

Overview of PEER Bridge Program

Seung Han Kim, Senior Bridge Engineer

DES-OEEAR

California Department of Transportation

PEER Annual Meeting

August 15, 2024



PEER Bridge Program Affiliates

PEER Core Institutions

PEER is a consortium of participating institutions, including eleven Core Institutions that are mainly involved in the activities of PEER. PEER also involves [Educational Affiliates](#) who participate in education activities, as well as individual researchers from other institutions and organizations. The PEER Core Institutions are:

ABOUT

- ▶ People
- ▶ Mission and Goals
- ▶ **Core Institutions**
- ▶ PEER Student Committee
- ▶ Educational Affiliates
- ▶ Business and Industry Partnership (BIP)
- ▶ Benefits to California
- ▶ Educational Outreach
- ▶ FAQs



PEER Bridge Program Overview

- \$4.5 million awarded to PEER in March 2020.
- Five-Year Master Agreement Between Caltrans and PEER.
- Projects executed as a subtask under the Master Agreement
- Caltrans RDAC selects/approves new project each year.
- Caltrans manages the project and establishes a Technical Advisory Panel.
- PEER provides technical and administrative support for RFP solicitation from PEER affiliated universities.
- Principal Investigator (PI) produces a research report vetted by PEER at end of project.
- PEER makes project data available to the community in open-source format.

PEER Bridge Program Research Topic Areas

- 1. Maintenance/Sustainability:** Develop cost effective methods for assessing the structural health of a bridge. Create repair techniques to prolong a bridge's functional life. Assess innovative design and material options that will minimize life-cycle costs.
- 2. New Materials:** Perform evaluation and trial application of new construction materials such as high strength reinforcing steel, stainless steel, ultra-high-performance concrete, light-weight concrete, and composite materials.
- 3. Bridge Modeling & Analysis:** Develop improved methods for assessing structural demand and performance.
- 4. Accelerated Bridge Construction:** Develop techniques and structural systems that increase the speed of construction and minimize disruption to the traveling public.
- 5. Performance Based Earthquake Engineering (PBEE)/Bridge and System Reliability:** Develop bridge design methods that include seismic performance targets at different hazard levels. Investigate how different performance targets impact the performance of the transportation network following a major earthquake.
- 6. Foundations & Walls:** Improve the geotechnical design of bridge foundations and retaining walls to improve performance and cost efficiency.
- 7. Intelligent Design Tools/Bridge Design Aids:** Develop new tools and methods that take advantage of artificial intelligence to accelerate the bridge design process.

