

**Does Fundamental Engineering
Research Cause Timely and Adequate
Societal impact?**

Sri Sritharan

**YES. NO.
MAYBE.
I DON'T KNOW.
CAN YOU REPEAT
THE QUESTION?**

Societal Impact

- 1,510,000,000 results (0.62 seconds)
- 18,440,000,000 results (0.54 seconds)
- Purdue University
 - “...effect of research in the real world – a change or benefit beyond academia to the economy, society, culture, public policy or services, health, and the environment or quality of life.”

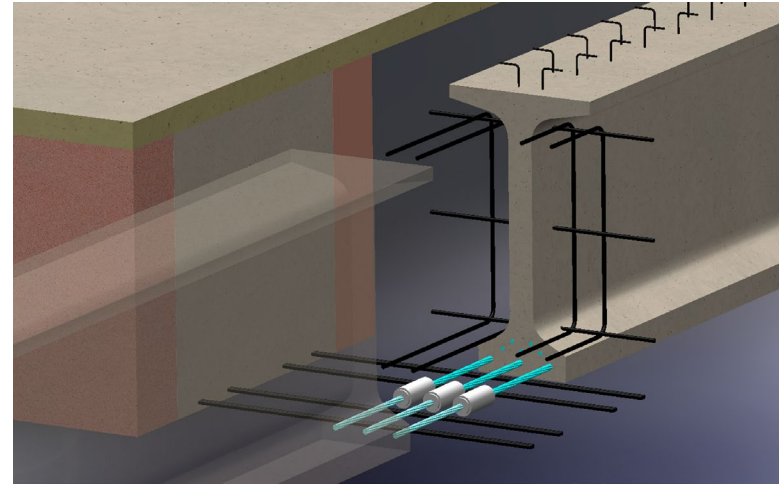
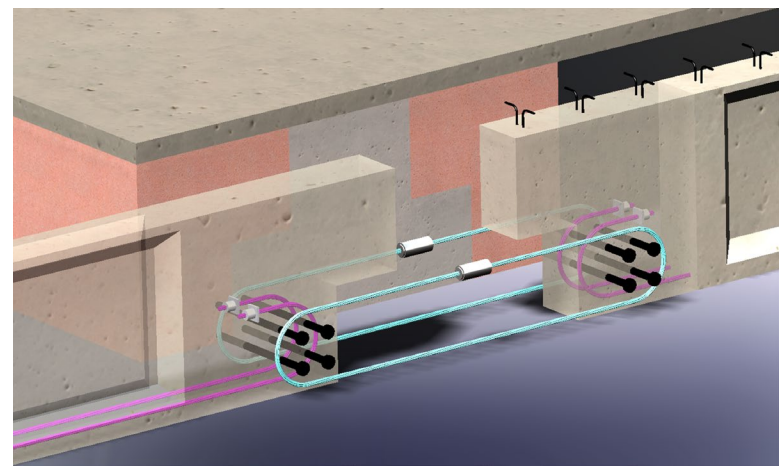
Three Examples - Precast Concrete

- ABC for Seismic Application (Caltrans)
 - Improved safety, reduced costs and environmental impact, and reduced delivery time
- PreWEC System (NSF)
 - Improved safety and increased resilience
- Tall Wind Turbine Towers (DOE)
 - Improved health, environment and economy

