

OSHPD/CSMIP
HOSPITAL INSTRUMENTATION

Annual Report

July 1, 2018 through June 30, 2019

OSHPD Agreement No. 16-7415
(DOC No. 1016-990R)

California Strong Motion Instrumentation Program
California Department of Conservation
California Geological Survey

801 K Street, MS 13-35
Sacramento, California 95814-3531

October 1, 2019

Annual Report
OSHPD/CSMIP Hospital Instrumentation by the
California Strong Motion Instrumentation Program
July 1, 2018 through June 30, 2019

I. INTRODUCTION

The California Strong Motion Instrumentation Program (CSMIP) of the California Geological Survey, Department of Conservation, performs installation, maintenance and data recovery for strong motion instrumentation in hospitals through an interagency agreement with the Office of Statewide Health Planning and Development (OSHPD). Funding strong motion instrumentation of hospitals through the interagency agreement is in lieu of normal building-permit fee funding referenced in Chapter 8 of the Public Resources Code.

Hospital buildings have been instrumented under ten Interagency Agreements: 89-0046 (DOC 1089-025R), 92-3187 (DOC 1092-541R), 95-6011 (DOC 1095-570R), 98-9034 (DOC 1098-701R), 01-2069 (DOC 1001-753R), 04-5072 (DOC 1004-790R), 07-7071 (DOC 1007-911R), 10-1266 (DOC 1010-930R), 13-4097 (DOC 1013-960R), and 16-7415 (DOC 1016-990R). These agreements extend from July 1989 through June 2019, each covering a period of three fiscal years. The tenth and most recent interagency agreement 16-7415 (DOC 1016-990R) extended from July 1, 2016 to June 30, 2019. This Annual Report covers activities performed during the third and final fiscal year (FY18-19) of this agreement, July 1, 2018 through June 30, 2019.

During FY18-19, the instrumentation of two hospital buildings was completed: Rancho Springs Medical Center (Women's Center and ER) in Murrieta, and the new 7-story Hospital in Stanford. In addition, the complete re-instrumentation and equipment upgrade of the County Hospital in Ventura (originally instrumented in 1996) was also completed. Also, CSMIP continued to provide technical guidance and assistance to the general contractors and structural engineers on instrumentation projects currently underway (see Tables 2 and 3). Most notably the sensor marking visit by CSMIP staff to the University Medical Center Replacement Hospital in Loma Linda was completed during FY18-19.

II. HOSPITAL INSTRUMENTATION STATUS

Hospital buildings recently instrumented and underway are listed in Tables 1, 2, and 3. Like most other hospitals recently instrumented by the CSMIP, the new stations will have near-real-time data communication capability to allow the recorded motion to be automatically transmitted to Sacramento after an earthquake where it will be automatically processed and made available for use in post-earthquake response by the OSHPD and the hospital owners.

1) Type 1 - OSHPD-Funded Regular Instrumentation of Hospitals (Table 1)

CSMIP completed the instrumentation of the Women's Center and ER building at the Rancho Springs Medical Center in Murrieta, and its reference free-field station, in June 2019, as shown in Table 1. The instrumentation of this building is presented in Appendix A. It was anticipated that the reference free-field station of the Santa Clara Valley Hospital (Replacement Bed Bldg. 1) in San Jose would be installed during FY18-19. However, delays in landscaping of the intended area has pushed installation of this free-field station to FY19-20.

2) Types 2 and 3 - Owner-Funded Instrumentation of Hospitals with CSMIP Guidance and Assistance (Tables 2 and 3)

In addition to the hospital instrumentation funded under the OSHPD/CSMIP contract discussed above, a significant component of CSMIP hospital instrumentation work involves detailed technical guidance and assistance with hospital instrumentation projects for which the owner absorbs the capital cost of instrumentation under OSHPD regulations. These may be in new hospitals (Type 2), or in existing hospitals being retrofitted (Type 3). Twelve CSMIP-assisted hospital instrumentation projects have been completed since July 1, 2016 and another five are currently underway.

CSMIP guidance and assistance in the instrumentation of hospitals includes the following steps:

1. Development of the sensor locations or review of the proposed sensor locations from the design structural engineer, after study of the structural plans, to ensure sufficient number of sensors to characterize the building seismic response. An instrumentation planning meeting or conference call among the structural engineer, architect of record, OSHPD and CSMIP staff is held to discuss and develop consensus on sensor locations and number of sensors.
2. Establishment of the specific locations of all sensors, based on detailed study of the architectural plans by the design architect or SE. Sensor locations need to be avoid conflict with other non-structural components and sensors need to be accessible after they are installed.
3. Development of the comprehensive, detailed design of the system, called the Technical Specifications Letter (TSL), by CSMIP staff. The TSL is provided to the owner, OSHPD, and the contractor, and is included in the plans. It specifies acceptable instruments and approved installation practices as well as details for the locations and interconnection of the components, to result in a well-installed project. The final instrumentation plans are approved by the OSHPD.
4. Sensor marking field visit by CSMIP staff with representatives of the owner, construction contractor and OSHPD Inspector of Record. During this visit the actual sensor locations

are approved and physically marked on the structural members. During the subsequent work by the contractor, CSMIP staff approves the submittals, assists with problems and issues as they arise.

5. Acceptance field testing of the completed instrumentation system, some months or years later, by CSMIP staff. If problems are found in the installation or operation, the contractor is called back in for repairs, followed by a repeat of tests. Once the installed system is accepted, OSHPD is notified, and CSMIP takes on long-term maintenance of the instrumentation, as well as data recovery and processing, supported by OSHPD.
6. CSMIP staff prepare sensor location diagram, building descriptions and photo for the building, which are made available at the Center for Engineering Strong Motion Data (CESMD) after the instrumentation is completed.

Type 2 Instrumentation Projects

The six completed projects and five projects underway of Type 2 instrumentation are listed in Table 2. These hospital buildings have base-isolation and/or energy dissipation devices, or use an Alternate Method of Compliance (AMOC) in their design. These are required to have owner-paid instrumentation installed during construction per the California Building Code and OSHPD regulations.

One new Type 2 instrumentation project was added during FY18-19: Marina Del Rey – Cedars-Sinai Medical Center Replacement Hospital. This is a 9-story steel moment frame structure with Side Plate connections. A conference call was held on May 23, 2019 to initiate discussion between stakeholders regarding instrumentation. CSMIP has received plans and soils report from structural engineer. The next step is development of the proposed layout of instrumentation by the structural engineer with CSMIP assistance.

CSMIP completed the instrumentation of the new 7-story Hospital in Stanford and its reference free-field station in February 2019, as shown in Table 2. The instrumentation of this building is presented in Appendix B.

Type 3 Instrumentation Projects

There are six Type 3 hospital instrumentation projects which have been completed as shown in Table 3. These buildings were retrofitted under the Voluntary Seismic Improvement (VSI) regulations. Because of an AMOC design used in their retrofit, these buildings were required to be instrumented at owner expense. St. Bernardine Hospital in San Bernardino is the only Type 3 hospital instrumentation project that remains to be instrumented.

