



AB 100 Report-Alfred E. Lundquist Seismic Safety Commission



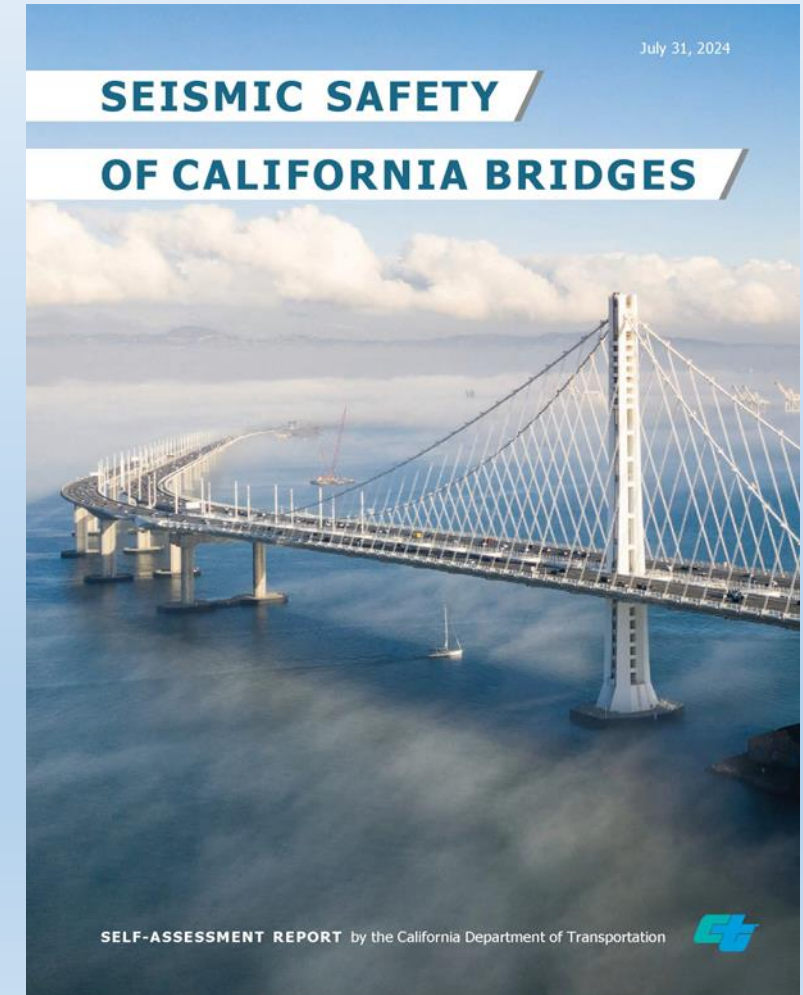
Seismic Safety of California Bridges

Assembly Bill 100 Report to the
Alfred E. Lundquist Seismic Safety Commission

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California Department of Transportation
October 10, 2024

Presentation Topics

- Seismic Safety of California Bridges
- Emergency Response Planning and Post-Earthquake Investigations
- Strategic Planning Efforts
- Risk-Based Seismic Design



Why are investments in seismic resilience necessary?



FIGURE 8: San Francisco-Oakland



FIGURE 7: Collapsed Section of the Cypress Street Viaduct



Seismic Safety of California Bridges

The intent of the report is to:

- Paint a realistic picture of what Californians can expect in terms of the seismic performance of bridges on the State Highway System after a major earthquake.
- Outlines measures Caltrans is currently undertaking and planning to do in the future to continue to improve the seismic safety of California's bridges.
- Document the improvements made in the seismic safety of California's bridges since the 1971 San Fernando Earthquake.



Seismic Safety of California Bridges

The report answers three questions posed by the Caltrans Seismic Advisory Board:

- What has Caltrans done to improve the seismic safety of the state transportation system since the Loma Prieta Earthquake in 1989?
- What is the expected performance of bridges on the state transportation system that have been retrofitted?
- What should Caltrans be doing to further reduce the seismic risk to the state transportation system?



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- What has Caltrans done to improve the seismic safety of the state transportation system since the Loma Prieta Earthquake in 1989?
 - ✓ \$12 .2 billion investment towards the retrofit or replacement of seismically vulnerable bridges on the State Highway System.
 - ✓ \$1.4 billion investment in local agency bridges
 - ✓ \$125 million investment in seismic research.
 - ✓ Development of Caltrans Seismic Design criteria and critical seismic design guidance.



