

"I think I found what's slowing us down..."

# Research Planning in a



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# Key Steps

- 1) Project vision, test purpose, impact**
- 2) Selecting your team**
- 3) Developing your schedule**
- 4) Estimating your budget**

# 1) Vision, Test Purpose, Impact

## ➤ Outline the **Project Vision**

- These tests are LARGE, COSTLY, and LARGE
- They will take immense time and resources
- By their nature, they are landmark and completely unique & support broad *visions to solve grand challenge research problems*

## ➤ Clearly define the **Tests Program Purpose**

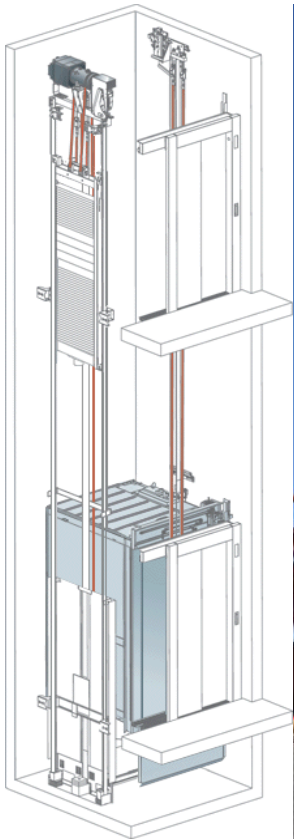
- Identify the purpose of the test program
- Focus on clarifying the mechanisms that will dominate the response; this will help you sell your vision, and know what to measure
- What are the key gaps in knowledge?
  - ✓ Past related research
  - ✓ Limitations in design codes/methods/standards of practice

## ➤ Incorporate **modeling/simulation/design standards**, for:

- Validation of existing, advancement of new, extending test scenario conditions, etc.

# Test Program Overview (NEESR-BNCS)

- Three-phased full-scale test program conducted on a 5-story building-NCS system
- **Vision (short): understand total building system seismic response**



## Summary of Major NCSs:

- ▶ Egress systems:
  - ▶ Operable Elevator
  - ▶ Stairs
- ▶ Facades:
  - ▶ Concrete cladding
  - ▶ Balloon framing
- ▶ Hospital equipment
- ▶ Roof mounted equipment
- ▶ Sprinkler and riser systems
- ▶ Ceilings
- ▶ Interior partition walls



**HVAC**



**Facades**



**Hospital Floor**





# Project Vision (verbose)

- ❑ To make breakthrough advances in the understanding of total building systems performance (structural *and* nonstructural systems) under moderate and extreme seismic conditions through full-scale testing.
- ❑ Obtain data, which are sorely needed to characterize the earthquake performance of structural and nonstructural building systems, including nonstructural systems with protective measures.
- ❑ Use this data to validate nonlinear simulation tools, which in turn can be used for higher-performance code design and performance-based seismic design of nonstructural and building systems.
- ❑ Infuse findings into seismic design guidelines and codes
  - Validate current code assumptions
  - Advance current code guidelines

# Identify your hopeful impact!

## ➤ State your impact in the context of NSF Merit Review Criteria

- Identify the transformative impacts
- Identify the broader impacts

## 2) Choose your project team

### ➤ Complex, large test programs can require input and support from large teams:

- Academics (PIs, graduate students, undergraduate students)
- Industry partners (design engineers, manufacturers, code experts)
- Staff (your home University, NHERI@UCSD, DesignSafe-CI)



15 members of the “CFS-Midrise Building” test program (Summer 2016), three PIs (UCSD, WPI), two grad students, eight industry partners (four companies), two staff

# Project leaders

- **Researcher(s) on-site = project leaders**
- **Manage project resources to achieve deliverable (timeline)**
  - Supplies, contractors, equipment
  - Work closely with NHERI staff
- **Before coming to UCSD**
  - Scheduling
  - CAD drawings (construction, instrumentation)
  - Pre-test analysis
    - ✓ Motion selection
    - ✓ Instrumentation layout
  - Prepare mathcad/matlab sheets
- **At UCSD**
  - Instrumentation, cameras
  - Tooling, labeling, oversight/participate in construction





