Construction Safety Research Center (CSRC)

November 10, 2022

Lawrence Technological University

Agenda

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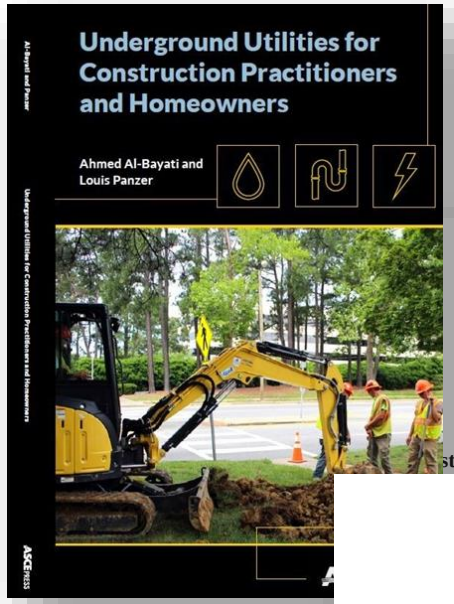
Our team is…

GROWING

Center Director, Ahmed Al-Bayati, PhD, PE

- Assistant Professor, Civil and Architectural Engineering, Lawrence Technological University
- Assistant Professor, Kimmel School of Construction, Western Carolina University
- Doctor of Philosophy (Ph.D.), Construction Engineering, Western Michigan University
- Master of Science (M.S.), Construction Management, East Carolina University



Minimizing Underground Infrastructure Damages: Utility Locators' Perspectives

Ahmed Al-Bayati, Ph.D., P.E., M.ASCE1; Louis Panzer2; and Khalid Kaddoura, Ph.D.3

1Assistant Professor, Dept. of Civil and Architectural Engineering, Lawrence

Satisfying the Need for Diversity Training for Hispanic Construction Workers and Their Supervisors at US Construction Workplaces: A Case Study

Ahmed Jalil Al-Bayati, Ph.D., M.ASCE

Abstract: The representation of the Hispanic construction workforce has substantially

Construction Safety Culture and Climate: Necessity for an Industry Framework

Ahmed Jalil Al-Bayati, Ph.D.,
and George

Abstract: Much of the construction liter
climate ignores the unique characteristics

ASCE AMERICAN SOCIETY OF CIVIL ENGINEERS

OSHA Authorized Outreach Trainer

THE CITY OF Kalamazoo

National Institute for Occupational Safety and Health NIOSH

DBIA ASSOCIATE DESIGN-BUILD PROFESSIONAL™

CDC

CSRC Structure

Dr. Elin Jensen
Department Support

Dr. Liping Liu
College Support

Ross Sanders
Business Outreach

Gabrielle VanAmberg
Website Management

Lyubov Kagan
Budget Management

Matthew Roush
Marketing and PR

Dr. Ahmed Al-Bayati, PE
CSRC Founder & Director

LTU Support Body

2022-2023 CSRC Members

Bouma Corporation
Barton Malow
Carhartt
CAB Engineering
DTE Energy
Frank Rewold & Sons
MISS DIG 811
City of Southfield
City of Kalamazoo

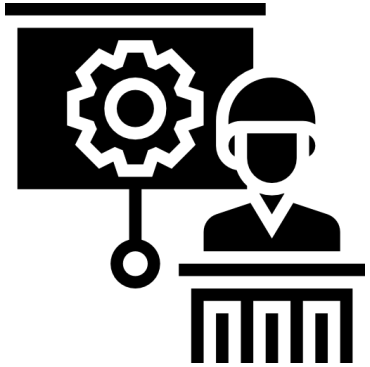
CSRC Mission

To lead the way in reducing work-related fatalities and injuries by providing construction firms with innovative safety practices derived from groundbreaking research

CSRC Goals

CONDUCT SAFETY RESEARCH

TRANSFORM RESEARCH TO BEST PRACTICES



CONVERT BEST PRACTICES INTO TRAINING MATERIAL

First Year in Review

CSRC Research

Why is PPE non-compliance a widespread issue among construction workers?

