



Toll Bridge Allision Prevention and Mitigation Measures and Fender Status

Bay Conservation and Development Commission

November 7, 2024



Caltrans
Bay Area

Francis Scott Key Bridge Allision

On March 26, 2024, the **container ship MV Dali** struck the **Francis Scott Key Bridge** resulting in its collapse.

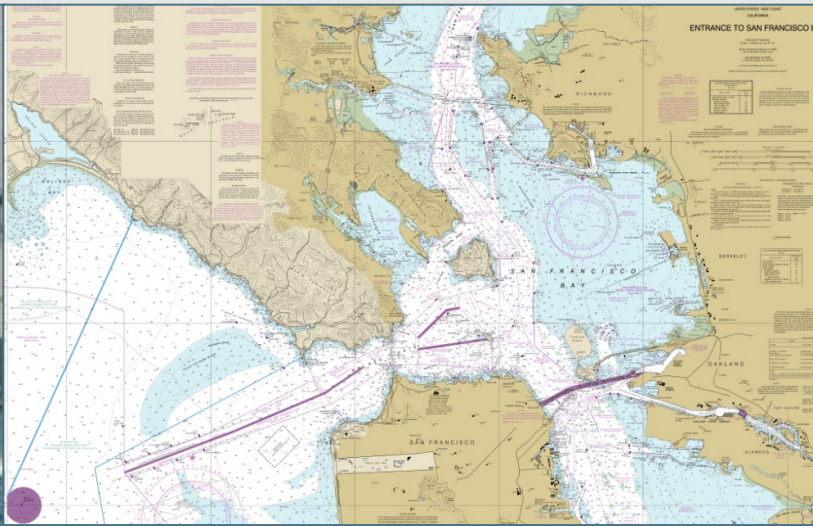


San Francisco-Oakland Bay Bridge is the most traversed of BATA's toll bridges

- In 2019, 140,000 vessels of different sizes and weights passed under BATA's bridges.
- About 1,000 of those were more than 100,000 Deadweight Tonnage (DWT)
- The largest ship was estimated to be 309,000 DWT



Allision Prevention, Mitigation, and Response



Prevention

- Operations overseen by San Francisco Bar Pilots and United States Coast Guard (USCG)

Mitigation

- Navigational Aids
 - Charts
 - Radar Beacons
 - Navigation Lights
- Fenders

Response

- Coordination and Communication

San Francisco Bar Pilots

- San Francisco Bar Pilots are mandated by the State of California to provide pilotage service in the San Francisco Bay and tributaries.
- San Francisco Bar Pilots work on call all hours of the day and night, 365 days a year, safely navigating vessels in and out of San Francisco Bay and its tributaries.
- The San Francisco Bar Pilots are licensed and regulated by both the United States Coast Guard and the California Board of Pilot Commissioners.



USCG Vessel Traffic Service

United States Coast Guard
Vessel Traffic Service (VTS)
San Francisco makes sure
vessel transits are safe,
secure, and efficient



Bridge Allision Prevention and Protection Systems

- **Navigation Aids**
 - Navigational Lights
 - Radar Beacons (Racons)
 - Fog Horns
 - Air Gap Sensors
- **Fenders**



Fender Design

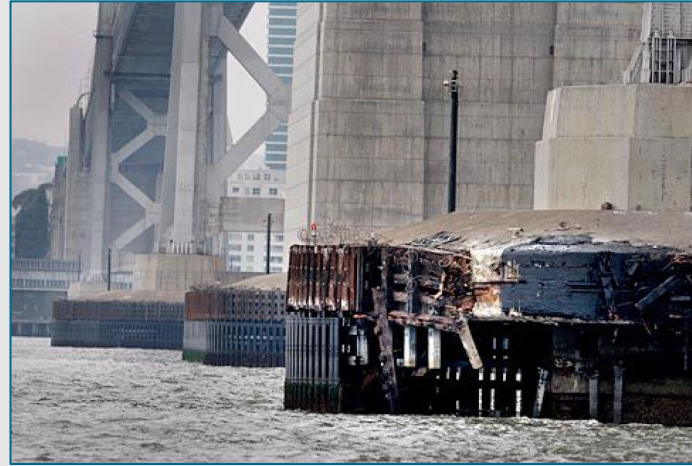
- Fender protection design, like seismic design, is risk and probabilistic based
- Factors considered, including
 - Ship Traffic
 - Ship Sizes
 - Channel Depth and Alignment
 - Fender geometry
- Fenders are intended to be sacrificial to absorb the impact of the collision and protect the bridge pier.