# Industry Partners (BNCS)



### 3) Develop your schedule (major items)

#### ➤ @Proposal level

- *Test planning*
  - ✓ Construction drawings, pre-test modeling, instrumentation planning, material & construction procurement
- *On-site test efforts*
  - ✓ Construction: duration varies significantly based on test scope (BNCS > 1yr, CFS ~ 5 weeks)
  - ✓ Instrumentation: can vary, 2-4 weeks is common, some can occur during construction
  - ✓ Test Execution: can vary, 2-4 weeks is common, but depends on how many motions, how much in between (different phases/model configurations, retrofit/repair, inspection down-time, etc)
  - ✓ Demolition: don't forget this in your schedule & budget! Can take 2-4 weeks depending on the complexity of specimen!
- *Post-test data processing*
- *Post-test modeling*
- *Technology transfer – outcomes of your research project*

### 3) Develop your schedule (on-site efforts)

#### ➤ @Start of project

- Notification of award, rough planning (approximate YrQrt)
- Prior year (narrow in on the quarter)
- ~3 months before (*when is highly dependent on complexity*)
  - ✓ Specimen drawings
  - ✓ Test protocol
  - ✓ Motion selection, iteration (bare table)
  - ✓ Instrumentation plans
- Present to NHERI staff (*when is highly dependent on complexity*)
  - ✓ Solicit input on planning
  - ✓ Assure safety protocols are in place
  - ✓ Discuss ideas regarding motions, instrumentation, maximizing test outcomes

# Schedule e.g. (on-site efforts, CFS)

- **Start of construction: (layout, tie-downs); major construction items [4-5weeks]:**
  - Structural framing erector (4/18-4/28); mass installation with floors
  - Doors (framing, finish) (5/8-5/13)
  - Interior work (sheetrock, mud/tape) (5/2-5/13)
- **Instrumentation (5/9-5/27) [3weeks]**
- **Seismic tests (hopeful...5/30-6/3) [1week]**
- **Remove seismic sensors (6/6-6/10) [1week]**
- **Fire tests (6/13-7/1) [2weeks]**
- **[11-12 weeks total on-site]**





# Schedule e.g. (on-site efforts, superstructure construction, BNCS)



ROOF SLAB:  
September 21<sup>st</sup>, 2011

FIFTH FLOOR SLAB:  
September 6<sup>th</sup>, 2011

FOURTH FLOOR SLAB:  
August 19<sup>th</sup>, 2011

THIRD FLOOR SLAB:  
August 3<sup>rd</sup>, 2011

SECOND FLOOR SLAB:  
July 15<sup>th</sup>, 2011

FOUNDATION:  
June 27<sup>th</sup>, 2011



# Research Activities (during construction)

- **During construction, research team needed to multi-task**
  - Conduct pre-test simulations (guide motion selection, instrumentation layout)
  - Watch, document, & take part in (as feasible) construction
  - Create instrumentation drawings
  - Watch, document, & take part in (as feasible) construction
    - ✓ We created a weekly construction log documenting all key construction activities digitally & disseminating them during a weekly team meeting