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- What is the expected performance of bridges on the state transportation system that have been retrofitted?
 - ❖ Important and Recovery Bridges are expected to perform well.
 - ❖ May be closed for a short period of time to complete minor repairs before quickly being returned to service (hours to days).
 - ❖ Bridges constructed after 1990 using post 1990 seismic design guidance are expected to perform well with a minimal potential for collapse during a large earthquake.
 - ❖ Retrofitted bridges could have extensive damage but will not collapse.
 - ❖ Retrofitted bridges will be out of service for several months or need replacement.



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- What should Caltrans be doing to further reduce the seismic risk to the state transportation system?
 - ❖ Continuous risk assessment of the California bridge inventory.
 - ✓ 2015 and 2019 Seismic Screening of State Highway System bridges.
 - ✓ 2024 Local Agency Bridge Screening program
 - \$3.5 million in Federal funding

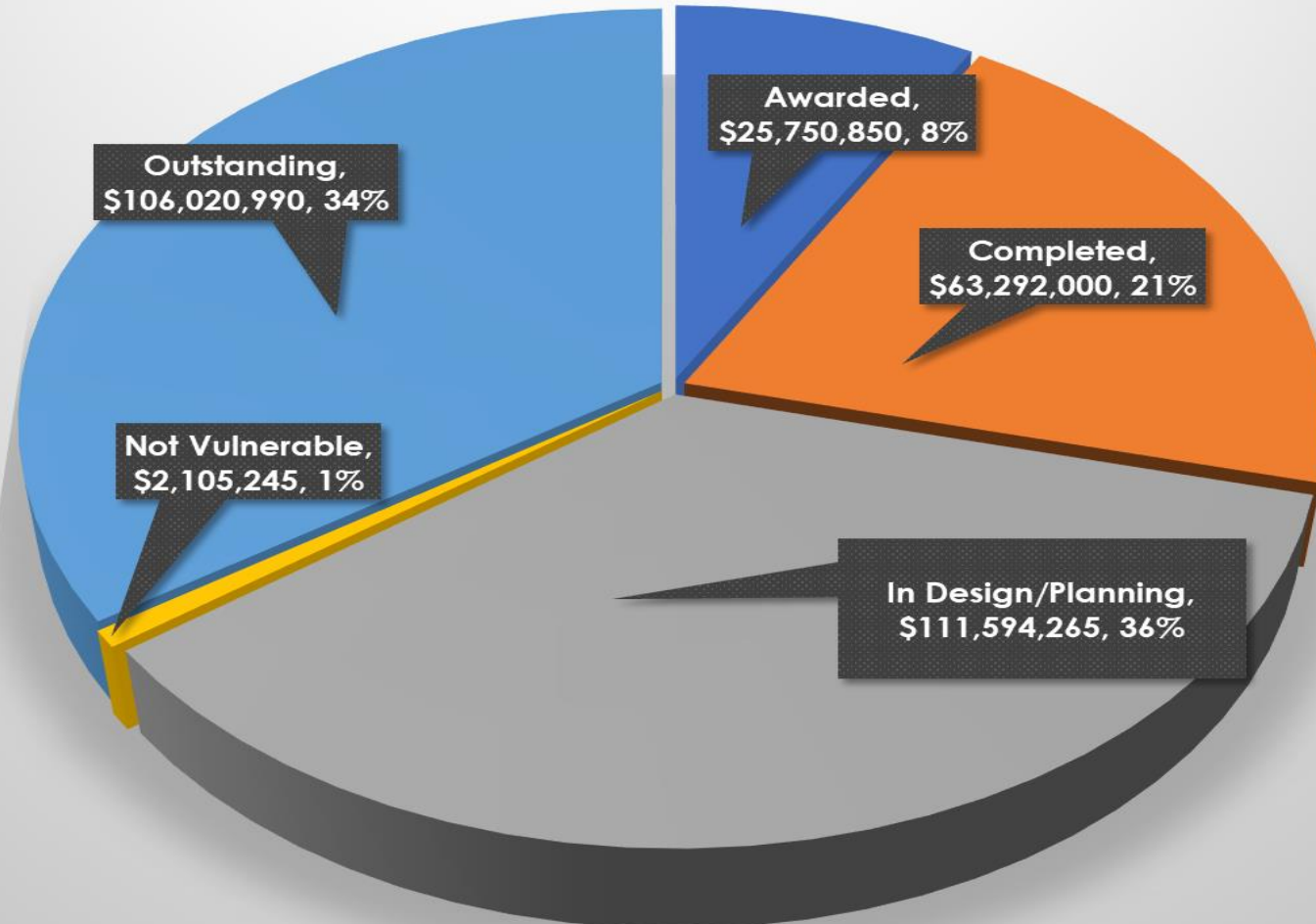


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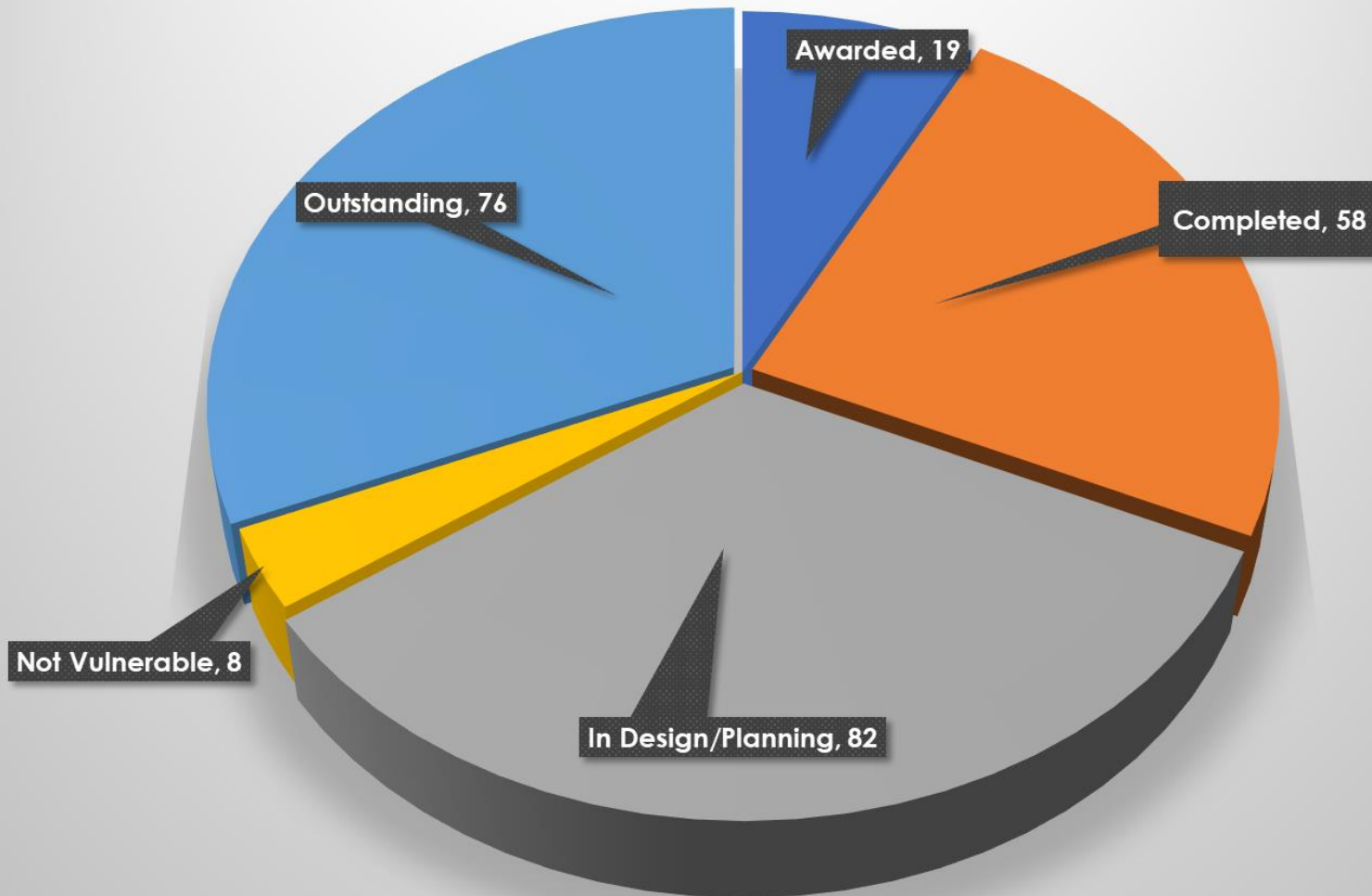