3) Outline of the Report

In Section III of this report, the instrumentation of the Rancho Springs Medical Center in Murrieta and the 7-story Hospital in Stanford are discussed. The photos, sensor location diagrams and building descriptions for these buildings are shown in Appendix A and B.

In Section IV, the previously instrumented hospital buildings for which ongoing maintenance was performed throughout FY18-19 are listed. With two more hospital buildings added during FY18-19, 80 are being maintained as of the start of FY19-20.

A total of 80 hospital buildings have been instrumented in the OSHPD/CSMIP project through the end of FY18-19. The locations of the 80 hospital buildings are shown on a probabilistic seismic hazard map in Appendix C. The hospital buildings and information about their structural systems are listed in the table in Appendix D. The number of strong-motion recorders at each building and the communication speed are also shown in the table as these will determine how quickly data can be recovered for application after earthquakes.

In Section V of this report, the strong-motion records that were obtained during FY18-19 at instrumented hospitals and their reference free-field sites are listed. These records were all of low level shaking. All recordings can be viewed online and downloaded at www.strongmotioncenter.org. The fiscal report is included in Section VI.

Table 2

**New Hospital Buildings (Type 2) – Assisted Instrumentation
Base-Isolated or Alternate Method of Compliance**

(Owner-Funded with CSMIP Assistance and Guidance)

Hospital Name	CSMIP Sta. No.	OSHPD Approval No.	Year Built	No. of Stories	No. of Sensors	Completion Date
<u>Instrumentation Completed Since July 1, 2016</u>						
1. Ventura – Community Memorial Hospital						
	25594	IS 082255-56	2017	6/1	24+FF	8/11/2016
Steel concentrically-braced frames on CDSM improved ground (includes 3 downholes under building)						
Reference geotech array: Ventura – Community Hosp Geotech Array , CSMIP Sta. 25596						
2. Palo Alto – Lucile Packard Children’s Hospital Stanford						
	58604	IS 091547-43	2017	6/2	21	12/7/2017
Steel moment frames with SidePlate connections in the EW direction and steel BRB braced frames in the NS direction above First Level; Concrete shear walls below First Level (AMOC) (Pre-existing reference free-field: Stanford – Quarry & Welch , CSMIP Sta. 58086)						
3. San Francisco – CPMC Cathedral Hill Hospital						
	58640	IS 080885-38	2019	12/2	24	2/15/2018
Steel moment frames with viscous wall dampers						
No reference free-field station						
4. San Francisco – St. Luke’s Hospital						
	58649	I 140001-38	2018	7/0	16	2/16/2018
Steel buckling-restrained braced frames						
No reference free-field station						
5. Fremont – Washington Hospital						
	57643	HS 051385-01	2018	3/1	24+FF	6/15/2018
Steel moment frames isolated with friction pendulum bearings and viscous dampers						
Reference free-field station: Fremont – Mowry & Civic Center , CSMIP Sta. 57644						
6. Stanford – 7-story Hospital						
	58623	IS 081923-43	ca. 2019	7/1	34+FF	2/6/2019
Steel moment frames isolated with friction pendulum bearings at the base (includes 25 accelerometers and 3 relative displacement sensors in the building and 6 accelerometers on the pedestrian bridge)						
Reference free-field station: Palo Alto – Welch & Pasteur , CSMIP Sta. 58622						
<u>Instrumentation Underway (in estimated order of completion)</u>						
1. Greenbrae (San Rafael) – Marin General Hospital Replacement Building						
	58nnn	I 140004-21	ca. 2019	4/1	16+FF	FY 19-20
Special steel moment frames with SidePlate connections						
[TSL completed 5/4/16; Sensor locations marked 11/2/2017]						
(To include a reference free-field station)						

(continued on next page)

Table 2 (continued)

**New Hospital Buildings (Type 2) – Assisted Instrumentation
Base-Isolated or Alternate Method of Compliance
(Owner-Funded with CSMIP Assistance and Guidance)**

Hospital Name	CSMIP Sta. No.	OSHPD Approval No.	Year Built	No. of Stories	No. of Sensors	Completion Date
2. Loma Linda – University Medical Center Replacement Hospital	23nnn	I 150010-36	ca 2020	16/2	42+FF	FY 19-20
Steel BRB and SidePlate moment frames isolated with triple pendulum bearings and viscous dampers. [TSL completed 4/26/17; Sensor locations marked 9/6/2018 and 4/11/2019] (To include a reference free-field station)						
3. Los Angeles - Hollywood Presbyterian Medical Center Acute Care Services Replacement Building	24nnn	I 17002-19-02	ca 2020	4/1	16	tbd
Steel moment frames with SidePlate connections [TSL completed 10/26/17; instrumentation plans approved] (Pre-existing reference FF station: Los Angeles – Vermont & Fountain , CSMIP Sta. 24642)						
4. Downey – Kaiser Hospital Tower Expansion	14nnn	I 160024-19-02	ca 2020	6/partial	16+FF	tbd
Steel moment frames with SidePlate connections. [TSL completed 5/24/18; instrumentation plans approved] (To include a reference free-field station)						
5. Marina Del Rey – Cedars-Sinai Medical Center Replacement Hospital	14nnn	I 180008-19-00	ca 2021	9/0	tbd	tbd
Steel moment frames with SidePlate connections. [Conference call to discuss instrumentation, 5/23/19] (To include a reference free-field station)						

Table 3

**Existing Hospital Buildings (Type 3) – Assisted Instrumentation
Voluntary Seismic Improvement (VSI) Projects**

(Owner-Funded with CSMIP Assistance and Guidance)

Hospital Name	CSMIP Sta. No.	OSHPD Approval No.	Year Design	No. of Stories	No. of Sensors	Installation Date
<u>Instrumentation Completed Since July 1, 2016</u>						
1. Riverside – Community Hospital (Building B)						
	13633		1963	6/1	12+FF	2/24/2017
Concrete shear walls (retrofit: add concrete shear walls and FRP wrap columns)						
Reference free-field station: Riverside – 14th & Magnolia , CSMIP Sta. 13635						
2. Los Angeles - Hollywood Presbyterian Medical Center (South Wing)						
	24662	P-2011-00625	1959	4/1	12+FF	1/9/2018
Concrete shear walls & masonry walls (retrofit: add concrete shear walls and wrap columns)						
Reference free-field station: Los Angeles – Vermont & Fountain , CSMIP Sta. 24642						
3. Los Angeles - Hollywood Presbyterian Medical Center (Doctor’s Tower)						
	24682	P-2011-00626	1971	10/2	15	1/10/2018
Steel moment frames (retrofit: add concrete shear walls below ground floor)						
Reference free-field station: same as the FF station for South Wing						
4. Santa Ana – Orange County Global Medical Center (Admin Bldg)						
	13611	HL 101526-30	1971	1/0	6+FF	2/21/2018
Steel x-braced frame (retrofit: replace steel x-braces)						
Reference free-field station: Santa Ana – Tustin & E 17th , CSMIP Sta. 13613						
5. Downey – PIH Health Medical Center (Nursing Tower)						
	14646	IL082802-19A	1967	4/1	12+FF	2/22/2018
Concrete shear walls and moment frames (retrofit: add concrete shear walls)						
Reference free-field station: Downey – Iowa & Brookshire , CSMIP Sta. 14644						
6. Encino – Encino Hospital (Building 3)						
	24648	HL 101538-19A	1969	4/1	12+FF	6/15/2018
Reinforced masonry shear walls (retrofit: apply FRP to selected columns and beams)						
Reference free-field station: Encino – Ventura & Libbit , CSMIP Sta. 24645						
<u>Instrumentation Underway</u>						
1. San Bernardino – St. Bernardine Hospital (Central Tower)						
	24nnn	IL 082842-36	1972	6/0	12+FF	FY19-20
Steel moment frames (retrofit: add exterior steel frames with viscous dampers)						
[TSL completed 12/1/16; instrumentation plans approved]						
(To include a reference free-field station)						

