Post-Earthquake Bridge Inspection

Cypress Viaduct on Route 880 after the 6.9 Loma Prieta EQ, 1989

Ching Chao, PE, MS;  Vinh Dang, PE
Office of Structure Maintenance & Investigations, Caltrans
Provide a safe, sustainable, integrated and efficient transportation system to enhance California’s economy and livability.
EOC Emergency Operation Centers

LA Regional Transportation Management Center
ShakeCast
A post-earthquake decision-making and rapid-response tool
ShakeCast

- Retrieves measured shaking data within minutes after an earthquake.
- Compares shaking distribution with unique bridge vulnerabilities.
- Provides hierarchical lists and maps of bridges most likely impacted.
- Emails bridge and facility location and inspection priority information to responders within 15 minutes following events with a magnitude greater than 4.0.
- Automatically generates products for direct use in Google Earth, ArcGIS, and Excel
- Provides a suite of tools on ShakeCast website

USGS ShakeCast website:

http://earthquake.usgs.gov/research/software/shakecast/
Event Summary
Name: (Unnamed Event) Version 1
Magnitude: 6.9
ID: Loma_Prieta_scte-1
Location: 7 km NNE of Aptsos, CA
Latitude: 37.04
Longitude: -121.88
Time: 1989-10-18 00:04:00 GMT

Downloads & Resources
Caltrans Intranet Links:
- Caltrans_ShakeCast Intranet
- Caltrans_ShakeMap Products

GoogleEarth KML files:
(save to your computer as a KML file
and open with GoogleEarth)

Statewide Bridge Inventory
Caltrans Real-time Traffic
USGS Real-time Earthquakes

ShakeCast Bridge Impact Assessment
Caltrans ShakeMap Products
Caltrans Real-time Traffic
USGS Real-time Earthquakes
ShakeCast

Caltrans ShakeCast Preliminary Earthquake Bridge Impact Report

This report supplements the bridge inventory and provides the latest assessment of the damage caused by the 2021 ShakeCast event. It is intended to be used as a first response tool to assist in identifying Caltrans bridges most likely impacted by the event.

Bridge Assessment Summary

- Maximum Peak 1 sec Spectral Acceleration: 1.371 g
- Maximum Acceleration: (not measured)
- Total number of bridges assessed: 104
- Summary by inspection priority:
  - High: 111 (High Priority for full engineering assessment)
  - Medium-High Priority: 7 (Medium-High Priority for full engineering assessment)
  - Medium: 7 (Medium Priority for full engineering assessment)
  - Low: 0 (Low Priority for full engineering assessment)

Bridge Assessment Details

- Bridges presented in the table are listed in order of severity of impact to bridges.

<table>
<thead>
<tr>
<th>Bridge Name</th>
<th>Bridge Number</th>
<th>Dist-City-Rte-PM</th>
<th>Inspection Priority</th>
<th>1sec Peak Spectral Acceleration</th>
<th>Exceedance Ratio</th>
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<tbody>
<tr>
<td>Ralston Avenue OC</td>
<td>35 0114</td>
<td>04-SW-1019.57-BUT</td>
<td>High</td>
<td>105.3003</td>
<td>2.934</td>
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<tr>
<td>Via Del Rio OH</td>
<td>37 0477</td>
<td>04-SC-008-1.22-SUS</td>
<td>High</td>
<td>49.2111</td>
<td>2.472</td>
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<td>San Mateo-Hayward Bridge</td>
<td>35 0094</td>
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<td>49.6514</td>
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<td>Constitution Way OC</td>
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<td>Medal-M Road Upgraded</td>
<td>37 0528</td>
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<td>Medium</td>
<td>59.9229</td>
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<tr>
<td>Campbell Underpass</td>
<td>37 0135</td>
<td>04-SL-011.12-CMB</td>
<td>Medium</td>
<td>70.2112</td>
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<td>East-Herdale Blvd OC</td>
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<tr>
<td>Redwood Creek</td>
<td>35 0146</td>
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<td>Stobb-Approach Lower Deck</td>
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<td>04-SF-460.46-SF</td>
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<td>Route 1380 Separation (North)</td>
<td>33 0191G</td>
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<td>Race Street Overpass</td>
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<td>Preble Yard</td>
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<td>South Delaware Street UC</td>
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<td>South Delaware Street UC</td>
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<td>Powell Street UC</td>
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<td>Redwood Harbor Overpass</td>
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<td>Maceehet Avenue OC</td>
<td>37 0100</td>
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<td>San Francisco Creek</td>
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<td>Hawkins Slough Road OC</td>
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<td>Sunny Street Rd UC</td>
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<td>Sunny Street Rd UC</td>
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<td>42.2720</td>
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## SM&I Earthquake Field Damage Report

