

Engineering, Operations, & Technology Committee



Center for Smart Infrastructure

Item 6c
September 11, 2023

Background - Innovation

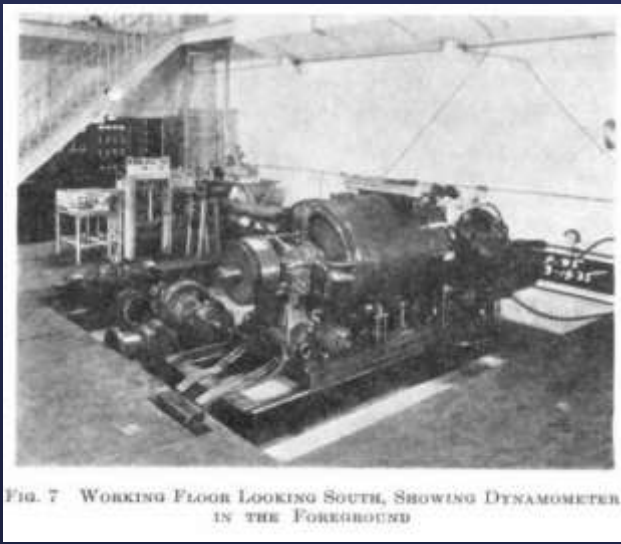


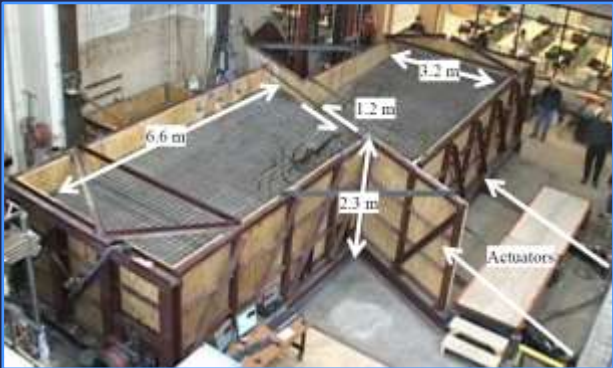
FIG. 7 WORKING FLOOR LOOKING SOUTH, SHOWING DYNAMOMETER IN THE FOREGROUND.

Metropolitan Innovation, Yesterday and Today

- MWD Engineering has a long history of innovation
 - Main pumps developed at Caltech in the 1930s
 - Pressure Control/Sleeve Valve designs in the 1970s/80s
- Currently innovating across the organization.
Just this year:
 - Instrumentation monitoring the condition of those same CRA pumps
 - Installed earthquake-resistant ductile iron (ERDIP) pipe across a fault at our Casa Loma siphon

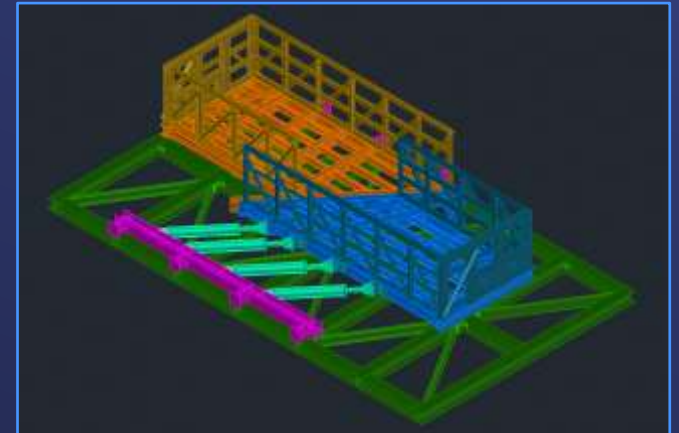
Cornell University ERDIP Pipe Development

Background - Innovation



Slip Plane Box at
Cornell University

- Seismic slip plane box allowed shaking and observing buried pipe
- Foundational data collected validated earthquake-resistant pipe design
- MWD used this data to design Casa Loma project
- Cornell lab closed a few years ago and shipped the equipment to UC Berkeley



Model of Slip Plane Box

New Opportunity - CSI

Center for Smart Infrastructure



- Located at UC Berkeley, launched in 2021, has the seismic pipe testing box
- Partnership between infrastructure owners, academia & industry to solve problems through innovation
- Mission: Develop resilient systems through state-of-the-art lab/field testing equipment, smart sensors and robotics, gig data & machine learning/multi-scale computer modeling & simulation
- Only pipe testing facility on west coast
- 100% supported by outside funding



