



NHERI 
Natural Hazards Engineering Research Infrastructure

NHERI Technology Transfer Committee



Summer Institute 2024

Kelly Cobeen, PE, SE, Wiss Janney Elstner Associates
Joseph Cibor, PE, DGE, Cibor Geoconsultants
Chris Rojahn, Director Emeritus, Applied Technology Council


1


Technology Transfer Outline

- Part 1 - Introduction
 - Objectives of Technology Transfer (TT)
 - Committee Introduction
 - TT Success Story
- Part 2 – How TT Works
 - TT Mechanisms
 - TT Resources Available
- Part 3 – Next Steps
 - Consultation
- Part 4 – Response to Questions

2



NHERI 
Natural Hazards Engineering Research Infrastructure

Part 1 - Introduction

3

Technology Transfer Objectives

NHERI research explores and tests ground-breaking concepts to protect homes, businesses and infrastructure lifelines from the impacts of earthquakes, windstorms, and water hazards such as tsunami and storm surge.

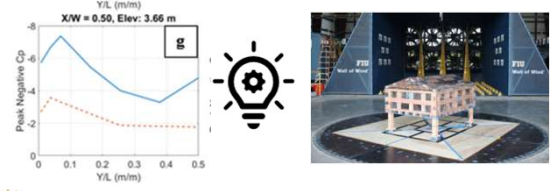




Figure Credits: Kim et al., Engineering Structures, Elsevier, 2020

4

Technology Transfer Objectives

Implementation relies on adoption of research results by end-users and provides benefit to stakeholders through many mechanisms including technical guidelines, building codes and standards, and community outreach and education.



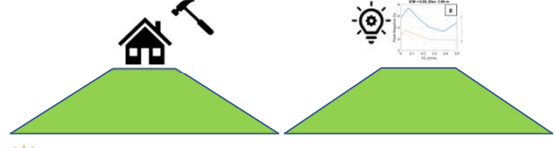




5

Technology Transfer Objectives

There can be significant gaps between the results of research and implementation

- Designers not aware of research
- Researchers not aware of implementation potential and process

6

Technology Transfer Objectives

Attention to technology transfer can provide quicker and more effective implementation

- The Technology Transfer Committee aims to help close the gap by proactively providing connections with collaborators, implementors and champions early in the project.

7

Technology Transfer Objectives

Limitations Because of the fundamental research objectives of NHRI, it is recognized that the results of research projects will not always be able to be implemented in the near term

Regardless, envisioning stakeholders, end-users and technology transfer mechanisms can have a positive impact on future implementation

8

The Technology Transfer Committee

We are practicing professionals who are interested and actively involved in:

- Development of building codes, standards, and guideline documents,
- Improvement of the built environment for resistance against damage due to natural hazards,
- Communication of new technology and research findings to the engineering profession, and
- Outreach to communities regarding proposed infrastructure projects and enhancements

9

TTC Membership

Member	Earthquake			Wind			Tsunami/Surge			Geotech			Social Science		
	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
David Bonowitz	✓	✓													
Seth Thomas															
Joe Cibor															
Kelly Cobeen	✓	✓													
Shane Crawford (User Forum)															
Cherylyn Henry															
Yazen Khasawneh															
Jim Harris	✓	✓													
Bill Holmes (Chair)	✓														
Graham Brasic															
Phil Line															
Jim Malley (User Forum)															
Bonnie Manley															
Insung Kim															
Dee Dee Bennett															
Chris Rojahn															
Mike Valley															
Holly Davies															
Gymnah Kasali															

10

What We Do

- Engage with you when you contact us
- Help you make connections that benefit your research and facilitate technology transfer
- In addition: Work is underway on searchable NHRI database tool to help spur access to natural hazards engineering research results by a broader group of potential implementors

What We Do Not Do

- Direct or run technology transfer activities

11

Technology Transfer Success Story

Wind Pressures on Underside of Elevated Buildings

Figure Credit: FEMA P-55 Coastal Construction Manual

12

Technology Transfer Success Story

Field Work:

- NSF Award CMMI-1903486
- P.I. Elaina Sutley, Thang Dao
- Collected field data on performance of elevated homes, both site-built and manufactured, following Hurricane Michael in 2018



Figure Credit: Kim et al., Engineering Structures, Elsevier, 2020




13

Technology Transfer Success Story

Laboratory Work:

- Funded by State of Florida Department of Emergency Services
- P.I. Arindam Chowdhury
- Wind tunnel testing of elevated structures to identify wind pressures