**Date:** 9/22/14  
**SM&I Disaster Command Center - Email: smidcc@dot.ca.gov  Phone: (888) 893-9974**

### Bridge Information
- **Bridge Number:**  
- **Bridge Name:**  
- **Inspector 1:**  
- **Inspector 2:**  
- **Unit:**  
- **Phone No:**

### Current Status

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<td>1</td>
<td>Open</td>
<td>2</td>
<td>Open with Shoring</td>
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### Restrictions

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<td>6</td>
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<td>7</td>
<td>Structural</td>
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<td>8</td>
<td>Investigate / Repair Prior to Open</td>
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### Damage

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<tr>
<td>12</td>
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<td>14</td>
<td>No Additional Damage</td>
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### Repair Cost Estimates

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<tr>
<td>16</td>
<td>None</td>
<td>17</td>
<td>Low &lt;$5k</td>
<td>18</td>
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<tr>
<td>19</td>
<td>Med-High $50-100k</td>
<td>20</td>
<td>High &gt;$100k</td>
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<td>21</td>
<td>Detailed Cost Estimates:</td>
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</table>

### Feature Damage: (Detailed Distress)

- Approach Roadway:  
- Approach Slabs:  
- Superstructure:  
- Wingwalls and Rails:  
- Abutments:  
- Expansion Joints:  
- Hinges:  
- Shear Keys:  
- Bearings:  
- Columns/Pier Caps:  
- Foundation/Piles:  
- Retrofit:  
- Other:  

Structure Maintenance & Investigations 1801 30th Street, Sacramento, CA, 95818  Phone: (916) 227-8631  Fax: (916) 227-8357
# Field Inspection

**EMERGENCY RESPONSE INSPECTION**

Affix this sticker to the RIGHT BRIDGE RAILING next to the BRIDGE NAME/NUMBER LOCATION

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>By</th>
<th>Ph#</th>
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</tbody>
</table>

Any bridge concerns contact: Structure Maintenance and Investigations (888) 893-9974
Structures Maintenance Automated Report Transmittal System

- Integrated Oracle Form Application database
- Compatible with NBIS, National Bridge Inspection Standards, coding guides & data reporting requirements
- Consistent with the design of the AASHTOWare® Pontis® Bridge Management System database
- Supports the entire cycle of bridge management, including Inventory, Inspection and Project and Program Development
- Used on Bridge Routine Inspection, Specialized Inspections, Hydraulics, Load Rating & Project Development
Bridge Inspection Records Information System

Provides an interface to as-built plans, inspection reports, and other documents pertaining to transportation structures in the state of California. The system currently contains over 950,000 documents.

