Research and Training with UW Faculty and Students
Center for Education and Research in Construction (CERC)

CERC: Applied Research & Training

> What is CERC? Who is CERC?

> Partnerships showing Variety and Impact
  – UW Capital Planning and Development: LED Lighting Study
  – PacTrans (US DOT): Public Private Partnerships and Roadway Safety
  – Sound Transit: Asset Data & Building Information Modeling
Build It and They Will Come

> A Department of Construction Management
   (first graduates in 1965)

> A Unique Lab Facility
   – former Navy building @ Magnuson Park, 1975
   – Our lab: Building 5, Bay B (25,000 sq.ft., high-bay/low-bay)
   – Labs and classrooms
   – Build-out for CM 2004-2009
     > Materials and Methods Lab
     > Virtual Construction Lab
     > Collaboration suites
     > Classrooms and Library
Then and Now - Materials and Methods Lab

CENTER FOR EDUCATION AND RESEARCH IN CONSTRUCTION
Department of Construction Management, College of Built Environments
Virtual Construction Lab

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Industry Made It Happen

Industry – Academia Partnership
CERC – Who We Are Today

Research and Training

SHARE Lab: Safety & Health

ESC Lab: Energy & Sustainability

CTOP Lab: Communication & Technology

Project Delivery: Design-Build & Public Private Partnerships
CERC – SHARE Lab

Laboratory for Safety and Health Advancement through Research and Education

> iSafe Field Inspection System
> Computer Animated Fall Protection Training
> 3D Virtual Construction Safety Training

SHARE Research Funders:
Hewlett Packard, Inc. (HP)
Occupational Safety and Health Administration (OSHA)
National Science Foundation (NSF)
National Institute for Occupational Safety and Health (NIOSH)
Royalty Research Fund
CERC – ESC Lab

Laboratory for Energy & Sustainability in Construction
> Energy-related risk management
> Phased Investment
> Energy Retrofit Loan Analysis
> Optimized portfolio analysis for community-based photovoltaic investment

ESC Research Funders:
The Center for Construction Research and Training
Oregon Department of Transportation
PacTrans
ELECTRI International
Laboratory for Communication, Technology and Organizational Practices

> BIM to BUILDER workflow
> Team Practices for energy design
> How and why IPD and collaborative strategies are more reliable
> Rebaselining workflows for collecting as-is data for existing buildings

CTOP research funders:
- Skanska Building USA, Inc.
- Sound Transit
- U.S. Army Corps of Engineers
- General Services Administration
- University of Washington Capitol Projects Office
- National Science Foundation
CERC – Project Delivery

Expertise in Design-Build and PPP

> Public Private Partnerships
> Contractual terms for safety
> Contractual safety incentives
> Improved roadway safety
> Tools to monitor contractor performance
> Tools to forecast time and costs

Project Delivery research funders:
- PacTrans (US DOT)
- WS DOT
- UW Capitol Development and Planning

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Partnership UW Capital Planning and Development

Safety Technology: LED for Temporary Construction Lighting

Dr. Ken-Yu Lin

Associate Professor
Construction Management
Safety _ Cost _ Energy

- Natural Lighting
- Temporary Lighting
- Task Lighting

Egress Lighting

- Electrical Sub
- Bid Package
- G.C.
- General Req.

Project Owner
Traditional Temp. Lighting Setup

Incandescent lamps (100W or 150W) suspended from the slab deck at a 10’ x 10’ grid. (Smith, 2007)

Suspended compact fluorescent lamps, (Clear-Vu Lighting, www.clearvulighting.com)
Low Voltage LED Lighting Setup

Case Study Project

- UW Bothell Phase 3
  - **Location:** Bothell, WA
  - **Facility Size:** 75,000 ft²
  - **Type of Project:**
    - Academic Building
    - New Construction
  - **Construction Duration:** 17 Months
  - **Total Project Cost:** $68 Million
  - **GC/CM:** Lease Crutcher Lewis
  - **EC/CM:** Nelson Electric
  - **LED Manufacture:** Clearvu Lighting


http://pm.uw.edu/cpo/cpoutlook/uw-bothell-discovery-hall
LED Lighting Setup @ UWB P3

• Meeting the 5 FC OSHA requirement

Temporary lighting power cables installed within concrete slab

Temporary lighting whips and light fixtures dropped and exposed below ceiling deck
Installation_Costs
Data Collection

- Interview with Clear-Vu representative
- Site interviews with project staff
- Survey questionnaires distributed to workers on site
- Cost information derived from Nelson Electric and others
Survey Findings

- 21 response (of which 19 were analyzed)
- Agreement level (1~5 Likert scale)

<table>
<thead>
<tr>
<th>Description</th>
<th>Average rating</th>
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<tbody>
<tr>
<td></td>
<td>LED lighting</td>
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<tr>
<td>Distracted from work</td>
<td>2.43</td>
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<tr>
<td>Amount of light provided</td>
<td>3.70</td>
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<tr>
<td>Consistent and well distributed</td>
<td>3.50</td>
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<td>Productive</td>
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<td>2.94</td>
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<td>Visually comfortable</td>
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<td>Safe operation of work</td>
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<td>Distracted from work</td>
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Conclusion: Safety _ Cost _ Energy

• LED lighting is perceived as safer than traditional lighting
  – 5 FC OSHA requirement not met with traditional lighting
  – LED support immediate use of temp. lighting

• LED required additional pre-construction planning and higher installation cost

• With 5 FC, the cost of LED is comparable if not less

• However, cost saving might belong to different parties

Impact: Seattle City Light Rebate for LED projects
Made positive change on the job sites