PEER Bridge Program Benefits

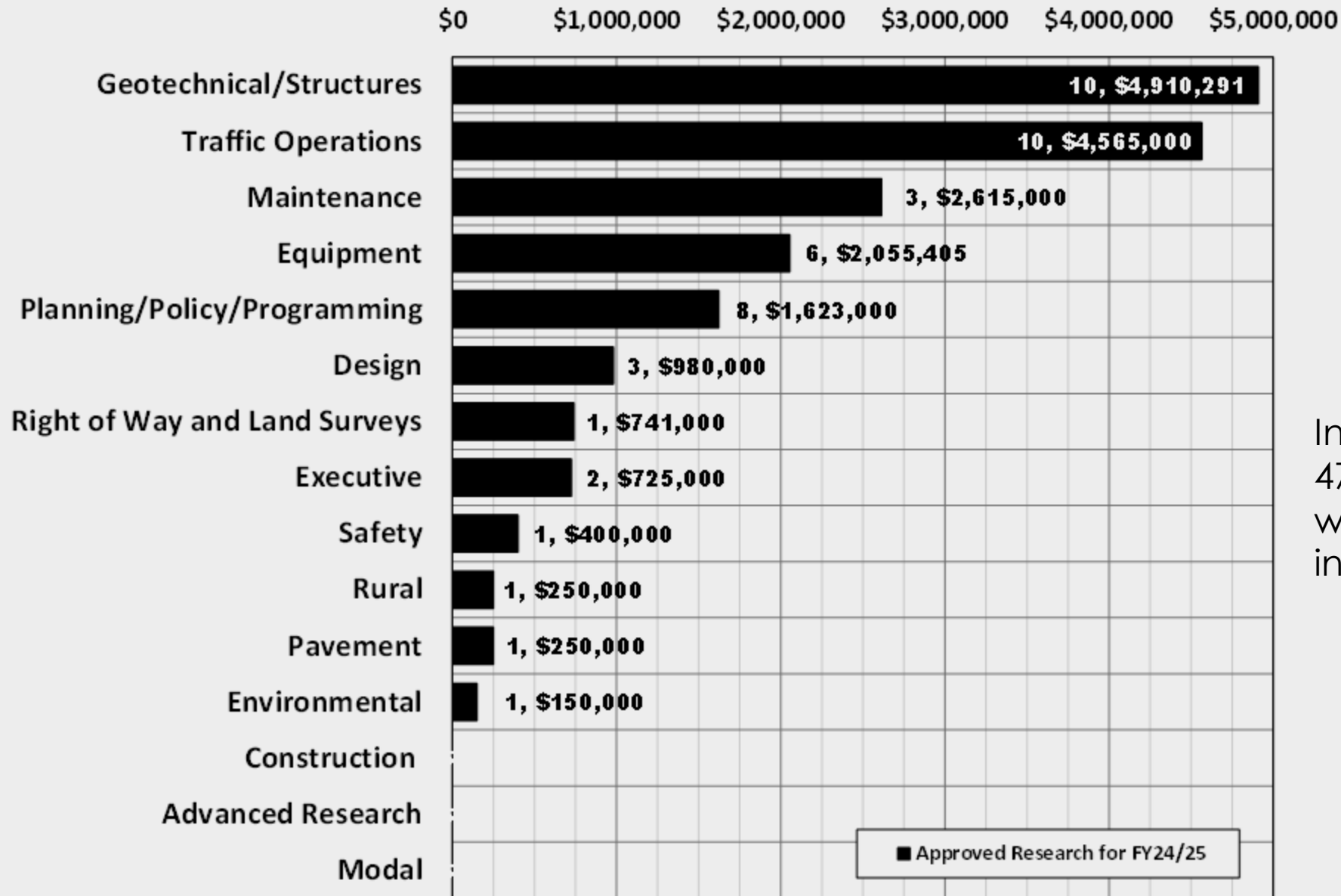
- Caltrans can leverage PEER Center's expertise, long record of accomplishment, research infrastructure, and pool of world-renowned researchers.
- Caltrans can reduce administrative burden on Caltrans/OEEAR staff:
 - RFP solicitation process is formally administrated by PEER for Caltrans;
 - PEER Center administrated solicitation process is fully streamlined to ensure project qualifications and requirements are met.
- PEER Center can promote collaboration and funding support through Business and Industry Partnerships and attract other government sponsors.
- Caltrans sponsorship supports the research community; improved technology/innovation which ultimately benefit California.

PEER Bridge Program Research Projects

Title of Project	PI	Total Fund	Duration
Project Beginning in 2020		2 Projects, Total Fund=\$1,375,000	
Refined Bridge Deck Design and Analysis	Dawn Cheng (UC Davis)	\$375,000	11/2020-10/2024
Bridge Rapid Assessment Center for Extreme Events (BRACE2)	Khalid Mosalam (UC Berkeley)	\$1,000,000	8/2020-1/2024
Project Beginning in 2021		2 Projects, Total Fund=\$720,000	
Advanced Guidelines for Stability Design of Slender RC Bridge Columns	Michael Scott (Oregon State Univ)	\$300,000	6/2021-11/2023
Statistical Variation of Seismic Damage Index (DI) of California Bridges	Farzin Zareian (UC Irvine)	\$420,000	3/2021-2/2024
Project Beginning in 2022		4 Projects, Total Fund=\$880,000	
In-Service Structural Evaluation of Box Beam Overhead Sign Structures	Khalid Mosalam (UC Berkeley)	\$350,000	6/2022-11/2024
