Hospital Response to the Napa Earthquake and the Role of OSHPD

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South Napa Quake
August 24, 2014

Blues, Brews & BBQ has all the elements one would expect – three musical stages, 30 micro-brewed beers, and lots of BBQ.
BREAKING NEWS
Significant Damage from 6.0 Earthquake Near Napa
What Worked
Lessons Learned
OSHPD’s Role in Emergency Response

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Deputy Division Chief
Office of Statewide Health Planning and Development
The Need for Functioning Hospitals in a Natural Disaster

Olive View Medical Center
Godden Collection, Earthquake Engineering Research Center, University of California, Berkeley

Lessons Learned in the San Fernando Earthquake

• The Earthquake demonstrated deficiencies in:
  – Building design codes
  – Code enforcement process
    • Plan review
    • Construction inspection
The 1972 Hospital Seismic Safety Act (HSSA)

The HSSA Establishes Hospitals as essential facilities and defines explicitly their expected performance.

The 1st Ever Definition of Functionality

.... that hospitals, that house patients who have less than the capacity of normally healthy persons to protect themselves, and that must be reasonably capable of providing services to the public after a disaster, shall be designed and constructed to resist, insofar as practical the forces generated by earthquakes, gravity, and winds.
The Need for a Statewide Enforcement Agency

- Laws and regulations without rigorous enforcement are ineffective.
- OSHPD/FDD is the enforcement agency of the HSSA.
  - Purpose:
    - Design plan review
    - Construction oversight

Higher Standards for Performance of Hospital Buildings in California

- Commercial buildings may not be repairable or functional following a catastrophe (fire, earthquake, etc.)
- Hospitals must function following an incident
- Health philosophy:
  - Ventilation systems must provide comfortable healing environment
  - Does not facilitate the spread of contagious diseases
  - Does not adversely affect immune suppressed patients
Higher Standards for Performance of Hospital Buildings in California (cont.)

• Earthquake philosophy:
  o Hospitals must be reasonably capable of providing services to the public
  o Limited damage
  o Critical equipment and systems remain operational
  o Requires hospitals to be built 1 ½ times stronger than most other buildings

• Fire philosophy:
  o Patients may be too ill to evacuate
  o “Defend in Place” by moving patients to adjacent “compartments”

Higher Standards for Performance of Hospital Buildings in California (cont.)

• Sustained Operations philosophy:
  o Adequate sanitation
  o Adequate lighting
  o Emergency power systems
  o Medical Gas Systems

• Achieving this high performance in hospital construction requires:
  o Comprehensive building codes that are more complex
  o Thorough plan review requires more time than for other types of buildings
    - FDD has California licensed architects, structural engineers, mechanical engineers and electrical engineers and fire marshals which review hospital construction drawings
  o Continuous construction inspection and quality assurance which is more demanding on contractors and inspectors
Northridge Earthquake

- The 1972 HSSA applied only to new hospital buildings
- All existing hospitals licensed at that time were “grandfathered”
- Northridge raised additional questions

Northridge Performance

Performance of all Buildings at 23 Hospital Sites with One or More Yellow or Red Tagged Buildings

<table>
<thead>
<tr>
<th>Type of Damage</th>
<th>Number (%) of Buildings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre Act</td>
</tr>
<tr>
<td>Structural Damage</td>
<td></td>
</tr>
<tr>
<td>Red tagged</td>
<td>12 (24%)</td>
</tr>
<tr>
<td>Yellow tagged</td>
<td>17 (33%)</td>
</tr>
<tr>
<td>Green tagged</td>
<td>22 (43%)</td>
</tr>
<tr>
<td>Nonstructural Damage</td>
<td></td>
</tr>
<tr>
<td>Major</td>
<td>31 (61%)</td>
</tr>
<tr>
<td>Minor</td>
<td>20 (39%)</td>
</tr>
<tr>
<td>Total Buildings</td>
<td>51</td>
</tr>
</tbody>
</table>
Quantification of Seismic Resilience for a Critical Facility

Quality of Building %
Pre-EQ Level = 100%

Hospital Services e.g. Patients/Day

Vulnerability

t0

 Significant Seismic Event Occurs

Without the Earthquake

Earthquake Effects (Damaged systems or equipment)

Δt = Rapidity
Rebuilding of Capacity (Repair, Retrofit, Replacement)

