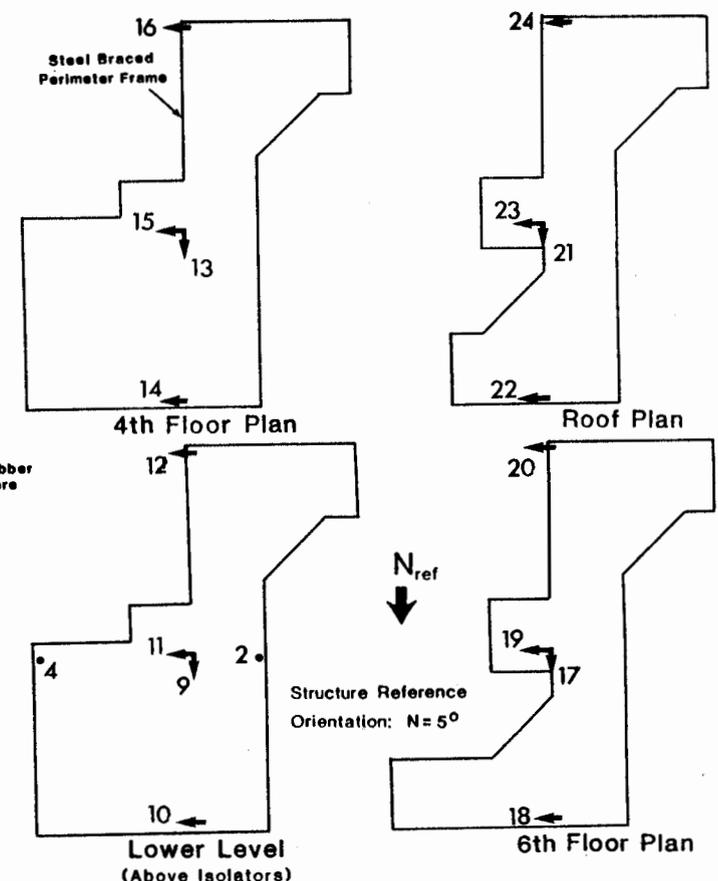
Max. Accel.(g)



**This page plotted with 4x vertical exaggeration.**



**SENSOR LOCATIONS**



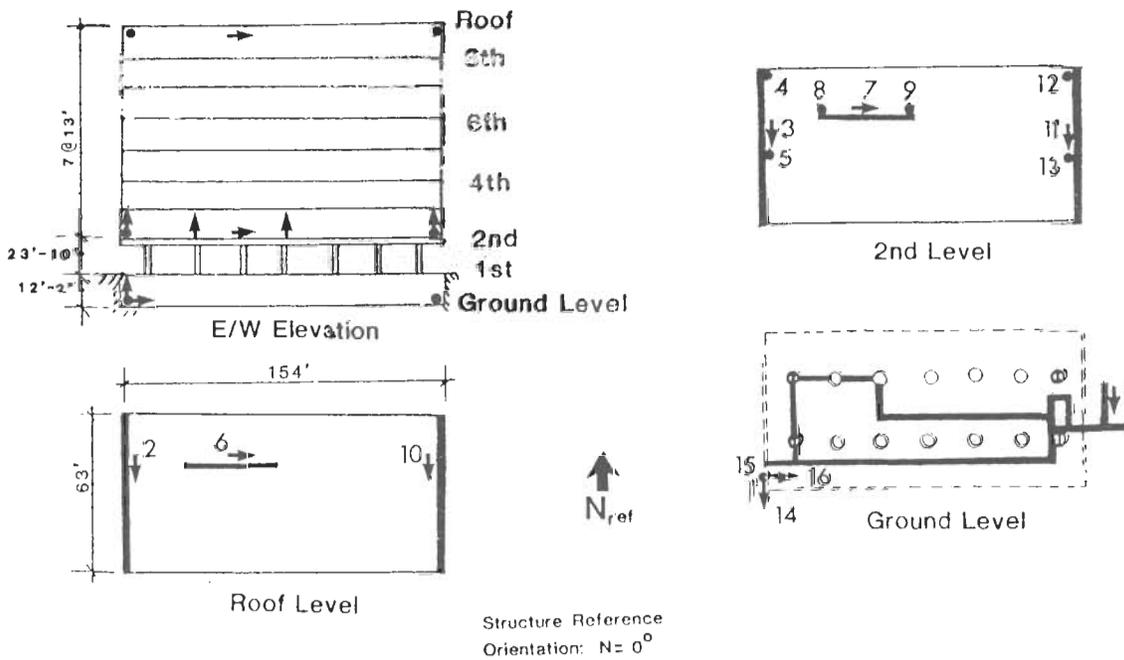
**Los Angeles - 8-story CSULA Admin. Bldg.**  
(CSMIP Station No. 24468)



No. of Stories above/below ground: 8/1  
 Plan Shape: Rectangular  
 Base Dimensions: Irregular base shape  
 Typical Floor Dimensions: 154' x 63'  
 Design Date: 1967  
 Construction Date: 1969

Vertical Load Carrying System:  
 Concrete slabs supported by concrete beams and columns.  
 Lateral Force Resisting System:  
 Concrete shear walls except between levels 1 and 2 where composite concrete/steel columns resist lateral forces.  
 Foundation Type:  
 Concrete spread footings and caissons.

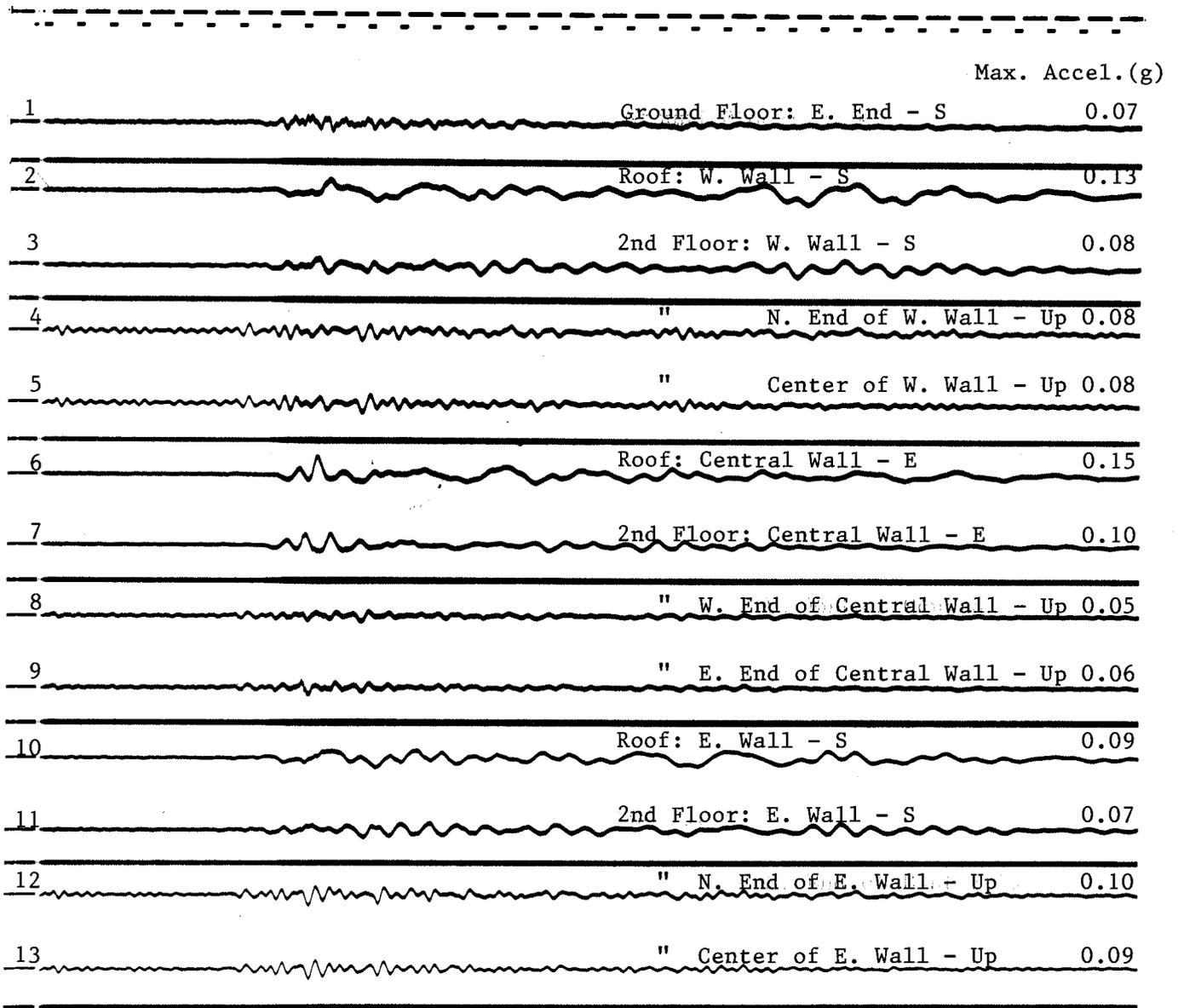
**SENSOR LOCATIONS**



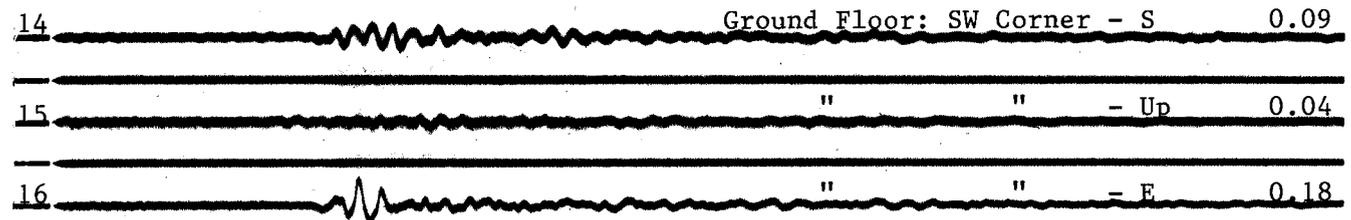
Revised: 7/91

Los Angeles - 8-story CSULA Admin. Bldg.  
(CSMIP Station 24468)

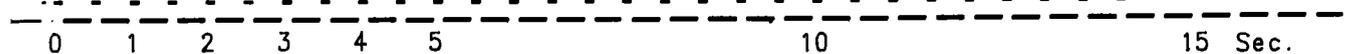
Record 24468-C0222-91182.01



Record 24468-S1602-91182.01



Structure Reference Orientation: N=0°



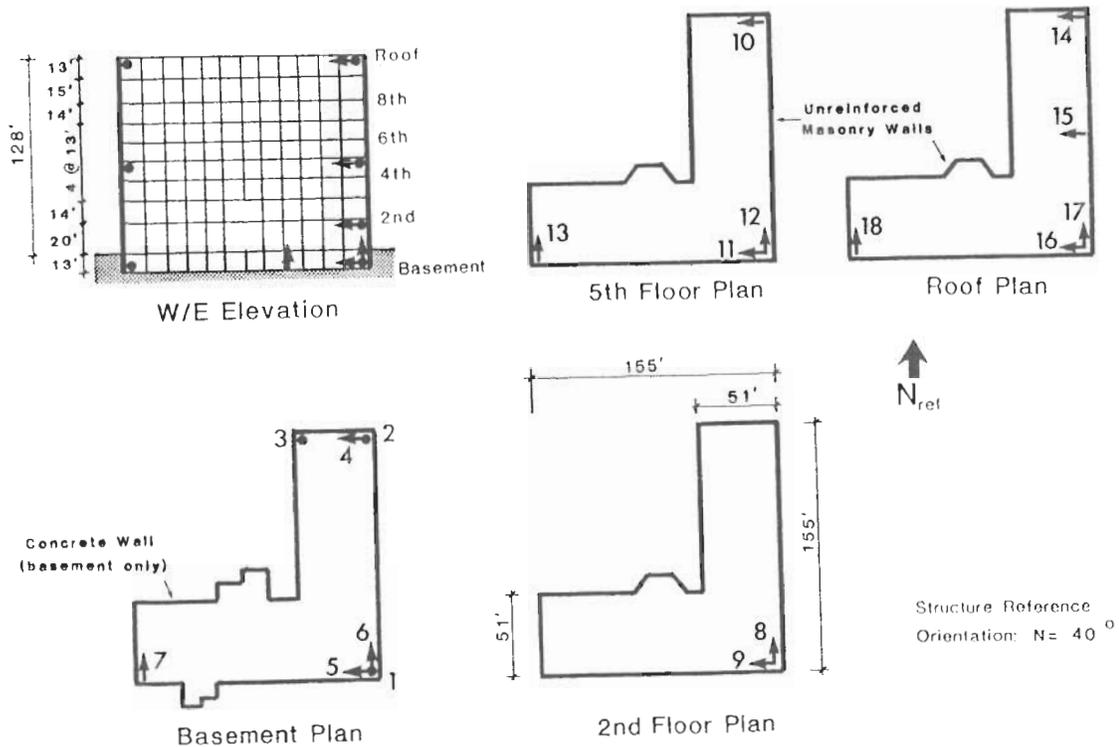
**Los Angeles - 9-story Office Bldg.**  
 (CSMIP Station No. 24579)



No. of Stories above/below ground: 9/1  
 Plan Shape: "L" shaped  
 Base Dimensions: 155' x 51' (each wing)  
 Typical Floor Dimensions: 155' x 51'  
 Design Date: 1923  
 Construction Date: 1924

Vertical Load Carrying System:  
 4"-5" concrete slabs supported by concrete beams and columns.  
 Lateral Force Resisting System:  
 Concrete frames with 13" unreinforced masonry infill walls on the perimeter.  
 Foundation Type:  
 Continuous and spread footings.

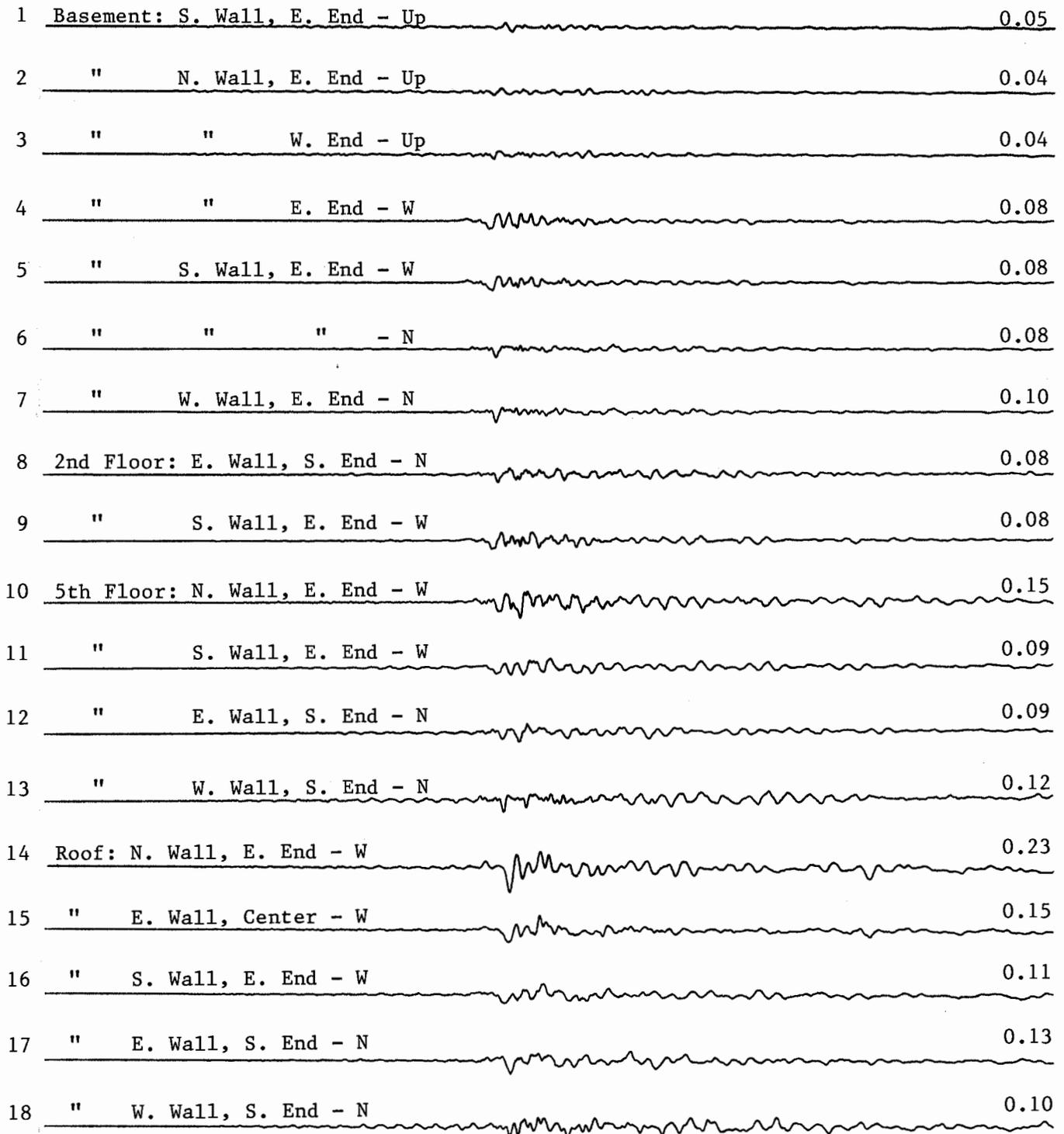
**SENSOR LOCATIONS**



Los Angeles - 9-story Office Bldg.  
(CSMIP Station 24579)

Record 24579-CS103-91189.02

Max. Accel.(g)



Trigger Time: 14:43:59.6 GMT

Structure Reference Orientation: N=40°

0 1 2 3 4 5 10 15 Sec.