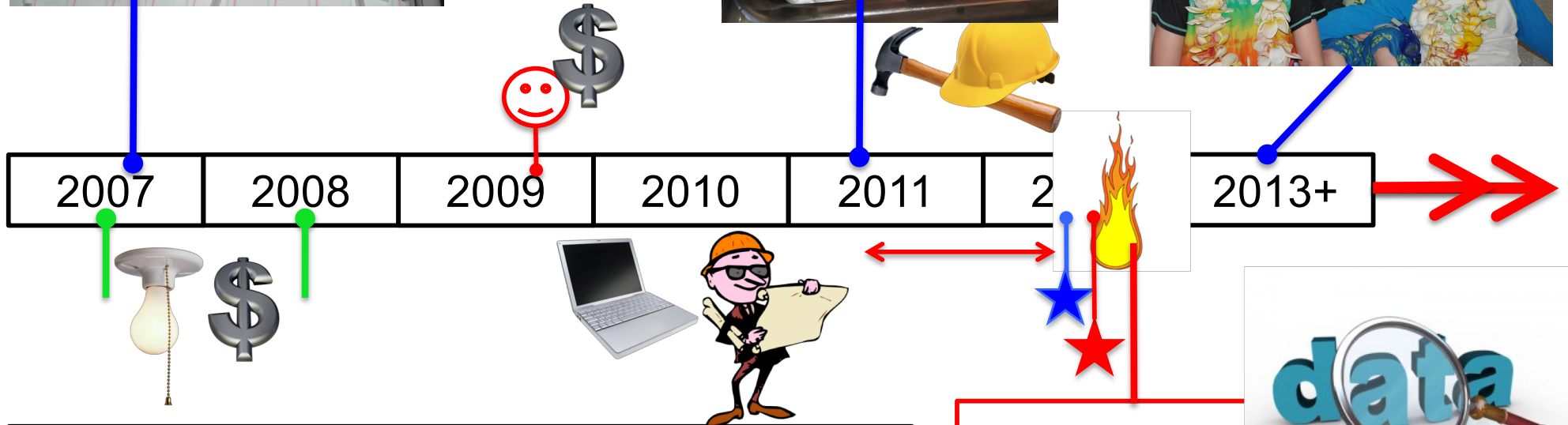











chedule

Temus: March 31, 2011



-  **Pre-proposal workshop**
-  **NEESR Funding & Kick-off meeting**
-  **Construction (~9m)**
-  **Seismic Testing Phases (~1m)**
-  **Live Fire Testing (~0.5m)**



## 4) Estimating your budget (*Big Picture*)

### ➤ **Research staff (PI, students)**

- Carrying out tests, modeling, project, etc.
- How many and for how long (designate PI/students to major items)

### ➤ **Tests**

- Physical test costs
- Can vary dramatically, some ideas next slide....

### ➤ **Travel, workshops**

- Supporting your research planning and dissemination
- How much, how many, purpose, etc.

***Overall budget heavily linked to duration, scope of tests, and additional support (outside of NSF resources)***



## 4) Estimating your budget (*Physical Test Costs*)

- **Site will support operations during construction and de-erection**
  - Guidance on test planning
  - Over-sight of construction and de-erection
- **Site will not support construction and de-erection costs – you will need a separate budget for these costs**
  - Select several contractors, request estimates; understand their heavy equipment needs (during construction they will need to either rent the sites equipment or obtain rental outside of site)
  - Useful list of UCSD-vendor contractors (used in the past with success by various research teams): <https://ucsd.designsafe-ci.org/resources/>
- **Site will provide and support placement of all major sensors**
  - Analog sensors, camera system – check our inventory against your needs, if there are specialty sensors you will need to budget for them
- **Site will not support cost of expendables associated with sensors – you will need a separate budget for these costs**
  - Strain gages, cabling, labels, unique support brackets for sensors or cameras, damaged sensors and cables (include SOME allowance)

## 4) Budget: Expect the Unexpected!





# Testing Scope & Project Resources (BNCS)

## ➤ Three Test Phases

1. Base isolated building-nonstructural system
2. Fixed base building-nonstructural system
3. Controlled live fire tests

## ➤ ~5M US\$, multi-organizational 4 year project (2010-2014)

- NSF-NEES core research project - \$1.2M
- Englekirk Advisory Board - \$1.5M (est)
- Charles Pankow Foundation - \$250k
- California Seismic Safety Commission (hospitals) - \$360k
- Industry consortium - remainder \$ resources, materials, equipment, technical expertise, etc.



# Last Remarks

- **NHERI@UC San Diego staff and PI/Co-PIs/SP are available resources to help with your proposal planning and project execution**
- **We recommend discussions during proposal preparation to help develop scope & budget**
- **All conversations are kept confidential**
  - We want to help you succeed!
  - The actual level of early interactions during project planning with NHERI@UC San Diego is up to you - but again, we want you to succeed!

*Thank you for coming!*