Owner Views on Designer Participation in Construction Safety

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Outline

- Objective
- Prevention through Design (PtD)
- Methodology
- Results
- Conclusions
Objective

• Identify the characteristics of owners who are interested in promoting construction safety and designer participation in construction safety

• Designer participation: Prevention through Design (PtD)
Prevention through Design (PtD)

- PtD = Design for Safety (DfS), Safety in Design (SiD)

- What is PtD
  - Actively considering and valuing worker safety during design
  - Inclusion of worker safety considerations in design and the constructability review process

- What is not PtD
  - Active participation of designers in worker safety DURING construction
  - The endorsement of legislation mandating designers practice PtD
  - The endorsement that designers can and should be held partially responsible for construction accidents

- PtD within this research project was described as “Design for Construction Worker Safety” (DCWS)
Fatalities linked to design

- Europe: “60% of fatal accidents in construction arise from decisions made upstream from construction site”
  - (The European Foundation for the improvement of Living and Working Conditions, EF/88/17/FR, 1991)

- US: 42% of construction site fatalities can be linked to design
  - (Behm, M., “Linking Construction Fatalities to the design”, Safety Science 43 (2005), 589-611)

- Australia: 63% of all fatalities and injuries attributed to design decisions or lack of planning
  - (NSW WorkCover, CHAIR Safety in Design Tool, 2001)
When to implement safety?

DCWS A Pre-thought, Not an Afterthought

Design | Build/Maintain | Retire
Conception | Build | Operate
| | | Eliminate/Recycle/Revise

Ease of Integrating Safety

Cost of Integrating Safety

Hierarchy of controls

1. Elimination
2. Substitution
3. Engineering Controls
4. Warnings
5. Administrative Controls
6. PPE
DCWS in other countries

• Europe – European Union – Legislation
  • UK: “Construction (Design and Management) Regulations”
  • Spain’s Royal Decree 1627/1997 – “Minimum Provisions for Health and Safety at Construction Sites”

• Australia
  • Australian National Occupational Health Strategy

• South Africa
  • Occupational Health & Safety Act, 2003

• Singapore
  • Workplace Safety & Health

• US
  • No guidelines/legislation
Owners and Construction

- Provide the need for a project
- Funding capabilities
- Provide guidelines and expectations

For this research study:
- University Owners
Why University Owners?

- Accessible
  - Traditional owner groups did not allow survey dissemination
- Construct Variety of Buildings
  - Educational, Sport Facilities, Medical Facilities, Offices, Residential, Power Generation, Civil, etc.
- Use Variety of Procurement Methods
  - Design-Bid-Build, Design-Build, Construction Management, CM@Risk, Self-perform, etc.
- Variety in Ownership
  - Public, Private
Responding participants

- Representative personnel from facility services
  - Designers (Engineers, Architects)
  - Construction Managers
  - Facility Services Administrators

- University Size
  - Large universities (15000 students and more)
  - Mid-sized universities (5000-15000 students)
  - Small universities (2000-5000 students)

- Very small universities (<2000 students) not surveyed
Methodology – Survey Questions

• Section 1
  • Types of construction projects
  • Types of contracts
  • Selection criteria for constructors/designers

• Section 2
  • Prior DCWS knowledge/participation

• Section 3
  • 5-point Likert scale (Strongly Agree to Strongly Disagree) on knowledge of construction industry, construction safety, owner and designer participation in construction safety

• Section 4
  • 5-point Likert scale (Strongly Agree to Strongly Disagree) on obstacles and enablers for designer participation in construction safety
Methodology – Survey

US Census Bureau Divisions

Oregon State University
UNC Charlotte
Methodology – Survey

Selected states (n=29), at least half from each US Census Bureau division
Results – Response Distribution

Owner responses (n=121), response rate 35.1%
## Results – Response Distribution

<table>
<thead>
<tr>
<th></th>
<th>Small</th>
<th>Medium</th>
<th>Large</th>
<th>Total</th>
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## Results – Ranking Criteria for Selecting Contractors

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<th>3rd</th>
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<th>5th</th>
<th>6th</th>
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<td>28</td>
<td>28</td>
<td>31</td>
<td>17</td>
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<td>3</td>
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<tr>
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<td>26</td>
<td>22</td>
<td>11</td>
<td>9</td>
<td>10</td>
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<tr>
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<td>6</td>
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<td>9</td>
<td>19</td>
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<td>Technical ability of contractor</td>
<td>13</td>
<td>26</td>
<td>23</td>
<td>27</td>
<td>10</td>
<td>8</td>
<td>1</td>
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<tr>
<td>Trust in contractor personnel</td>
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<td>11</td>
<td>17</td>
<td>28</td>
<td>24</td>
<td>9</td>
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<td>9</td>
<td>8</td>
<td>4.0</td>
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</table>
## Results - Statistical Test

- **Ordered contingency tables (2 x k)**

<table>
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<th>Level</th>
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<th>Option B</th>
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<tr>
<td>Level k</td>
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<tr>
<td>Totals</td>
<td>A</td>
<td>B</td>
<td>N</td>
</tr>
</tbody>
</table>

Results – Contractor Safety Record

• High Rank of “Contractor Safety Record”
  • Organization actively participates in construction worker safety (p=0.0011)
  • State that “Organization knows how construction site operations take place” (p=0.0107)
  • Agree that “Organization members have adequate capacity and opportunities to be educated in construction safety” (p=0.0253)
  • Disagree that “Construction contractors are the only group to participate in construction safety (p=0.02636)
  • Agree that there are “Ethical” (p=0.0440) and “Cultural” (p=0.0298) obstacles for designers to participate in DCWS
  • Agree that there are “Regulatory” (p=0.0475), “Economic” (p=0.0051) and “Contractual” (p=0.0067) incentives for designers to participate in DCWS
Results – Designer’s Involvement in Safety

- High Rank of “Designer’s active involvement in construction worker safety”
  - Agree that “decisions made before” (p=0.0103) and “during design” (p=0.0181) can eliminate construction site hazards
  - Disagree that there are “Economic” (p=0.0117) obstacles for designers to participate in DCWS
  - Agree that there are “Regulatory” (p=0.0335), and “Contractual” (p=0.0011) incentives for designers to participate in DCWS
  - Agree that their organization would support legislation for designer involvement in construction safety (p=0.0092)
Conclusions

• Safety not the primary criterion for selecting contractors and designers

• Safety conscious owners:
  • More likely to be involved in safety as well
  • Employ personnel aware of how construction operations take place (personnel to supervise construction, design requirements)
  • Provide opportunities for education in safety
  • Are aware of hazardous nature of construction industry
  • Are aware that decisions made prior to construction influence construction site safety
Questions?

• Thank you

• For more information:
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