**Los Angeles - 12-story Commercial/Office Bldg.**  
(CSMIP Station No. 24581)



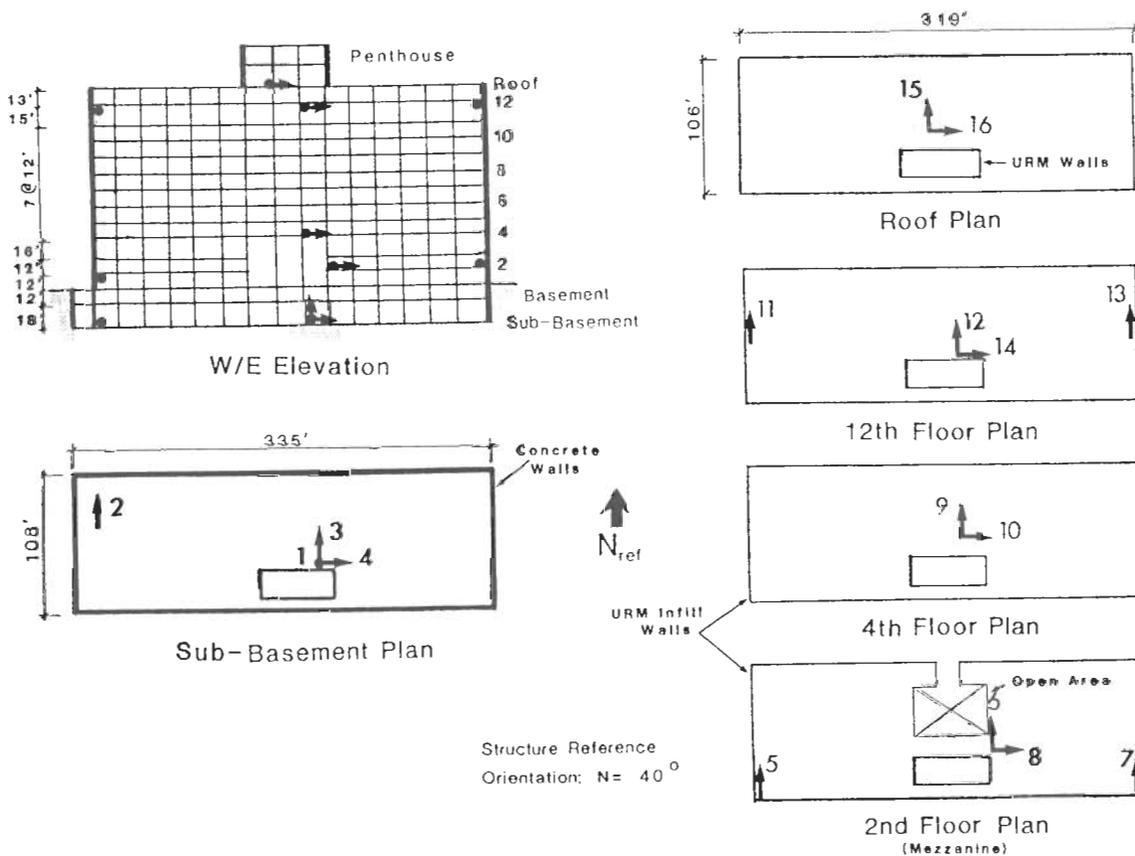
No. of Stories above/below ground: 12/2  
 Plan Shape: Rectangular  
 Base Dimensions: 335' x 108'  
 Typical Floor Dimensions: 319' x 106'  
 Design Date: 1925  
 Construction Date: 1925

**Vertical Load Carrying System:**  
 Wood floor on 3" concrete slabs and pan joists supported by steel beams and columns embedded in concrete.

**Lateral Force Resisting System:**  
 Composite steel/concrete frame with infill unreinforced masonry walls on the perimeter.

**Foundation Type:**  
 Concrete spread footings.

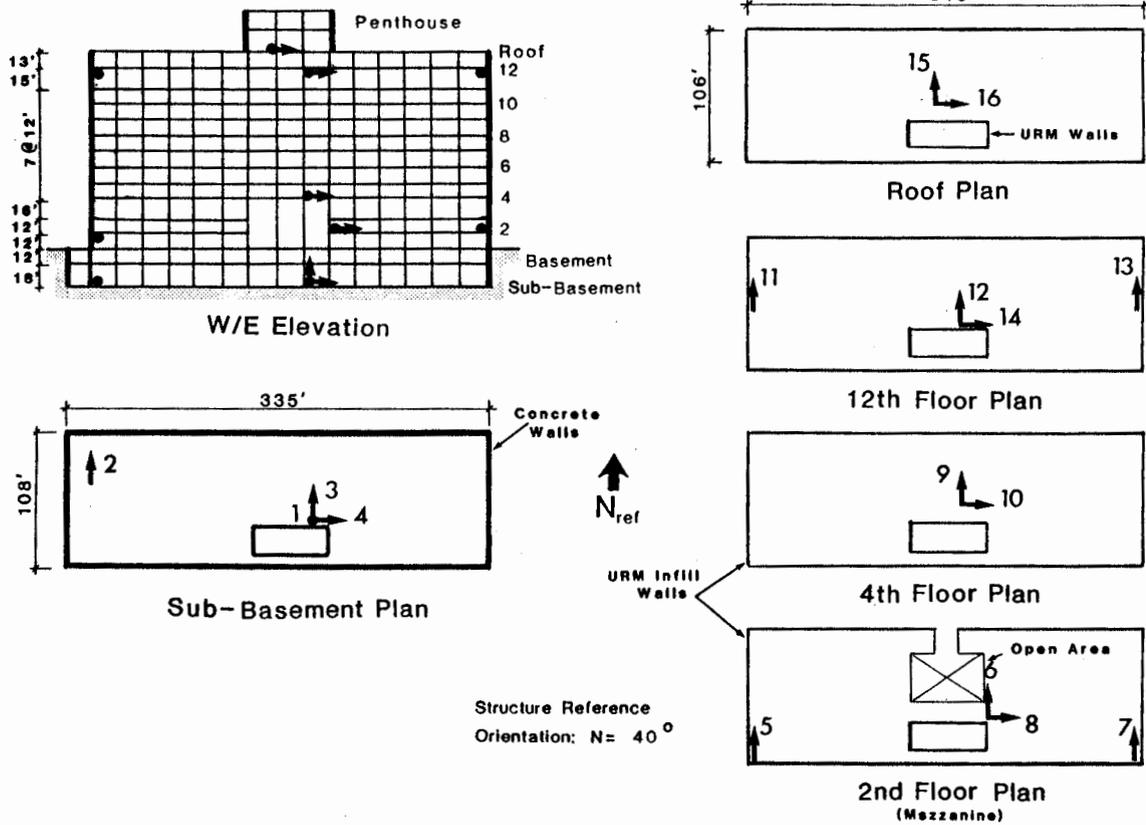
**SENSOR LOCATIONS**





**Los Angeles - 12-story Commercial/Office Bldg.**  
 (CSMIP Station No. 24581)

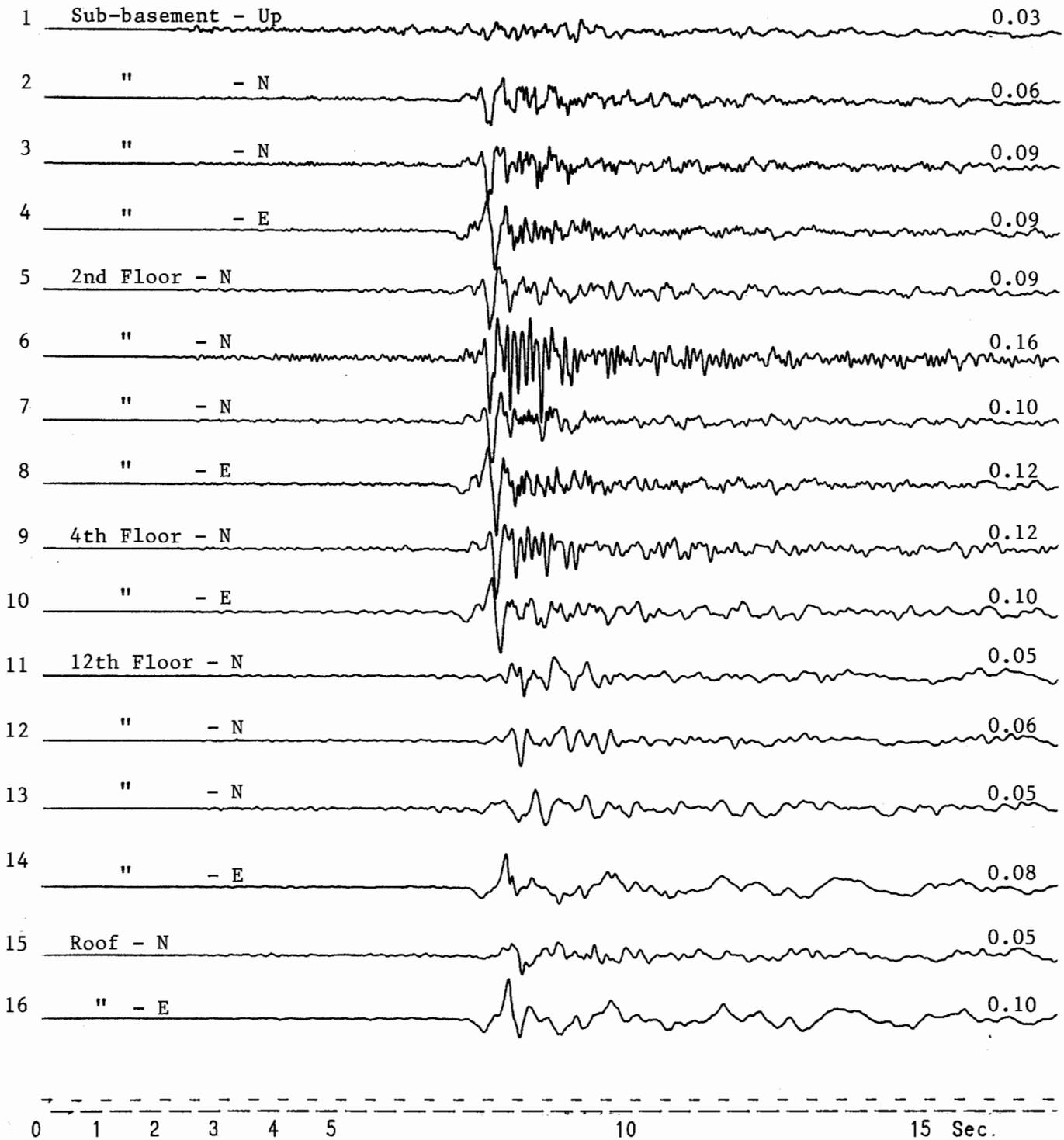
**SENSOR LOCATIONS**



Los Angeles - 12-story Commercial/Office Bldg.  
(CSMIP Station 24581)

Record 24581-CS105-91184.03

Max. Accel. (g)



**This page plotted with 4x vertical exaggeration.**

**Los Angeles - 13-story Office Bldg.**  
(CSMIP Station No. 24567)



No. of Stories above/below ground: 13/1  
 Plan Shape: "U" shaped  
 Base Dimensions: 136' x 96'  
 Typical Floor Dimensions: 130' x 85'  
 Design Date: 1912  
 Construction Date: 1913

**Vertical Load Carrying System:**

Concrete slabs on one-way concrete joists supported on steel beams and columns embedded in concrete.

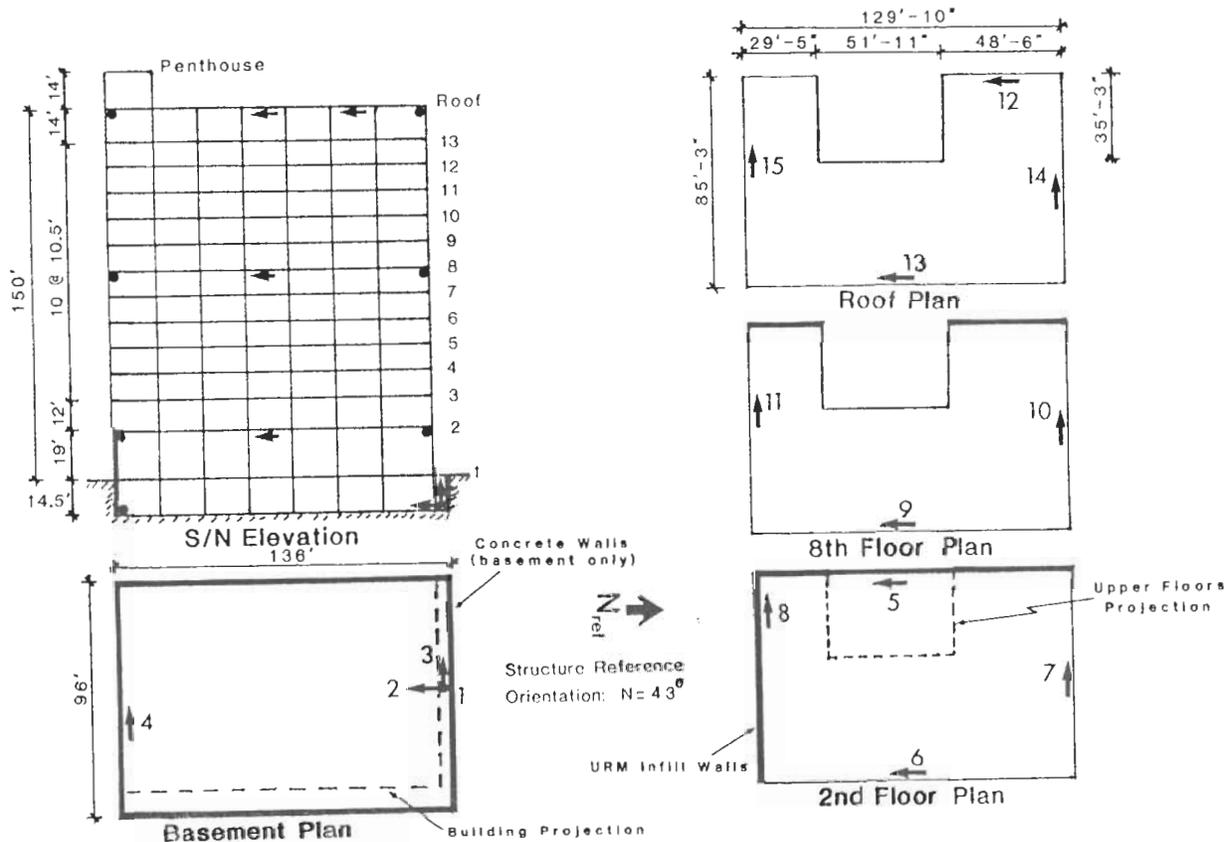
**Lateral Force Resisting System:**

Composite steel/concrete frame with infill unreinforced masonry walls on the perimeter.

**Foundation Type:**

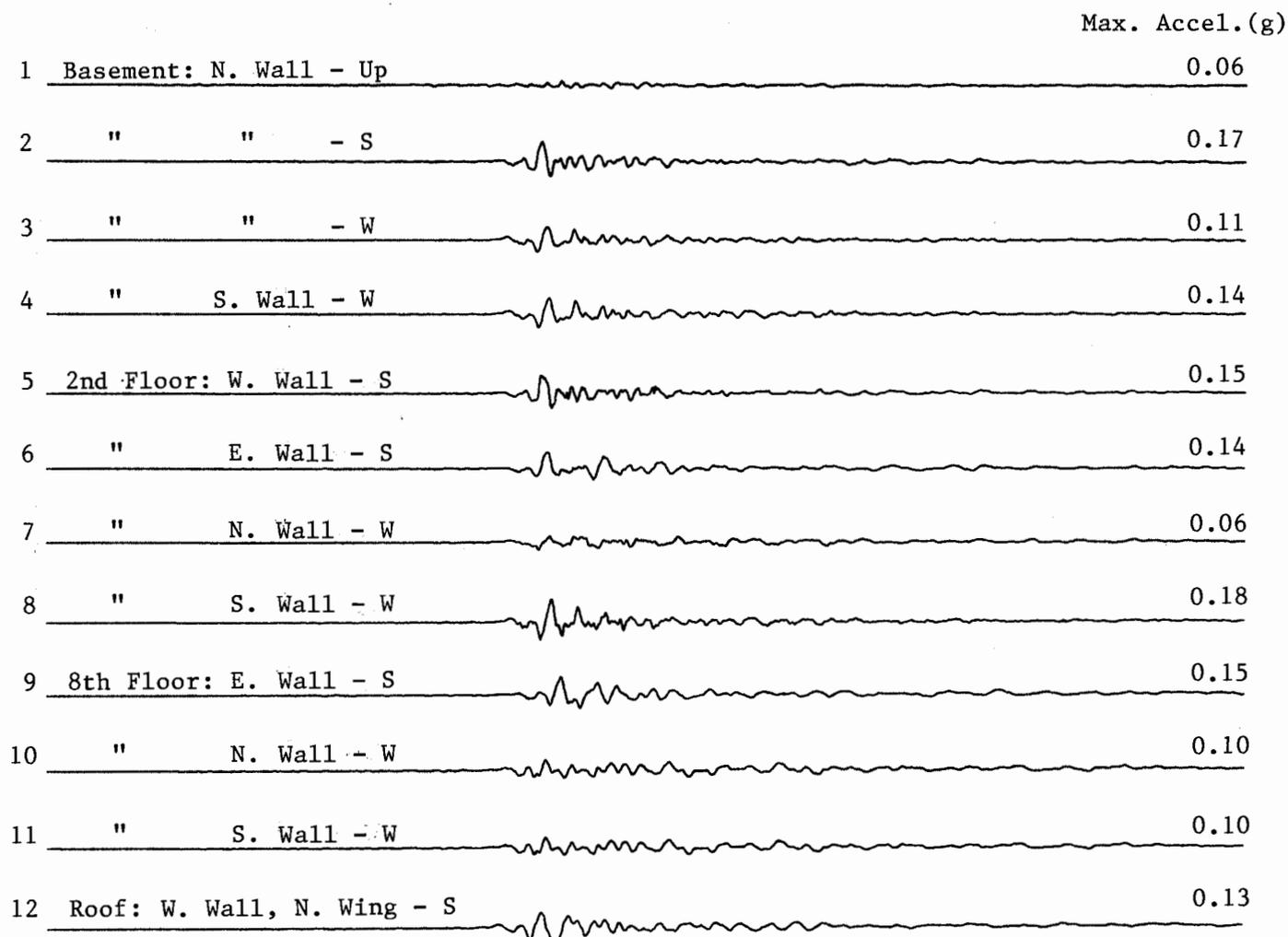
Concrete spread footings.