Liquefaction-Induced Ground Settlement Procedure	Jonathan Bray (UC Berkeley)	\$65,000	10/2021-9/2022
Hazard-Based Risk and Cost-Benefit Assessment of Temporary Bridges	Floriana Petrone (UNR)	\$200,000	6/2022-5/2024
Prioritizing Regional Needs for Recovery Bridges through Post-earthquake Corridor Identification and System Fragility Assessment of the SF Region	Kenichi Soga (UC Berkeley)	\$265,000	4/2022-2/2025
Project Beginning in 2023		1 Project, Total Fund=\$450,000	
Remaining fatigue life assessment of bridge decks based upon a numerical-experimental SYSCOM (SYStem-COMponent-Material) based approach	Alessandro Palermo (UCSD)	\$450,000	Pending execution (4 year)
Project Beginning in 2024		6 Projects, Total Fund=\$900,000	
Development of Performance-Based Multi-hazard Engineering (PBME) Framework with Inclusion of Climate Change and Bridge Vulnerability	Michele Barbato (UC Davis)	\$150,000	3/2024-2/2025
Uncertainty Quantification for Meeting Bridge Design Objectives	Tracy Becker (UC Berkeley)	\$150,000	3/2024-2/2025
New Near-Fault Adjustment Factors for Caltrans Seismic Design Criteria (SDC)	Yousef Bozorgnia (UCLA)	\$150,000	3/2024-2/2025
Influence of Fines and Alternative Intensity Measures on Liquefaction Triggering	Scott J. Brandenberg (UCLA)	\$150,000	3/2024-2/2025
Development of Autonomous Drone Inspection for Bridge Maintenance	Raja Sengupta (UC Berkeley)	\$150,000	3/2024-2/2025
Caltrans Risk Based Seismic Design (CT-RBSD) for Bridges	Farzin Zareian (UC Irvine)	\$150,000	3/2024-2/2025

