RESEARCH PROJECT

Application of Prevention through Design to Improve Safety in Solar Installations for Small Buildings

Mar 16, 2017

Chung Ho, PhD Student
Hyun Woo “Chris” Lee, Assistant Professor
Department of Construction Management
University of Washington

John Gambatese, Professor
School of Civil and Construction Engineering
Oregon State University

Annual U.S. Solar Energy Production

(source: GTM/SEIA, 2016)

Reference:
Safety in Solar Energy Installation

- Solar Energy Installation
  - On rooftops
  - At outside conditions

SAFETY FACTS
- Falls account for 35% of fatalities in construction (CPWR 2015)
- Almost 50% of construction fatalities and accidents are linked to design decisions (Behn 2005)

References:

PtD for Solar Safety

Address Safety Issues from the Design Process

- Site Assessment
- Design a Solar Energy System
- Installation
- Operation

Basic Steps to Obtain a Solar Energy System
Research Method

- Analyze PtD attributes through case study projects
- Investigate safety practices and identify PtD attributes
- Develop a PtD guidance and obtain industry feedbacks
- Develop the final report and publish the paper

Case Study

Interview

PtD Protocol

Report

Research Activities

- Review codes, regulations
- Interview Industry Experts
- Observe Site Installations
- Conduct a Seminar
- Participate Solar Workshops Conferences
### PtD Attributes in Solar Safety

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof Material</td>
<td>Influence of roof materials on the location of safety anchors, and the safety operation at unfavorable weather conditions</td>
</tr>
<tr>
<td>Roof Slope</td>
<td>Influence of roof slopes on working platforms and working methods</td>
</tr>
<tr>
<td>Roof Accessory</td>
<td>Different safety impacts caused by roof vents, chimneys, skylights</td>
</tr>
<tr>
<td>Panel Layout</td>
<td>Influence of clear access pathways and the clearance between panel edge and roof ridge on the safety in solar installation</td>
</tr>
<tr>
<td>Fall protection system</td>
<td>Influence of roof conditions on the design of fall protection systems</td>
</tr>
<tr>
<td>Lifting Method</td>
<td>Influence of panel size, panel weight and wind condition on lifting methods</td>
</tr>
<tr>
<td>Electrical System</td>
<td>Shocking hazards caused by the solar power; Tripping hazards by the wires, conduits.</td>
</tr>
</tbody>
</table>

### PtD Attributes in Solar Safety (cont.)

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof Material</td>
<td></td>
</tr>
<tr>
<td>Roof Slope</td>
<td></td>
</tr>
<tr>
<td>Roof Accessory</td>
<td></td>
</tr>
<tr>
<td>Panel Layout</td>
<td></td>
</tr>
<tr>
<td>Fall protection system</td>
<td></td>
</tr>
<tr>
<td>Lifting Method</td>
<td></td>
</tr>
<tr>
<td>Electrical System</td>
<td></td>
</tr>
</tbody>
</table>
Conclusion

7 PtD Attributes for Solar Safety
PtD Guidance

Safety Hazards Prevention

Design Process:
- Design decisions
- Design drawings, specifications.

Installation Process:
- Installation methods.
- Safety risks and hazards

Diagram for the Implementation of PtD to Improve the Safety in Solar Installations

THANK YOU!

Chung Ho, PhD Student
email: ctth@uw.edu

Department of Construction Management
University of Washington