**RECORD TYPE AND SEARCH CRITERIA**
San Fernando Earthquake, 1971
Route 210/5 Interchange
San Fernando Earthquake, 1971

Route 14/5 Interchange
Anchorage Failure at Base of Column

Lap Splices at Base or Lack of Development into the Footing
San Fernando Earthquake
Route 5/210 Interchange - Foothill Blvd. UP

Non-ductile failure: Lack of Confinement Resulted in Rapid Loss of Section and Consequently, Rapid Loss of Strength.
San Fernando Earthquake
San Fernando Road OH (Route 210)

Lack of Confinement
San Fernando Earthquake, 1971

San Fernando Rd. OH, Loss of Girder Support
San Fernando Earthquake, 1971

Balboa Blvd. OC, South Abut Failure in Shear of Superstructure and End Diaphragm at Soffit
San Fernando Earthquake, 1971

210 Interchange

Wingwall Damage at Abutment
Pre 1971 Caltrans Column Details

- Non-ductile details built by Caltrans had four main structural problems:
  - Lack of confinement. (#4 @ 12” ties)
  - Lap splice at the base of the column
  - No top mat in footing
  - Inadequate rebar development into the superstructure
Earthquake Damage to Bridge

- **Superstructure**
  - Loss of Girder Support
  - Rotation due to High Skew
- **Substructure**
  - Column Flexural Failure
  - Column Shear Failure
  - Column Anchorage Failure
- **Abutments**
  - Abutment Movement/Failure
  - Approach Settlement
- **Foundations**
  - Ground Movements
  - Liquefaction
Retrofit Approach

• **Collapse prevention by:**
  - *providing sufficient seat for displacement*
  - *allowing max ductility in the supporting members (columns)*
Column Retrofit

- Most common type of retrofit
- Previous design approach relies heavily on column’s inelastic capacity for ductile response
Steel Column Casings

• Most Common Type of Column Retrofit
• Increase Flexural Ductility Capacity
• Develop Flexural Capacity of Existing Lap Splices
• Increase Shear Capacity
Steel Shell Encased Around Existing Column-Filled With Grout
Column Retrofit-Steel Column Casings

- **Thicknes**s 5/8” min-1” max
- **2” Gap-Prevent Bearing on Soffit and Footing**
- **Weld Seams**

*Common Shapes are Circular and Elliptical*
Column Addition
Additional Columns are Added to Strengthen Transverse Response

Originally a Single Column Bent
**In-Fill Wall**

- Acts Like a Shear Wall
- Improves Stability in Transverse Direction

RC Wall Securing Two Adjacent Columns Together
In-Fill Wall

Not all bents are retrofitted-
Minimum one bent per frame
Link Beam Retrofit

Applicable to Tall Multicolumn Bents

Control Distribution of Transverse Forces

Beam Element Connected to Columns Within a Bent
Link Beam Retrofit

(a) Retrofit for reduced displacements.

(b) Retrofit for reduced cap beam forces.

(c) Retrofit for reduced footing forces.
Retrofitted for Reduced Cap Beam Forces
**Bent Cap Retrofit**

Additional Strength to Ensure Elastic Response of Bent Cap

DIAPHRAGM BOLSTERS

- 610 | 686 (Typ)
- 1525 (Typ)

- 115 core hole Total 3 (Typ)
- 2-29
- 2-43
- 16 Ø 305 max
- 16 Ø total 10

Note A: Lap splice is not allowed.

Concrete Bolster (Typ)

- 43 Bundle 2 bundles total 2 bars per bundle
- 29 Bundle 1 bundle with 2 bars

Column Casing (Typ)

Section A-A

Drill & Bond in 205 deep hole into exist

w/135° Selsmic hook
5 rows of dowels
Bent Cap Retrofit in Progress

Uses High Strength Threaded Bars

Access Openings at All Bays Indicates Retrofit Work
Cable Restrainer

Prevent girders from falling off their supports
Preferred detail

- Tied into bent cap
- Each girder is tied independently
Hinge Retrofit

Northridge Earthquake 1994, M 6.8
Gavin Canyon Undercrossing – Year Designed: 1965

Unseating of Hinge Seat Leads to Collapse
Hinge Retrofit-Cable Restrainer

Uses Cables Anchored to One Side to Prevent Hinge From Unseating
Hinge Retrofit-Pipe Seat Extender

Allows Hinge Joint to Open and Close in Longitudinal Direction

Uses Steel Pipe Anchored to One Side of Hinge
Old way-seat width ~ 8-12”
New way-Seat width=24” min
Footing Retrofit