PPE Compliance Importance

The absence of and inappropriate use of PPE, PPE non-compliance, are major causes of fatal and non-fatal injuries at construction workplaces

- Kang et al. (2017) found that 70% of all fall incidents involved a lack of PPE
- Similarly, Al-Bayati and York (2019) found that 85% of examined fatal fall incidents among Hispanic workers in the United States were associated with not using required PPE
- Construction workers who do not use PPE are 3 times more likely to be injured than those who do

OSHA's Construction Top 10 Violations

October 2021 - September 2022

1. Duty to have fall protection (PPE)
2. Ladders
3. General requirements
4. Training requirements (Related)
5. Eye and face protection (PPE)
6. Head protection (PPE)
7. General safety and health provisions
8. Aerial lifts
9. Specific Excavation Requirements
10. Hazard Communication (Related)

PPE Non-compliance Causes

Research carried out by the CSRC, and its members reveals 16 factors that contribute to PPE non-compliance

These factors can be grouped into 4 categories:

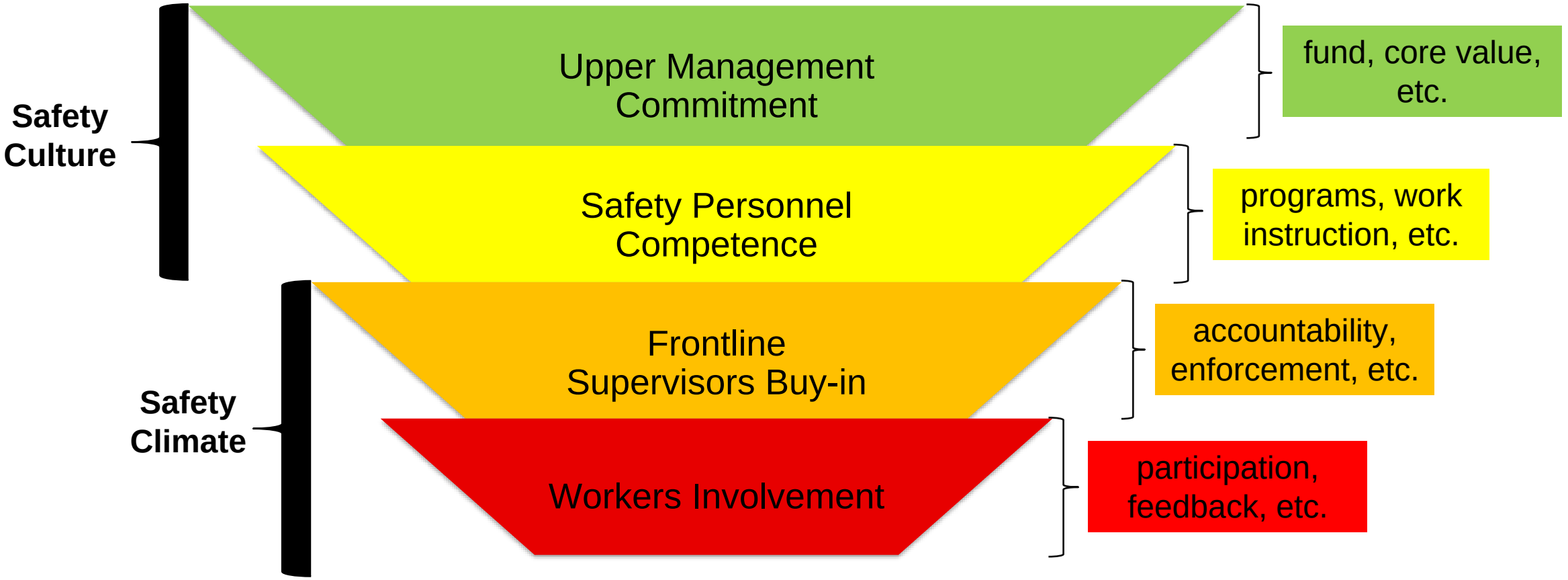
- PPE Design Factors
- Safety Climate Factors
- Safety Culture Factors
- Other Factors

Safety Culture Vs. Safety Climate

There are three dimensions of safety culture:

- **Corporate Safety Culture** consists of an organization's official policies, systems, procedures, and workflow.
- **Psychological Safety Culture** refers to thoughts and feelings about safety.
- **Behavioral Safety Culture** includes employee activities, behaviors, and actions related to workplace safety.