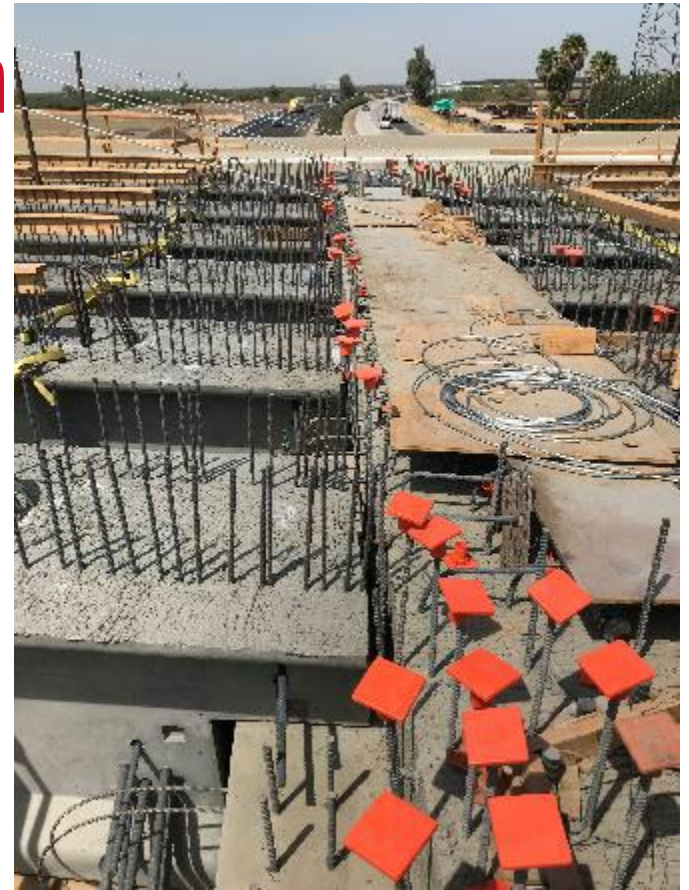
ABC for Seismic

- Positive moment connections
- Vertical acceleration effects
- Ease of construction
- Eliminate active prestressing
- Required detailed and simple analytical modeling

ABC for Seismic

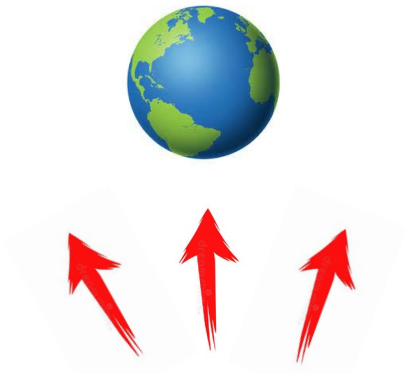
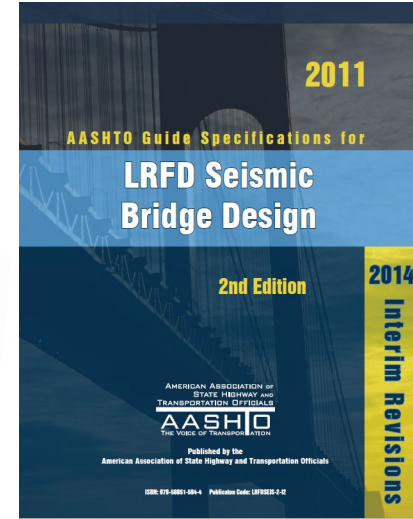
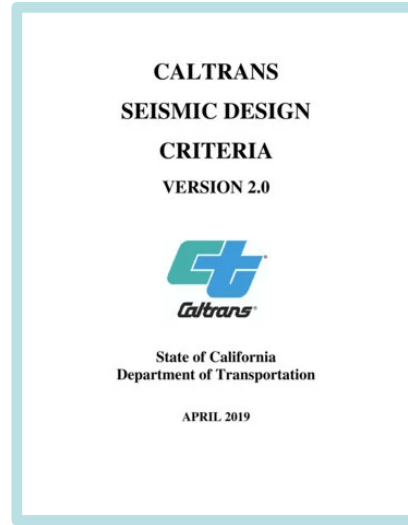