- What should Caltrans be doing to further reduce the seismic risk to the state transportation system?
 - ❖ Fund the seismic retrofit of bridges in the Caltrans Transportation Asset Management Plan (TAMP).
 - ✓ 642 bridges with seismic vulnerabilities identified.
 - ✓ Seismic Retrofit Priority list has been developed.
 - ✓ State Highway System Management Plan will provide \$62 million over the next five years.
 - ✓ State Highway Operation and Protection Program (SHOPP) will fund \$2.2 billion in bridge projects over four years.

Bridge Seismic Retrofit Priority List Project Expenditures by Category



Bridge Seismic Retrofit Priority List
Number of Bridges by Category-2020 Baseline List





Seismic Safety of California Bridges

Publishing Timeline

- Report will be published following this presentation.
- Report will be available to public on DES and SSC webpage.



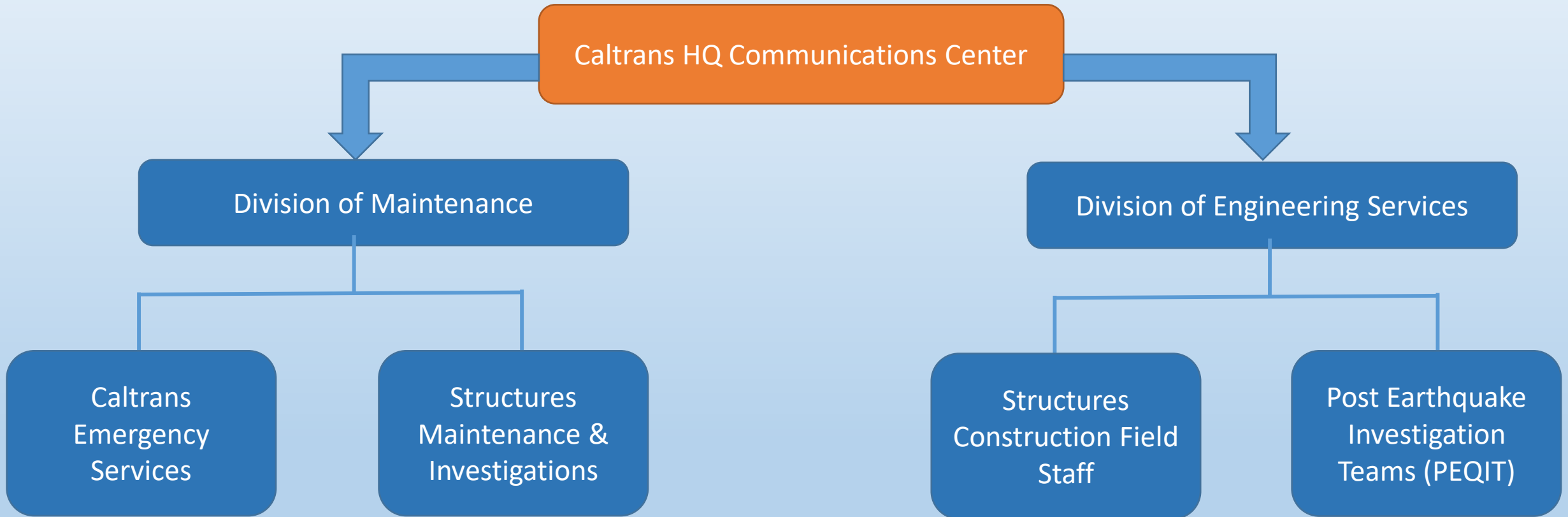
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Structure Emergency Response and Post Earthquake Investigation Teams (PEQIT)