**SENSOR LOCATIONS**



Los Angeles - 13-story Office Bldg.  
(CSMIP Station 24567)

Record 24567-CD111-91182.01



13-15 Inoperative

0 1 2 3 4 5

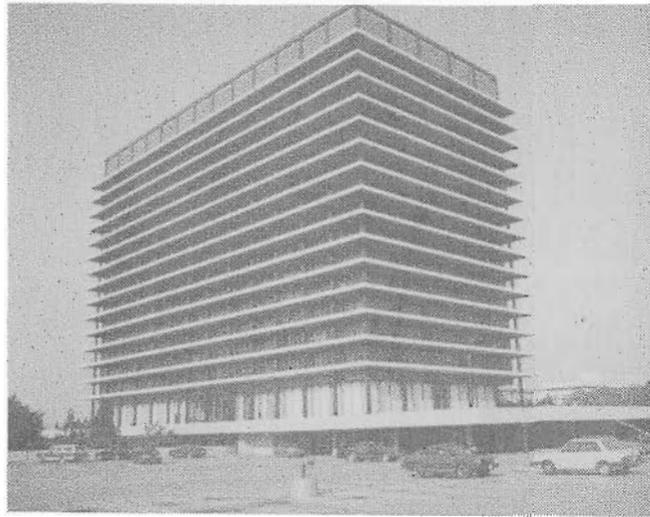
10

15 Sec.

Trigger Time: 14:44:00.1 GMT

Structure Reference Orientation: N=43°

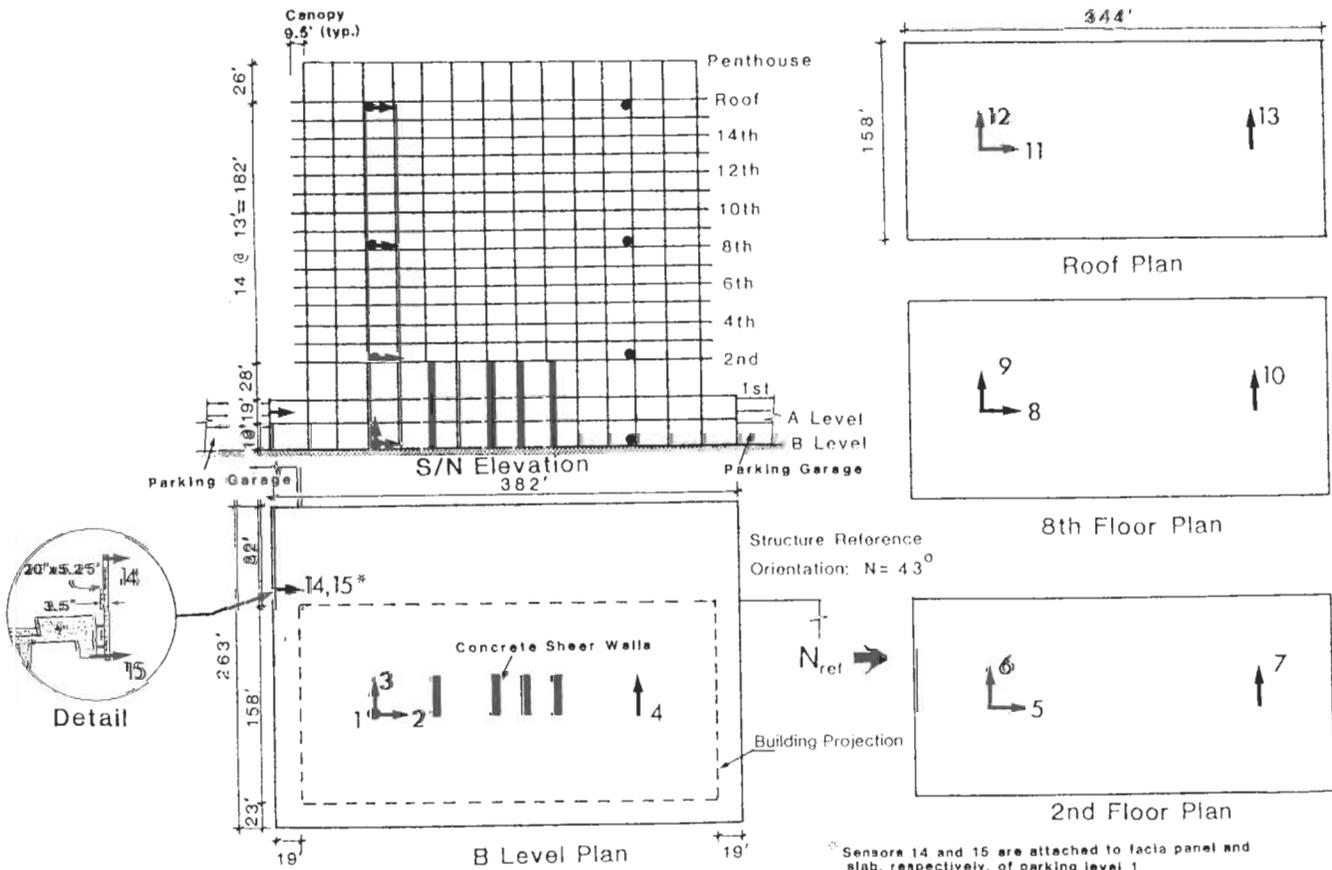
Los Angeles - 15-story Government Office Bldg.  
(CSMIP Station No. 24569)



No. of Stories above/below ground: 15/2  
 Plan Shape: Rectangular  
 Base Dimensions: 382' x 263'  
 Typical Floor Dimensions: 344' x 159'  
 Design Date: 1961  
 Construction Date: 1962

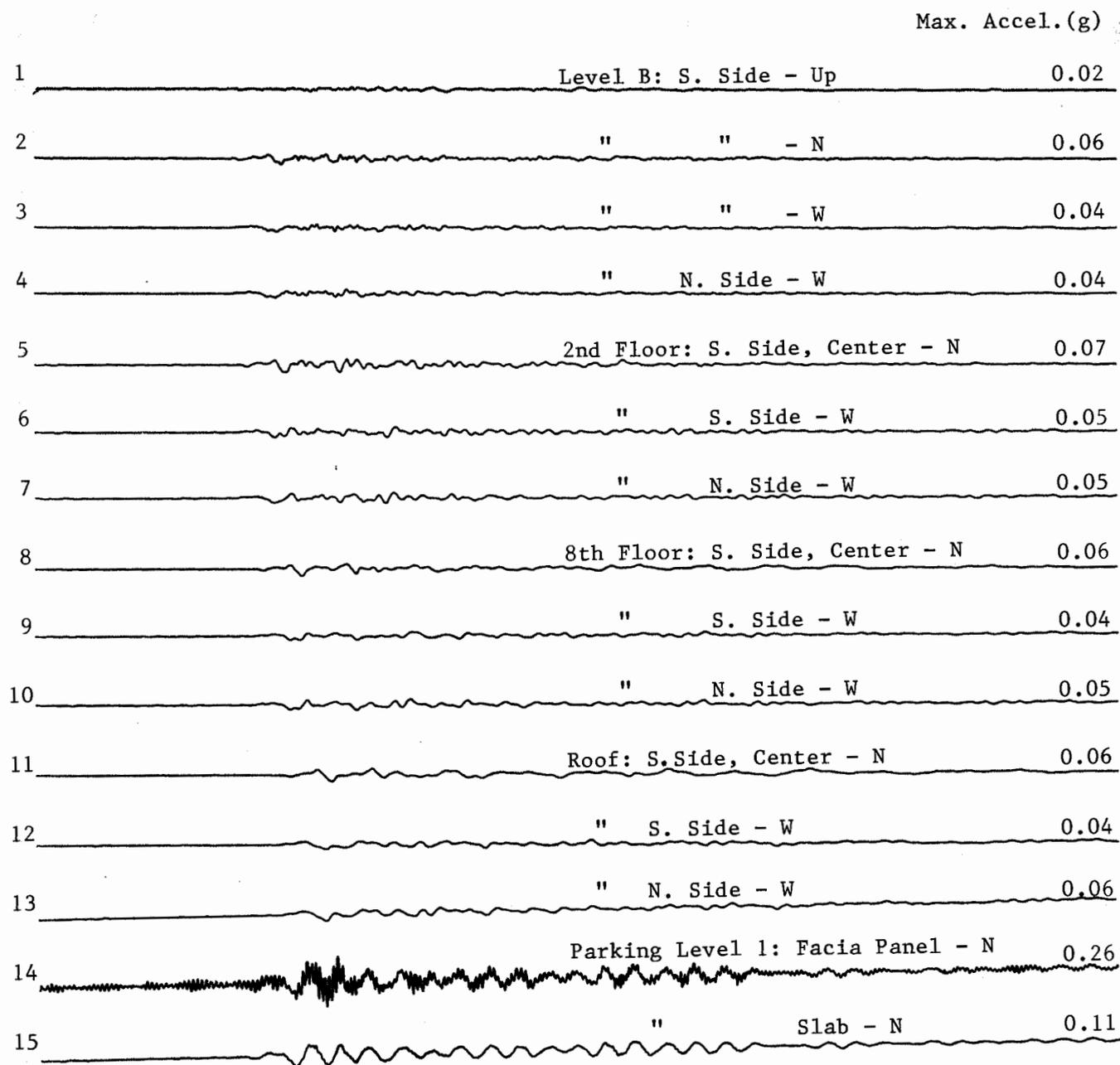
Vertical Load Carrying System:  
 Concrete slabs on steel deck supported by steel frames.  
 Lateral Force Resisting System:  
 Distributed moment resisting steel frames.  
 Concrete shear walls in the core area from the basement to the 2nd level.  
 Foundation Type:  
 Concrete spread footings.

SENSOR LOCATIONS



Los Angeles - 15-story Government Office Bldg.  
 [CSMIP Station 24569]

Record 24569-CS102-91182.02



Structure Reference Orientation: N=43°

0 1 2 3 4 5 10 15 Sec.

The reference free field site for this building is about 800 feet ENE of the northeast corner of the building. The record appears on page 28.

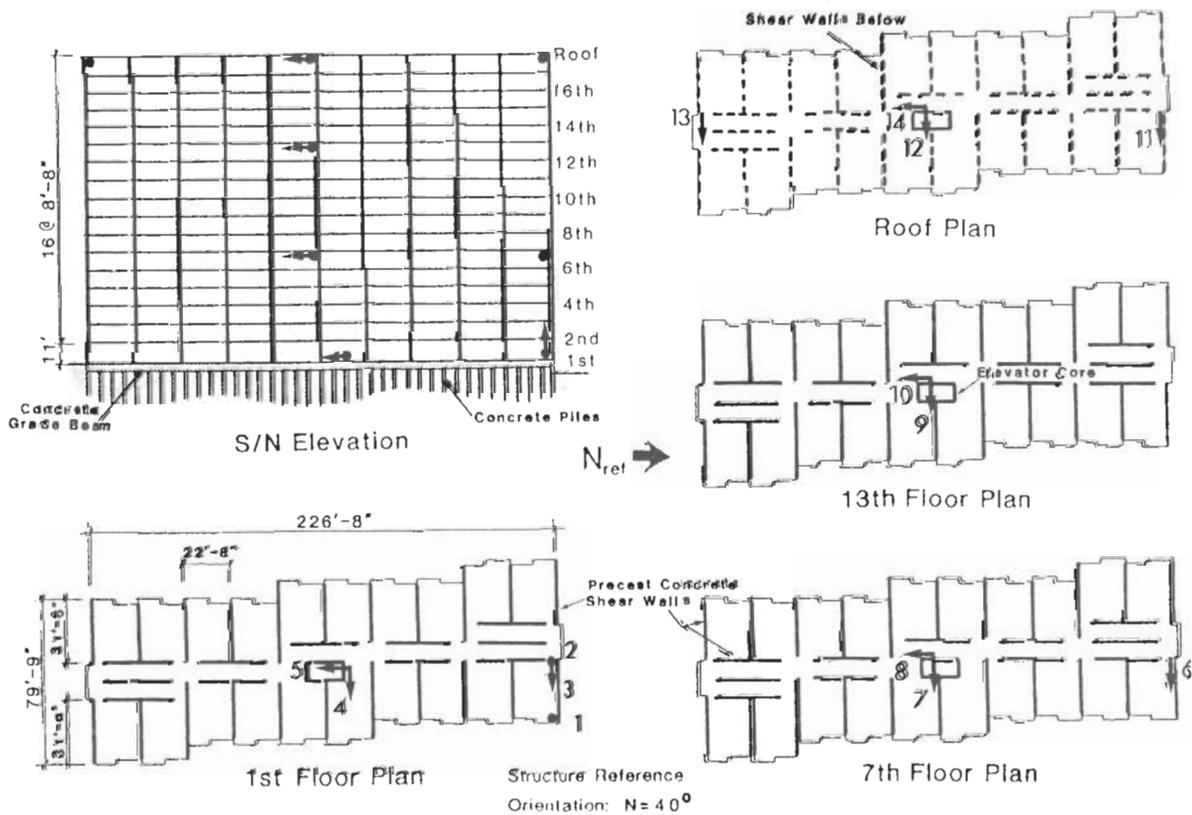
**Los Angeles - 17-story Residential Bldg.**  
(CSMIP Station No. 24601)



No. of Stories above/below ground: 17/0  
 Plan Shape: Rectangular  
 Base Dimensions: 227' x 80'  
 Typical Floor Dimensions: 227' x 80'  
 Design Date: 1980  
 Construction Date: 1982

Vertical Load Carrying System:  
 Precast, pretensioned concrete slabs (8" or 4" thick) supported by precast concrete walls (8"-12" thick).  
 Lateral Force Resisting System:  
 Distributed precast concrete shear walls.  
 Foundation Type:  
 Concrete drilled piles (44'-54' long).

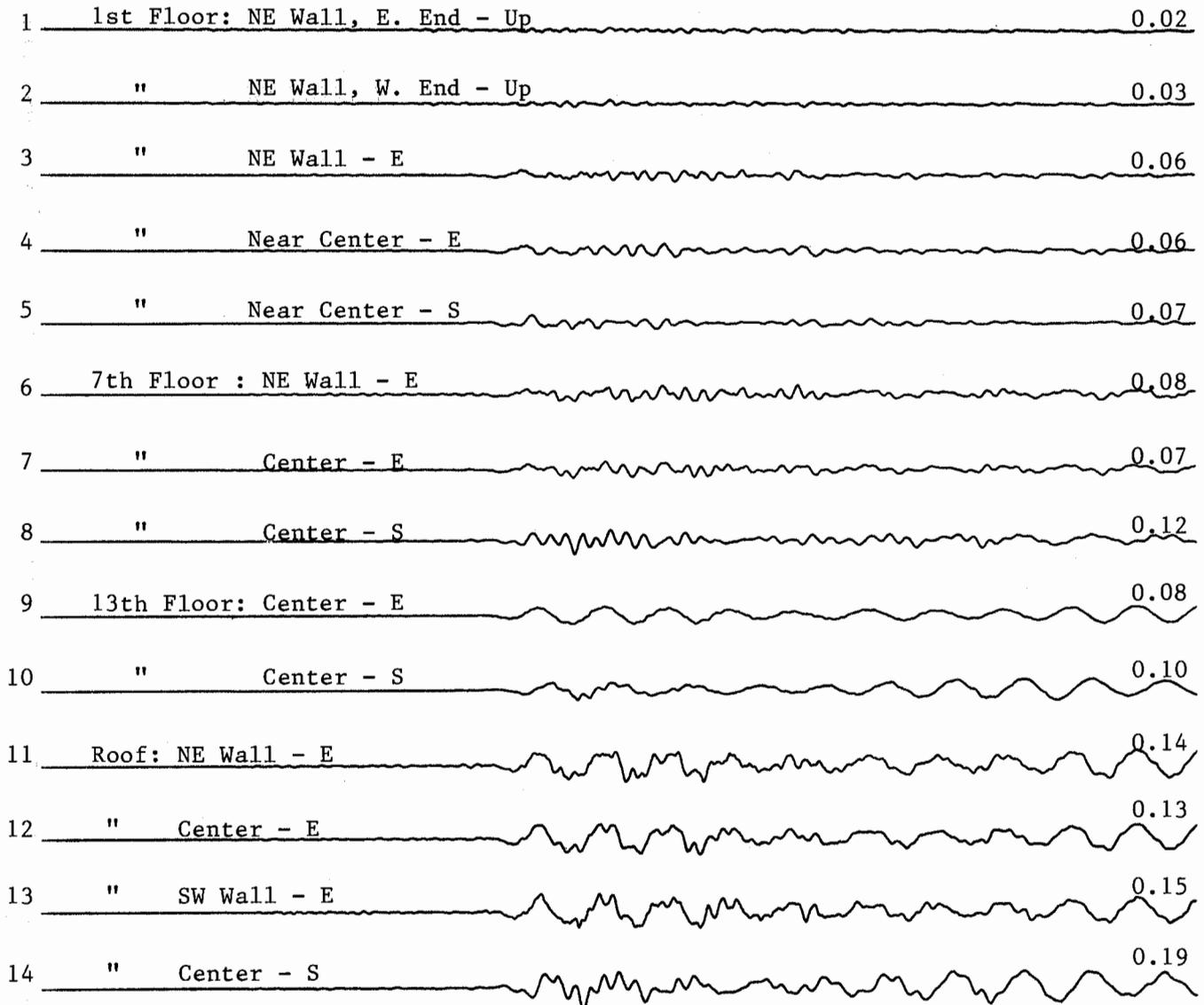
**SENSOR LOCATIONS**



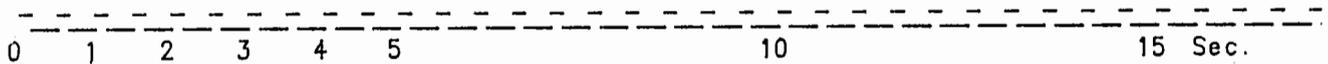
Los Angeles - 17-story Residential Bldg.  
(CSMIP Station 24601)

Record 24601-CS111-91183.02

Max. Accel.(g)



Structure Reference Orientation: N=40°



**Los Angeles - 52-story Office Bldg.**  
(CSMIP Station No. 24602)



No. of Stories above/below ground: 52/5  
 Plan Shape: Square with clipped corners  
 Base Dimensions: 274' x 263'  
 Typical Floor Dimensions: 156' x 156'  
 Design Date: 1988  
 Construction Date: 1988-90

**Vertical Load Carrying System:**

3"-7" concrete slabs on steel deck supported by steel frames.