Field Implementation



Impact

- Significant
- Adopted in SDC

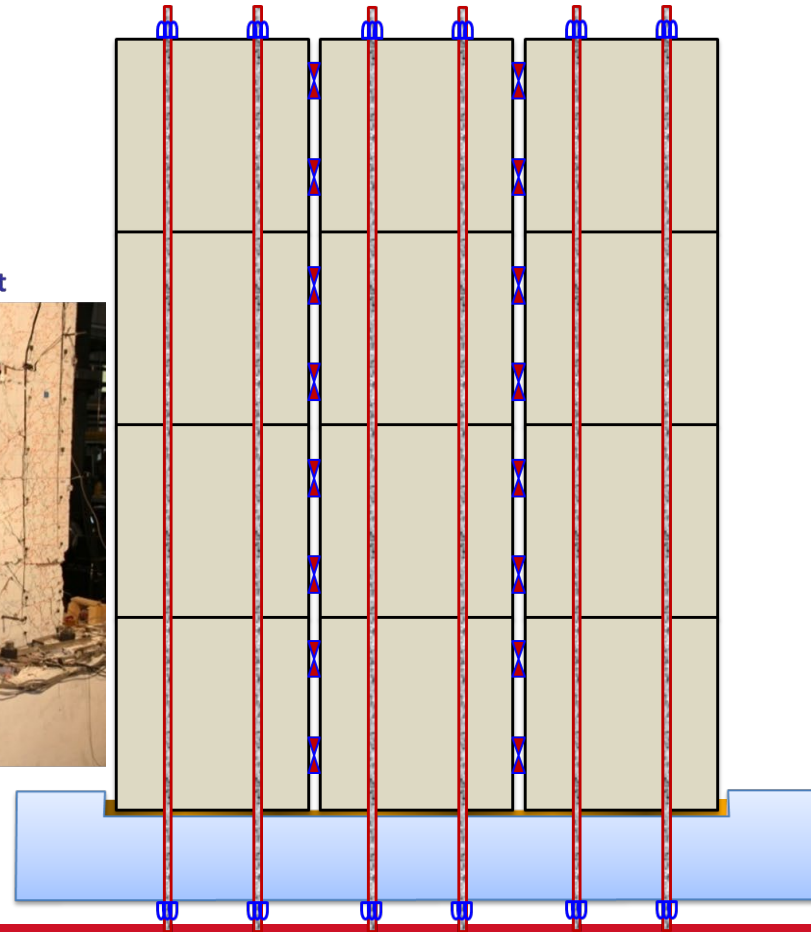


Rocking Precast Wall System

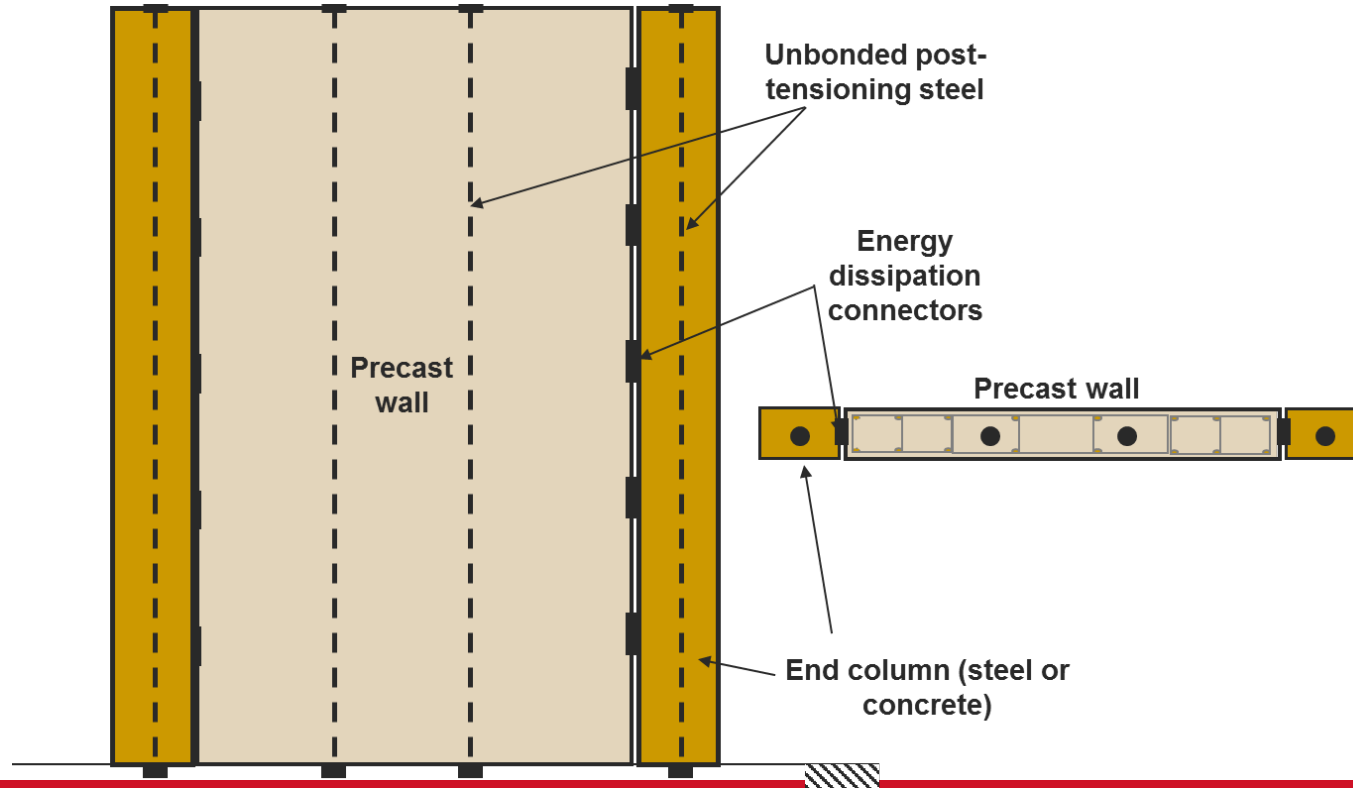