Structure Emergency Response Organization



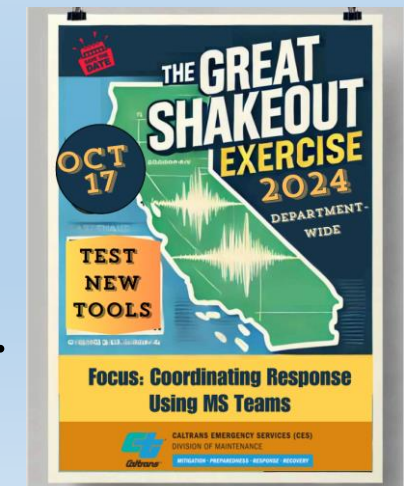
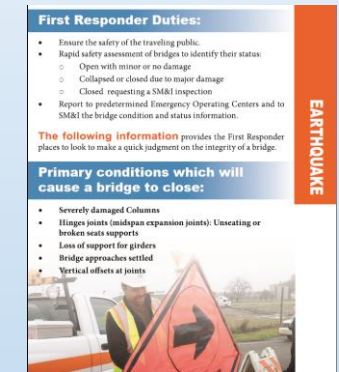
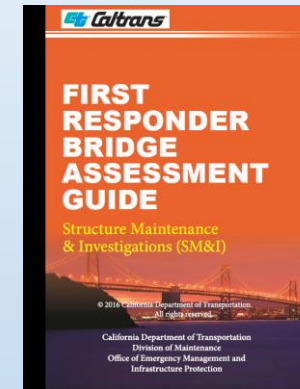


Structure Emergency Response Notification

- Members of the Caltrans Emergency Response Teams are notified through Shakecast E-mails for Earthquakes larger than 4.5 magnitude.
- Magnitude 5.5 or larger-The Caltrans HQ communication center notifies all key Emergency Response Team staff by e-mail and phone.
 - ✓ Staff confirms receipt of notification.
- Bridge Emergency Response Center is activated when significant damage to bridges occurs.
- Responds to CalOES structure-related mission tasks as necessary.

Structure Emergency Response Workgroup Collaboration & Training

- ✓ Annual training meetings with review of the First Responder Bridge Assessment Guide.
- ✓ Annual and specific incident related meetings with Structures Emergency Response Working group.
- ✓ Currently focusing on collaboration to ensure cross-Division policy and guidance are consistent and current for training of new staff.
- ✓ Incorporating lessons learned from I-10 Santa Monica Viaduct response in November 2023.
- ✓ Annual participation in Great Shakeout exercises.





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DES Post Earthquake Investigations (PEQIT)

- The PEQIT effort is led by the Office of Earthquake Engineering, Analysis, and Research (OEEAR) in conjunction with our counterparts at Structure Maintenance & Investigations.
- PEQIT gathers field information about the performance of damaged bridges and highway structures and uses this information to improve Caltrans seismic design guidance and retrofit procedures.
- 32 DES engineers will support 8 PEQIT teams
 - ❖ Six 4-person teams (24 total PEQIT members) are based in Sacramento.
 - ❖ Two 4-person teams (8 total PEQIT members) are based in the DES Southern California Diamond Bar Office.
- DES PEQIT currently has seven FAA licensed pilots and two pilots in-training new pilots to support PEQIT response efforts.
 - ❖ Pilots attend monthly training sessions.
 - ❖ The Structure Construction and Geotechnical Services Subdivisions at DES have additional drone assets.

Recent PEQIT Activity

- 2014 South Napa (Mw 6.0)
- 2019 Ridgecrest (Mw 7.1)
- 2021 Little Antelope Valley (Mw 6.0)
 - ❖ First use of UAS Inspections
- 2022 Ferndale (Mw 6.4)



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Drone Inspection of Mill Creek Bridge 2021 Little Antelope Valley Earthquake





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Drone Inspection of Eel River Bridge 2022 Ferndale Earthquake





Future Innovation in Earthquake Engineering at Caltrans

➤ **DES Seismic Strategies and Implementation Plan**

- ✓ Develops a roadmap of the future of earthquake engineering efforts at the Division of Engineering Services and Caltrans.

➤ **Risk-Based Seismic Design**

- ✓ Risk-Based Seismic Design (PBSD) is a an innovative method that will be utilized to assess the risk of bridge collapse and will be utilized to tailor the seismic-design of bridges to achieve certain target performance and post earthquake functionality.
- ✓ Will be the basis for the future Caltrans Seismic Design Criteria version 3.0.



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Questions?