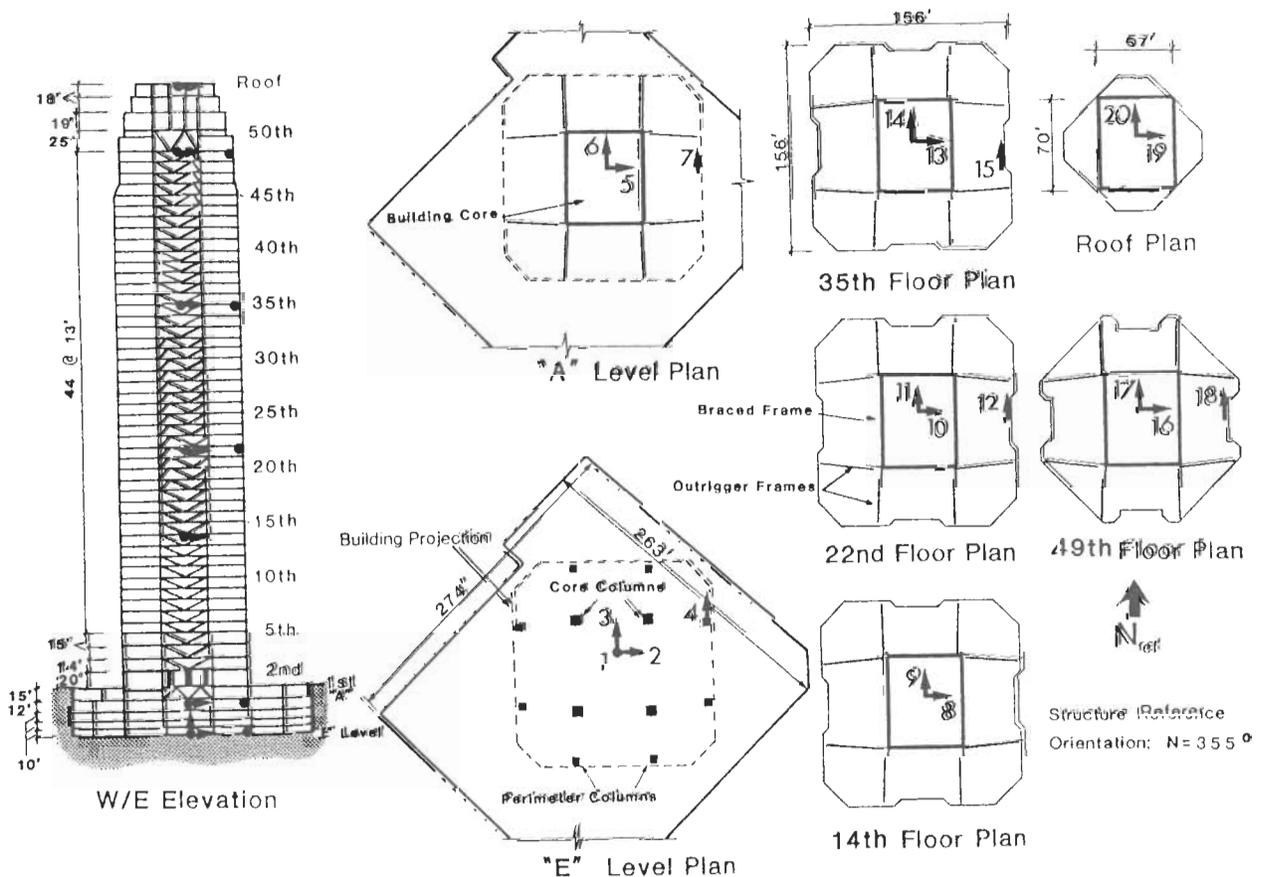
**Lateral Force Resisting System:**

Concentrically braced steel frame at the core with moment resisting connections and outrigger moment frames in both directions.

**Foundation Type:**

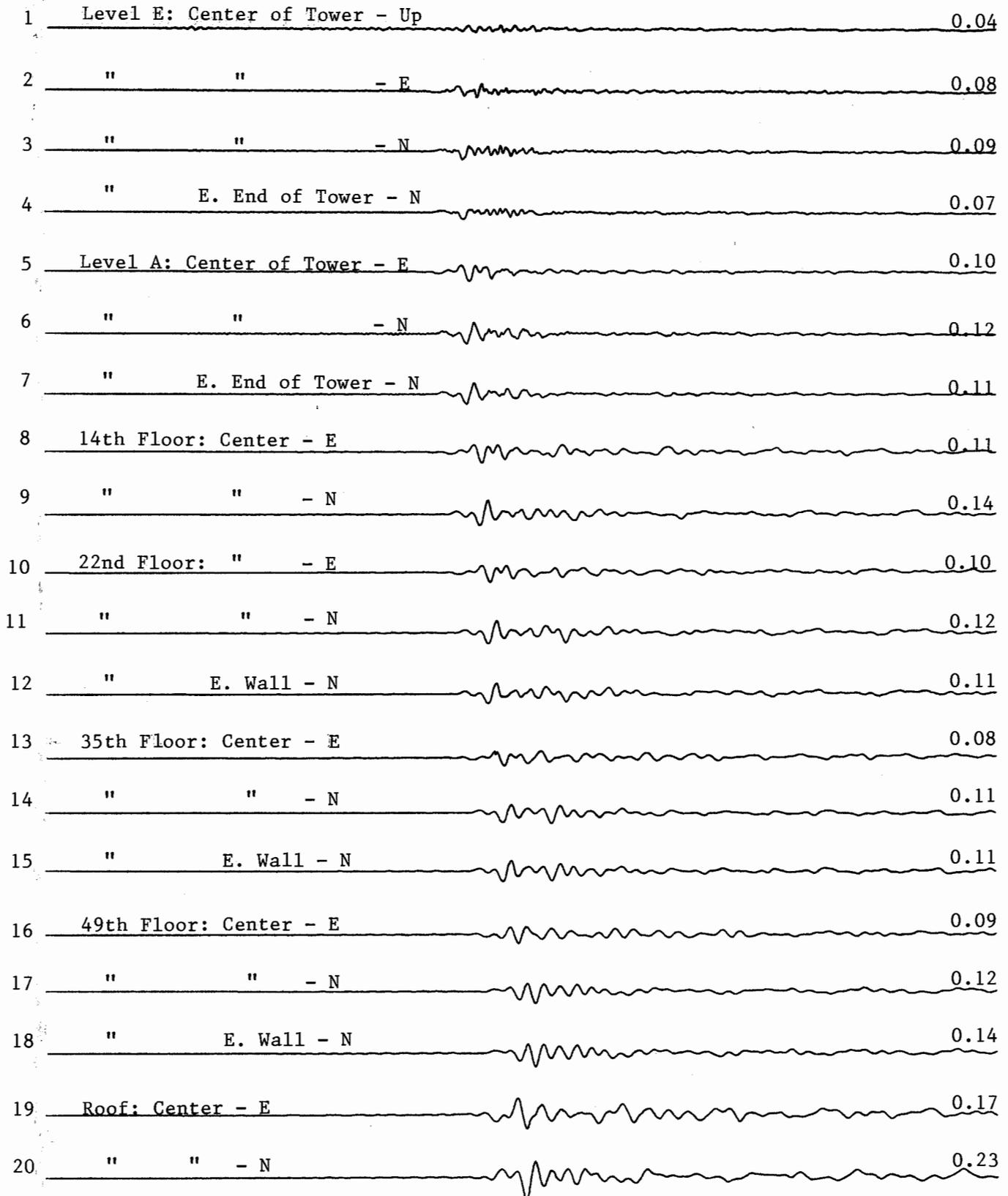
Concrete spread footings (9'-11' thick).

**SENSOR LOCATIONS**



Los Angeles -- 52-story Office Bldg.  
(CSMIP Station 24602)

Record 24602-CS112-91184.02  
Max. Accel.(g)

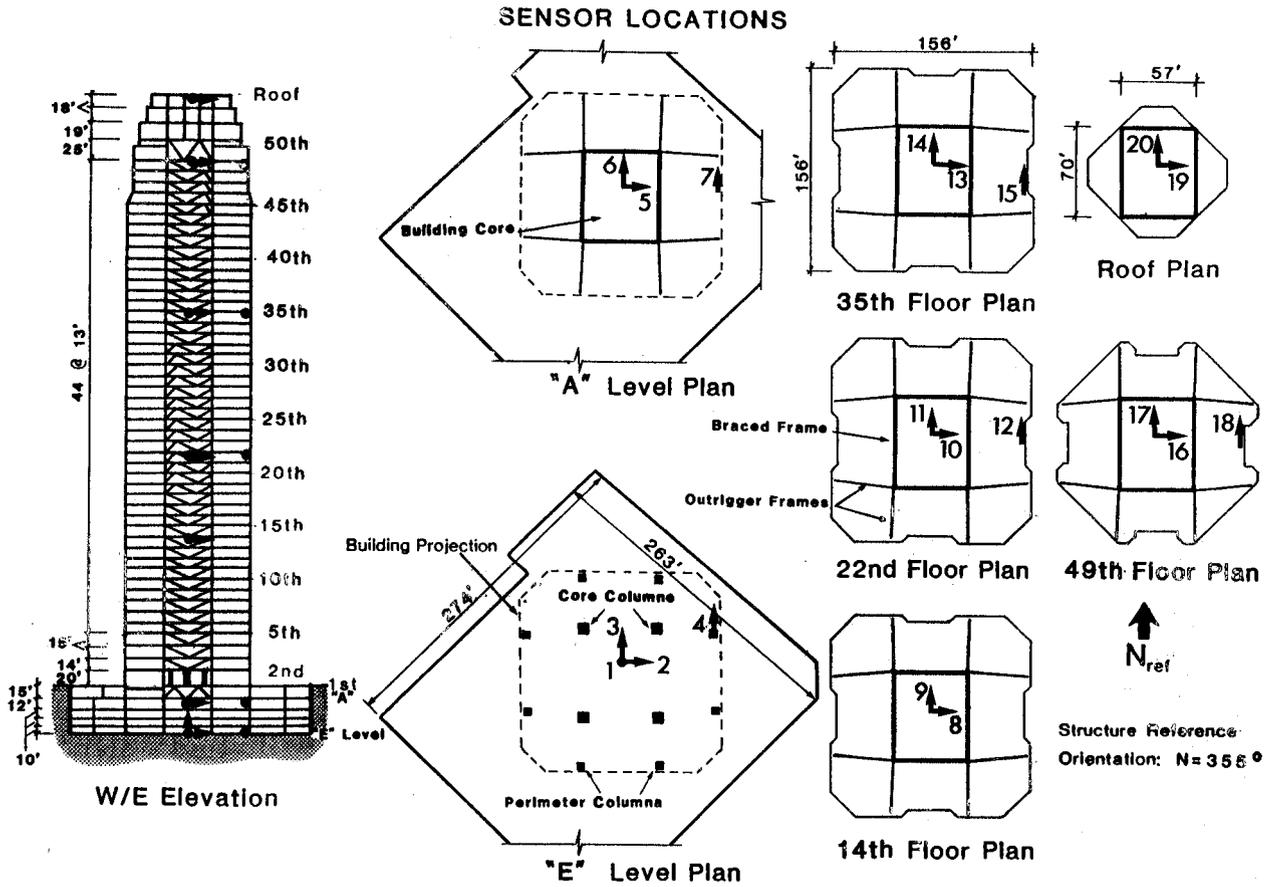


Trigger Time: 14:43:59.5 GMT

Structure Reference Orientation N=355°

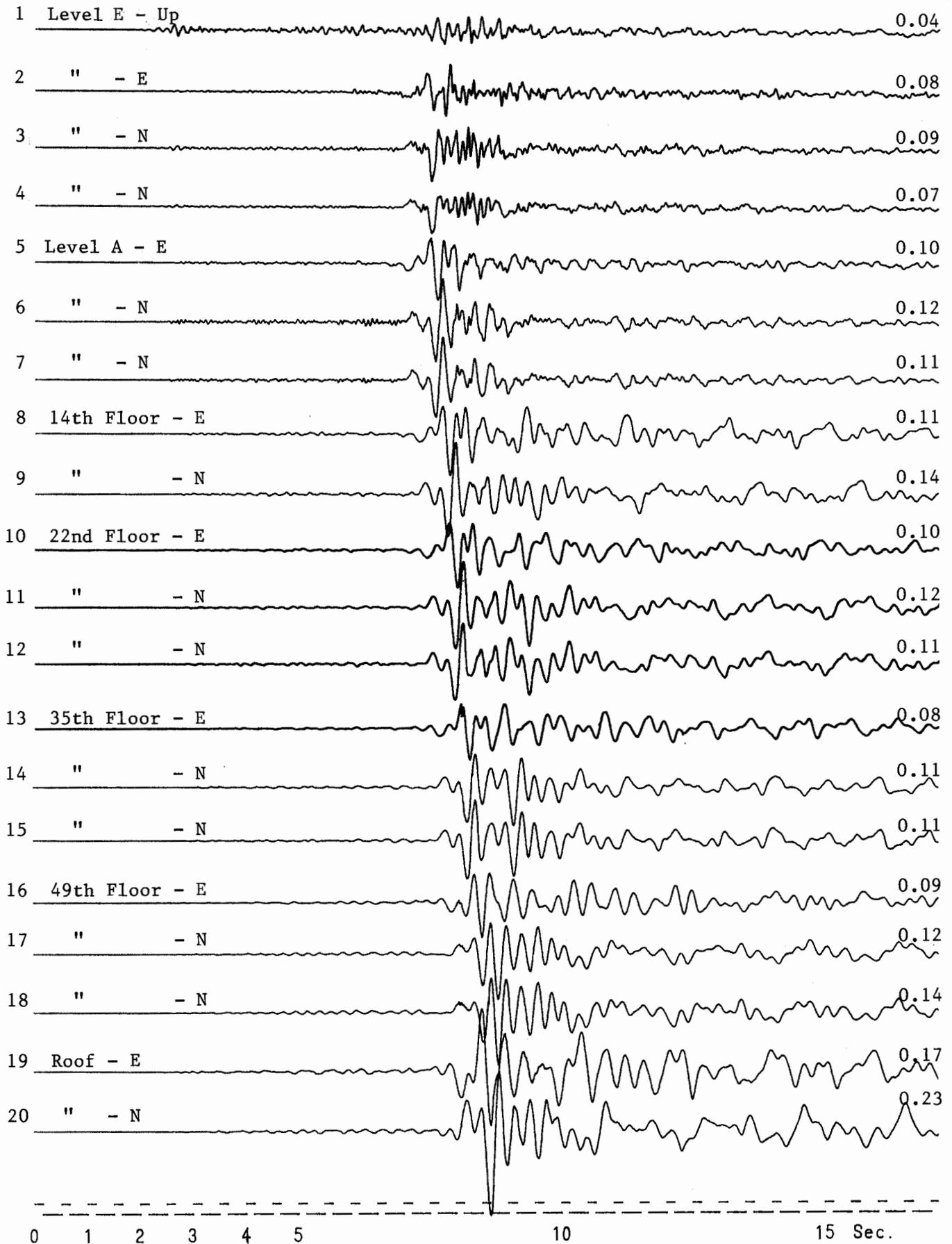
0 1 2 3 4 5 10 15 Sec.