PreWEC condition at 3% drift



RWN condition at 3% drift

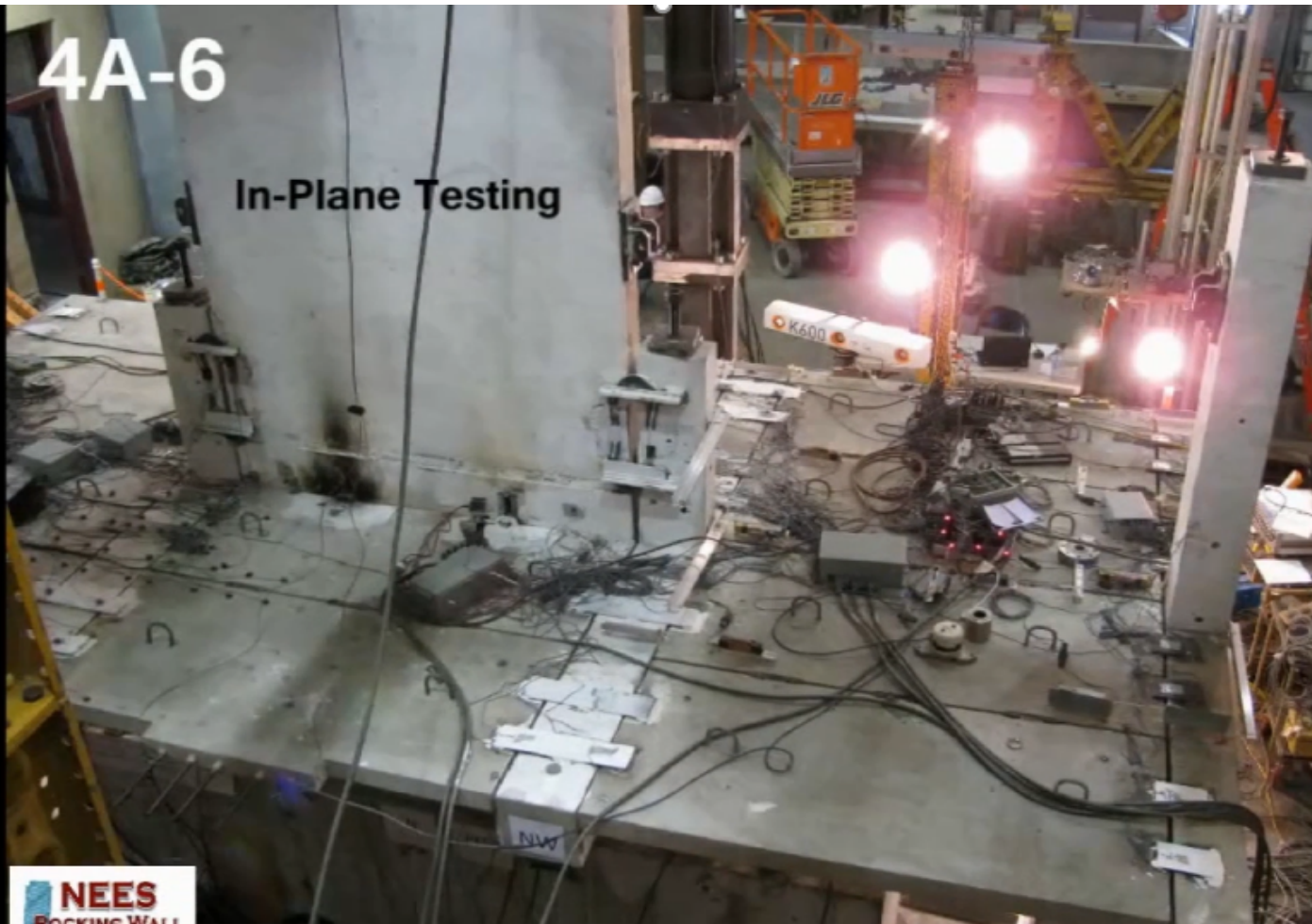


Precast Wall with End Columns



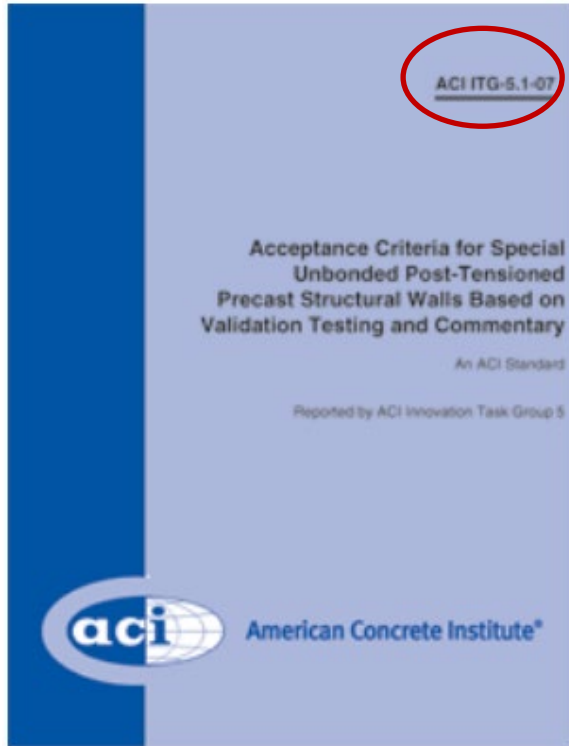