Parking lot palliative interim measures until weather inclement or National Guard withdraws

Hospital building Recovers

Seismic Compliance Legislation — SB 1953

- Enacted following the Northridge Earthquake
- Established system for rating buildings based on seismic risk
- SB 1953 Deadlines
  - 2008: Remove buildings identified as at risk of collapse (SPC-1) from acute care service
  - 2030: All hospital buildings compliant with the Alfred E. Alquist Hospital Facilities Seismic Safety Act
OSHPD’s Role in a Disaster

• EMERGENCY RESPONSE
  o OSHPD’s Responsibilities
    – In the event of a calamity that may have effected the structural integrity or damaged a major system of a hospital building, OSHPD shall:
      • Send one or more authorized representatives
      • Examine the structure or system
      • Tag the building

Authority: Health and Safety Code, Division 107, Part 7, Chapter 1, Sections 129985, 129990, 130025

OSHPD’S EMERGENCY RESPONSE PLANS
Emergency Response

• OSHPD’s objectives in Emergency Response:
  – Provide for safety of OSHPD personnel during response operations
  – Provide damage assessments of health care facilities
  – Provide data to EMSA, CDPH (L&C) & CALOES
  – Facilitate repair and reconstruction

EOC Organization

Incident Commander

Operations | Planning & Intelligence | Logistics | Finance & Administration
Planning Assumptions

- OSHPD will provide emergency damage assessments using ATC-20-2, *Post Earthquake Building Safety Evaluation Procedures*
- Health Care Facilities (HCF) will be closed, in whole or in part, **only as a last resort and only if a threat to life safety exists**
- Potential aftershocks will be considered
Planning Assumptions (cont.)

• Damage assessment reports will be compiled and forwarded to EMSA and CDPH (L&C) & CAL-OES
• For a specific and limited time period following an Earthquake, unobserved repair of HCF’s will be allowed by OSHPD
• Review, approval, and permitting of damage repair and reconstruction projects will be given priority

Planning Scenarios

• The OSHPD Plan describes emergency response operations for a major damaging earthquake in California.
• The Plan is based on “worst case scenarios” for the San Francisco Bay Area or the Los Angeles.
Plan Activation

• OSHPD officially is notified by the CAL-OES Warning Center and EMSA
  – Earthquakes recorded in a major metropolitan area (M>4.5)

• The Director, Chief Deputy Director or FDD Deputy Director may activate the Emergency Operation Center (EOC), located at 400 R Street, Room 452, Sacramento

EOC Functions

• Staffed by “A” and “B” teams
• Objectives in first 8 hours
  – Get the EOC up and running
  – Gather information on the incident
  – Establish EOC priorities and Incident Action Plan for the initial operational period
  – Assemble, coordinate, and deploy Damage Assessment Teams
  – Identify issues beyond the initial 3-day response
Field Operations

• Minimum of 3 members — ACO, FLSO, SE
  – Teams are to remain together at all times
  – Team composition, release, or assignments are made only through the EOC or Forward Staging Area Manager

• Official inspection teams should be operational within 24 hours

• Forward Staging Area (if needed) established but not staffed until day 2

Earthquake Information Tools for Post Earthquake Response

• Shake maps
• GIS
• OSHPD-ATLAS
• Building strong motion records
• Building design drawings
• Hospital personnel
• Media
Hospitals in Google Earth/ArcGIS Explorer

- Download Google Earth or Download ArcGIS Explorer
- Facility Information for Hospitals in Google Earth/ArcGIS Explorer (KMZ file)
- Seismic Performance Ratings (SPC/NPC)

Construction projects underway at hospital facilities and SPC/NPC ratings of hospital buildings.

California Integrated Seismic Network (CSIN)

Welcome to the CSIN

The California Integrated Seismic Network (CSIN) is a partnership among federal, state, and university agencies involved in California earthquake monitoring. The CSIN is dedicated to serve the emergency response, engineering, and scientific communities. The CSIN is a part of the National Earthquake Information Center.