Figure Credit: Kim et al., Engineering Structures, Elsevier, 2020

14

Technology Transfer Success Story

Equipment Site:

- NHRI Wall of Wind Experimental Facility
- Supported by NSF Award 1520853

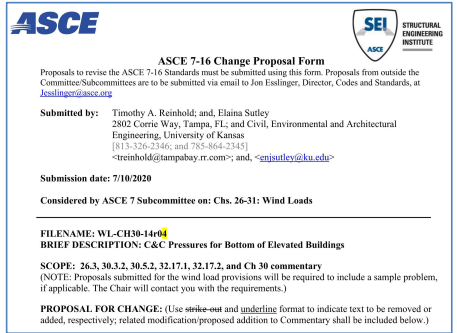


Figure Credit: NSF.gov





15

Technology Transfer Success Story



FILENAME: WL-CH30-14-04
BRIEF DESCRIPTION: C&C Pressures for Bottom of Elevated Buildings
SCOPE: 26.3, 30.3.2, 30.5.2, 32.17.1, 32.17.2, and Ch. 30 commentary
(NOTE: Proposals submitted for the wind load provisions will be required to include a sample problem, if applicable. The Chair will contact you with the requirements.)
PROPOSAL FOR CHANGE: (Use strike-out and underline format to indicate text to be removed or added, respectively; related modification/proposal addition to Commentary shall be included below.)

NHRI NCO Network Coordination Office




16

Technology Transfer Success Story

New Provisions in ASCE 7-22:



30.3.2.1 Bottom Horizontal Surface of Elevated Buildings.

Design wind pressures for C&C elements on the bottom flat horizontal surface of elevated buildings shall be determined using the roof pressure coefficients from Figure 30.3-2A with the following modifications:

1. h_b shall be the height above grade of the bottom surface of the elevated building, as depicted in Figure 30.3-1A. The value of h shall equal h_b for determining zone dimensions from Figure 30.3-2A. For elevated buildings with a flat bottom horizontal building surface and situated on a slope, h_b shall be taken as the maximum height between the slope and the bottom of the elevated building.
2. Areas of the horizontal surface above partially enclosed spaces and areas extending a_p perpendicular to walls beneath the elevated building with plan dimension greater than 4 ft (1.2 m), as shown in the shaded regions in Figure 30.3-1A, shall be designed to resist positive pressures equal to the Zone 4 wall pressures obtained using Figure 30.3-1. The value of a_p shall equal $0.4h_b$ or the width of the wall, whichever is smaller for determining zone dimensions from Figure 30.3-1A.

<https://www.designsafe-ci.org/community/news/2022/april/moving-natural-hazard-research-practice-success-story/>

NHRI NCO Network Coordination Office

17

Technology Transfer Success Story

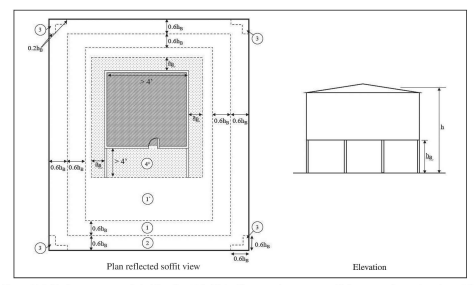





Figure 30.3-1A. Components and cladding ($h \geq 60$ ft (18.3 m)): external pressure coefficient zones for enclosed, partially enclosed, and partially open elevated buildings with partially enclosed spaces and areas beneath the elevated building—bottom horizontal surface of elevated buildings.

NHRI NCO Network Coordination Office

18




NHERI
Natural Hazards Engineering Research Infrastructure

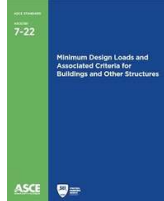
Part 2 – How Technology Transfer Works

19


Technology Transfer Mechanisms



Design Codes
(Family of Codes from ICC), AASHTO

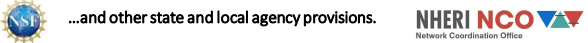


Design Criteria Standards (ASCE 7, ASCE 41)



Material Design Standards (AISC, ACI, AWC, ASTM)

...and other state and local agency provisions.



20

Technology Transfer Mechanisms



FEMA





NIST
National Institute of Standards and Technology
U.S. Department of Commerce


Organizations Involved in Technology Transfer






21

Technology Transfer Mechanisms



Seismic Performance Assessment of Buildings

Performance-Based Design


ATC-58 series, FEMA P-58 Seismic Performance Assessment of Buildings, Methodology and Implementation (FEMA, 2018)

- Translation of the PEER performance-based earthquake engineering (PBEE) framework into an engineering computational methodology
- More than 100 background documents translating experimental testing into fragility functions used as a basis of the methodology
- Adoption of environmental impact research from the University of Washington (UW) and the Carbon Leadership Forum (Simonen) on calculation of carbon impacts associated with earthquake damage.