4A-6

In-Plane Testing



NEES
Rocking Wall

Codification

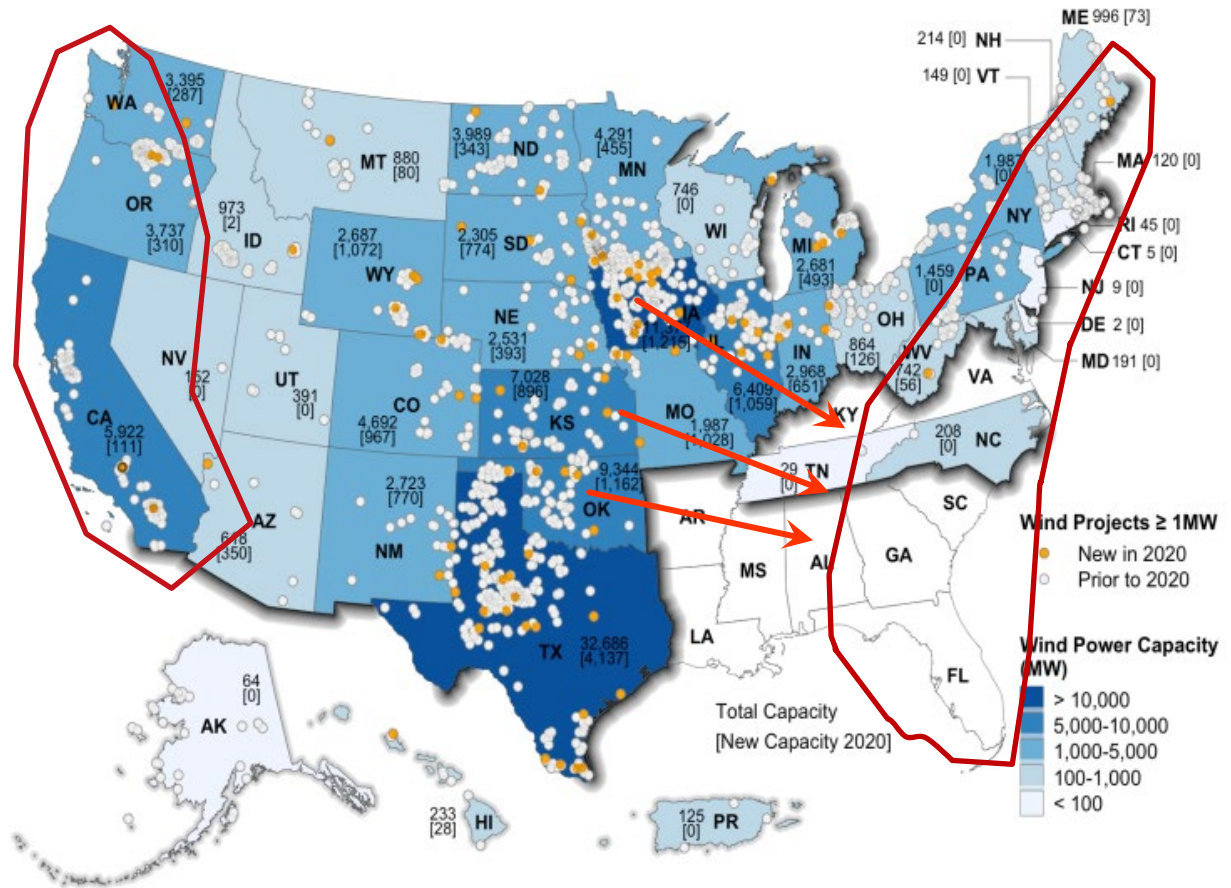


- No single PreWEC system has been implemented in the US
- Limited application of post-tensioned walls

Why?

- Owners are hesitant to use new systems
 - Bridge vs Building
- No incentives
 - Buildings are leased out
 - Building and contents are protected