Under 2020 Master Agreement, total 15 Projects (\$4,325,000) were approved. DRISI is working on to get 2025 Master Agreement executed.

Caltrans Research Program – FY24/25 Approved Research



In FY24/25, RDAC approved 47 research projects with total funding of \$19.3M in 15 discipline areas

FY 24/25 Approved G/S Research Slate - DES

PEER
Bridge

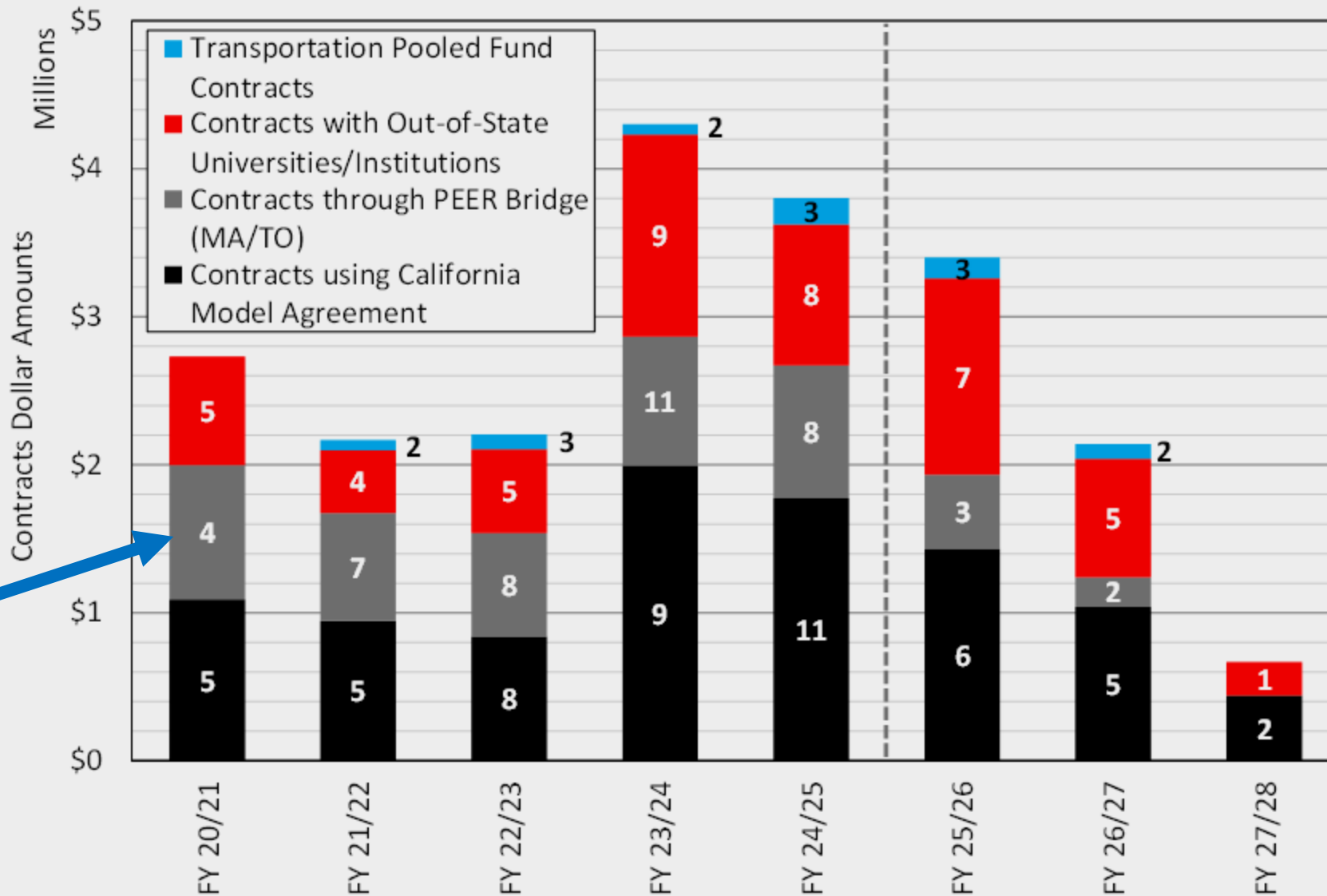
Regular
research

TPF

Task ID	Task Title	Sponsor	Proposal Author	Principal Investigator / Lead Agency	Total Fund	Project Timeline
4428	Caltrans Risk-Based Seismic Design for Modern Bridges	Chris Traina Don Nguyen-Tan Anhdan Le	Sharon Yen	Frazin Zareian, UC Irvine	\$450K	3 years
4285	Generation 2 Fragility Models for Steel Bridge, Part 2	Chris Traina Anhdan Le	Qui Zheng	Sashi Kunnath, UC Davis	\$760K	4 years
4427	Evaluation of Simplified Procedures for Estimating Lateral Spreading	Chris Traina Hector Valencia	Tom Shantz	Scott Brandenburg, UCLA	\$600K	4 years
4434	Performance Assessment and Optimization of ABC Column Connections	Chris Traina Don Nguyen-Tan	Sharon Yen Floriana Petrone Saiid Saiidi	Floriana Petrone, UNR	\$600K	3 years
4433	Damage to Ends of PC/PS Concrete Bridge Girders from Seismic Impact	Chris Traina	Robert Dowell Gloria Faraone	Robert Dowell, SDSU	\$525K	3 years
4432	Primary Vertical Rebar Cutoffs for RC Bridge Columns, Plastic Hinge Location	Chris Traina	Robert Dowell Gloria Faraone	Robert Dowell, SDSU	\$560K	3 years
4426	Evaluation of Fatigue Strength of Open-Grid Deck Systems for Use on Highway Bridges	Don-Nguyen Tan Dan Adam Michael J. Lee	Lian Duan	Robert Connor, Purdue	\$1M	4 years
4442	Bridge Abutment Skew Reduction Factors (TPF5-(264))	Chris Traina Don Nguyen-Tan	Richard Heninger Anoosh Shamsabadi	Utah DOT	\$150K	3 years
4437	Concrete Bridge Engineering Institute (TPF-5(508))	Chris Traina Hanna Dergham	Chris Traina	Texas DOT	\$150K	3 years
4443	Steel Bridge Inspection Enabled by AR/AI (TPF5-(535))	Chris Traina Michael J. Lee	Colman Cronin	Kansas DOT	\$120K	2 years