**Los Angeles - 52-story Office Bldg.**  
 (CSMIP Station No. 24602)



Los Angeles - 52-story Office Bldg.  
(CSMIP Station 24602)

Record 24602-CS112-91184.02  
Max. Accel. (g)



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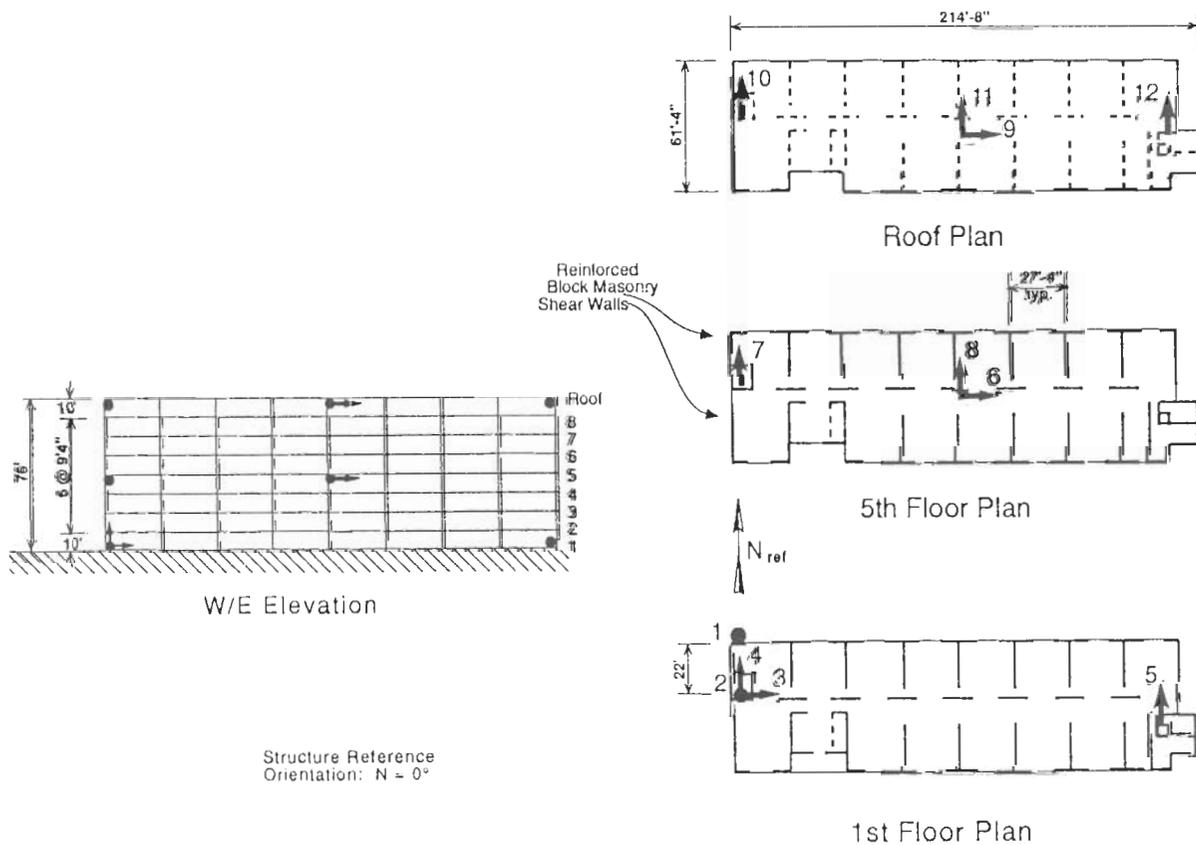
**Whittier - 8-story Hotel**  
(CSMIP Station No. 14606)



No. of Stories above/below ground: 8/0  
 Plan Shape: Rectangular  
 Base Dimensions: 215' x 61'  
 Typical Floor Dimensions: 215' x 61'  
 Design Date: 1984  
 Construction Date: 1985

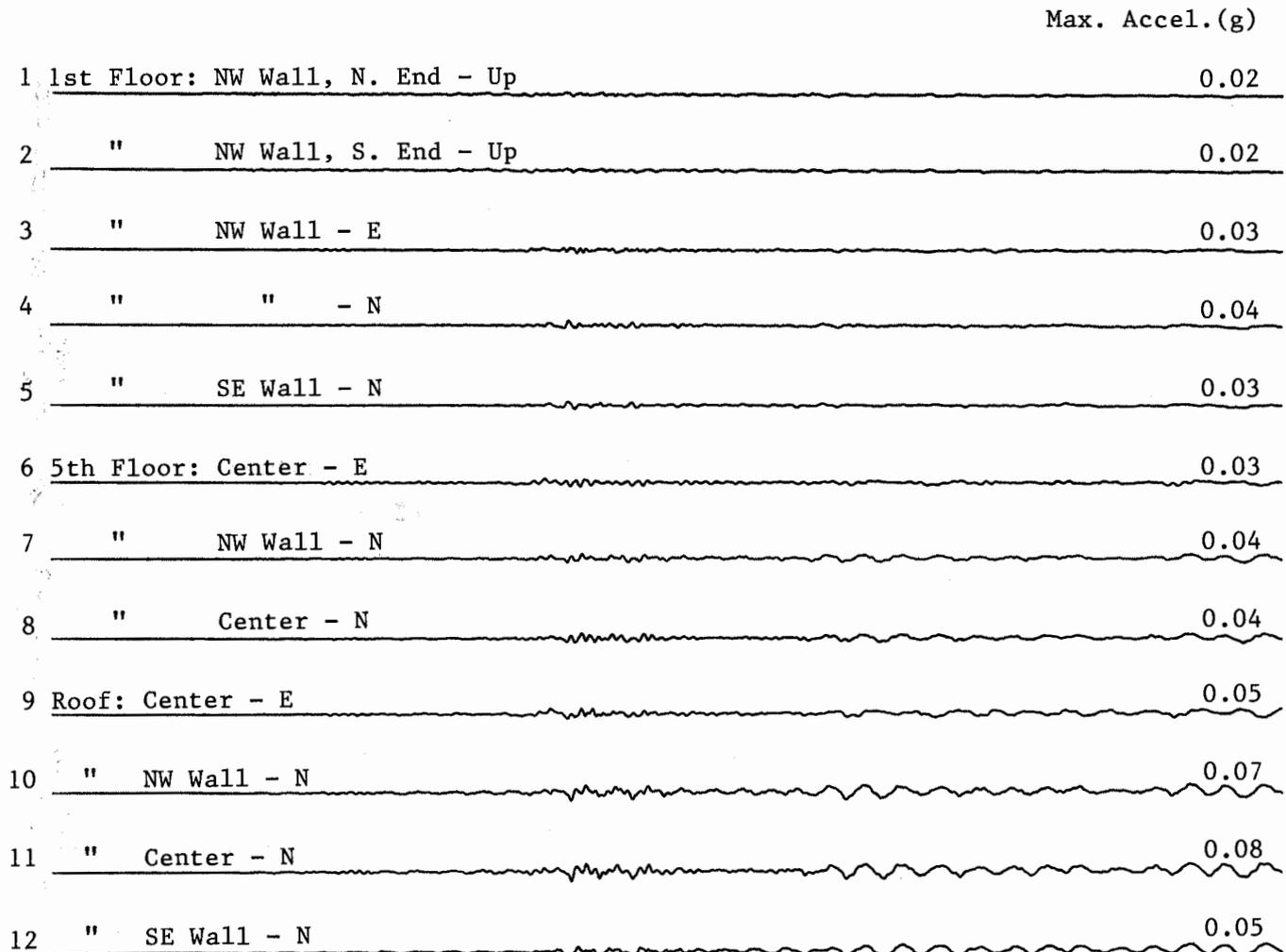
**Vertical Load Carrying System:**  
 Precast concrete floors supported by 8" reinforced hollow unit concrete masonry walls.  
**Lateral Force Resisting System:**  
 Distributed 8" thick reinforced concrete block masonry shear walls in both directions.  
**Foundation Type:**  
 Continuous footings.

**SENSOR LOCATIONS**



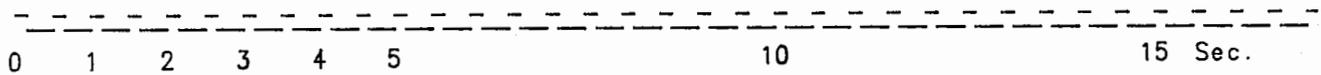
Whittier - 8-story Hotel  
(CSMIP Station 14606)

Record 14606-CS118-91183.02



Trigger Time: 14:43:59.4 GMT

Structure Reference Orientation: N=0°



## Rancho Cucamonga - 4-story Law & Justice Center (CSMIP Station No. 23497)



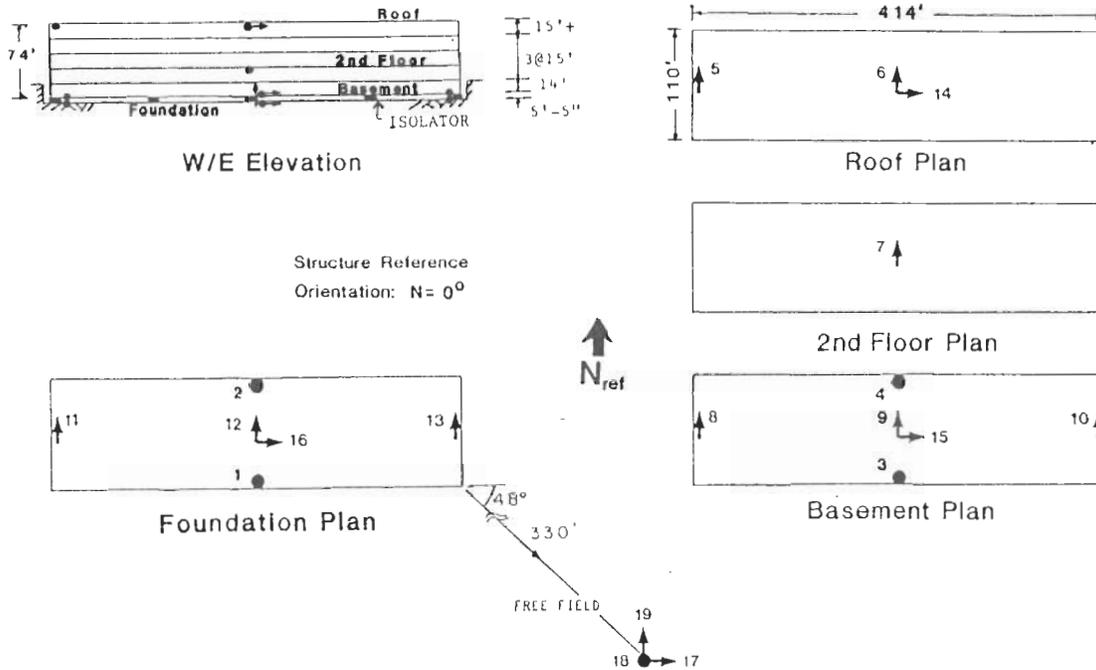
No. of Stories above/below ground: 4/1  
 Plan Shape: Rectangular  
 Base Dimensions: 414' x 110'  
 Typical Floor Dimensions: 414' x 110'  
 Design Date: 1983  
 Construction Date: 1985

**Vertical Load Carrying System:**  
 Concrete slabs over steel deck supported by steel frames on elastomeric bearings.

**Lateral Force Resisting System:**  
 Braced steel frames in upper four stories; concrete shear walls at basement; base isolated on elastomeric bearings.

**Foundation Type:**  
 Spread footings.

### SENSOR LOCATIONS



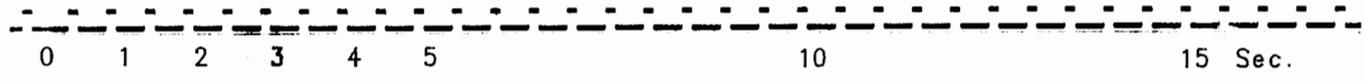
Rancho Cucamonga - Law & Justice Center  
(CSMIP Station 23497)

Record 23497-C0273-91179.01

		Max. Accel.(g)
1	Foundation (Below Isolators): S. Wall - Up	0.02
2	" " N. Wall - Up	0.02
3	Basement (Above Isolators): S. Wall - Up	0.02
4	" " N. Wall - Up	0.02
5	Roof: W. Wall - N	0.07
6	" Center - N	0.08
7	2nd Floor: Center - N	0.04
8	Basement (Above Isolators): W. Wall - N	0.04
9	" " Center - N	0.03
10	" " E. Wall - N	0.04
11	Foundation (Below Isolators): W. Wall - N	0.03
12	" " Center - N	0.02
13	" " E. Wall - N	0.03

Trigger Time: 14:44:02.8 GMT

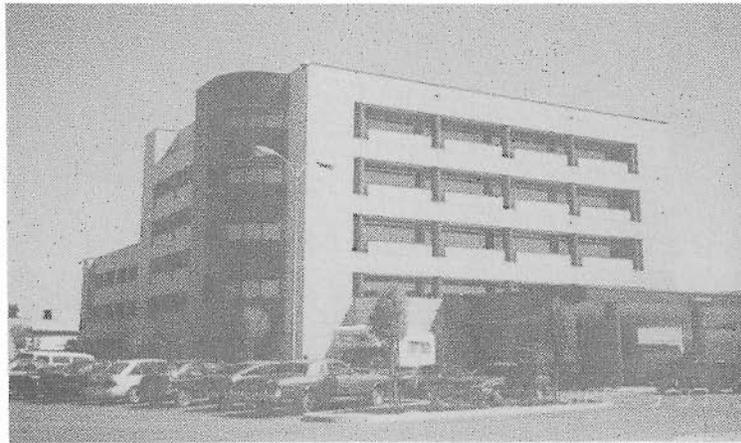
Structure Reference Orientation: N=0°







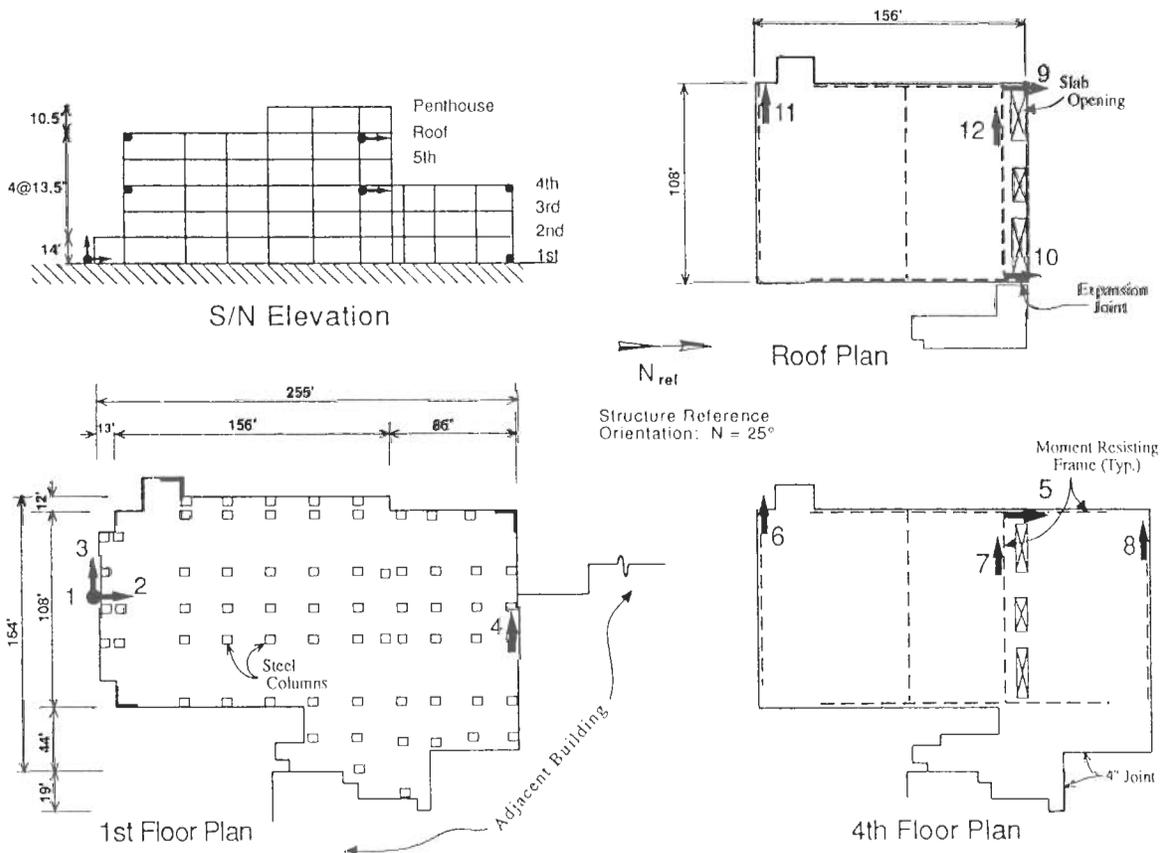
## Lancaster - 5-story Hospital (CSMIP Station No. 24609)



No. of Stories above/below ground: 5/0  
 Plan Shape: Irregular  
 Base Dimensions: 255' x 164'  
 Typical Floor Dimensions: 242' x 108'  
 Design Date: 1986  
 Construction Date: 1988

Vertical Load Carrying System:  
 Concrete slabs over metal deck supported by steel frames.  
 Lateral Force Resisting System:  
 Moment resisting steel frames.  
 Foundation Type:  
 Drilled, cast-in-place concrete friction piles (15' to 50' long).

### SENSOR LOCATIONS



Lancaster - 5-story Hospital  
(CSMIP Station 24609)

Record 24609-CS119-91183.02

	Max. Accel.(g)
1 1st Floor: S. Wall - Up	0.02
2 " " - N	0.02
3 " " - W	0.02
4 " N. Wall - W	0.01
5 4th Floor: W. Wall - N	0.04
6 " S. Wall - W	0.02
7 " Near Center - W	0.02
8 " N. Wall - W	0.03
9 Roof: W. Wall - N	0.05
10 " E. Wall - N	0.04
11 " S. Wall - W	0.04
12 " N. Wall - W	0.03

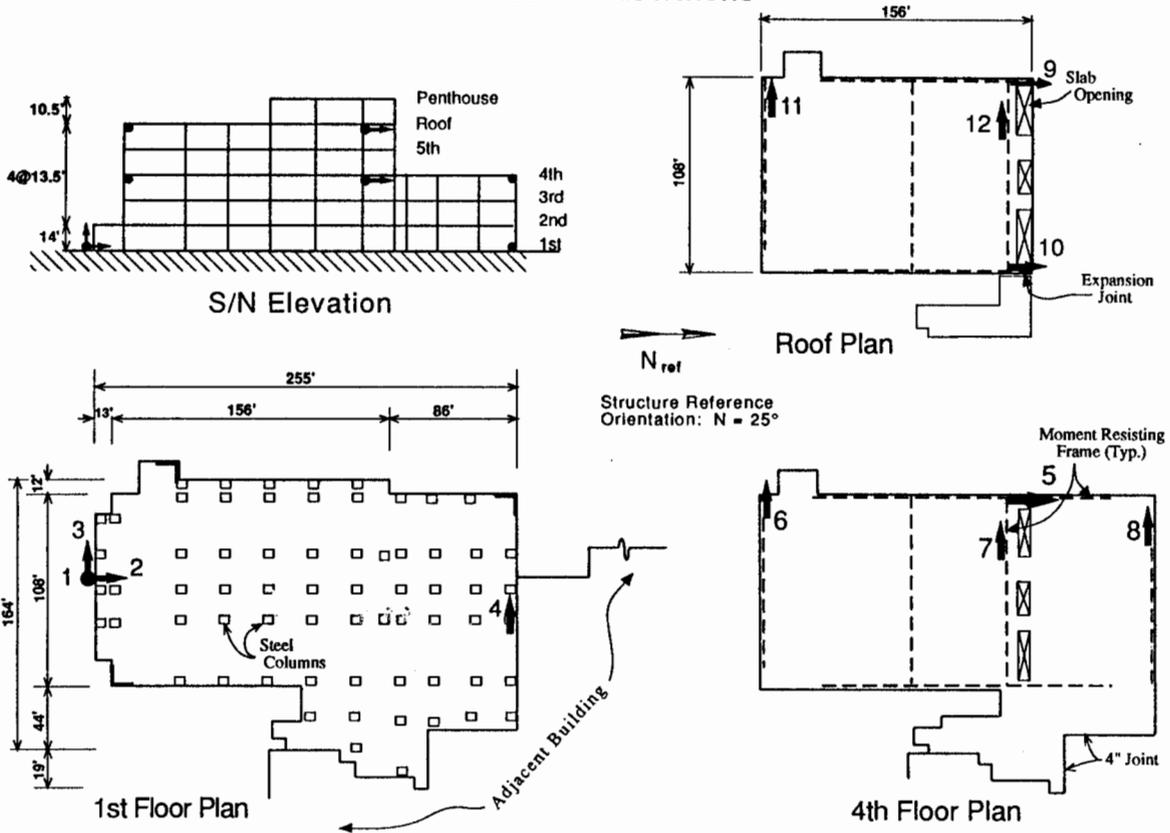
Trigger Time: 14:44:01.3 GMT

Structure Reference Orientation: N=25°

0 1 2 3 4 5 10 15 Sec.

