Owner Views on Designer Participation in Construction Safety

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Outline

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

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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)

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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)

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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)

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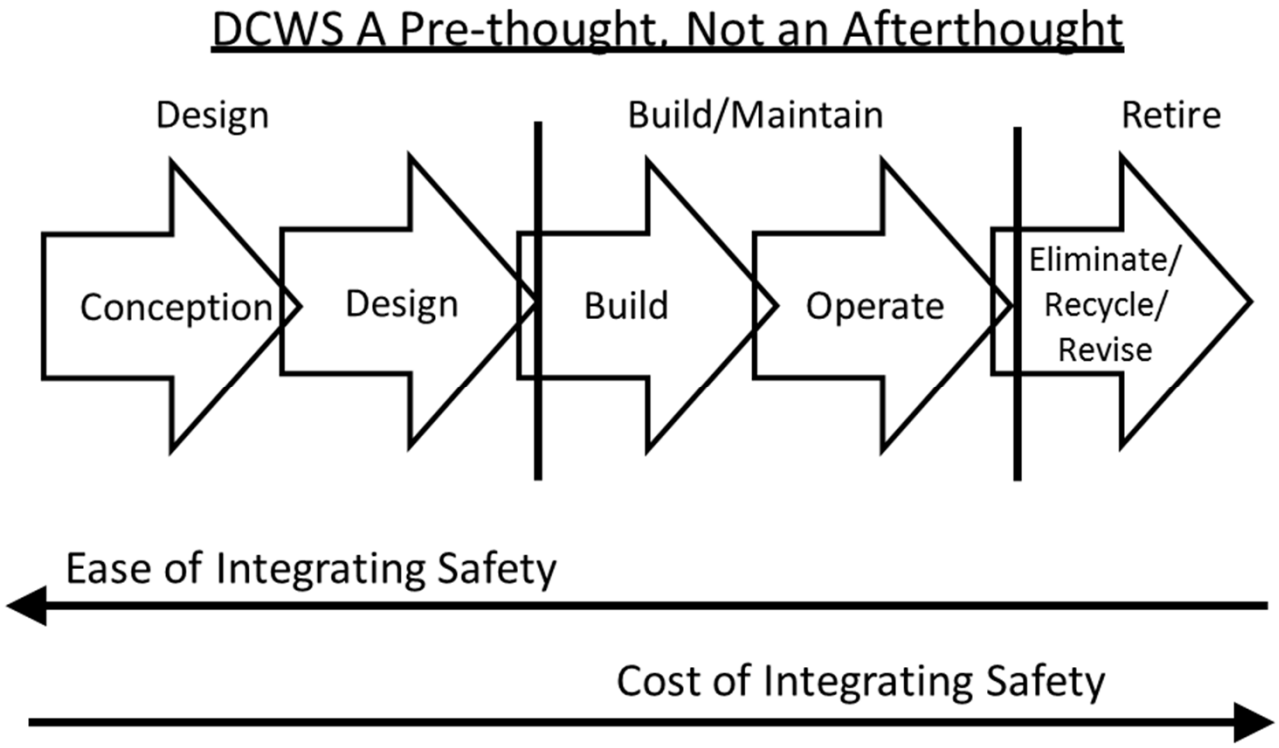
When to implement safety?



Reference: Philip E. Hagan, J. F. M., James T. O'Reilly, Ed. (2009). Accident Prevention Manual for Business & Industry. Occupational Safety and Health series. Itasca, IL, National Safety Council

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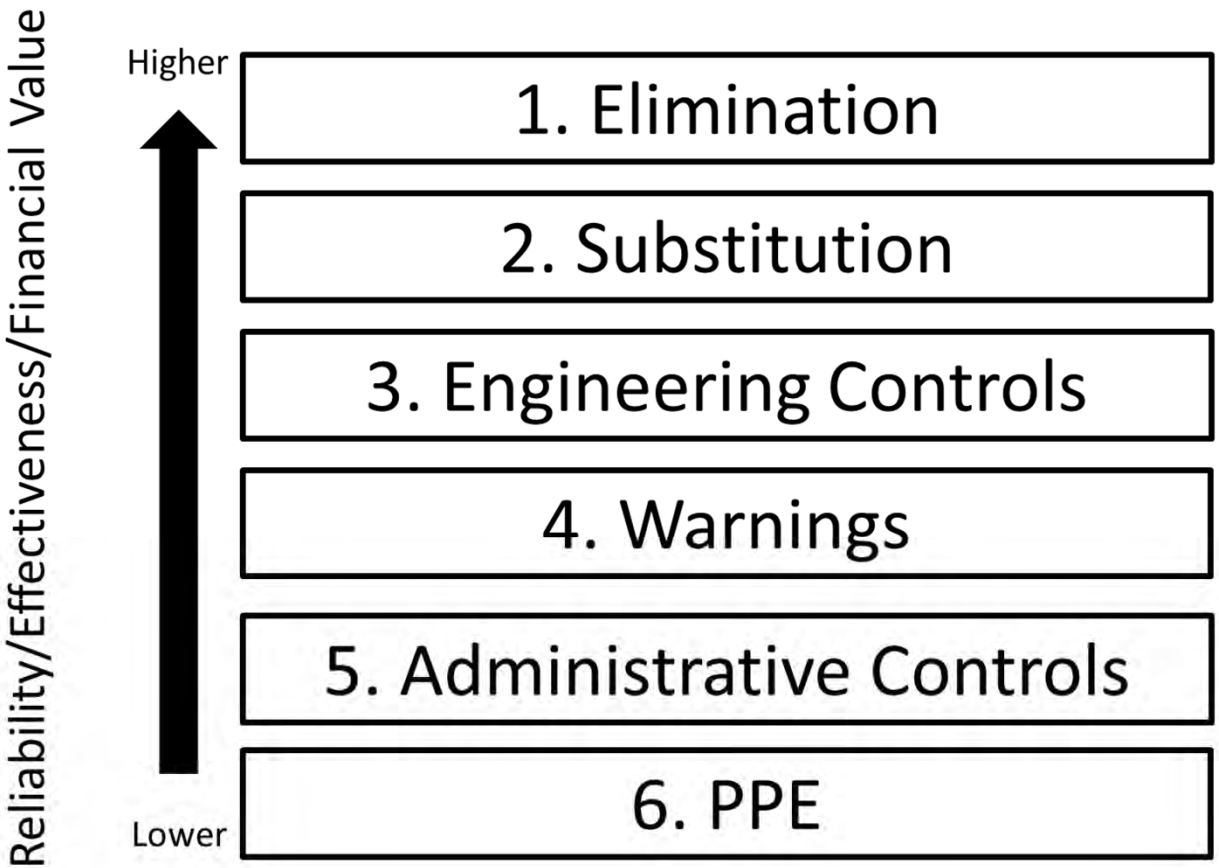
Hierarchy of controls