Get Ready to ShakeOut.
October 17, 2013 Register Now at www.shakeout.org

News
- 06/23/12: Update on the August 2012 Earthquake Swarm in the ShakeOut Seismic Zone
- 09/10/11: 2.9, El Centro, CA
- 10/25/11: The Great California ShakeOut
- 07/06/11: M 5.7 Earthquake Near Indio, California
- 06/13/11: M 3.2 Earthquake Near Alamosa, Colorado
- 05/17/11: M 3.2 Earthquake Near San Simeon, California
- 04/25/11: M 2.8 Earthquake Near University City, California

http://www.cisn.org/
Earthquake Information

Latest Quakes

Map of California & Nevada earthquakes
http://earthquake.usgs.gov/earthquakes/map/

http://www.data.scec.org/recenteqs/

ShakeMaps

ShakeMaps is a product of the U.S. Geological Survey Earthquake Hazards Program in conjunction with regional seismic networks operators. ShakeMaps provide near-real-time maps of ground motion and shaking intensity following significant earthquakes. These maps are used by federal, state, and local organizations, both public and private, for post-earthquake response and recovery, public and scientific information, as well as for preparedness exercises and disaster planning.

Networks producing ShakeMaps

Click a network name to view a list of events, or an image to view the event.

http://earthquake.usgs.gov/earthquakes/shakemap/
Hospital Instrumentation Program

- Instrumentation as intelligence tool for emergency response and recovery operations
- Seismic networks (CSIN) & instrumented buildings
  - California Seismic Instrumentation Program
  - Hospital Instrumentation Program
- Real time data for efficient response
Hospital Building Instrumentation Layout

San Simeon Eq. 12/22/03

OSEHPD
Office of Seismic Safety Planning and Development
Posting System

- **INSPECTED** (Green): Appears safe for lawful occupancy
- **LIMITED ENTRY/RESTRICTED USE** (Yellow): Some restriction on use, controlled by building owner/manager
- **UNSAFE** (Red): Entry controlled by jurisdiction

... Plans into Action

M6.0 South Napa, California Earthquake (American Canyon, CA) August 24 2014

OSHPD EOC
Time of Occurrence

- August 24, 2014
- at 3:20 a.m. Local time

Earthquake Stats

- Magnitude 6.0 - moment magnitude (Mw)
- Distance from American Canyon, CA - 4 miles NW
- Napa, CA - 5 miles SSW
- Vallejo, CA - 9 miles NNW
- Santa Rosa, CA - 26 miles SE
- Depth 7.0 miles
Franklin Fault or West Napa Fault?

- Quake originally attributed to the Franklin Fault
  - Inactive for thousands of years.
- After inspecting the damage, CGS declared the quake occurred on the West Napa Fault, not the Franklin Fault.

Napa Valley Seismicity

- The last earthquake to rattle the Napa Valley struck on Sept. 3, 2000.
  - M5.1 Magnitude
  - 10 miles northwest of Napa
    - Near Yountville, previously unknown fault
Napa Valley Seismicity

- 2008 estimate of Bay Area earthquake probabilities
  - Conducted by scientific and engineering community
  - Does not include the West Napa Fault

Why Strong Shaking in Napa?

- The actual earthquake rupture only lasted four seconds,
- The valley floor is lined with soft river soils that amplify earthquake waves.
- Fault zipped open from south to north, directing the earthquake energy toward the city
ShakeMap — PGA

Designates GAC Hospital

Geotechnical Issues
Damage to Transportation Systems

- Highway 12, Route 121, Route 29
  - damaged, with cracks that could cause flat tires
- Highway 37: Roadway separated and concrete crumbled, buckling on an off-ramp
Damage to Transportation Systems

- City, county roads

Damage to Transportation Systems

- Bridges and ramps
Damage to the Electric Power Grid

• Electrical Power
  – Power lines down — 42,000 homes without power

Damage to the Water Grid

• Crews repaired 120 water main breaks in the aftermath of quake.
  – As quickly as one pipe fixed, another brakes.
Airport & Telephone Substations

Damage to URMs

J.L. Sousa/Register

Justin Sullivan/Getty Images
Fires

- Destroyed four homes (mobile homes) and damaged two
- 50 fires put out by the Napa Fire Department

Apartments & Carports
Winery Inventory Damage

OSHPD Response

• EOC Activated on 8/24/14 at 0408 hours
• EOC Personnel
  – EOC (Room 452)
    o Total = 13
  – Field Operations = 22
    o ACOs = 7
    o DSE = 7
    o FLSO = 3
    o SSE = 3
    o SArch = 1
    o PSE = 1