### Lancaster - 5-story Hospital (CSMIP Station No. 24609)

#### SENSOR LOCATIONS





### Seal Beach - 8-story Office Bldg. (CSMIP Station No. 14578)



No. of Stories above/below ground: 8/1  
 Plan Shape: Rectangular  
 Base Dimensions: 245' x 137'  
 Typical Floor Dimensions: 245' x 137'  
 Design Date: 1966  
 Construction Date: 1967 & 1990

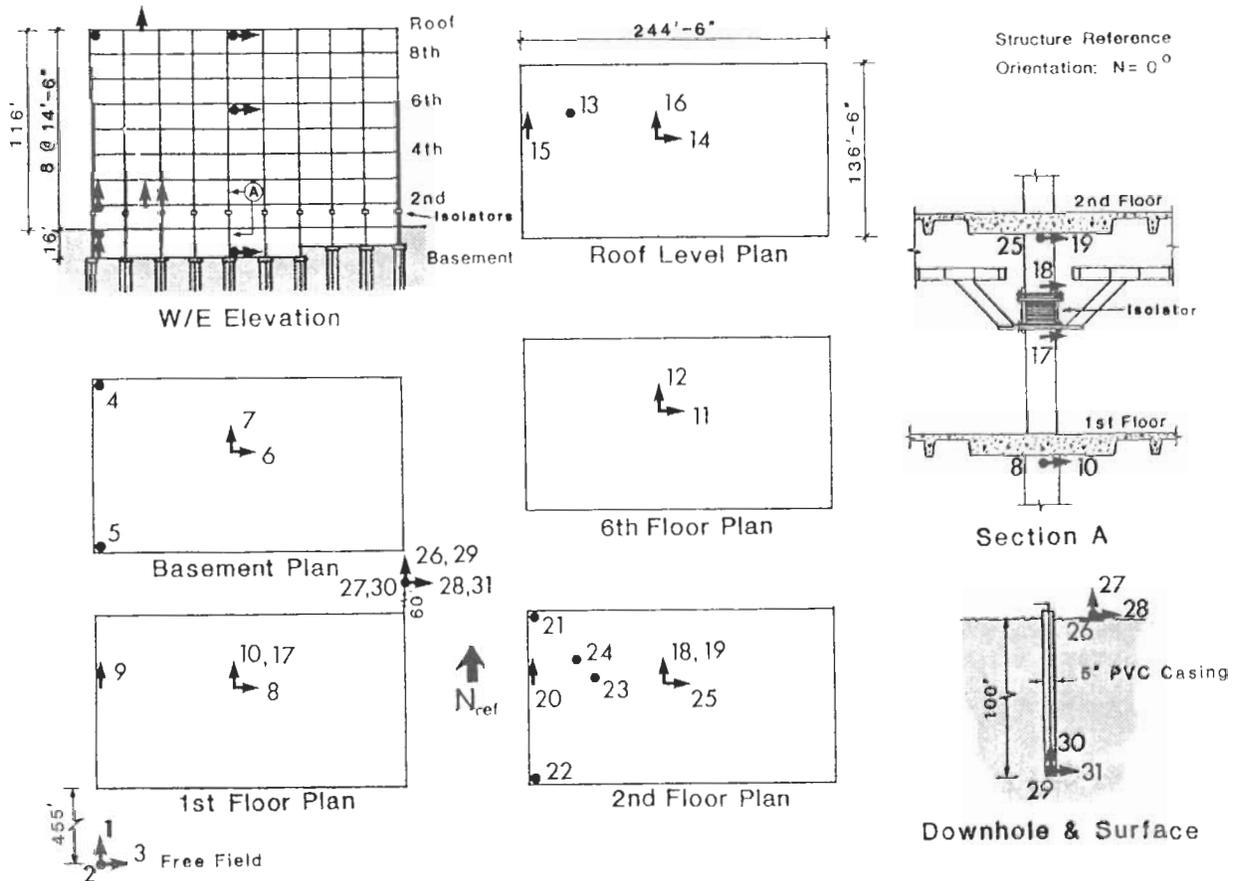
**Vertical Load Carrying System:**  
 Concrete waffle slabs supported by concrete columns on load-bearing isolators.

**Lateral Force Resisting System:**  
 Exterior ductile concrete frames, isolated by rubber/steel laminated bearings between the first and second floors.

**Foundation Type:**  
 Cast-in-place concrete piles (about 50' long).

Note: In 1989-90, the building was strengthened by adding an exterior ductile concrete frame and isolating the columns.

#### SENSOR LOCATIONS



Seal Beach - 8-story Office Bldg.  
(CSMIP Station 14578)

Record 14578-CS101-91183.01

	Max. Accel. (g)
1 Free Field - N	0.02
2 " - Up	0.01
3 " - E	0.02
4 Basement: NW Corner - Up	0.01
5 " SW Corner - Up	0.01
6 " Center - E	0.02
7 " " - N	0.01
8 1st Floor: Center, Below Isolator - E	0.02
9 - 12 Inoperative	
13 Roof: Center, West Side Slab - Up	0.05
14 " Center - E	0.03
15 " W. Wall - N	0.02
16 " Center - N	0.03
17 1st Floor: Column, Below Isolator - N	0.02
18 2nd Floor: Column, Above Isolator - N	0.02
19 " Center, Above Isolator - N	0.02
20 " W. Wall - N	0.02
21 " NW Corner - Up	0.01
22 " SW Corner - Up	0.01

Trigger Time: 14:44:06.7 GMT

Structure Reference Orientation: N=0°

0 1 2 3 4 5 10 15 Sec.

Seal Beach -- 8--story Office Bldg.  
(CSMIP Station 14578)

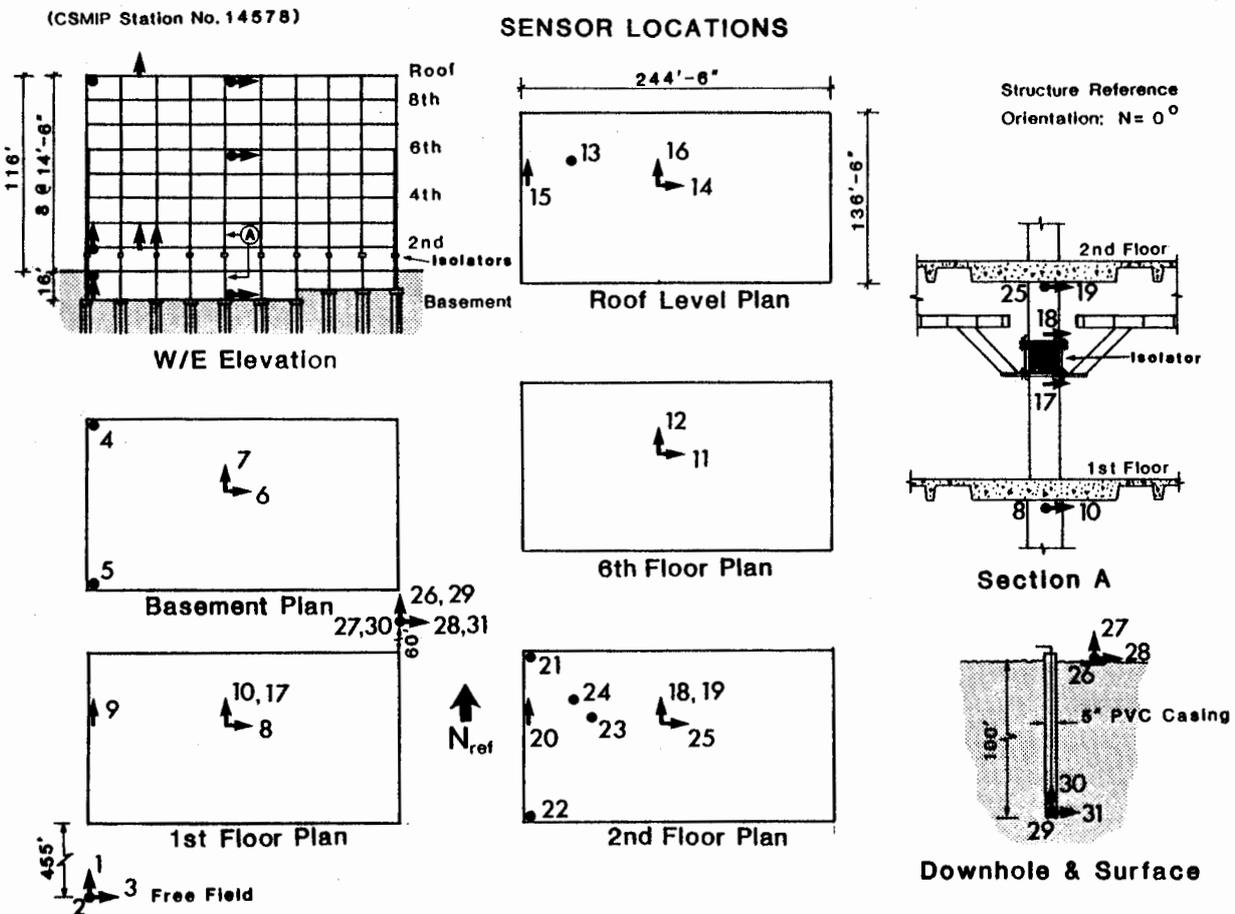
Record 14578-CS101-91183.01

	Max. Accel.(g)
23 2nd Floor: W. Side Column - Up	0.01
24 " Center of W. Side Slab - Up	0.02
25 " Center, Above Isolator - E	0.02
26 Ground surface - N	0.02
27 " - Up	0.02
28 " - E	0.03
29-31 To be installed	

Trigger Time: 14:44:06.7 GMT

Structure Reference Orientation: N=0°

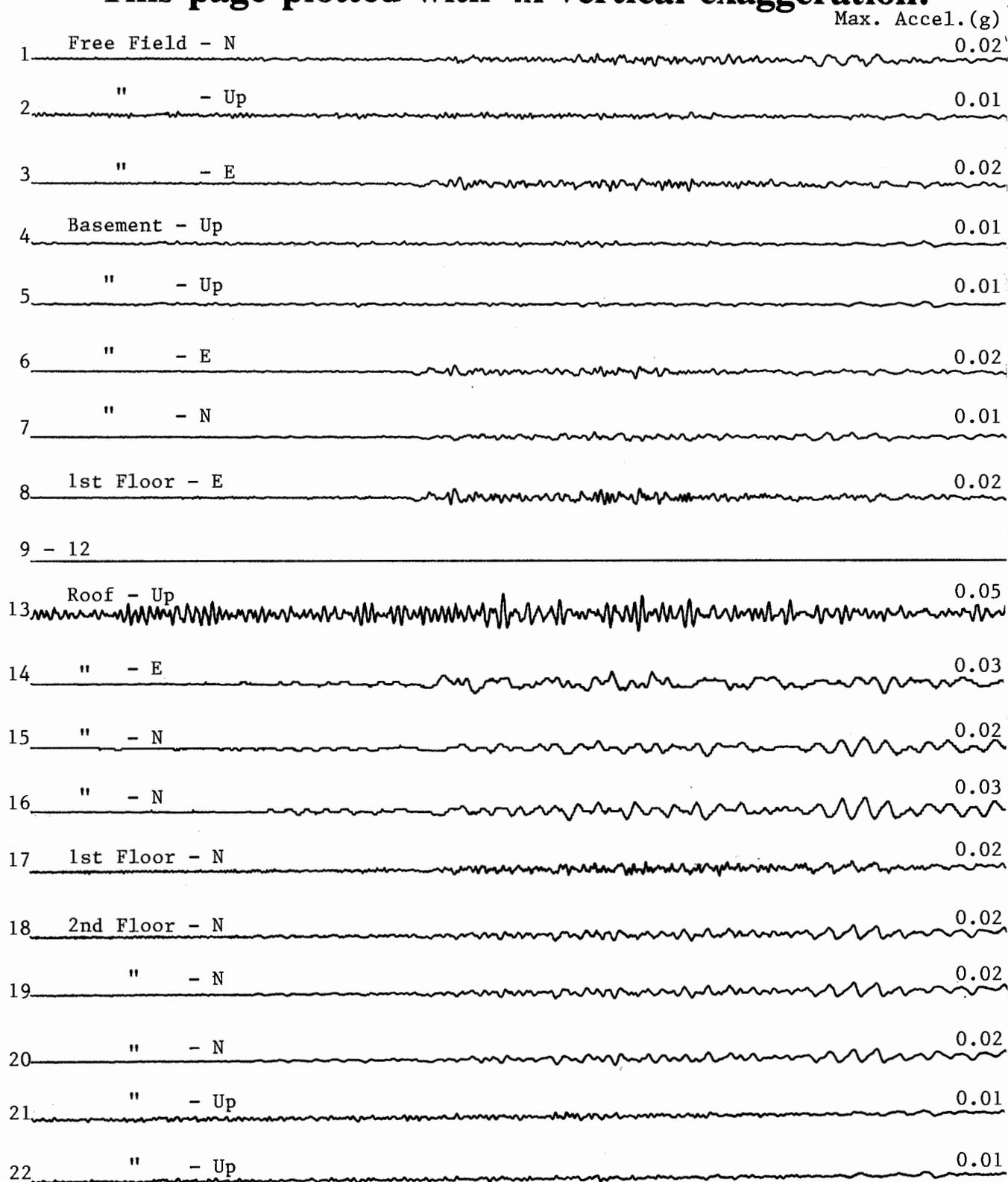
0 1 2 3 4 5 10 15 Sec.



Seal Beach - 8-story Office Bldg.  
(CSMIP Station 14578)

Record 14578-CS101-91183.01

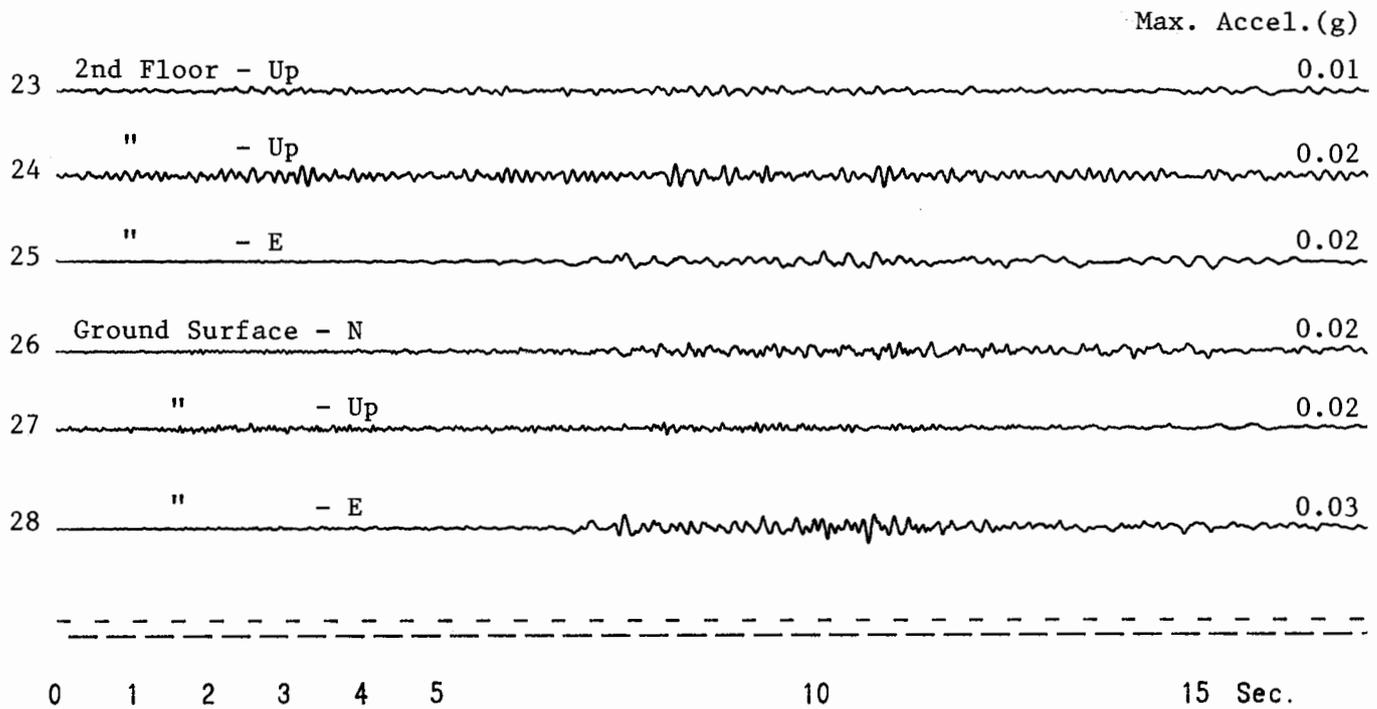
**This page plotted with 4x vertical exaggeration.**



0 1 2 3 4 5 10 15 Sec.