Active G/S Research Program by Contract Type

Geotechnical/Structures Research Program Contract Status

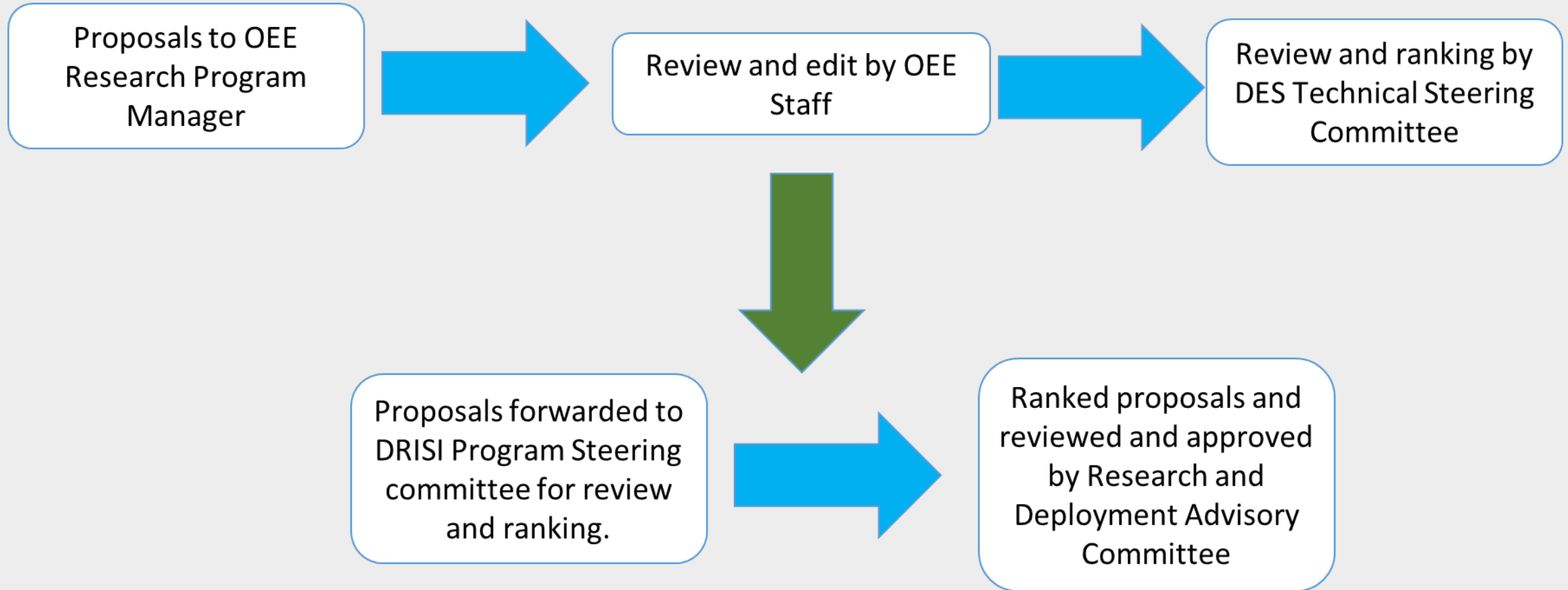


PEER Bridge Projects

Caltrans G/S Research Contract Management Team

Division of Engineering Services (DES)	Division of Research, Innovation, and Systems Information (DRISI)
<p>Chris Traina (Chief, Office of Earthquake Engineering and Research)</p>	<p>Anhdan Le (Chief, Office of Materials and Infrastructure)</p>
<p>OEEAR</p> <ul style="list-style-type: none"> • Seung Han Kim • Foued Zayati • Shahrooz (Sha) Amidi • Nagdhali (Ali) Hosseinzadeh • Bob Tanaka (Engineering Application Branch Chief) • Christian Unanwa (Seismic Design Criteria Branch Chief) • Mark Mahan (Retired Annuitant) <p>Bridge Design</p> <ul style="list-style-type: none"> • Manode Kodsuntie (ABC Branch Chief) • Habib Hotaki <p>Geotechnical Services</p> <ul style="list-style-type: none"> • David Jang • Anna Sojourner 	<ul style="list-style-type: none"> • Sharon Yen - PEER Bridge Program • David (TM) Liao • Colman Cronin • Kyungtae (KT) Kim

Research Proposal Flowchart



Research Proposal Review

Technical Steering Committee (TSC)

- Consists of subject matter experts
- Review and prioritize research funding, work on contract special provisions, and implement technical policies.

Program Steering Committee (PSC)

- Consists of Division or Office Chiefs
- Identifies program-level research priorities, annually approve multi-year research roadmaps, and support implementation of research products.

Research and Deployment Advisory Committee (RDAC)

- Consists of 8 Deputy District Directors, 18 Division Chiefs, and 2 DRISI staff
- Reviews and approves research proposals to develop the annual Caltrans research program
- Sponsors deployment of research products

Seismic Advisory Board

In 1990, Caltrans established the Seismic Advisory Board, whose role is to:

- Review Caltrans' earthquake engineering practices.
- Recommend improvements in seismic design practices.
- Review Caltrans' seismic research and priorities.
- Provide the public with explanations regarding Caltrans' seismic safety policies and procedures.

Fiscal Year 25/26 Research Proposal Timeline

- **7/15/2024** **Initiate Research Cycle**
TSC/SPB/SAB review
- **9/20/2024** **Research Proposal Due to OEEAR**
Structure Policy Board Briefing
Technical Steering Committee Briefing
Finalize Research Request Form and ranking
- **11/1/2024** **Research Request Due to DRISI**
PSC review and ranking
Scorer's meeting
- **3/6/2025** **Prioritized List Due to RDAC**
Executive review
- **3/19/2025** **RDAC meeting. Approved research slate distributed.**
- **8/31/2025** **Approved Research Contract Packages Due**