10 Teams @ Peak Assessment
OSHPD Response (cont.)

• Facilities under OSHPD jurisdiction
  – 6 General Acute Care Hospital Facilities with 58 Buildings

<table>
<thead>
<tr>
<th>Hospital Name</th>
<th>Epicentral Dist (miles)</th>
</tr>
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<tbody>
<tr>
<td>Kaiser Foundation Hospital - Rehabilitation Center Vallejo</td>
<td>7.1</td>
</tr>
<tr>
<td>Sutter Solano Medical Center</td>
<td>7.2</td>
</tr>
<tr>
<td>Queen of the Valley Hospital - Napa</td>
<td>7.7</td>
</tr>
<tr>
<td>St. Helena Hospital Center For Behavioral Health</td>
<td>7.7</td>
</tr>
<tr>
<td>Sonoma Valley Hospital</td>
<td>9.4</td>
</tr>
<tr>
<td>North Bay Medical Center</td>
<td>14.8</td>
</tr>
</tbody>
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Queen of the Valley Ground Motion
OSHPD Response

• GAC Post EQ assessment Postings
  – Queen of the Valley
    • 3 Yellow Tags
      – Main Hospital – Building 01 -1957 (SPC1/NPC2)
        » 2 elevators out of service
        » Ceiling damage
        » Cracks in elevated floor slabs/beams

Queen of the Valley MC

Main hospital roof telephone rack severely out of plumb

Building Corridor water leak

Main Hospital 3rd floor

Boiler room crack in landing
OSHPD Response

- GAC Post EQ assessment Postings
  - Queen of the Valley
    - 3 Yellow Tags
      - South Nursing Wing - Building 07 (SPC3/NPC2 3 Story bldg.)
        » Substantial damage with displacement of storefront entrance and window system
        » 1st floor Patient room #1114 multiple cracks in gypsum walls due to building drift.
        » 2nd floor ICU rooms #3, 4, 5, 6, 7, Rooms 16, ICU Nurse Managers Office and Respiratory therapy
          • Exterior walls deflected out approximately ½”
          • Stucco exterior walls pulled down from upper deck at the top of wall approximately ½”

Queen of the Valley MC

South Nursing Wing Roof electrical panel damage

South Wing Nursing Tower ICU 2nd floor exterior wall (stucco on stud walls) leaning out ½”
OSHPD Response

- GAC Post EQ assessment Postings
  - Queen of the Valley
    - 3 Yellow Tags
      - North Acute Care Corridor – Building 18 (SPC5s/NPC NYA 3 story bldg.)
        - Ceiling grid damaged and dropped on floor. Grid appeared to lack lateral bracing.
    - Remainder 17 buildings Green Tagged
Queen of the Valley MC

OSHPD Response

• Remainder of 5 GACs Green tagged
  – 38 Green Tags (55 Total)
• 1 General Acute Psychiatric
  – St. Helena Hospital Center For Behavioral Health
  • 1 Green Tag
OSHPD Response — SNFs

- 16 SNFs
  - 16 Green Tags

OSHPD Response

- Mutual Aid Requests:
  - 3 Sites — Health care
    - Veterans Home of California, Yountville — 6 Green Tags
    - Napa State Hospital
      - 1 Red Tag
      - 8 Yellow Tags
      - 49 Green Tags
    - Sonoma Developmental Center
      - 21 Green Tags
Napa State Hospital

OSHPD Response

• Mutual Aid Requests:
  – Local Gov. Jurisdictions
    • City of Napa
    • City of Vallejo

30 Staff @ Peak Assessment
Earthquake Comparison

South Napa Earthquake
Date: August 24, 2014, at 3:20:44 (PDT)
Magnitude: 6.0

Loma Prieta Earthquake
Date: October 17, 1989, at 5:04:15 p.m. (PDT)
Magnitude: 6.9

Intensity of ground shaking

<table>
<thead>
<tr>
<th>1</th>
<th>2-3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not felt</td>
<td>Light</td>
<td>Strong</td>
<td>Severe</td>
<td>Extreme</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Felt indoors by many people, windows, doors and dishes rattle</td>
<td>Houses suffer non-structural damage</td>
<td>Hard to stand, walls crack, old structures may collapse</td>
<td>Ordinary well built buildings collapse</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: USGS

In Closing . . .
Questions?