Safety Culture Vs. Safety Climate



PPE Design Factors

This category centers on shortcomings in the design and fabrication of PPE wear

- Poor quality, fit, and comfort
- Lack of climate adaptation (e.g., workers do not want to wear PPE such as helmets or gloves in hot climates)

Construction Safety Climate Factors

This category includes factors related to the actions of workers and frontline supervisors

- Workers believe that PPE reduces the ability to meet performance deadlines, increases work effort, and increases restrictions
- Inadequate safety supervision and enforcement of safe work practices can cause workers to display a negligent attitude toward PPE use and disregard safety rules
- Peer pressure among workers insinuating that wearing PPE denotes weakness in a worker
- Poor worker perception of the risks they are exposed to when not wearing PPE

Construction Safety Culture Factors

This category includes factors related to the actions of upper management and safety personnel

- Lack of safety training
- Lack of management support
- Lack of safety rules and policies
- Lack of PPE availability and accessibility

Other Factors

This category includes a collection of other factors

- **Unstable employment status** (e.g., temporary, undocumented, or seasonal employment): some workers, particularly those of Hispanic descent, do not always receive the necessary PPE due to their undocumented or temporary employment status, which forces them to value job security over speaking up about safety issues.

- **Somatic health effects**: some workers with health conditions cannot wear PPE due to physical and mental stress, especially in confined or poorly ventilated areas.

- **Cultural and language barriers**: these barriers contribute to higher fatality rates among ethnic minority construction workers (e.g., the Hispanic workforce in the US).

Factor Ranking

The CSRC conducted a national survey to rank the importance of the factors within each of the aforementioned four categories

Factor Ranking

- Inadequate Safety Supervision
- Poor Risk Perception
- Lack of Climate Adaptation
- Lack of Safety Training
- Lack of Management Support

HIGH IMPORTANCE

Factor Ranking

- Poor Quality, Fit, and Comfort
- PPE Increases Restrictions
- Somatic Health Effects
- PPE Increases Work Effort

HIGH - MODERATE IMPORTANCE

Factor Ranking

MODERATE

- PPE Increases Work Time
- Performance Pressure

MODERATE TO LOW

- Unstable Employment Status
- Lack of PPE Availability and Accessibility
- Lack of Safety Rules and Regulations

LOW

- Cultural and Language Barriers & Peer Pressure

MODERATE - LOW IMPORTANCE

Proactive Measures

Focus groups were conducted to suggest proactive measures that can address the factors

Proactive Measures

Inadequate Safety Supervision (High Importance)

- Encouraging, measuring, and monitoring frontline supervisor accountability
- Providing safety resources (e.g., designated site safety representatives) and fostering clear and professional communication between frontline supervisors and workers

Proactive Measures

Poor Risk Perception (High Importance)

Poor assessments of the risks that workers are exposed to. For example, some experienced workers rely on their experience, believing that they don't need PPE; some young workers often see work as an adventure and are overconfident.

- Emphasizing the stakes involved in non-compliance with PPE
- Enhancing the critical thinking of workers through interactive risk perception training (dialoguing with workers about "what-if" and worst-case scenarios)

Proactive Measures

Lack of Climate Adaptation (High Importance)

- Improving PPE supply and providing specialized training and resources for wearing PPE in adverse weather conditions
- Providing cooling and heating stations for workers operating in intense weather conditions

Lack of Safety Training (High Importance)

- Providing training at the same time that PPE is provided, to all new hires, and as a yearly refresher
- Improving management support for educational and outreach programs

Proactive Measures

Lack of Management Support (High Importance)

- Emphasizing the reputational and financial costs of accidents due to PPE non-compliance
- Increasing leadership involvement, visibility (e.g., bringing management into the safety program to demonstrate PPE use), and accountability

Proactive Measures

Poor Quality, Fit, and Comfort (High to Moderate)

- Improving the supply of PPE (different styles and sizes)
- Improving PPE training and gaining worker input on PPE fit and comfort

PPE Increases Restrictions (High to Moderate)