Wind Power



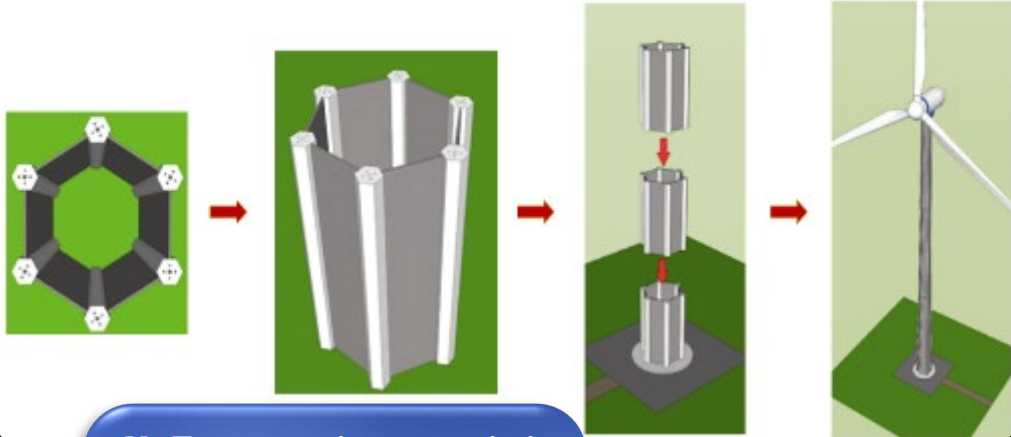
Note: Numbers within states represent MegaWatts of cumulative installed wind capacity and, in brackets, annual additions in 2020.

Tall Wind Turbine Tower Challenge

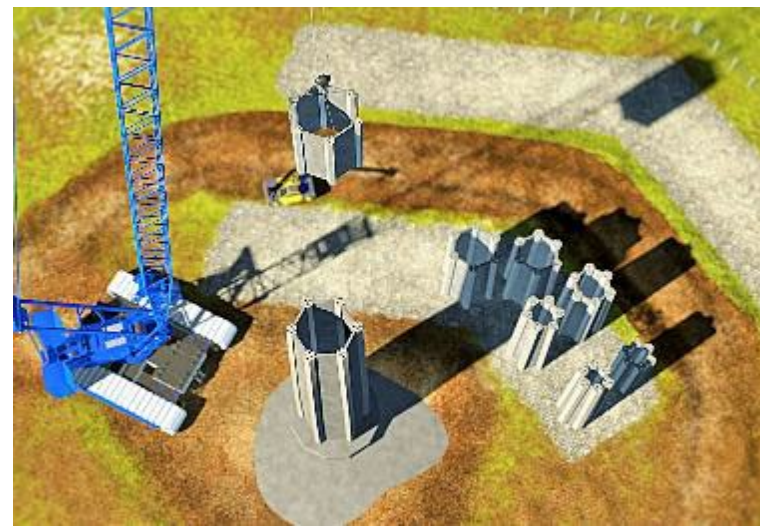


Hexcrete

Basic tower and construction concepts



No Transportation constraint!



Joint Industry Partnership



IOWA STATE
UNIVERSITY



Contract Negotiation

- LafargeHolcim
- Berger ABAM
-

Implementation Challenges

- Certification
- OEM does not want a new technology to come into the market!

Wind Power's 'Colossal Market Failure' Threatens Climate Fight

- Turbine makers reel from soaring costs, changes in subsidies
- Chinese companies could grab more of market as rivals stumble