III. HOSPITAL INSTRUMENTATION COMPLETED DURING FY18-19

Details of the instrumentations of the Rancho Springs Medical Center in Murrieta and the 7-story Hospital in Stanford are included below:

Rancho Springs Medical Center, Murrieta – Appendix A

The Women's Center and ER building at the Rancho Springs Medical Center in Murrieta is a 2-story concrete moment frame structure. The building was designed in accordance with the 2001 California Building Code and was built in 2009. The instrumentation includes nine accelerometers in the building and three accelerometers at a reference free-field station about 275 feet south of the building.

CSMIP obtained permission from the owner in January 2019. CSMIP staff studied the plans and proposed an instrumentation plan which was approved by OSHPD (Roy Lobo) on May 14, 2019. CSMIP staff performed the pre-installation sensor marking visit at the building on May 16, 2019. The installation of accelerometers was then completed by CSMIP staff in June 2019.

Photos of the instrumented building and reference free-field, the sensor location diagram and the building description are included in Appendix A.

7-story Hospital, Stanford – Appendix B

The new 7-story Hospital in Stanford is a steel moment frame structure which is base isolated using Triple Friction Pendulum bearings beneath Ground Level. Construction of the new hospital will be completed in Fall 2019. The building was designed in accordance with the 2007 California Building Code and was required to be instrumented. The instrumentation includes 25 accelerometers and three relative displacement sensors in the building, six accelerometers in the adjacent pedestrian bridge and lobby building, and three accelerometers at a reference free-field station about 390 feet west of the building.

CSMIP prepared the technical requirements letter and sent it to the structural engineer on June 1, 2012. The instrumentation plans were approved by OSHPD on September 17, 2012. CSMIP staff performed the pre-installation sensor marking visit at the building on March 3, 2016, and at the pedestrian bridge and lobby building on June 7, 2017. The system was installed by the contractor and the equipment manufacturer. CSMIP performed the acceptance test on February 6, 2019.

Photos of the instrumented building and reference free-field, the sensor location diagram and the building description are included in Appendix B.

IV. HOSPITAL INSTRUMENTATION MAINTENANCE

During FY18-19, CSMIP technical staff performed periodic maintenance of the strong-motion instrumentation installed in the 78 previously-instrumented hospital buildings, 59 of which have an associated free-field instrument. With the addition of two newly instrumented hospital buildings, a total of 80 buildings will be maintained during the next fiscal year (FY19-20).

The 78 hospital buildings instrumented as of the beginning of FY18-19 (buildings with an associated reference free-field station are indicated by an *), are listed alphabetically by city below:

1. Alameda - Alameda Hospital *
2. Bakersfield - Kern County Hospital *
3. Berkeley - Alta Bates Hospital
4. Burlingame - Mills Peninsula Hospital *
5. Castro Valley - Sutter Eden Medical Center *
6. Colton - Arrowhead Regional Medical Center (base-isolated) *
7. Crescent City - Sutter Coast Hospital *
8. Downey - PIH Health Medical Center (VSI) *
9. El Centro - El Centro Regional Medical Center *
10. Encino - Encino Hospital (VSI) *
11. Escondido - Palomar West Medical Center, Central Plant
12. Escondido - Palomar West Medical Center, Main Tower *
13. Eureka - St. Joseph Hospital *
14. Fairfield - North Bay Medical Center *
15. Fremont - Kaiser Hospital *
16. Fremont - Washington Hospital (base isolated) *
17. Gilroy - St. Louise Hospital *
18. Hemet - Hemet Valley Medical Center *
19. Indio - JFK Memorial Hospital *
20. Irvine - Kaiser Sand Canyon Hospital *
21. King City - Mee Hospital *
22. La Jolla - Scripps Memorial Hospital (VSI) *
23. La Jolla - UCSD Hospital *
24. La Jolla - UCSD Jacobs Medical Center
25. Lancaster - Antelope Valley Hospital *
26. Los Angeles - Childrens Hospital
27. Los Angeles - Good Samaritan Hospital
28. Los Angeles - Hollywood Presbyterian Medical Center, Doctor's Tower (VSI)
29. Los Angeles - Hollywood Presbyterian Medical Center, South Wing (VSI) *
30. Los Angeles - LAC+USC Hospital D&T (base-isolated) *
31. Los Angeles - LAC+USC Hospital Inpatient Bldg
32. Los Angeles - MLK Hospital (base-isolated) *
33. Los Angeles - USC Hospital (base-isolated)
34. Los Angeles - USC Hospital Addition
35. Mammoth Lakes - Mammoth Hospital *
36. Moreno Valley - Riverside County Hospital *
37. Newport Beach - Hoag Hospital West Tower *
38. Newport Beach - Hoag Hospital East Tower (base-isolated)
39. Novato - Community Hospital *
40. Oakland - Kaiser Hospital
41. Ontario - Kaiser Hospital *
42. Oxnard - St. John's Medical Center *
43. Palm Springs - Desert Hospital
44. Palmdale - Palmdale Regional Medical Center *