- Gaining worker input on potential restrictions and addressing them
- Conducting case-by-case evaluations to reach a resolution

Proactive Measures

Somatic Health Effects (High to Moderate)

- Exploring PPE alternatives for individuals with health problems and employing case-by-case decision-making
- Raising worker awareness of the possible relationships between PPE use and certain health conditions

PPE Increases Work Effort (High to Moderate)

- Collecting employee feedback on PPE options that will not adversely affect effort and encouraging workers to suggest PPE alternatives
- Showing the costs of accidents associated with failure to use PPE

Proactive Measures

PPE Increases Work Time (Moderate)

- Providing explanations and examples of the time-costs of incidents and ensuring adequate time for PPE use and installation
- Letting workers know they will be evaluated more favorably if they work safely than if they work quickly but unsafely

Performance Pressure (Moderate)

- Emphasizing the costs of safety incidents associated with PPE non-compliance
- Ensuring that field leadership understands that safety cannot be sacrificed and providing rewards and incentives for good safety performance

Proactive Measures

Unstable Employment Status (Moderate to Low)

- Ensuring that all employees are trained to the same standard
- Developing a temporary worker program and partnership with staffing agencies

Lack of PPE Availability and Accessibility (Moderate to Low)

- Improve PPE availability by introducing technologies such as PPE vending machines and QR codes to make PPE distribution more efficient
- Improve PPE funding by obtaining available grants and allocating PPE pay items within the contracts of smaller subcontractors

Proactive Measures

Lack of Safety Rules and Regulations (Moderate to Low)

- Ensuring safety programs are up to date, posting safety programs at all job sites, and communicating OSHA PPE requirements
- Enforcing PPE compliance and creating a sliding scale for safety performance penalties

Cultural and Language Barriers (Low)

- Implementing multi-language literature and training (e.g., using images and pictures in training)
- Fostering an inclusive workplace culture

Proactive Measures

Peer Pressure (Low)

- Encouraging and rewarding positive peer pressure around PPE use
- Discouraging negative peer pressure via effective field monitoring and education

Key Findings

This study helps decision-makers prioritize resource allocation to the most critical PPE non-compliance factors

Key Findings

- The primary root causes of PPE non-compliance are inadequate safety supervision, poor worker risk perception, lack of PPE climate adaptation, lack of upper management support, and lack of safety training

Key Findings

This study illuminates the importance of addressing resource limitations, especially among residential construction firms. Project owners and general contractors should consider allocating funds specifically for safety programs when hiring smaller firms and only select contractors that agree to comply with a safety plan.

- Convey to construction company leaders the importance of PPE compliance and the reputational and financial costs of non-compliance
- Improve leadership accountability, focus on front-line supervisors
- Encourage, incentivize, measure, monitor, and reward the use of PPE
- Solicit worker input to provide PPE that better fits and adapts to different climates