- Enlarge Footing to Ensure Elastic Response and Prevent Overturning
- Add Top Mat and Shear Reinforcements
- Add Piles if Needed for Lateral/Tension/Compression Capacity
Generally, Footing Retrofits are the Most Expensive.
Footing Retrofit-Tiedown Anchors

Uses Prestressed Anchors to Prevent Footing from Uplifting
Abutment Retrofit-Fill up Gap Behind Superstructure

Superstructure Should Engage and Break Backwall Before Damage to Columns

Soil Behind Abutment is Mobilized and Absorbs Earthquake Loads Away From the Bents

Gap-Preferred 2” or Less
Abutment Seat

New Design-30” Min
Abutment Retrofit

For Existing Bridge, Addition Seat Width May be Required

Seat Extender
Abutment Retrofit
Abutment Retrofit - Vertical Pipe Seat Extender

Prevents Unseating at Abutment

Additional Restraint to Abutment
Tendency to Rotate Could Lead to Excessive Displacements at Abutments

- Unseating at the Abutment
  Leads to Collapse
Excessive Displacement Due to Rotation

Collapse of Superstructure
Abutment Retrofit-High Skew Bridges

Provide External CIDH Pile at the Acute Corner of the Bridge
Abutment Retrofit-High Skew Bridges
Abutment Retrofit-High Skew Bridges
Shear Keys—New Bridge

Accept Transverse Seismic Loads at Abutments

Shear Keys Must Break Before Piles

External Shear Key

Internal Shear Key

Not Preferred—Difficult to Repair
Approach Slabs

Settlement of Bridge Approach Slab

For *Important* Bridges on Lifeline Highways, Emergency Vehicles Must be Able to Get Across

San Fernando Earthquake Rte. 5/210
Tie bars to backwall are provided to prevent approach slab settlement
Approach Slab-Existing Bridge

Paving Notch Extension and Ties
Applicable to New Approach Slabs on Existing Bridge
Balance frame stiffness is necessary to efficiently distribute earthquake loads.

Isolation casings are provided to control columns stiffnesses across uneven grounds.
Loose Soils are Placed in the Casing to Allow Movement and Plastic Hinging Below Ground
External Debris and Dirt Should Be Prevented From Entering the Casing to Allow the Column to Move
Questions???
Pivotal Earthquakes for Bridge Design

- 1971 San Fernando
  - Hinge Retrofit
  - Ductile Details, Connections
- 1987 Whittier
  - Single Column Retrofit Program
  - Research on Design Details
- 1989 Loma Prieta
  - Multi-Column Retrofit Program
  - Joints, Continuity, Capacity Protection
- 1994 Northridge
  - Validated Retrofit Program
  - Balanced Geometry and System Effects
California Department of Transportation

Structure Maintenance and Investigation

Emergency Response Plan
2014

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Northridge Earthquake Response

• January 17 -- Within hours of the earthquake, a gubernatorial proclamation was issued directing all California state agencies to utilize available resources in responding to the emergency.

• Seven emergency orders were approved by the California Department of Transportation (Caltrans) and subsequent force account contracts were let to remove damaged structures, construct detours and install shoring to insure the safety of existing, standing structures.
January 17

- Caltrans maintenance and engineering staff began inspecting the freeway system throughout Los Angeles and Ventura counties. More than 1,000 structures were checked - that day alone.

- An Executive Order by the Governor suspended all rules imposing non safety-related restrictions on the delivery of food products. This order further suspended rules governing the hours during which deliveries could be made.
January 18

- Representatives of the Los Angeles County Metropolitan Transportation Authority (LACMTA), Los Angeles Department of Transportation (LADOT), the Federal Highway Administration (FHWA), and Caltrans map out emergency response strategies and identify earthquake-related damage to local transportation facilities.
January 23

• A gubernatorial proclamation suspended all statutes, rules and regulations, which apply to Caltrans contracts that would hinder or delay the restoration of facilities and services as a result of the Northridge earthquake.