- | | |
|--------------------|--|
| 45. Palo Alto | - Lucile Packard Children's Hospital Stanford * |
| 46. Redlands | - Community Hospital (VSI) * |
| 47. Riverside | - Community Hospital (VSI) * |
| 48. Salinas | - Natividad Medical Center * |
| 49. San Bernardino | - Community Hospital * |
| 50. San Diego | - Sharp Memorial Hospital (VSI) * |
| 51. San Diego | - UCSD Medical Center * |
| 52. San Francisco | - CPMC Cathedral Hill Hospital |
| 53. San Francisco | - General Hospital (base-isolated) * |
| 54. San Francisco | - Kaiser Hospital |
| 55. San Francisco | - St. Luke's Hospital |
| 56. San Francisco | - UCSF Hospital * |
| 57. San Francisco | - UCSF Mission Bay Hospital * |
| 58. San Jose | - O'Connor Hospital * |
| 59. San Jose | - Santa Clara Valley Hospital Bed Bldg 1 |
| 60. San Jose | - Santa Clara Valley Hospital Bldg K |
| 61. San Pedro | - Providence LCOM Medical Center Bldg 1T (VSI) * |
| 62. San Pedro | - Providence LCOM Medical Center Bldg 2 (VSI) |
| 63. San Rafael | - Marin General Hospital West Wing * |
| 64. Santa Ana | - Orange County Global Med Center (VSI) * |
| 65. Santa Barbara | - Cottage Hospital * |
| 66. Santa Clara | - Kaiser Hospital * |
| 67. Santa Maria | - Marian Hospital * |
| 68. Santa Monica | - St. John's Hospital (base-isolated) * |
| 69. Santa Rosa | - Kaiser Hospital * |
| 70. Simi Valley | - Simi Valley Hospital * |
| 71. Stanford | - University Hospital * |
| 72. Sylmar | - Olive View Hospital * |
| 73. Templeton | - Twin Cities Hospital * |
| 74. Torrance | - Providence LCOM Medical Center (VSI)* |
| 75. Valencia | - Mayo Hospital * |
| 76. Ventura | - Community Memorial Hospital * |
| 77. Ventura | - Ventura County Hospital * |
| 78. Walnut Creek | - Kaiser Hospital |

In addition to periodic maintenance, CSMIP staff completed the re-instrumentation and equipment upgrade of the County Hospital in Ventura (originally instrumented in 1996) during FY18-19. Twelve sensors distributed throughout the building were upgraded from 2g to 4g accelerometers, and the recorder was upgraded from a 12-bit to a 24-bit system.

CSMIP staff also performed monitoring and data recovery for the code-type instrumentation systems (three tri-axial accelerographs) in the following four hospitals without charge to OSHPD:

1. Los Angeles – White Memorial Hospital (7-story)
2. Pasadena – Huntington Memorial Hospital (7-story)
3. Downey – Kaiser Hospital (6-story)
4. Los Angeles – Kaiser LAMC Sunset Hospital (7-story)

V. STRONG-MOTION RECORDS FROM HOSPITALS

During July 1, 2018 through June 30, 2019 a total of 8 earthquakes with magnitude 3.0 or larger were recorded at instrumented hospitals. The hospitals and the maximum accelerations recorded in the hospital building (the base and superstructure) and at its reference free-field station (ground), if it exists, are listed below for these earthquakes.

M4.4 Aguanga Earthquake of August 14, 2018

Name of Hospital	Type of Structure	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
			Ground	Base	Structure
Hemet – Hemet Valley Hospital (Sta. 12267)	4-story concrete shear walls	33.6	2.2	1.8	5.7
Indio – JFK Hospital (Sta. 12759)	1-story concrete shear walls	58.5	1.3	1.0	2.9
Palm Springs – Desert Hospital (Sta. 12299)	4-story steel moment frames	46.9	No FF	0.8	1.6

M3.1 San Jacinto Earthquake of October 17, 2018

Name of Hospital	Type of Structure	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
			Ground	Base	Structure
Hemet – Hemet Valley Hospital (Sta. 12267)	4-story concrete shear walls	5.2	3.8	1.4	2.5

M4.8 Alberto Oviedo Mota, B.C. Earthquake of November 19, 2018

Name of Hospital	Type of Structure	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
			Ground	Base	Structure
El Centro – Community Hospital (Sta. 01699)	1-story steel braced frames and RC block wall	70.2	---	1.1	2.3

M3.5 Aguanga Earthquake of December 20, 2018

Name of Hospital	Type of Structure	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
			Ground	Base	Structure
Hemet – Hemet Valley Hospital (Sta. 12267)	4-story concrete shear walls	33.3	---	1.2	4.2

M3.4 Piedmont Earthquake of January 16, 2019

Name of Hospital	Type of Structure	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
			Ground	Base	Structure
Berkeley – Alta Bates Hospital (Sta. 58496)	2-story steel braced frames	2.1	No FF	1.1	2.8
San Francisco – UCSF Mission Bay Hospital (Sta. 58572)	6-story steel buckling-restrained braced frames	16.8	---	0.7	1.0

M3.4 Piedmont Earthquake of January 17, 2019

Name of Hospital	Type of Structure	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
			Ground	Base	Structure
Berkeley – Alta Bates Hospital (Sta. 58496)	2-story steel braced frames	1.8	No FF	1.5	2.1

M3.4 Valle Vista Earthquake of February 10, 2019

Name of Hospital	Type of Structure	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
			Ground	Base	Structure
Hemet – Hemet Valley Hospital (Sta. 12267)	4-story concrete shear walls	13.0	---	3.8	4.9

M3.7 Camarillo Earthquake of June 12, 2019

Name of Hospital	Type of Structure	Epicentral Distance (km)	Max. Horizontal Acceleration (%g)		
			Ground	Base	Structure
Oxnard – St. Johns Hospital (Sta. 25949)	4-story steel moment frames	19.1	---	0.4	1.9

The strong-motion records are made available rapidly after an earthquake by the CSMIP Strong-motion Automated Recovery and Analysis (SARA) system, and posted in the Internet Quick Reports at the web site of the Center for Engineering Strong Motion Data (CESMD), at <https://www.strongmotioncenter.org>.

VI. FISCAL REPORT

Expenditures and Department of Conservation billings to OSHPD are summarized in the following:

Total amount of Interagency Agreement (July 1, 2016 - June 30, 2019)	\$850,000.00
1) Budgeted for Year 1 (July 2016 - June 2017, FY16-17)	\$283,300.00
Expended and billed for Year 1	<u>\$283,300.00</u>
Remaining amount to be billed from Year 1	\$0.00
2) Budgeted for Year 2 (July 2017 – June 2018, FY17-18)	\$283,300.00
Expended and billed for Year 2	<u>\$283,300.00</u>
Remaining amount to be billed from Year 2	\$0.00
3) Budgeted for Year 3 (July 2018 – June 2019, FY18-19)	\$283,400.00
Expended and billed for Year 3	<u>\$283,400.00</u>
Remaining amount to be billed from Year 3	\$0.00

Appendix A

Murrieta – Rancho Springs Medical Center (Women’s Center & ER) (CSMIP Station No. 13601)



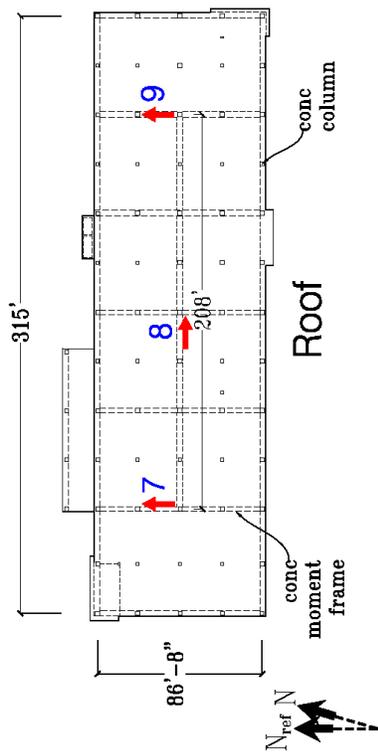
Murrieta – Hancock Ave & Med Center Dr (CSMIP Station No. 13602)