Seal Beach - 8-story Office Bldg.  
(CSMIP Station 14578)

Record 14578-CS101-91183.01



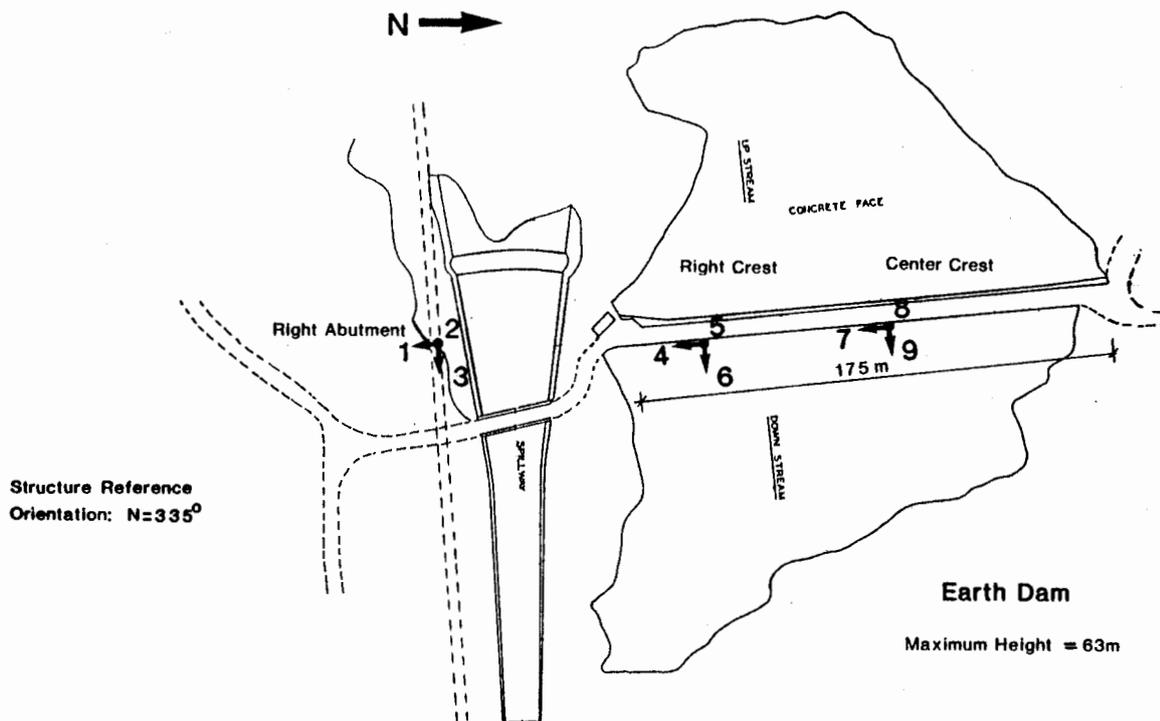
**This page plotted with 4x vertical exaggeration.**

## INDEX TO RECORDS FROM LIFELINES STRUCTURES

<u>Station</u>	<u>Page</u>
Cogswell Reservoir - Cogswell Dam	96
Big Dalton Reservoir - Big Dalton Dam	98
Puddingstone Reservoir - Puddingstone Dam	100

# Cogswell Reservoir - Cogswell Dam (CSMIP Station No. 23210)

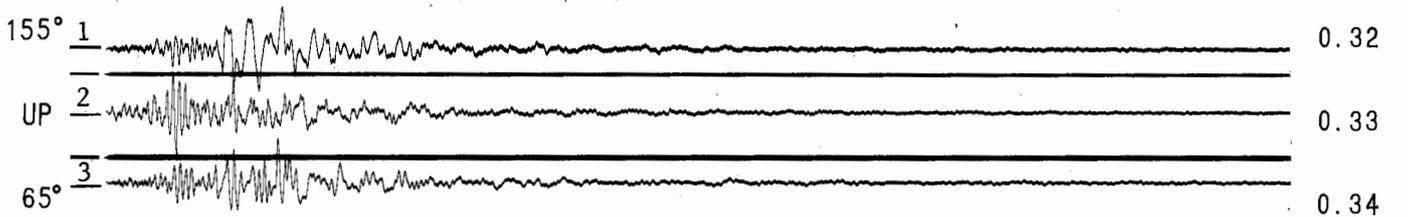
## SENSOR LOCATIONS



Cogswell Dam  
(CSMIP Station 23210)

Record 23210-S1867-91184.01

Right Abutment

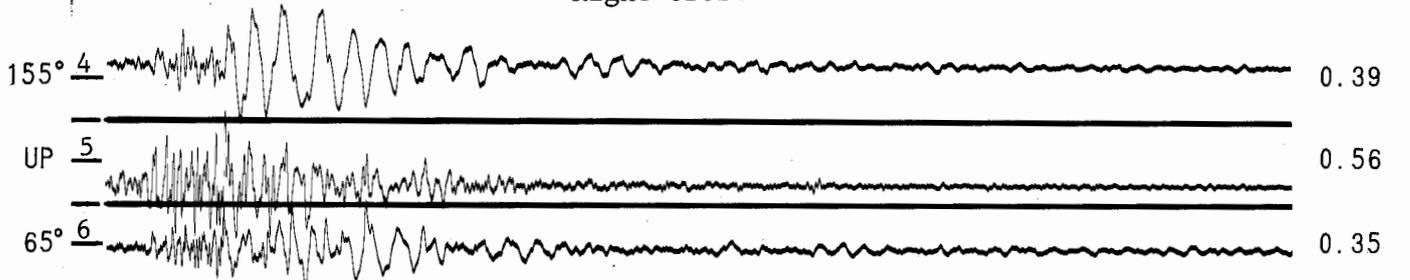


Trigger Time: 14:43:56.5 GMT

0 1 2 3 4 5 10 15 Sec.

Record 23210-S1680-91184.02

Right Crest

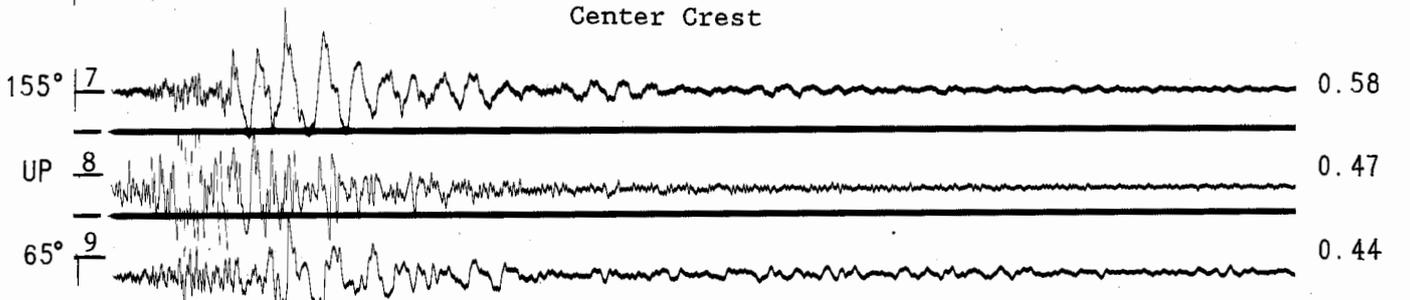


155° - Parallel to dam crest 65° - Transverse to dam crest

0 1 2 3 4 5 10 15 Sec.

Record 23210-S1713-91184.01

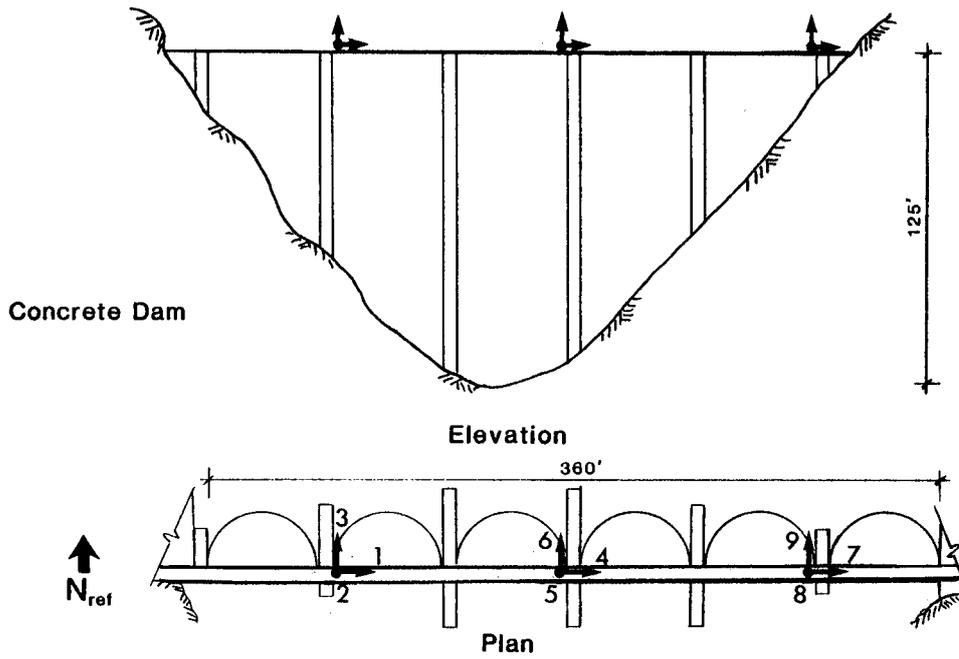
Center Crest



0 1 2 3 4 5 10 15 Sec.

### Big Dalton Reservoir - Big Dalton Dam (CSMIP Station No. 23247)

#### SENSOR LOCATIONS



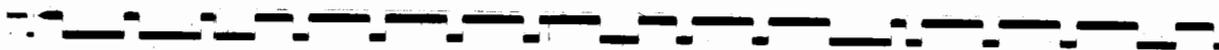
Structure Reference  
Orientation: N = 20°

Revised: 7/91

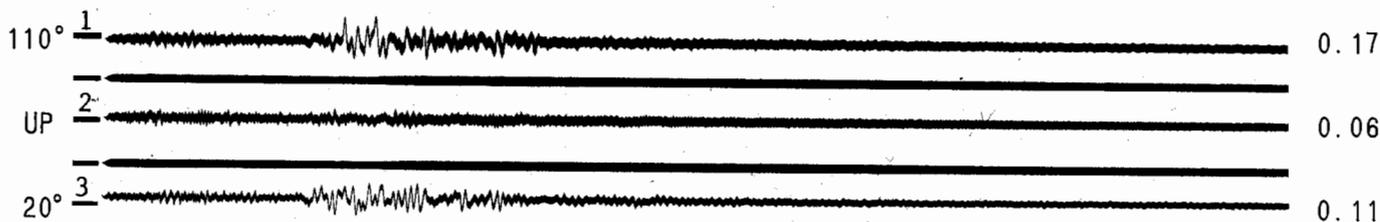
Big Dalton Reservoir - Big Dalton Dam  
(CSMIP Station 23247)

Record 23247-S2488-91179.01

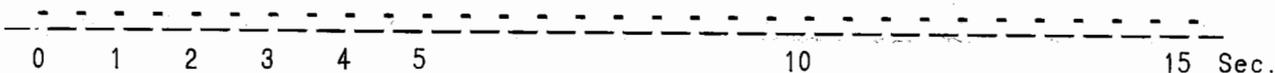
Max. Accel. (g)



Right Crest

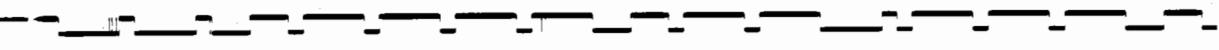


Trigger Time: 14:43:58.7 GMT

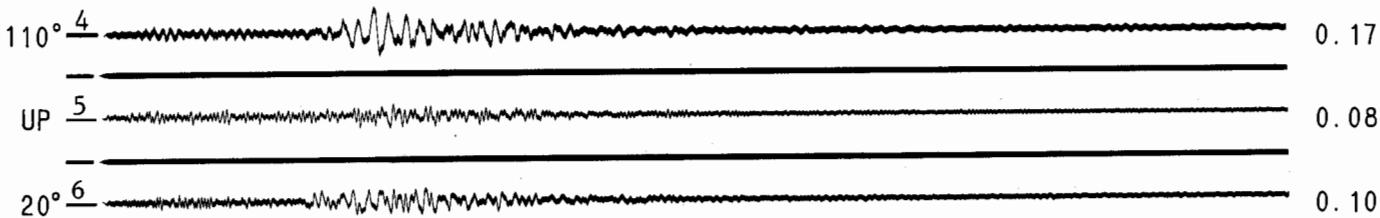


Record 23247-S2492-91179.01

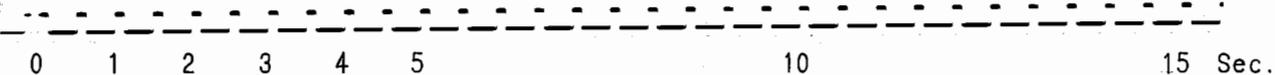
Max. Accel. (g)



Center Crest

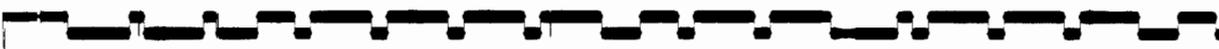


110° - Parallel to dam crest 20° - Transverse to dam crest

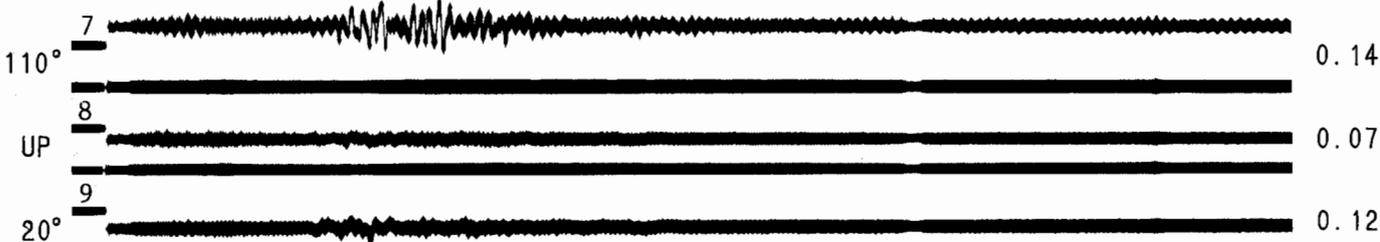


Record 23247-S1575-91179.01

Max. Accel. (g)