• This emergency proclamation modified contracting procedures and enabled Caltrans to respond more effectively and efficiently to the emergency. Innovative emergency contract procedures allowed Caltrans to put contractors to work immediately. The informal and streamlined bid process cut the time for advertising, awarding and approving contracts from a standard timeframe of four to five months to as little as three days.
• January 27 -- Caltrans issued guidelines to suspend usual contracting procedures. These guidelines included provisions to protect the public welfare, for example - ensuring ample competition, compliance with OSHA regulation, licensing, and participation by DBE firms.

• January 29 -- the first A+B contract was opened, awarded, executed and approved for Interstate 5. The A+B contract process called for contractors to submit bids that included both cost of the work and the time to complete the job. This contracting process was completed in one day instead of the standard five to seven weeks. On January 29, Caltrans also opened a newly paved, four-lane detour for the traffic on Interstate 5. This reopened a vital connection to and from Los Angeles.
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• January 30 -- less than two weeks after the earthquake, construction began on the bridge replacement at Interstate 5 at Gavin Canyon.

• April 12 -- Traffic service was restored on the I-10 Santa Monica Freeway, the busiest freeway in the nation. The freeway was reconstructed in 66 days, a total of 74 days ahead of schedule. By opening this $14.9 million reconstruction project to traffic significantly earlier than the 140 days previously bid and anticipated, Caltrans saved the Los Angeles economy approximately $1 million a day. The contractor received an incentive payment of $200,000 for each early day, totaling $14.8 million.
• May 17 -- Traffic service was restored on the I-5 Golden State Freeway at Gavin Canyon, 33 days ahead of schedule. By opening this $14.8 million project earlier than the 130 days previously anticipated, Caltrans saved the Los Angeles economy approximately $400,000 a day. The contractor received an incentive payment of $150,000 for each early day, totaling $4.95 million.

• July 8 -- Traffic was reopened on Stage one of the I-5/Route 14 Interchange, 35 days ahead of schedule. By opening this $19.6 million project earlier than the 132 days previously anticipated, Caltrans saved the Los Angeles economy approximately $1.6 million each day. The contractor received a bonus payment of $100,000 for each early day, totaling $3.5 million.
• Traffic service was completely restored to the Simi Valley Freeway (SR 118) approximately two weeks earlier than anticipated. This two-stage reconstruction project totaled $19.3 million. Stage one of the SR 118 reconstruction effort carried with it an incentive / disincentive payment of $50,000 per day for each day traffic was restored earlier than anticipated. A total of $450,000 was awarded as an incentive to the contractor. Stage two did not include an incentive/payment provision because of the effectiveness of Caltrans’ temporary detour. The detour was in service one month after the earthquake. The detour was so efficient that it carried 110,000 vehicles daily - roughly 75% of the pre-quake traffic - while under final reconstruction.
October 29 -- Traffic reopened along the first of the final two connector ramps which make-up Stage two of the 5/14 interchange. Traffic was completely restored to the entire interchange on November 4, one day earlier than anticipated.

Caltrans was able to accelerate the openings of the Southland’s major transportation arteries by challenging the private sector with a system of incentives and disincentives. Total bonus payments for the reconstruction projects were more than $20 million. According to the Governor’s Office for Planning and Research, early traffic openings saved the local and state economy approximately $145 million.

FOR EVERY ONE DOLLAR CALTRANS SPENT ON INCENTIVE BONUSES, THE CALIFORNIA ECONOMY SAVED MORE THAN $5.
Our response to a major disaster is built on three major elements –

- Prepare
- Response
- Recovery
• The first component is to make sure our personnel have the training and tools to respond in short order when a quake strikes. This includes nearly 5,000 Maintenance crews stationed around the state. Their job when a quake hits is to check the system for any damage. More than 120 engineers in Caltrans’ Structure Maintenance & Investigations (SM&I) are charged with ensuring the safety of all the state’s highway bridges. Caltrans conducts periodic disaster training for its personnel and procedures for all personnel involved in responding are outlined in various Maintenance and Engineering manuals used by the Caltrans staff.
RESPONSE –

• Caltrans is connected to the California Integrated Seismic Network that provides immediate notification about disasters such as earthquakes.