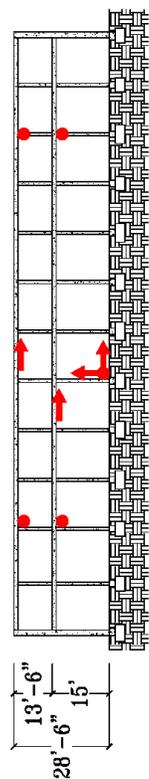
Appendix A

Murrieta- 2-story Hospital
 CSMIP Station No. 13601

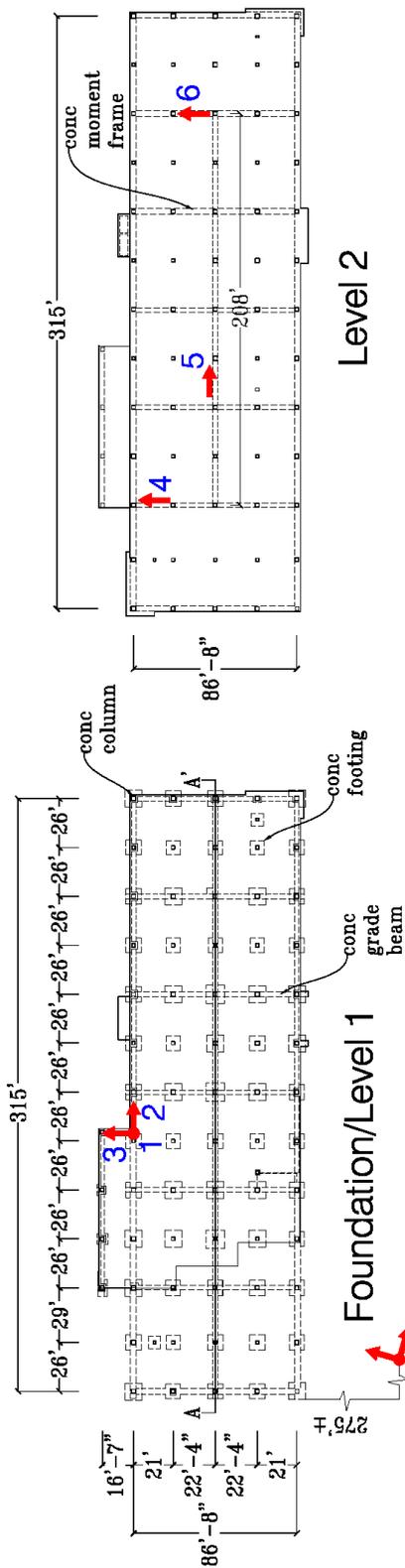
SENSOR LOCATIONS



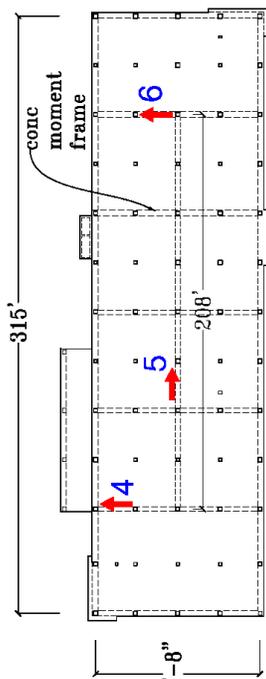
Section A-A'



Structure Reference
 Orientation: $N_{ref} - 344^\circ$



Level 2



Appendix A
CSMIP
INSTRUMENTED BUILDING DESCRIPTION

Station Name : Murrieta – Rancho Springs Medical Center **Station No:** 13601
Building : 25500 Medical Center Drive **Building Category (7/85):** L1
Address : Murrieta, CA 92562 **Material Category:** Concrete

Coordinates: 33.5585°N, 117.1829°W **No. of stories above/below ground:** 2/0

Base plan shape: Rectangular **Dimensions:** 315'x 87'

Typical floor shape: Rectangular **Dimensions:** 315'x 87'

Vertical load carrying system: 9.5" thick normal-weight concrete flat slab supported by
(include floor decking system) concrete beams and columns at each level.

Lateral force resisting system: Special concrete moment frame at each level and in each
(include element locations) direction.

Foundation Type: Concrete footings and grade beams.

Unusual architectural features: The building has a false mansard roof at Roof perimeter. The
building is separated by seismic joints from structure located on
north side.

Design date: 2005 (HS 030959-33) **Construction date:** 2009

Design Engineer: HKS Structural **Architect:** HKS Architects
(Name and 1919 McKinney Ave. **(Name and** 1919 McKinney Ave.
Address) Dallas, Texas 75201 **Address)** Dallas, Texas 75201

Geotechnical Engineer: MACTEC **Site class:** Sd (2001 CBC)
(Name and Address) 200 Citadel Drive
Los Angeles, CA 90040

Remarks: The building was designed in accordance with the 2001 California Building Code.
This hospital building is instrumented as part of OSHPD/CSMIP agreement to
instrument hospitals in California. It was proposed for instrumentation by the
Instrumentation Committee of the Hospital Building Safety Board.

Appendix B

Stanford – 7-story Hospital (CSMIP Station No. 58623)