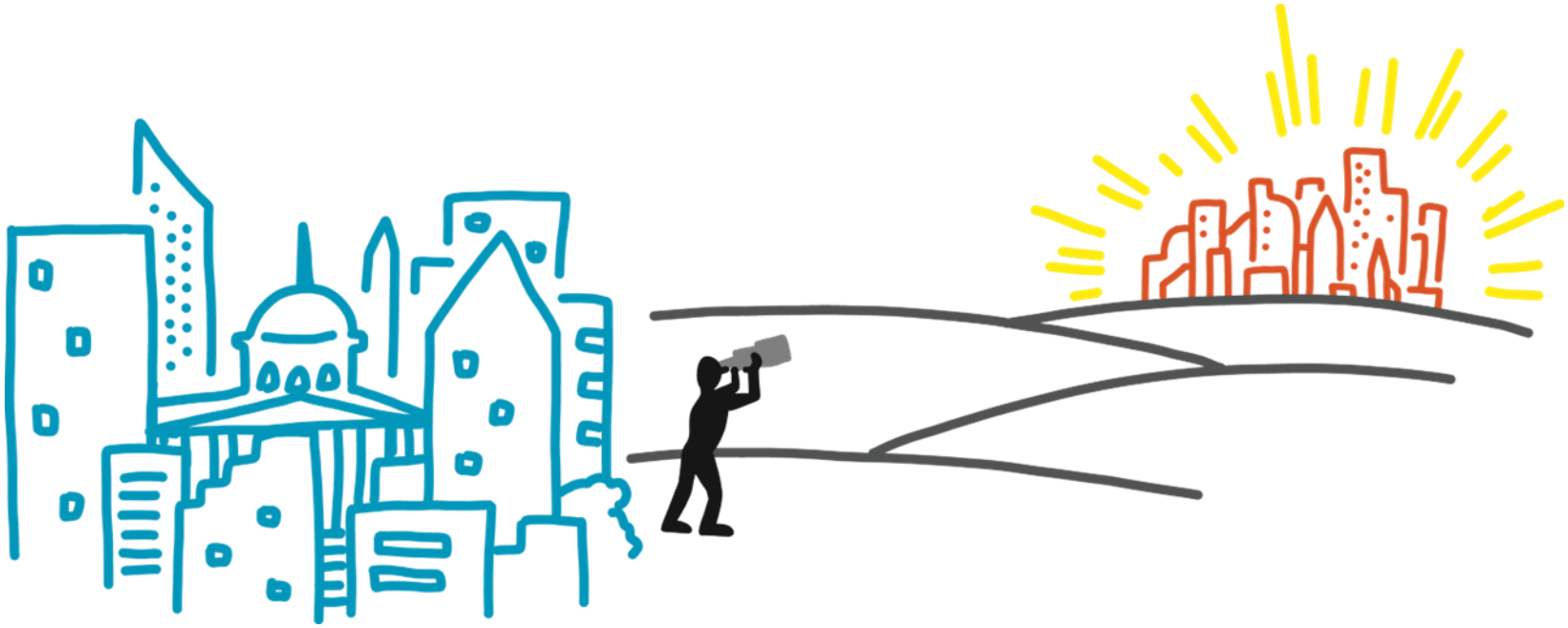
Dissemination Plan

- Scientific research paper
- White paper
- Full PPT Presentation
- New Senior Elective - Construction Safety Management

Questions?

Special thanks to our founding members!

The Year Ahead



Research Timeline

Nov 2022 — **Project Selection**

May 2023 — **Presenting the Initial Research Findings**

To be validated by firm members (in-person meeting)

Aug 2023 — **Sharing Research Recommendations**

Sep 2023 — **Providing Training Modules**

Presenting training modules in PPT format

Research Timeline

Project Title: PPE Non-Compliance Contributing Factors

The project proposed by: Carhartt Inc.

Research Description: This project aims to take a deeper dive into PPE non-compliance to gain a better understanding of the factors that influence PPE compliance issues. By understanding the reasons that risks are taken, we can identify opportunities to improve worker experiences with PPE and create a safer environment. **Carhartt will help** create and distribute the research survey.

Research Timeline

Nov 30, 2022 — **Project Selection**

- ✓ Submit your research ideas by Nov. 18th
- ✓ Voting link will be available between Nov. 21st and Nov. 29th
- ✓ Voting results will be sent out on Wednesday Nov. 30th