• Upon notification of a disaster and based on the type of event and extent of the damage, Caltrans activates its Emergency Operations Center (EOC), which serves as the central command post for sharing information on all disaster response activities involving the state transportation system.

• Maintenance crews in the affected area are dispatched to make visual inspections of the system and to make an initial damage assessment. Caltrans is able to draw upon the nearly 5,000 Maintenance crews and thousands of engineers statewide to assist in making initial damage assessments.

• The Maintenance crew members check the system and determine whether damage at a particular warrants closure of the facility or a closer examination by licensed engineers with expertise in bridges, pavement or hydrology.
Following a major earthquake, Caltrans’ Post Earthquake Inspection Team (PEQIT) collects information on damaged bridges with the goal of improving our understanding of structural performance in significant seismic events. The work of this team has led to research that has improved design procedures and the design details we employ today.

An inspection report is prepared documenting the damage and the repairs recommended. That report is made part of the official record maintained by Caltrans.
# LIST OF STRUCTURES INVESTIGATED

<table>
<thead>
<tr>
<th>Bridge No.</th>
<th>Bridge Name</th>
<th>Dist/County/Rte/PM</th>
</tr>
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<tbody>
<tr>
<td>53-1917F</td>
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<td>53-1919S</td>
<td>Route 134/2 Separation</td>
<td>07-LA-2/134-R18.80/R8.92</td>
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<tr>
<td>53-1128</td>
<td>Pacoima Wash</td>
<td>07-LA-5-39.19</td>
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<td>Gavin Canyon UC</td>
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<td>53-2327F</td>
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<td>53-1603</td>
<td>Centinela-Pico UC</td>
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<td>La Cienega-Venice UC</td>
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<td>Mission-Gothic UC</td>
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<td>53-2206</td>
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<td>Ruffner Avenue OC</td>
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<td>Olympic Blvd. OC</td>
<td>07-LA-710-23.44</td>
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</table>
DAMAGE CATEGORIZATION

MAJOR DAMAGE (Collapsed Structure)
- Gavin Canyon UC 53-1797R/L
- Route 14/5 Separation & OH 53-1960F
- North Connector OC 53-1964F
- Mission-Gothic UC 53-2205
- La Cienega-Venice UC 53-1609

MAJOR DAMAGE (No Collapse)
- Fairfax-Washington UC 53-1580
- Bull Creek Canyon Channel Bridge 53-2206
- Route 14/5 Separation & OH 53-1960G
- South Connector OC 53-1963F

MODERATE DAMAGE
- Southwest Connector OC 53-2329G
- Route 101/170/134 Separation 53-1336R

MINOR DAMAGE
- Balboa Blvd. OC 53-2395
- Rinaldi Street UC 53-1506
- Ruffner Avenue OC 53-2396
- South Connector OC 53-1917F
- Northeast Connector OC 53-1921F
- Pacoima Wash Bridge 53-1128
- West Sylmar OH 53-1984RL
- Southeast Connector OC 53-2327F
- Centinela-Pico UC 53-1603
- National Blvd. OC 53-1615
- Southeast Connector OC 53-1637F
- Truck Connector OC 53-1962F
- Wendy Drive OC 53-0266
- Las Virgenes OC 53-1442
- Hayvenhurst UC 53-2204
- Woodley Avenue UC 53-2207
- San Fernando Road OH 53-2095
- Southwest Connector OC 53-1989F
- Devonshire Street UC 53-1500
**NO DAMAGE**

<table>
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<th>Code</th>
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<tbody>
<tr>
<td>Olympic Avenue OC</td>
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<tr>
<td>Sierra Hwy UC</td>
<td>53-1936F</td>
</tr>
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</table>
RECOVERY-