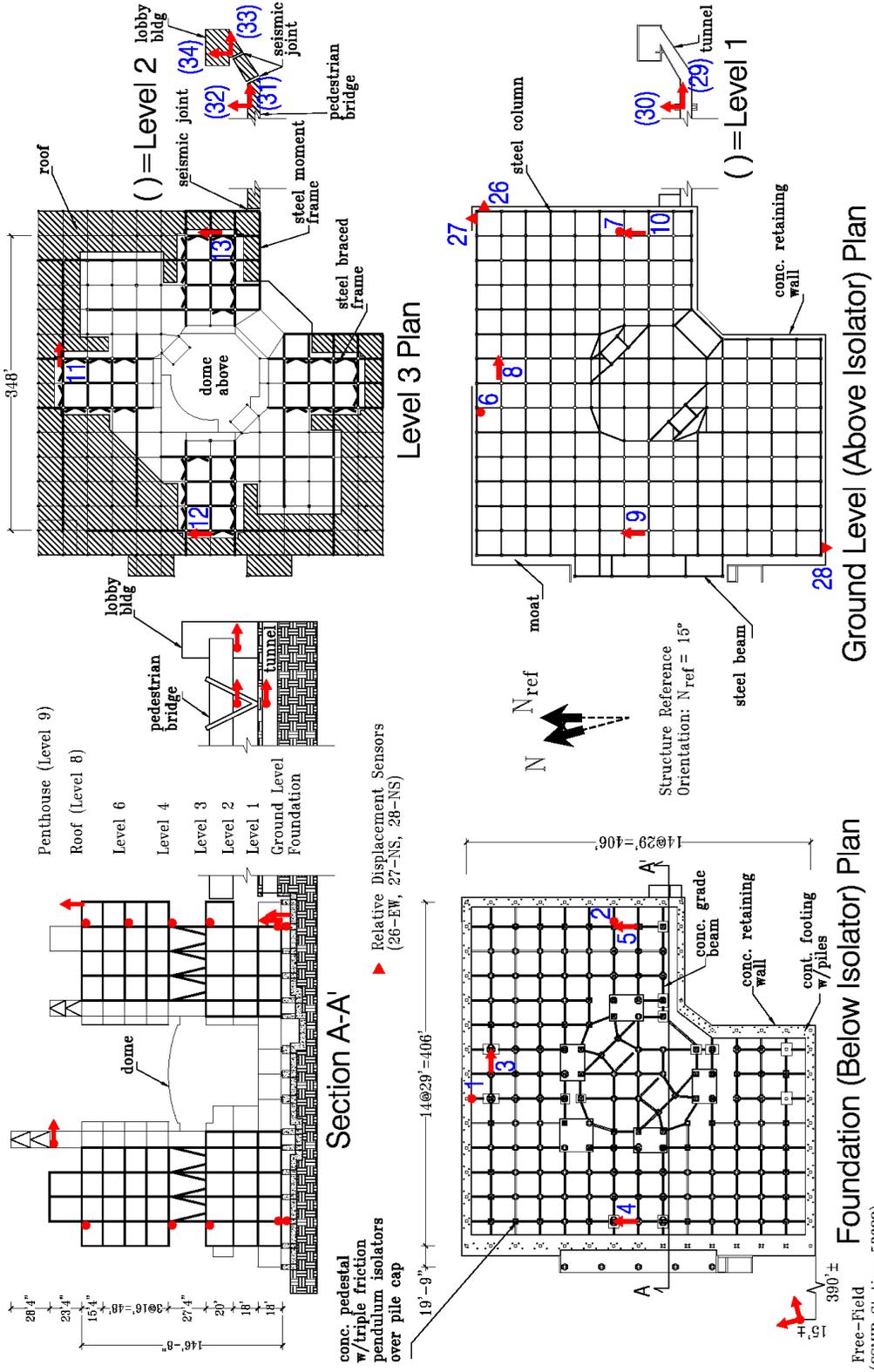
Stanford – Welch & Pasteur (CSMIP Station No. 58622)



Stanford - 7-story Hospital
(CSMIP Station No. 58623)

SENSOR LOCATIONS

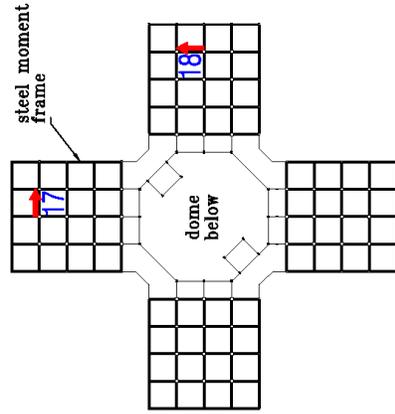
Page: 1 of 2



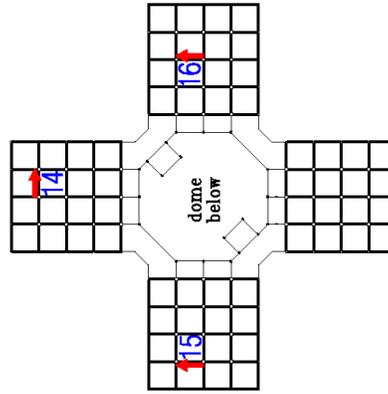
Installed: 2/6/2019
Diagram: 4/5/2019

Stanford - 7-story Hospital
(CSMIP Station No. 58623)

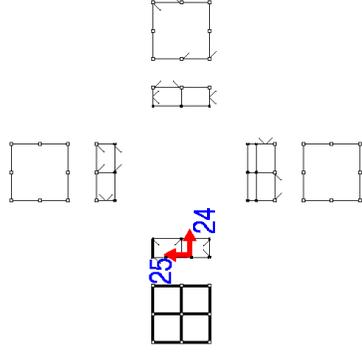
SENSOR LOCATIONS



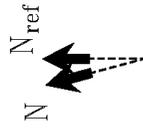
Level 6 Plan



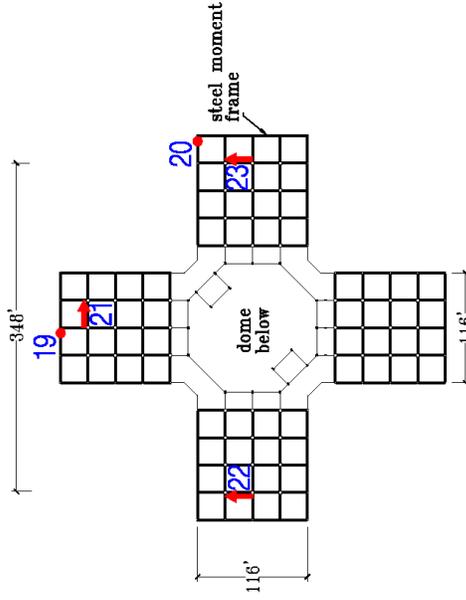
Level 4 Plan



Penthouse (Level 9) Plan



Structure Reference
Orientation: $N_{ref} = 15^\circ$



Roof (Level 8) Plan

Appendix B
CSMIP
INSTRUMENTED BUILDING DESCRIPTION

Station Name : Stanford – 7-story Hospital **Station No:** 58623
Building : 300 Pasteur Drive **Building Category (7/85):** Q2/28
Address : Palo Alto, CA 94304 **Material Category:** Steel

Coordinates: 37.4346°N, 122.1770°W **No. of stories above/below ground:** 7/1

Base plan shape: Square (Irregular) **Dimensions:** 406'x 406'

Typical floor shape: Cruciform **Dimensions:** 406'x 406'

Vertical load carrying system: 3.25" thick light weight concrete fill over 3" steel deck
(include floor decking system) (typical) supported by steel beams and columns at each level.

Lateral force resisting system: Intermediate steel moment resisting frames in each direction at
(include element locations) at each level at perimeter and interior locations. Eccentrically
braced steel frames at perimeter of cruciform at Level 3. Base
isolation of the structure is achieved using Triple Friction
Pendulum bearings beneath Ground Level.

Foundation Type: Concrete pedestals over pile caps connected by grade beams at interior
column locations and continuous concrete footings at perimeter each with
16" diameter reinforced concrete auger cast piles.

Unusual architectural features: Large setbacks occur at the 3rd Level at which point the
building becomes cruciform-shaped. The exterior edges of the cruciform from Level 4 to
Roof Level are cantilevered. At the center of the building is a glass dome roof near Level 4.