Past Bay Bridge Allision Incidents



2007
Cosco Busan
(68,000 DWT)



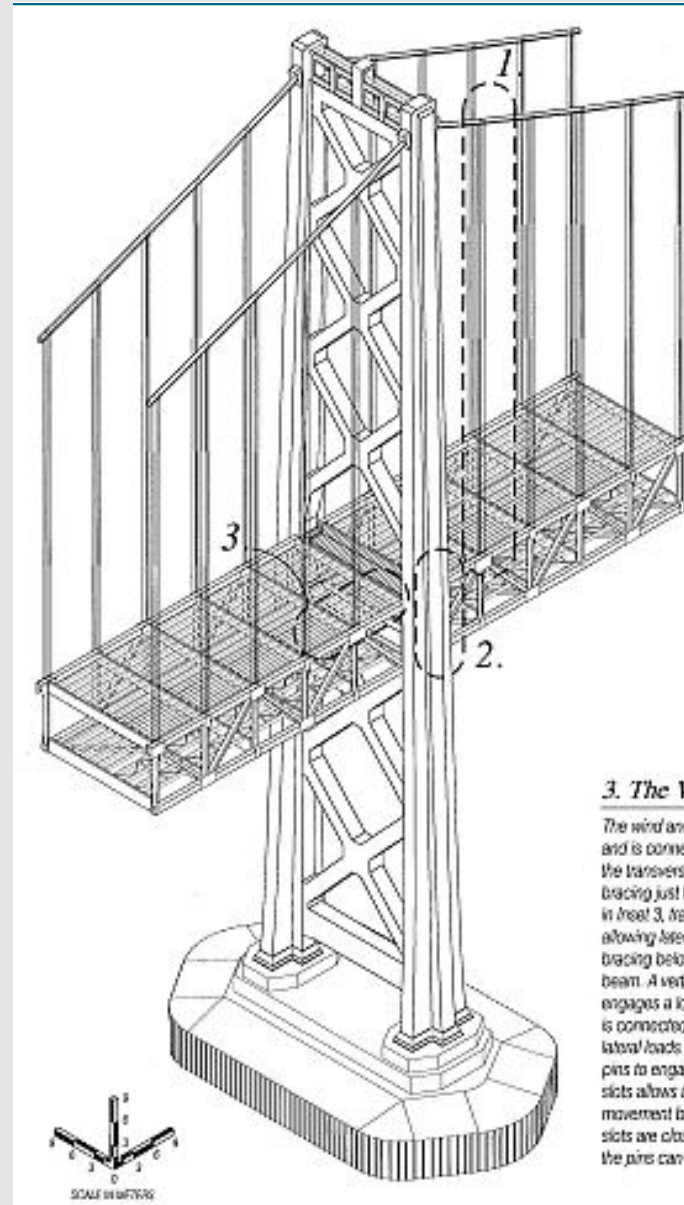
2007
Damaged SFOBB WS
Fender



2013
Overseas Reymar
(70,000 DWT)

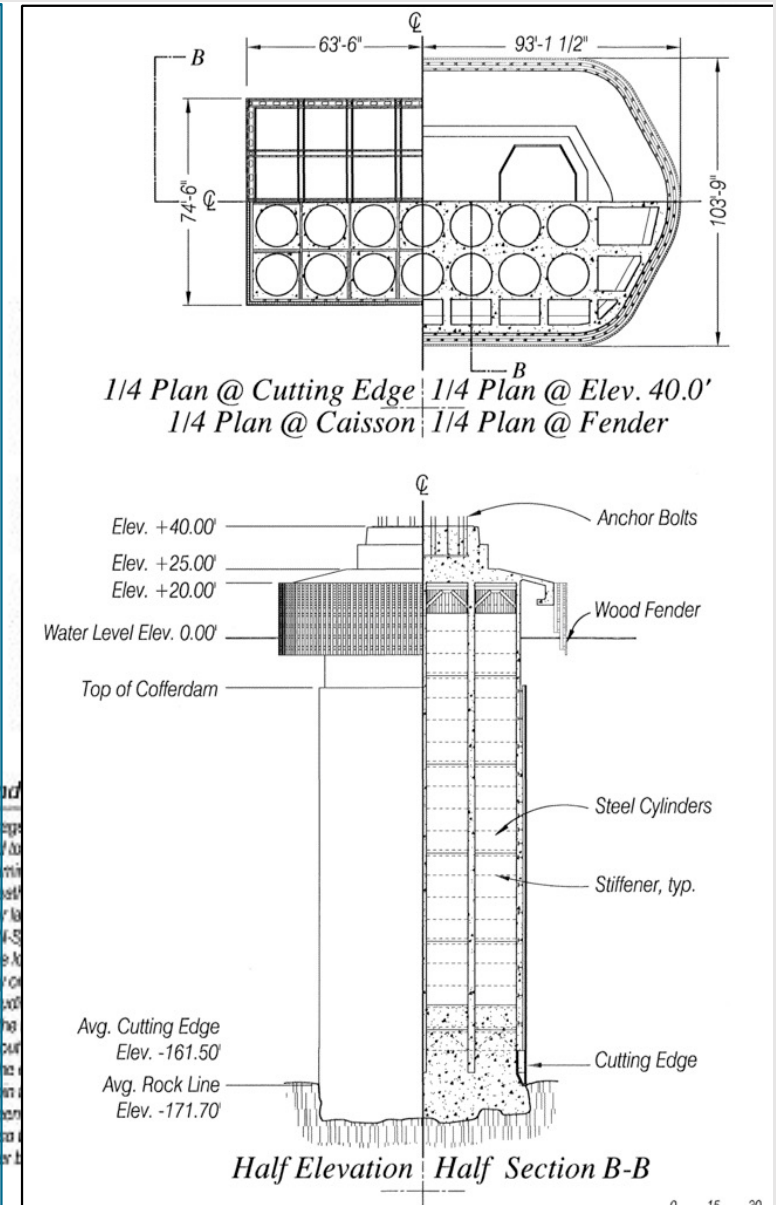
Bay Bridge West Span Fenders

- Original 1930's design
- Concrete skirt with reinforced recycled plastic lumber walers and posts
- 20' to 25' offset to tower leg
- Depth ~100' to mudline



3. The Wind

The wind anchorage and is connected to the transverse frame bracing just beneath in Area 3, transfer is allowing lateral (N-S) bracing below the A beam. A vertically or engages a longitudinal is connected to the lateral loads without pins to engage the slots allows the pin movement between slots are closed so the pins can never



2025-26 Fender Rehabilitation

- **Fender system will be rehabilitated with a bridge mounted rubber fender system** to have improved energy absorption capability compared for better protection for the bridge and vessels in an allision.
- **Rubber Fender System design** optimized to minimize the amount of force that the allision transfers to the structure and maximize the energy absorption of the system.