Once the extent of the damage has been determined, Caltrans initiates its recovery phase, which includes:

1) Enlisting the assistance of private construction companies to complete recommended repairs so facilities full traffic service can be restored soon as possible.
2) Working with local officials and transportation providers to restore a level of transportation service to the damaged area.
Since 1990, Caltrans has retrofitted more than 2,300 bridges at a cost of more than $2 billion. In addition, seven of the state’s toll crossings were strengthened, including the replacement of the eastern span of the San Francisco-Oakland Bay Bridge, at a total cost of $7 billion.
• All of the bridges identified for seismic strengthening following the Loma Prieta and Northridge quakes have been completed.

• Caltrans’ seismic safety program, however, is an ongoing effort. As new technologies are developed and knowledge of earthquakes and the resulting effects are expanded, Caltrans will upgrade its facilities as needed.
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<tr>
<th>Bridge Number:</th>
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<th>Time (24hr):</th>
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<tr>
<td>Current Status:</td>
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</tr>
<tr>
<td>1 Open</td>
<td>2 Open with Shoring</td>
<td>3 Closed / Can Be Open</td>
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<tr>
<td>Restrictions:</td>
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<tr>
<td>5 No Restrictions</td>
<td>6 No Permit Loads</td>
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<td>7 Operational</td>
<td>10 Traffic Control Required for Repair</td>
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<tr>
<td>8 Structural</td>
<td>11 Lane Usage Restrictions</td>
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<tr>
<td>8 Investigate / Repair Prior to Open</td>
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<tr>
<td>Damage:</td>
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<tr>
<td>12 Damage</td>
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<td>14 No Additional Damage</td>
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<td>Damage Summary:</td>
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<td>Repair Cost Estimates:</td>
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<td>16 None</td>
<td>17 Low &lt;$5k</td>
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<tr>
<td>18 Med $5-50k</td>
<td>19 Med-High $50-100k</td>
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<td>20 High &gt;100k</td>
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<td>Superstructure:</td>
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<td>Bearings:</td>
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<td>Columns/Pier Caps:</td>
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<td>Foundation/Piles:</td>
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<td>Retrofit:</td>
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<td></td>
</tr>
<tr>
<td>Other:</td>
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</tr>
</tbody>
</table>
EMERGENCY RESPONSE INSPECTION

Affix this sticker to the RIGHT BRIDGE RAILING next to the BRIDGE NAME/NUMBER LOCATION

DATE: _______ TIME: _______ BY: _______ PH#: _______

DATE: _______ TIME: _______ BY: _______ PH#: _______

DATE: _______ TIME: _______ BY: _______ PH#: _______

ANY BRIDGE CONCERNS CONTACT:
STRUCTURE MAINTENANCE AND INVESTIGATIONS (888) 893-9974
# Flood SMS Field Report

<table>
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<tr>
<th>Current Status</th>
<th>Restrictions</th>
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<tr>
<td>Open</td>
<td>Investigate/Repair Prior to Opening</td>
</tr>
<tr>
<td>Open with Shear</td>
<td>No Permit Load</td>
</tr>
<tr>
<td>Closed/Can be Open</td>
<td>Traffic Ctrl Req'd for Repair</td>
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<tr>
<td>Closed</td>
<td>Lane Usage Restriction</td>
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<table>
<thead>
<tr>
<th>High Water Mark</th>
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</table>

**TEXT**

**Approach Roadway**

**Superstructure**

**Wingwalls & Rails**

**Abutments**

**Embankments**

**Bearings**

**Hinges**

**Columns, Piers/Caps**

**Footings, Piles**

**Scur**

**Restriction**

**Comments**
Northridge Earthquake 1994, M 6.8
Gavin Canyon Undercrossing – Year Designed: 1965
Northridge Earthquake
Bull Creek Canyon Channel Bridge, Year Designed: 1973
Northridge Earthquake
Mission-Gothic Undercrossing – Column Failure before Architectural Flare
It All Looks Better At Night