Design date: 2012 (IS-081923-43) **Construction date:** 2017

Design Engineer: Nabih Youssef Associates **Architect:** Rafael Vinoly Architects
(Name and 50 California Street, Ste. 3150 **(Name and** 149 New Montgomery, 5th Flr
Address) San Francisco, CA 94111 **Address)** San Francisco, CA 94105

Geotechnical Engineer: Rutherford & Chekene **Site class:** C (2007 CBC)
(Name and Address) 55 Second St., Ste. 600
San Francisco, CA 94105

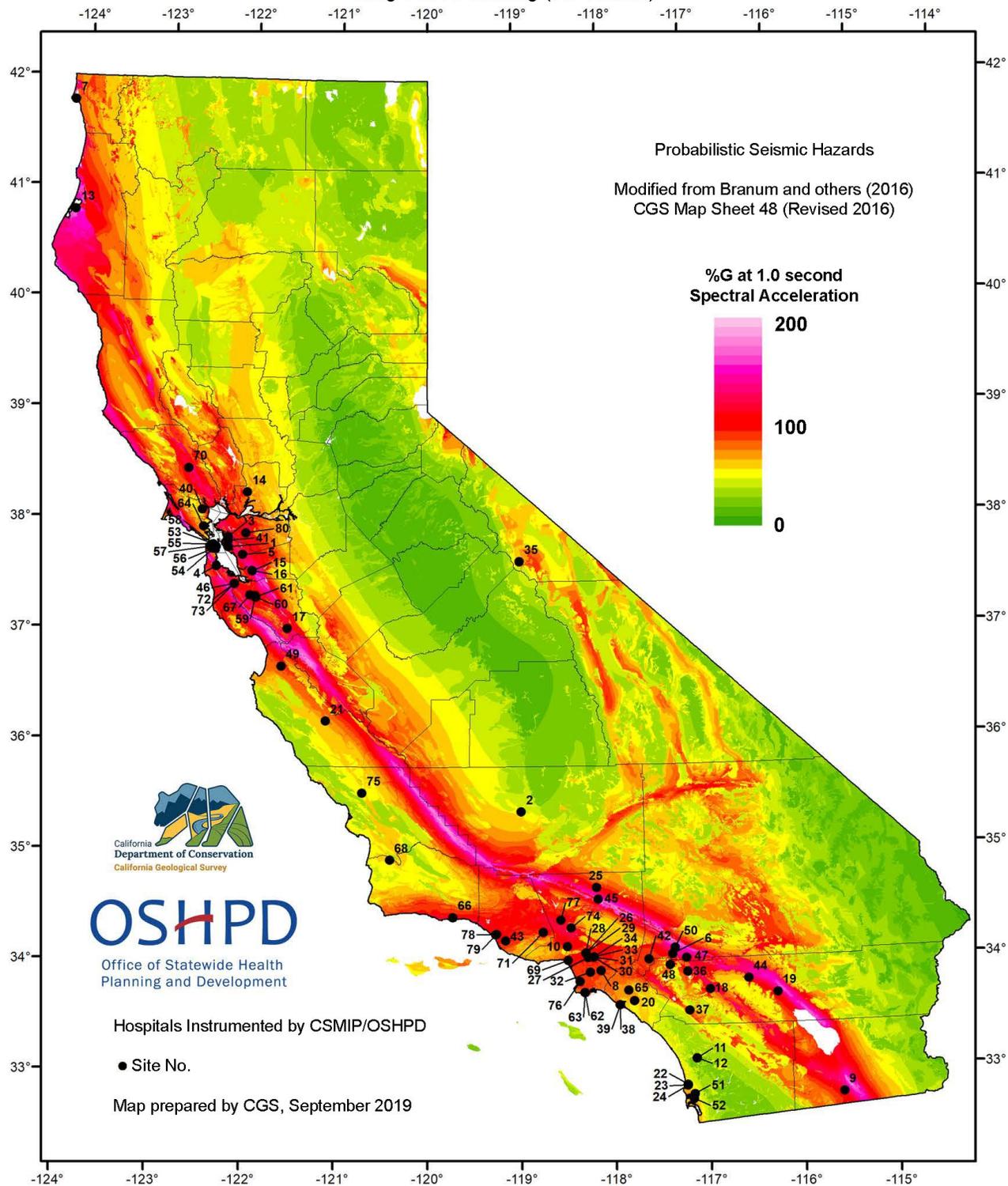
Remarks: The building was designed in accordance with the 2007 California Building Code.
Funding for instrumentation was provided by the owner as required by OSHPD.
CSMIP provided assistance in instrumentation.

Appendix C

Hospitals Instrumented by CSMIP/OSHPD

2% Chance of Being Exceeded in 50 years

Long-Period Shaking (1.0 second)