Societal Impact



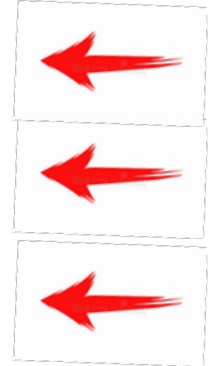
Caltrans



NSF/DOE



Funding Agencies





Basic Research

- Theoretical
- Knowledge expansion

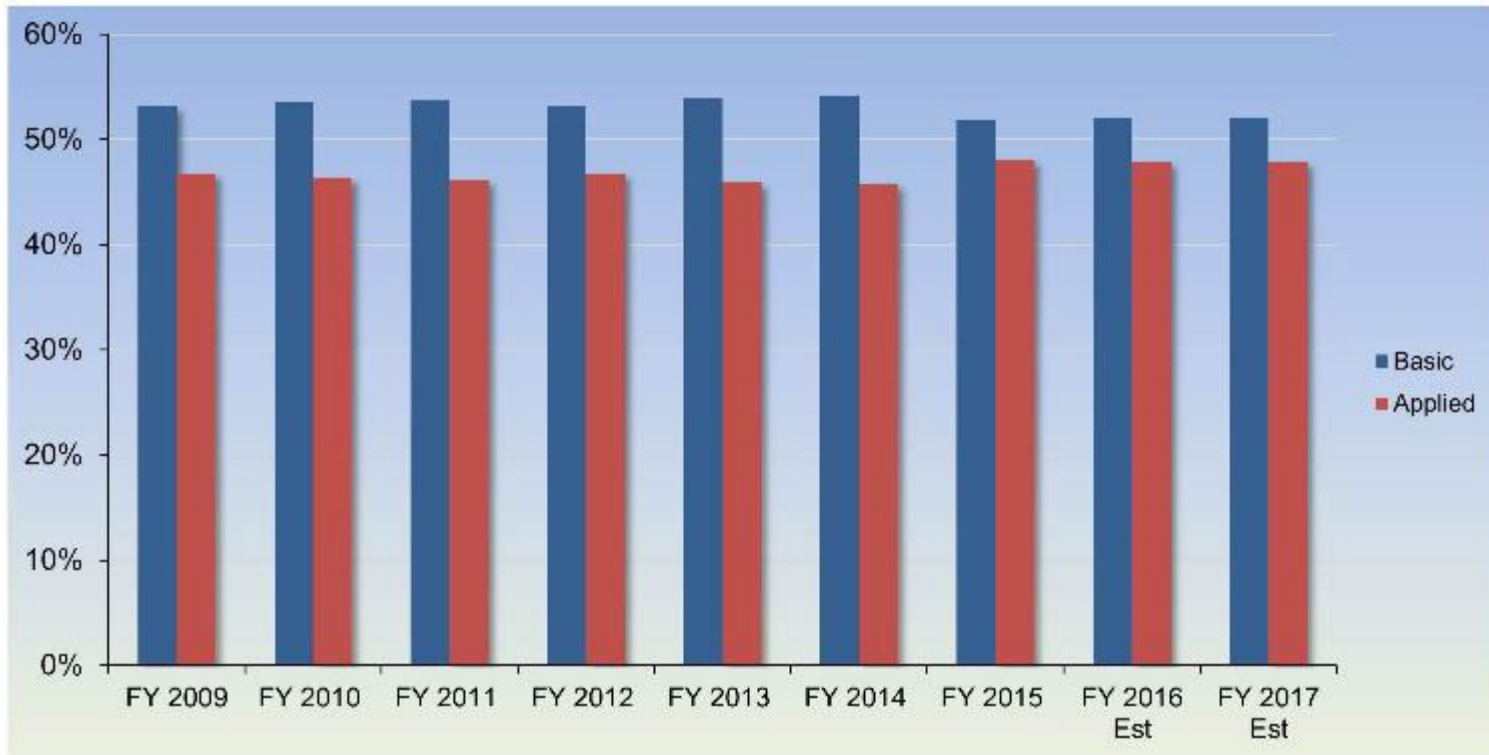
Applied Research

- Practical
- Betterment of humans

NIH/Medicine

- **Basic Research** - directed toward greater knowledge or understanding of the fundamental aspects of phenomena and of observable facts **without specific applications**.....
- **Applied Research** – Gain knowledge to determine the means by which a recognized and specific means may be met.

NIH Funding Trends



NSF

- Supports **basic research** and people to create knowledge that transforms the future.
 - Serves as a primary driver of the U.S. economy
 - Enhances the nation's security
 - Advances knowledge to sustain global leadership

Why is societal impact limited?

- Basic vs Applied Research
- Strategy/Action Plan



Cycles of Invention and Discovery

- Segregating basic research from applied research is flawed
- Discovery goes both ways – Inventions draw on scientific knowledge and scientists gain insight from applications

Narayanamurti and Odumosu

- “unsustainable and unacceptable,”
- Hasten the demise of term “basic” and “applied” research
- “The solutions to the pressing problems facing the nation are too reliant on science and engineering for us not to ensure that they proceed interactively”

A New “Horizontal” to Enhance Use-inspired and Translational Research



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