Research Timeline

Nov 30, 2022 — **Project Selection**

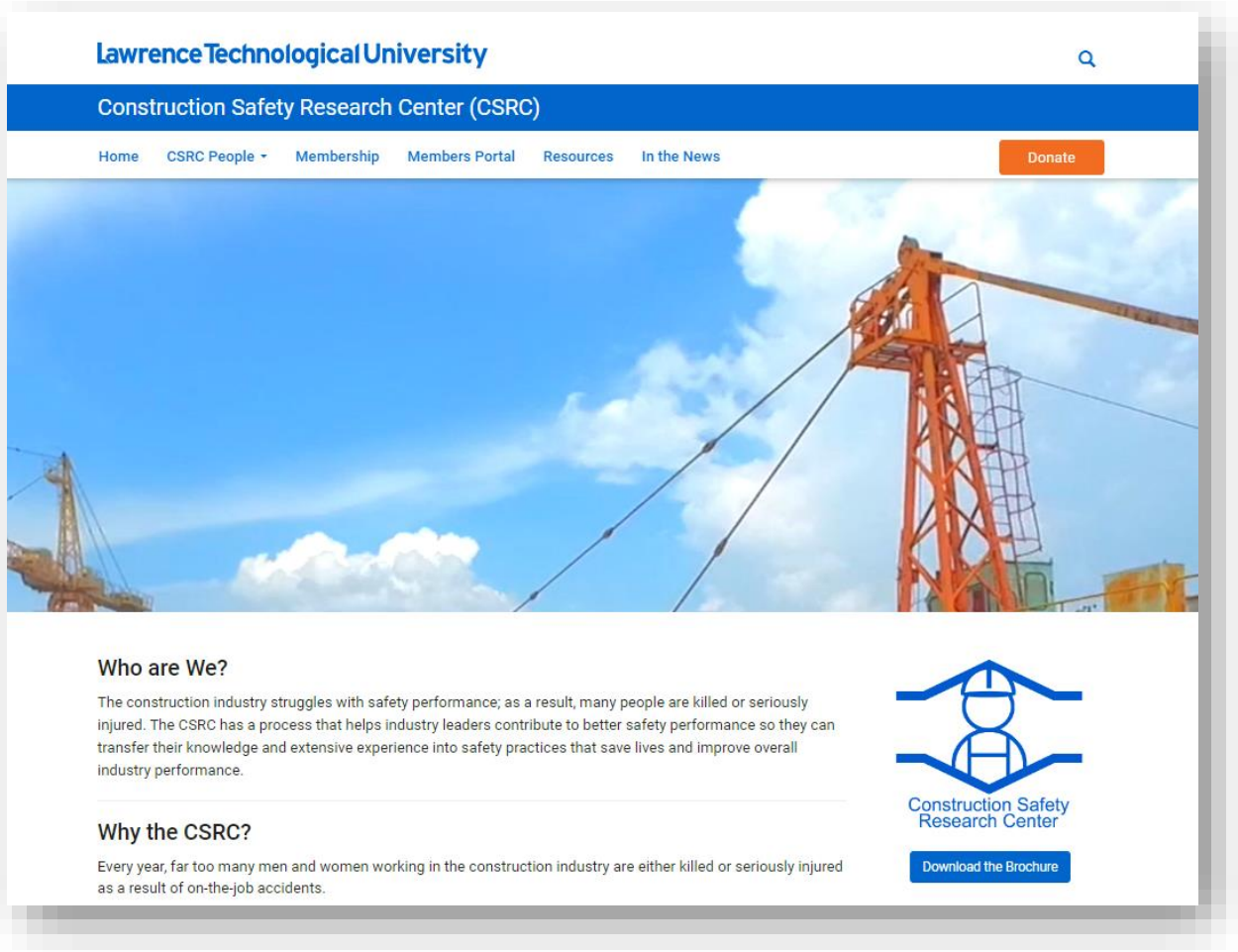
Project Title / Description	Average Score
Identifying Contractual Measures that Contribute to Lower Injury Rates. (Proposed by DTE Energy.)	5.25
PPE Non-Compliance Contributing Factors. (Proposed by Carhartt, Inc.)	9
Construction Incident Rates during Overtime Activities and Holidays. (Proposed by RBV Contracting.)	5.75
Safety and Health Hazard Assessment for Off-Site Construction Workplaces. (Proposed by The Construction Safety Research Center.)	5

Public Relations

Future Opportunities

- Release announcing new CSRC members (Nov 28)
- Release of findings of initial CSRC workplace safety study (Dec 5)
- National Work Zone Awareness Week (Apr 17-21)
- Michigan Safety Conference promotion (Apr 18-19)
- National Construction Safety Week (May 1-5)
- Coffee with MIOSHA workplace safety and health discussion (May)
- Release of findings of 2023 research study (Oct)

Website Updates



https://www.ltu.edu/engineering/csrc/

Please Note

Future Research

Needed In November

Look for an email tomorrow…

THINGS WE NEED FROM YOU	DUE
❑ Provide press release quotes (new members) ❑ Submit research project idea	FRI, NOV 18
❑ Look for link to vote on research idea	MON, NOV 21
❑ Complete voting on research ideas	TUE, NOV 29

Thank YOU!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CONSTRUCTION SAFETY RESEARCH CENTER

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