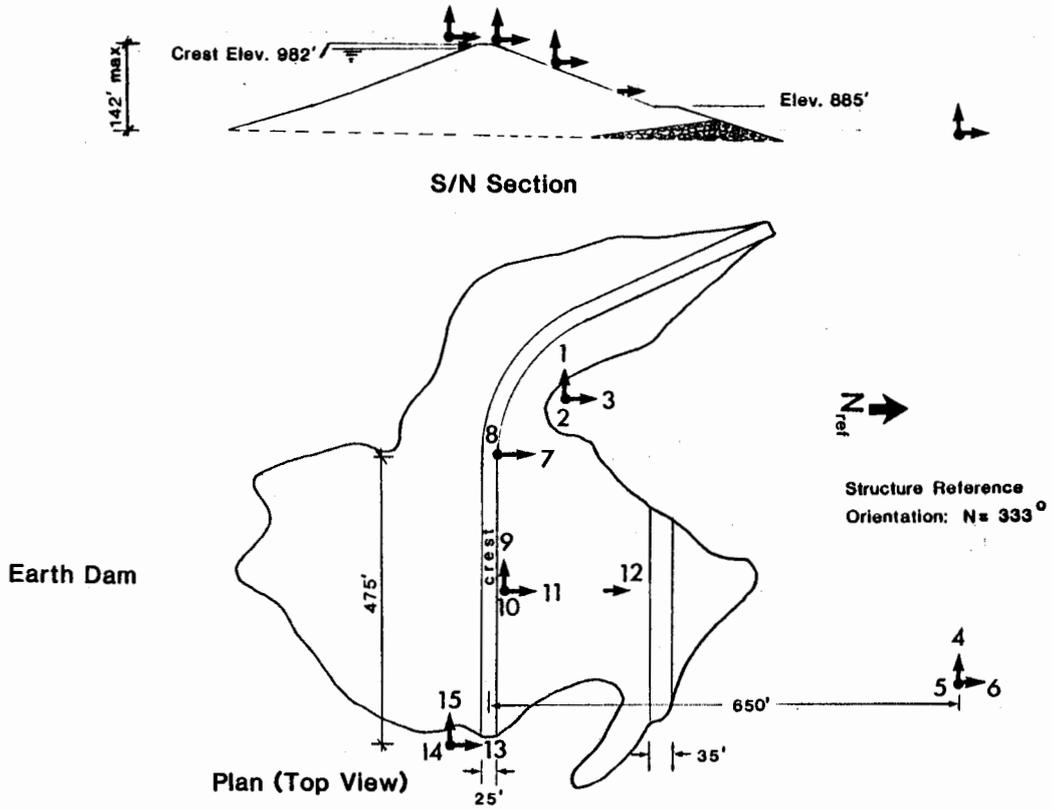


Left Crest



# Puddingstone Reservoir - Puddingstone Dam (CSMIP Station No. 23328)

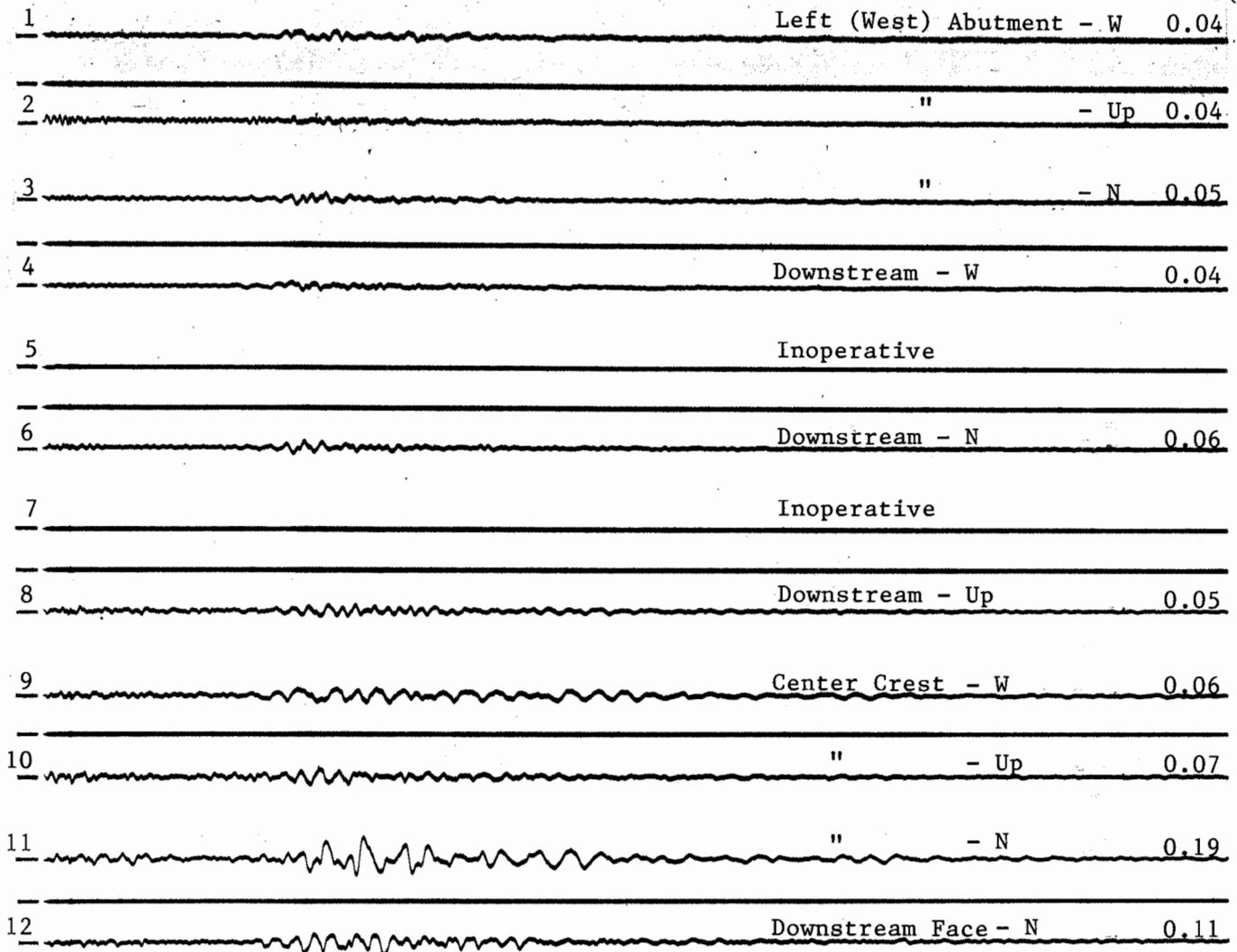
## SENSOR LOCATIONS



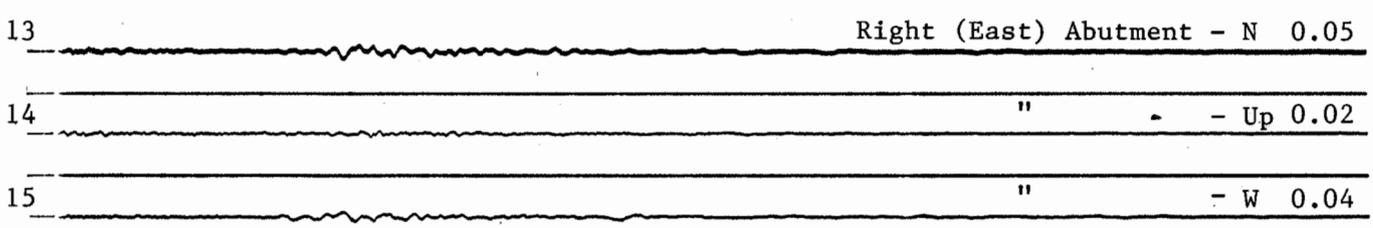
Puddingstone Reservoir - Puddingstone Dam  
(CSMIP Station 23328)

Record 23328-C0172-91182.01

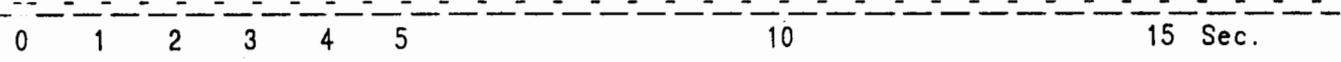
Max. Accel. (g)



Record 24328-S2513-91182.01



Structure Reference Orientation: N=333°





## LIST OF CSMIP REPORTS AND DATA TAPES

California Department of Conservation  
 Division of Mines and Geology  
 Office of Strong Motion Studies  
 California Strong Motion Instrumentation Program (CSMIP)

## AVAILABLE REPORTS:

<u>Title</u>	<u>Number</u>
<b>I. Earthquake Data Reports:</b>	
Quick Report on CSMIP Strong-Motion Records for the February 28, 1990 Earthquake near Upland, California	OSMS 90-02
CSMIP Strong-Motion Records from the Santa Cruz Mountains (Loma Prieta), California Earthquake of 17 October 1989	OSMS 89-06
CSMIP Strong-Motion Records from the Superstition Hills, Imperial County, California Earthquakes of 23 and 24 November 1987	OSMS 87-06
CSMIP Strong-Motion Records from the Whittier, California Earthquake of 1 October 1987	OSMS 87-05
CSMIP Strong-Motion Records from the Chalfant Valley, California Earthquakes of July and August 1986	OSMS 86-06
CSMIP Strong-Motion Records from the Palm Springs, California Earthquake of 8 July 1986	OSMS 86-05
Selected Accelerograms from the Redlands, California Earthquake of October 2, 1985	OSMS 85-02
CSMIP Strong-Motion Records from the Bishop, California Earthquake of 23 November 1984	OSMS 84-12
CDMG Strong-Motion Records from the Morgan Hill, California Earthquake of 24 April 1984	OSMS 84-7
Preliminary Summary of CDMG Strong-Motion Records from the 2 May 1983 Coalinga, California Earthquake	OSMS 83-5.2
Strong-Motion Records from the Mammoth Lakes, California Earthquake of 6 January 1983	OSMS 83-1.1
Strong-Motion Records Recovered from the Mammoth Lakes, California Earthquake of 30 September 1981	OSMS 81-10.1
Strong-Motion Records Recovered from the Westmorland, California Earthquake of 25 April 1981	OSMS 81-5.1

<u>Title</u>	<u>Number</u>
Strong-Motion Records Recovered from the Trinidad-Offshore, California Earthquake of 8 November 1980	OSMS 80-11.1
Strong-Motion Records from the Livermore Earthquakes of 24 and 26 January 1980	PR 28
Strong-Motion Records from the Mammoth Lakes Earthquakes of May 1980	PR 27
Compilation of Strong-Motion Records and Preliminary Data from the Imperial Valley Earthquake of 15 October 1979	PR 26
Compilation of Strong-Motion Records from the Coyote Lake Earthquake of 6 August 1979	PR 25
Compilation of Strong-Motion Records Recovered from the Bishop, California Earthquake of 4 October 1978	OSMS 78-7.1
Compilation of Strong-Motion Records Recovered from the Santa Barbara Earthquake of 13 August 1978	PR 22
Catalog of Strong Motion Accelerograph Records Recovered by Office of Strong Motion Studies before January 1, 1982	SR 154
Catalog of Strong Motion Accelerograph Records Recovered by Office of Strong Motion Studies During 1982	SR 154A

## II. Processed Data Reports:

Third Interim set of CSMIP Processed Strong-Motion Records from the Santa Cruz Mountains (Loma Prieta) Earthquake	OSMS 90-05
Processed Strong-Motion Data from the Base-Isolated San Bernardino County Law & Justice Center for the Upland earthquake of February 28, 1990	OSMS 90-03
Second Interim Set of CSMIP Processed Strong-Motion Records from the Santa Cruz Mountains (Loma Prieta) Earthquake of October 17, 1989	OSMS 90-01
Plots of the Processed Data for the Interim Set of 14 Records from the Santa Cruz Mountains (Loma Prieta) Earthquake of October 17, 1989	OSMS 89-08
Processed Strong-Motion Data from the Whittier, California Earthquake of 1 October 1987; Part I Ground-Response Records	OSMS 89-03
The Cerro Prieto, Baja California Earthquake of February 6, 1987 and Processed Strong-Motion Data	OSMS 87-04
Processed Strong Motion Data from the Palm Springs Earthquake of 8 July 1986; Part I Ground-Response Records	OSMS 87-01

<u>Title</u>	<u>Number</u>
Processed Strong Motion Data from the San Salvador Earthquake of October 10, 1986	OSMS 86-07
Processed Data from the Strong-Motion Record Obtained at a Base-Isolated Building in Rancho Cucamonga, California during the Redlands Earthquake of 2 October 1985	OSMS 86-01
Processed Data from Strong-Motion Records of the Morgan Hill Earthquake of 24 April 1984: Part I Ground-Response Records	OSMS 85-04
Processed Data from Strong-Motion Records of the Morgan Hill Earthquake of 24 April 1984: Part II Structural-Response Records	OSMS 85-05
Processed Data from the Strong-Motion Records of the Imperial Valley Earthquake of 15 October 1979.	SP 65
Processed Data from the San Juan Bautista 101/156 Separation Bridge and the San Juan Bautista Freefield Records from the Coyote Lake Earthquake 6 August 1979	SP 64
Processed Data from the Gilroy Array and Coyote Creek Records, Coyote Lake, California, Earthquake 6 August 1979	PR 24
Processed Data from the Strong-Motion Records of the Santa Barbara Earthquake of 13 August 1978. (in three volumes)	SR 144
<b>III. Other Reports:</b>	
Standard Tape Format of CSMIP Strong-Motion Data Tapes	OSMS 85-03

## AVAILABLE STRONG-MOTION DATA TAPES:

<u>Tape Name</u>	<u>Description</u>
SANTBARB78	Santa Barbara earthquake of 13 August 1978.
IMPERIAL79	Imperial Valley earthquake of 15 October 1979, County Services Bldg. and other CSMIP stations.
COYOTE79A	Coyote Lake earthquake of 6 August 1979, Gilroy Array stations.
COYOTE79B	Coyote Lake earthquake of 6 August 1979, San Juan Bautista overpass and nearest free-field station.
COYOTE79C	Coyote Lake earthquake of 6 August 1979, Halls Valley station.
MAMMOTH80A	Mammoth Lakes earthquakes of 25 May 1980 at 09:34 and 09:49 PDT.
MAMMOTH80B	Mammoth Lakes earthquakes of 25 May 1980 at 12:45 and 13:36 PDT.
MAMMOTH80C	Mammoth Lakes earthquakes of 26 May 1980 at 11:58 PDT and 27 May 1980 at 07:51 PDT.
WESTMOR81	Westmorland earthquake of 26 April 1981.
COALINGA83	Coalinga earthquake of 2 May 1983, 16:43 PDT; Vol. 2 and 3 data for 47 records.
COALINGA83-IA	Coalinga earthquake of 2 May 1983, Vol. 1 data for first 22 records.
COALINGA83-IB	Coalinga earthquake of 2 May 1983, Vol. 1 data for remaining 25 records.
COALINGA83AS	Vol. 2 and 3 data for eight aftershocks of the Coalinga 2 May 1983 earthquake. The aftershocks occurred between 8 May and 11 September 1983, and were of magnitude (ML) 4.3 - 6.0.
COALINGA83AS-I	Vol. 1 data for the Coalinga aftershock records included on the tape COALINGA83AS.
RIODEL8083	Processed data from the Highway 101 Overpass at Rio Dell for the earthquakes of: 8 Nov 1980 (6.9ML Trinidad-Offshore); 16 Dec 1982 (4.4ML Rio Dell) and 24 Aug 1983 (5.5ML Cape Mendicino Offshore).
MAMMOTH83	Mammoth Lakes earthquakes of 7 Jan 1983 at 01:38 and 03:24 GMT.
MORGANHILL84-IG	Morgan Hill earthquake of 24 April 1984; Vol. 1 data from 19 ground-response stations.
MORGANHILL84-G	Morgan Hill earthquake of 24 April 1984; Vol. 2 and 3 data from 19 ground-response stations.
MORGANHILL84-IS	Morgan Hill earthquake of 24 April 1984; Vol. 1 data from 7 buildings and one bridge.
MORGANHILL84-S	Morgan Hill earthquake of 24 April 1984; Vol. 2 and 3 data from 7 buildings and one bridge.

<u>Tape Name</u>	<u>Description</u>
REDLANDS85	Redlands earthquake of 2 October 1985; data from the Law & Justice Building at Rancho Cucamonga.
HOLLISTER86	Hollister earthquake of 26 January 1986.
MTLEWIS86	Mt. Lewis earthquake of 31 March 1986.
SANSALVADOR86	San Salvador earthquake of October 10, 1986.
PALMSPRINGS86-IG	Palm Springs earthquake of 8 July 1986; Vol. 1 data from 18 ground-response stations.
PALMSPRINGS86-G	Palm Springs earthquake of 8 July 1986; Vol. 2 and 3 data from 18 ground-response stations.
CERROPRIETO87	Cerro Prieto, Baja California earthquake of February 6, 1987.
WHITTIER87-IG	Whittier earthquake of 1 October 1987; Vol. 1 data 36 from 36 ground-response stations.
WHITTIER87-G	Whittier earthquake of 1 October 1987; Vol. 2 and 3 data from 36 ground-response stations.
WHITTIER87-IB1	Whittier earthquake of 1 October 1987; Vol. 1 data from first 10 of the 18 buildings.
WHITTIER87-IB2	Whittier earthquake of 1 October 1987; Vol. 1 data from last 8 of the 18 buildings.
WHITTIER87-IIB	Whittier earthquake of 1 October 1987; Vol. 2 data from all 18 buildings.
WHITTIER87-IIIB	Whittier earthquake of 1 October 1987; Vol. 3 data from all 18 buildings.
WHITTIER87-L	Whittier earthquake of 1 October 1987; Vol. 1, 2 and 3 data from 3 lifeline structures (1 bridge and 2 dams).
WHITTIER87-CALTECH	Whittier earthquake of 1 October 1987; Vol. 1, 2 and 3 data from 10 Caltech Stations.
PUGETSOUND65	Puget Sound, Washington Earthquake of 29 April 1965; Vol. 1, 2 and 3 data from two buildings.
UPLAND90-INTERIM	Upland earthquake of 28 February 1990; Vol. 1, 2 and 3 data from the base-isolated San Bernardino County Law & Justice Center.
LOMAPRIETA89-IG	Loma Prieta earthquake of 17 October 1989; Vol. 1 data from 44 ground-response stations.
LOMAPRIETA89-G	Loma Prieta earthquake of 17 October 1989; Vol. 2 and 3 data from 44 ground-response stations.
LOMAPRIETA89-IB1	Loma Prieta earthquake of 17 October 1989; Vol. 1 data from first 10 of 30 buildings.
LOMAPRIETA89-IB2	Loma Prieta earthquake of 17 October 1989; Vol. 1 data from middle 10 of 30 buildings.
LOMAPRIETA89-IB3	Loma Prieta earthquake of 17 October 1989; Vol. 1 data from last 10 of 30 buildings.

<u>Tape Name</u>	<u>Description</u>
LOMAPRIETA89-IIB1	Loma Prieta earthquake of 17 October 1989; Vol. 2 data from first 15 of 30 buildings.
LOMAPRIETA89-IIB2	Loma Prieta earthquake of 17 October 1989; Vol. 2 data from last 15 of 30 buildings.
LOMAPRIETA89-IIIB	Loma Prieta earthquake of 17 October 1989; Vol. 3 data from all 30 buildings.
LOMAPRIETA89-IL	Loma Prieta earthquake of 17 October 1989; Vol. 1 data from all 7 lifeline structures.
LOMAPRIETA89-L	Loma Prieta earthquake of 17 October 1989; Vol. 2 and 3 data from all 7 lifeline structures.

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Footnotes:

Each tape contains Vol. 1 data (uncorrected acceleration), Vol. 2 data (corrected acceleration, velocity and displacement) and Vol. 3 data (response and Fourier amplitude spectra) unless otherwise specified. The magnetic tapes are provided at cost. Included with each tape is a copy of either the processed data report (if available) or the plots of the data.

The Vol. 2 and 3 data are also available on floppy disks for use in personal computers. Requests for the reports, data tapes, data disks and/or for additional information should be addressed to:

Data Reduction Manager  
 Office of Strong Motion Studies  
 Division of Mines and Geology  
 California Department of Conservation  
 630 Bercut Drive  
 Sacramento, CA 95814

Phone: (916) 322-3105

**CSMIP STRONG-MOTION RECORDS FROM THE SIERRA MADRE,  
CALIFORNIA EARTHQUAKE OF 28 JUNE 1991**

**REPORT OSMS 91-03**