Incident Response

Coordination and Communication between numerous agencies

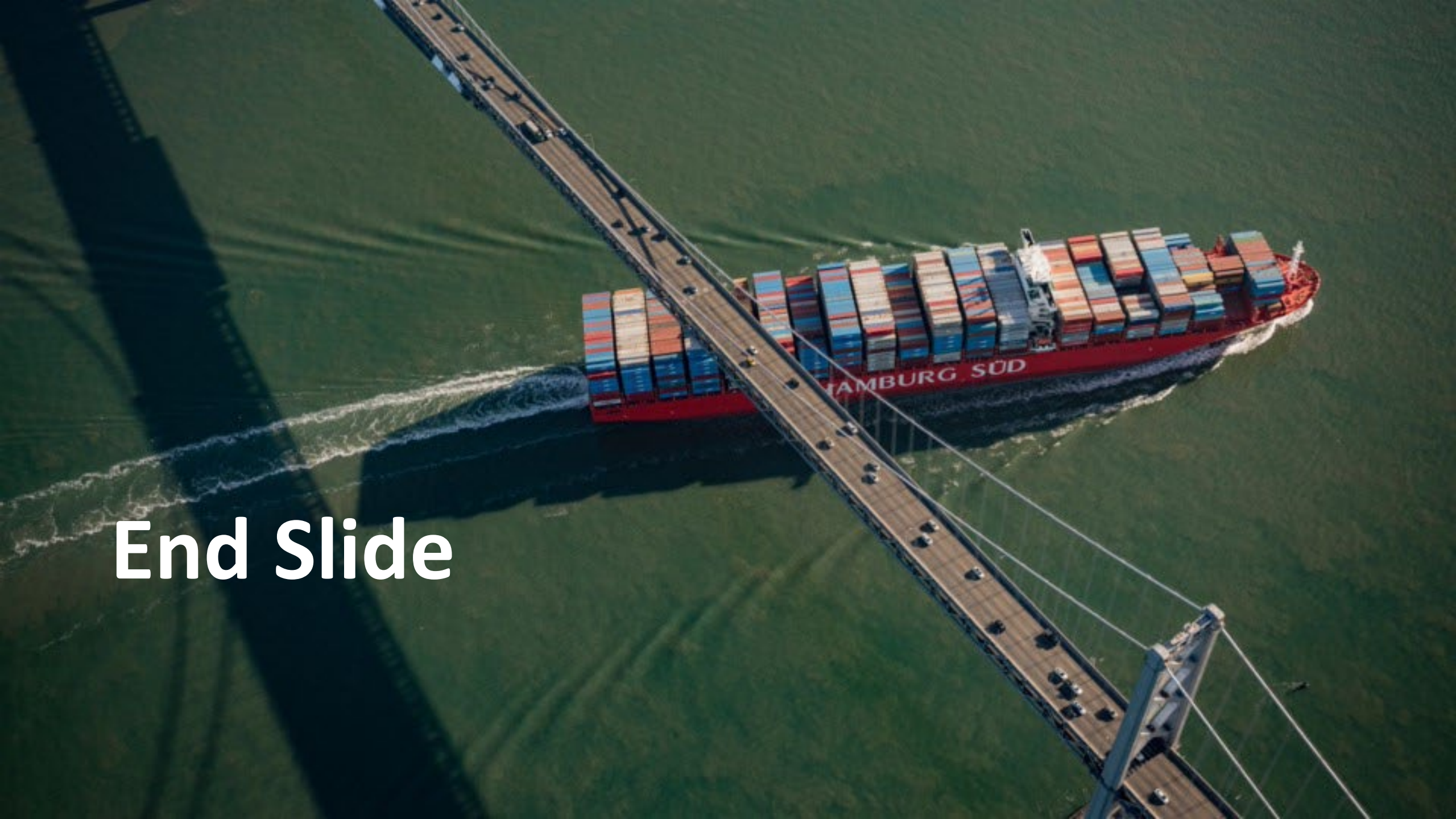
- San Francisco Bar Pilots
- United States Coast Guard
- California Highway Patrol
- Caltrans
- Others
 - California Office of Emergency Services (Cal OES)
 - US Army Corp of Engineers
- Table Tops Exercises



Maritime Risk Analysis Study



- Marine Exchange of the San Francisco Bay Region (SFMX) will lead a comprehensive maritime domain risk assessment study for the San Francisco Bay Area
- Focusing on evaluating the maritime traffic risks to bridges and similar critical infrastructure, quantifying the impact, probability of any identified risk being realized, and the risk mitigation opportunities that could be put in place.
- Employing risk analysis tools from the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA):



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