“Owner” Collaborators

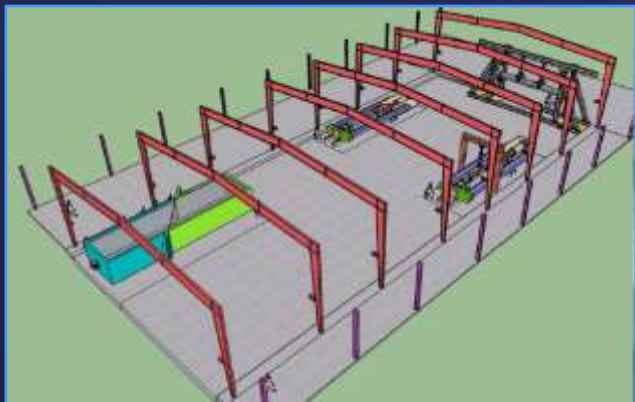
Activities – Phase 1

- Initial organizational development & staffing
- Capital improvements to facility
 - Install seismic slip plane box
 - Pipe bending equipment
 - Strong floor
 - Overhead crane
 - Other facility upgrades

Peer Funding

- EBMUD - \$1.5 M
- LADWP - \$1.5 M
- SFPUC (tentative) - \$1.0 M

CSI Startup



CSI Building Layout



Pre-Phase 1 CSI Building

MWD and Member Agency Benefits



Polymer Pipe Testing

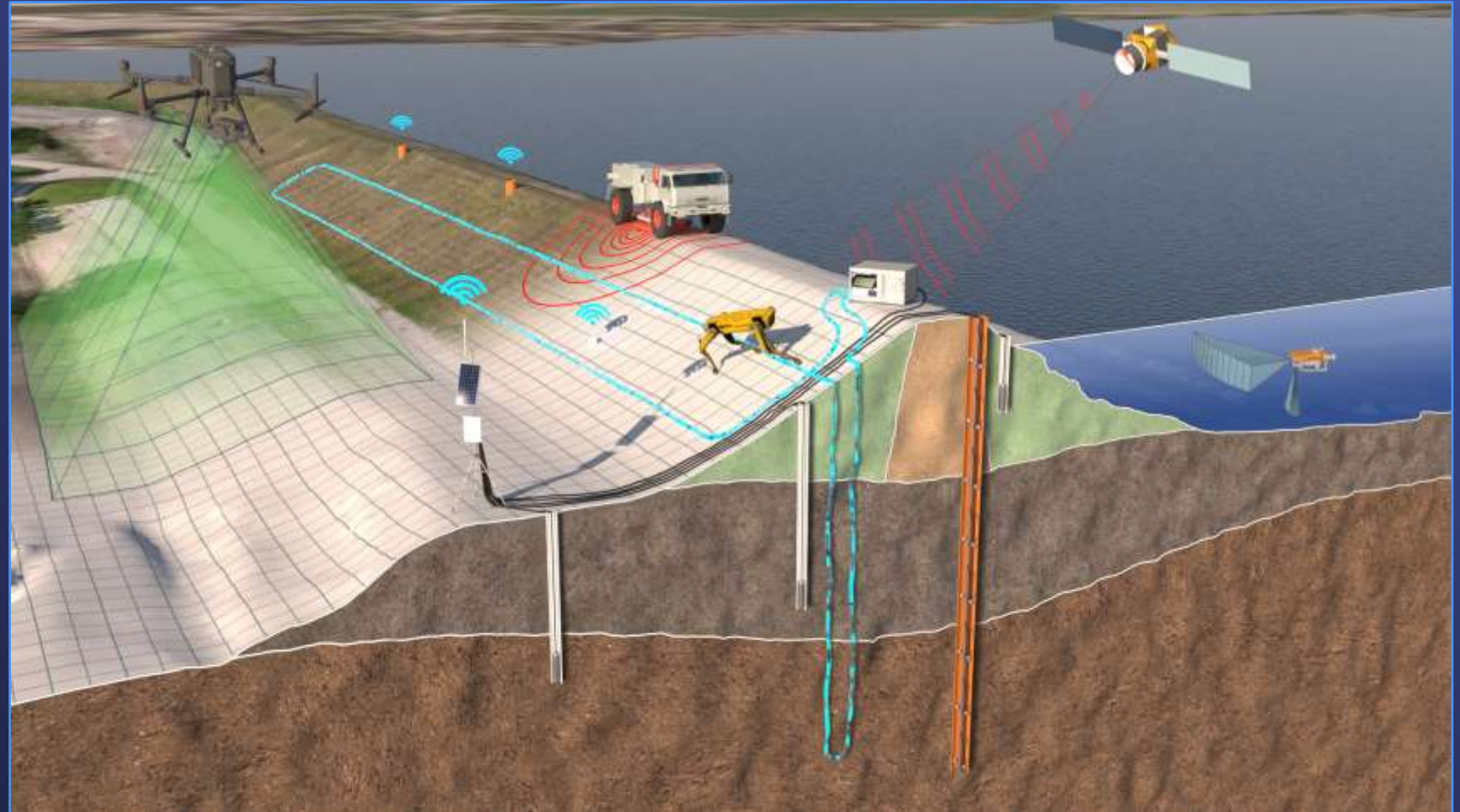
Examples of Innovation Research

- Fiber optic condition monitoring
- Pipeline performance in landslide zones
- Automatic Metering Infrastructure (AMI) testing
- Post-earthquake dam inspection criteria
- Spillway subdrain performance
- Different materials, designs, and manufacturer testing for bending, tension

Levee Condition Monitoring

Research & Innovation Projects

- Levee condition assessments using satellites, ground penetrating radar, smart sensors and drones
- Metropolitan currently piloting this tech with WaterStart in the Bay-Delta