Functional Recovery

ATC-138 series, Seismic Performance Assessment of Buildings, Functional Recovery Methodology (ATC, 2023)

- Adoption of research on computation of functional recovery time, performed at CU Boulder (Liel and Cook) and Texas A&M (Koliou), and expansion of the FEMA P-58 methodology to assess functional recovery time along with other measures (casualties, repair costs, repair time, carbon emissions).



22

Technology Transfer Mechanisms

- Mechanisms for geotechnical research results
- Mechanisms for software research results
- More...







23

What Can the Technology Transfer Committee Do For You?



- Talk with you!
- Understand your research
- Brainstorm implementation routes that might be applicable to your work and
- Help you make connections,
- While writing proposals, during research work or after completion of research work
- Email us to request a consult:
ttc-inquiry@designsafe-ci.org




24


What Might Technology Transfer Bring to Your Proposal and Work?

- Identify research needs statements that **support and prioritize** your research proposal
- Help you **envision paths to implementation** for your research – Who are the end-users? Who are the stakeholders? What guidance are they currently following? How might they become aware of results of your work? What input can they provide into your research?
- Identify industry advisors to be **contributors** of technical knowledge and recommendations through the course of your work, and that can become **champions** helping to implement your work
- Identify organizations and committees that might play a role in advancing results of your research into practice

25

Technology Transfer Resources: On The NHRI Website



<https://www.designsafe-ci.org/community/ttc/>




26

Technology Transfer Resources: The Flier




GUIDANCE FOR EARLY CAREER RESEARCHERS

Move Your Research Results Into Practice

Are you a researcher itching to develop and implement the means, methods and policies for reducing the adverse effects of natural hazards?

Will your research results have a novel practical application in engineering design or analysis?

Are you so excited about your potential research results that you are driven to inform others who could benefit?

If your answers are YES, consider connecting with NHRI's TECHNOLOGY TRANSFER COMMITTEE



REQUEST A CONSULTATION

Researchers can **request a consultation** with the TECHNOLOGY TRANSFER COMMITTEE at [ttc-inquiry@designsafe-ci.org](#)

The TECHNOLOGY TRANSFER COMMITTEE is a volunteer group of 20 individuals, mostly engineers, experienced in design, and the complexities of technology transfer.




27

Technology Transfer Resources: Mechanisms for Implementation Paper



MECHANISMS FOR IMPLEMENTATION OF NHRI RESEARCH RESULTS

NHRI Technology Transfer Committee
April 2020


The NHRI TTC is a volunteer group of about 20 individuals, mostly engineers, experienced in design and the various aspects of technology transfer. The TTC reviews research funded by NSF in the NHRI program to encourage and facilitate results that are implementable. In addition, the committee is a resource for researchers interested in implementation, either in preparation of proposals, during the research, or after the research is complete. The TTC can be contacted through the [NHRI website](#).

INTRODUCTION

The Network Coordination Office (NCO) of the Natural Hazards Engineering Research Infrastructure (NHRI) program created the Technology Transfer Committee (TTC) to encourage and facilitate implementation of NHRI research results. Funded by the National Science





28



NHRI

Natural Hazards Engineering Research Infrastructure





Part 3 – Next Steps

29

What to Expect When You Contact Us:

- We will want to understand what hazard(s) your work is addressing
- We will try to identify:
 - Implementation mechanisms already included in your work
 - Additional implementation routes that might be applicable to your work
 - Organizations, committees, or individuals that might provide input on technology transfer for your work

ttc-inquiry@designsafe-ci.org





30



What to Expect When You Contact Us:

- For some projects appropriate implementation mechanisms are clear at the beginning of the research work,
- For other projects, the implementation mechanisms will become clearer during or at the end of the research.
- Consultation is available at any stage during or after completion of the research work.

ttc-inquiry@designsafe-ci.org




31



NHERI
Natural Hazards Engineering Research Infrastructure

Part 4 – Response to Questions

32



National Science Foundation

The NHERI Network Coordination Office is supported by the National Science Foundation award [CMMI-2132782](#). Any statements in this material are those of the presenter(s) and do not necessarily reflect the views of the National Science Foundation.

33