Appendix D

BUILDINGS INSTRUMENTED BY CSMIP/OSHPD

10/1/2019

Site No. on Map	CSMIP Sta. No.	Station Name	No. of Stories	No. of Sensors	No. of Rcrdrs	Recov. Speed	FEMA-310 Bldg Type	SMIAC Bldg Type
1	58396	Alameda - Alameda Hospital	3/0	12+FF	1	M	S1L	K1
2	34234	Bakersfield - Kern County Hospital	4/1	12+FF	1	L	C2M	H2b
3	58496	Berkeley - Alta Bates Hospital	2/1	12	1	L	S2L	I1c
4	58390	Burlingame - Mills Peninsula Hospital (isolated)	6/0	27+FF	1	M	IM	Q2
5	58494	Castro Valley - Sutter Eden Medical Center	6/1	19+FF	1	M	S2M	I2a
6	23788	Colton - San Bernardino Co. Med. Center (isolated)	6/0,4/0,2/0	27+FF	2	L	IM	Q2
7	99261	Crescent City - Sutter Hospital	1/0	10+FF	1	L	S2L	I1c
8	14646	Downey - PIH Health Hospital (VSI)	4/1	12+FF	1	M	C2M	G2b
9	01699	El Centro - Community Hospital	1/0	12+FF	4	VL	S2L	I1b
10	24648	Encino - Encino Hospital (VSI)	4/1	12+FF	1	H	RM2M	F2a
11	13476	Escondido - PMC West Hospital Central Plant	2/0	6	1	M	C2L	H1f
12	13473	Escondido - PMC West Hospital (Main Tower)	11/1	12+FF	1	M	S1H	K3a
13	89770	Eureka - St. Joseph Hospital	4/1	11+FF	1	L	C2M	G2d
14	68032	Fairfield - NorthBay Medical Center	3/0	12+FF	1	L	S2L	I1d
15	57301	Fremont - Kaiser Hospital	2/0	15+FF	1	L	S1L	K1
16	57643	Fremont - Washington Hospital (isolated)	3/1	24+FF	1	M	IL	Q1
17	57200	Gilroy - St. Louise Hospital	2/0	10+FF	1	L	S1L	K1
18	12267	Hemet - Valley Hospital	4/1	10+FF	1	L	C2M	G2d
19	12759	Indio - JFK Hospital	1/0	8+FF	2	VL	W1	A1
20	13439	Irvine - Kaiser Sand Canyon Hospital	6/partial	15+FF	1	M	S2M	I2b
21	47231	King City - Mee Hospital	2/0	10+FF	1	L	S2L	I1c
22	03538	La Jolla - Scripps Memorial Hospital	7/1	12+FF	1	M	S1M	J2b
23	03233	La Jolla - UCSD Hospital	2/0	16+FF	1	L	S1L	J1b
24	03593	La Jolla - UCSD Jacobs Medical Center	10/2	24	1	M	S1H	K3a
25	24609	Lancaster - Antelope Valley Hospital	5/0	12+FF	3	VL	S1M	K2
26	24397	Los Angeles - Childrens Hospital	7/1	12	1	L	S1M	K2
27	24713	Los Angeles - Good Samaritan Hospital	8/1	15	5	VL	S2H	I3b
28	24662	Los Angeles - Hollywood Presbyterian MC S. Wing (VSI)	4/1	12+FF	1	M	C2M	H2b
29	24682	Los Angeles - Hollywood Presbyterian MC Drs Tower (VSI)	10/2	15	1	M	S1H	J3b
30	24250	Los Angeles - LAC+USC Hospital D&T Bldg (isolated)	6/0	20+FF	2	L	IM	Q2
31	24248	Los Angeles - LAC+USC Hospital IP Bldg	9/0	12	1	L	S2H	I3b
32	14724	Los Angeles - MLK Hospital (isolated)	5/1	21+FF	2	L	IM	Q2
33	24605	Los Angeles - USC Hospital (isolated)	7/1	24	7	VL	IH	Q3
34	24260	Los Angeles - USC Hospital Addition	9/1	12	1	L	S2H	I3b
35	54331	Mammoth Lakes - Mammoth Hospital	1/0	10+FF	1	L	S2L	I1b
36	13213	Moreno Valley - Riverside County Hospital	3/1	12+FF	1	L	S1L	K1
37	13601	Murrieta - Rancho Springs Medical Center	2/0	9+FF	1	M	C1L	L1
38	13291	Newport Beach - Hoag Hospital East Tower (isolated)	7/1	27	5	VL	IM	Q3
39	13589	Newport Beach - Hoag Hospital West Tower	11/0	18+FF	2	L	C2H	H3a
40	68430	Novato - Community Hospital	2/0	12+FF	1	M	S2L	I1b
41	58590	Oakland - Kaiser Hospital	12/1	18	1	M	S2H	I3b
42	23416	Ontario - Kaiser Hospital	5/partial	18+FF	1	M	S2M	I2b
43	25949	Oxnard - St. Johns Hospital	4/1	16+FF	1	L	S1M	K2
44	12299	Palm Springs - Desert Hospital	4/1	13	1	L	S1M	K2
45	24457	Palmdale - Palmdale Regional Hospital	5/0	16+FF	1	M	C2M	H2d
46	58604	Palo Alto - Lucile Packard Childrens Hospital Stanford	6/2	21	2	M	S2M	J2a
47	23548	Redlands - Community Hospital (VSI)	2/1	9+FF	1	M	C2L	H1c
48	13633	Riverside - Community Hospital (VSI)	6/1	12+FF	1	M	C2M	G2e
49	47796	Salinas - Natividad Medical Center	3/0	15+FF	1	L	S2L	I1b
50	23634	San Bernardino - Community Hospital	5/0	12+FF	1	M	S1M	K2

Appendix D

BUILDINGS INSTRUMENTED BY CSMIP/OSHPD

10/1/2019

Site No. on Map	CSMIP Sta. No.	Station Name	No. of Stories	No. of Sensors	No. of Rcrdrs	Recov. Speed	FEMA-310 Bldg Type	SMIAC Bldg Type
51	03546	San Diego - Sharp Memorial Hospital (VSI)	8/1	15+FF	1	M	C2H	H3b
52	03743	San Diego - UCSD Hospital	11/1	12+FF	4	VL	C1H	M3
53	58640	San Francisco - CPMC Cathedral Hill Hospital	12/2	24	1	H	S1H	K3a
54	58574	San Francisco - General Hospital (isolated)	7/2	24+FF	2	M	IM	Q2
55	58718	San Francisco - Kaiser Hospital	6/0	18	6	VL	C2M	H2d
56	58649	San Francisco - St. Luke's Hospital	6/1	16	1	M	S2M	I2b
57	58257	San Francisco - UCSF Hospital	15/1	16+FF	1	L	U	U
58	58572	San Francisco - UCSF Mission Bay Hospital	6/0	18+FF	1	M	S2M	I2b
59	57594	San Jose - O'Connor Hospital	5/0	16+FF	4	VL	S2M	I2c
60	57495	San Jose - Santa Clara Valley Hospital (Bldg K)	4/1	15	1	M	S1M	K2
61	57537	San Jose - Santa Clara Valley Hospital (Bed Bldg 1)	7/1	20+FF	1	M	S1M	K2
62	14535	San Pedro - Providence LCOM Hosp (Bldg 1T) (VSI)	5/partial	12+FF	1	M	S2M	I2d
63	14536	San Pedro - Providence LCOM Hosp (Bldg 02) (VSI)	4/1	12	1	M	C2M	H2d
64	58755	San Rafael - Marin General Hospital	5/1	12+FF	1	L	S1M	J2b
65	13611	Santa Ana - Orange County Global Medical Center (VSI)	1/0	6+FF	1	M	S2L	I1a
66	25777	Santa Barbara - Cottage Hospital	3/1	9+FF	3	VL	C2L	H1e
67	57251	Santa Clara - Kaiser Hospital	3/1	18+FF	1	L	S2L	I1b
68	26470	Santa Maria - Marian Hospital	4/partial	12+FF	1	M	S2M	I2c
69	24202	Santa Monica - St. John's Hospital (isolated)	5/1	24+FF	2	L	IM	Q2
70	68669	Santa Rosa - Kaiser Hospital	4/1	13+FF	5	VL	S1M	K2
71	24104	Simi Valley - Simi Valley Hospital	2/1	12+FF	1	L	S1L	K1
72	58623	Stanford - 7-story Hospital (isolated)	7/1	34+FF	1	M	IM	Q2
73	58055	Stanford - University Hospital	3/1	12+FF	1	L	S1L	K1
74	24514	Sylmar - Olive View Medical Center	6/0	13+FF	1	L	UM	R
75	36695	Templeton - Twin Cities Hospital	1/0	9+FF	3	VL	W1	A1
76	14529	Torrance - Providence LCOM Hospital (VSI)	4/2	21+FF	2	M	C2M	H2d
77	24344	Valencia - Mayo Hospital	2/partial	12+FF	1	M	S1L	K1
78	25594	Ventura - Community Memorial Hospital	6/1	24+GA	2	M	S2M	I2b
79	25744	Ventura - County Hospital	4/1	12+FF	3	VL	C2M	H2b
80	58199	Walnut Creek - Kaiser Hospital	3/1	16	1	L	S1L	K1