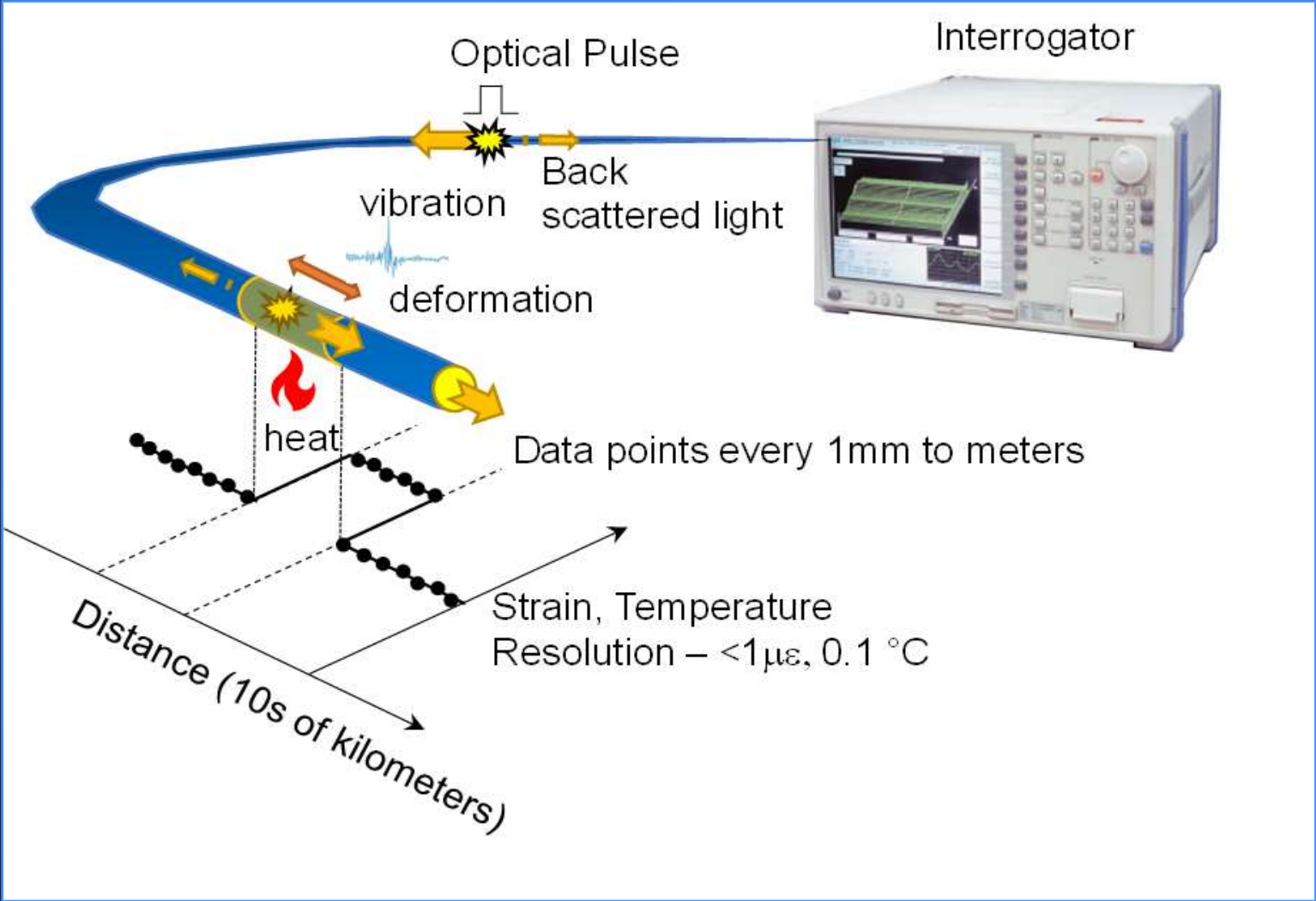


Technologies Used for Dam Assessment

Smart Infrastructure

Research & Innovation Projects

- Real-time fiber optic pipeline monitoring for water leaks, failures, wire breaks
- CSI discussed this tech at Member Agency Engineering Managers annual meeting at IEUA on June 1 this year



Fiber Optic Condition Monitoring

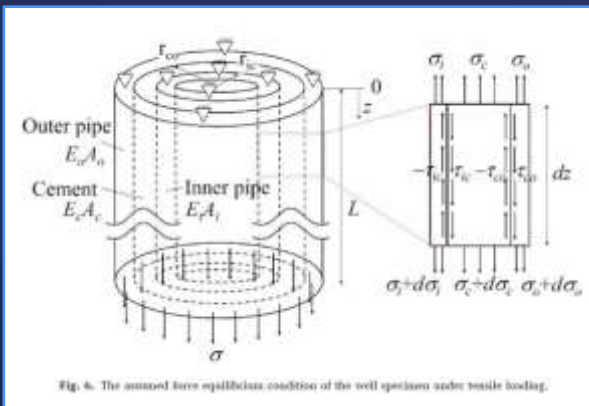
Earthquake Resistant Ductile Iron Pipe

Research & Innovation Projects

- Earthquake Resistant Ductile Iron Pipe (ERDIP) Testing
- Further development of technology



Center for Smart Infrastructure

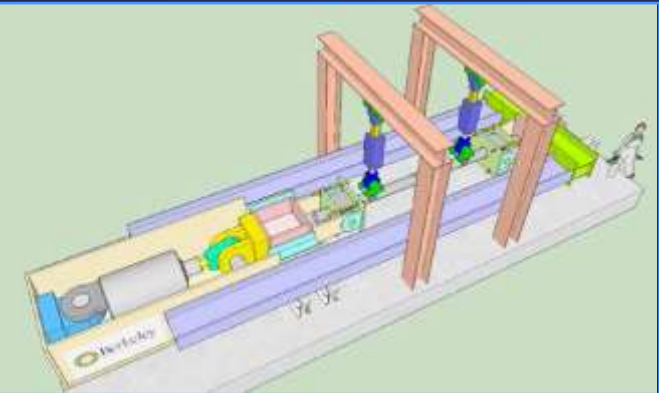


Steel-lined PCCP Pipe
in a Slide Zone

Other Ongoing and Potential Future Projects

- Testing other ERDIP designs, fabricators, and products
- Engineering working to develop test on PCCP slip-lining structure
- Analyzing MWD service area water pipeline network for post-earthquake condition/response
- Developing advanced sensors, tools and analytics to monitor asset condition over time
- Recalibrating climate change and supply impact models with the latest climate data
- Evaluating emergency response system interdependencies to mitigate cascading failures and assist with recovery plans

Center for Smart Infrastructure



Model of Bi-axial Pipe
Test Apparatus

Staff Recommendation

- Metropolitan to become a funding partner
 - \$250k/year for 4 years to fund Center startup funded through Engineering Services O&M
 - Additional agreement authority to fund specialized research to support Metropolitan or Member Agency activities
- Will return to the Board in the near future for board authorization

Future Workforce Development

Center for Smart Infrastructure

UC Berkeley
developing curriculum
specific to the water
business

Looking at
participating in their
program, and
developing partner
programs in MWD
service area



UC Berkeley Students at CSI