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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

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Owners and Construction

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

- For this research study:
  - University Owners

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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

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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

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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

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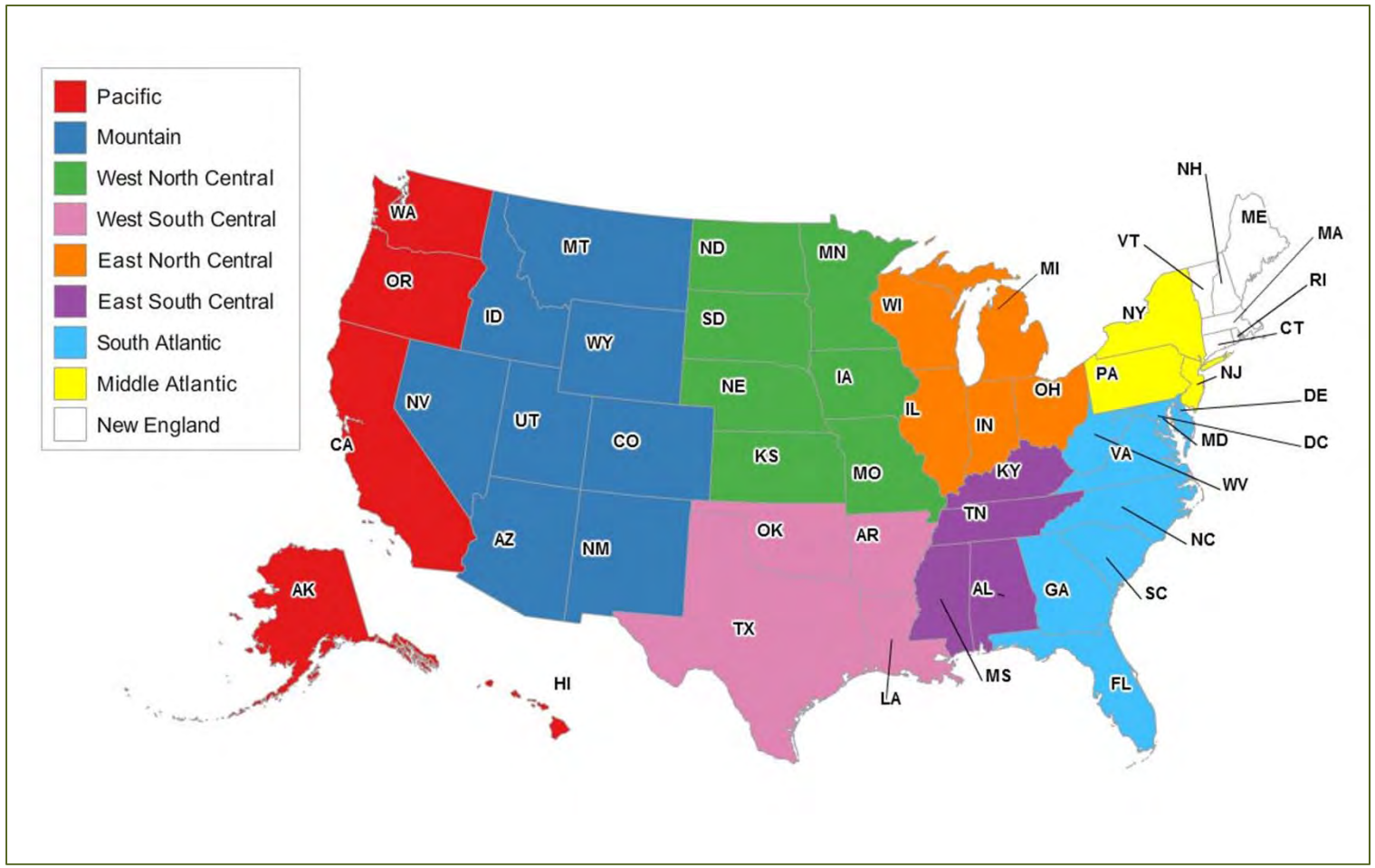
Methodology – Survey



US Census Bureau Divisions

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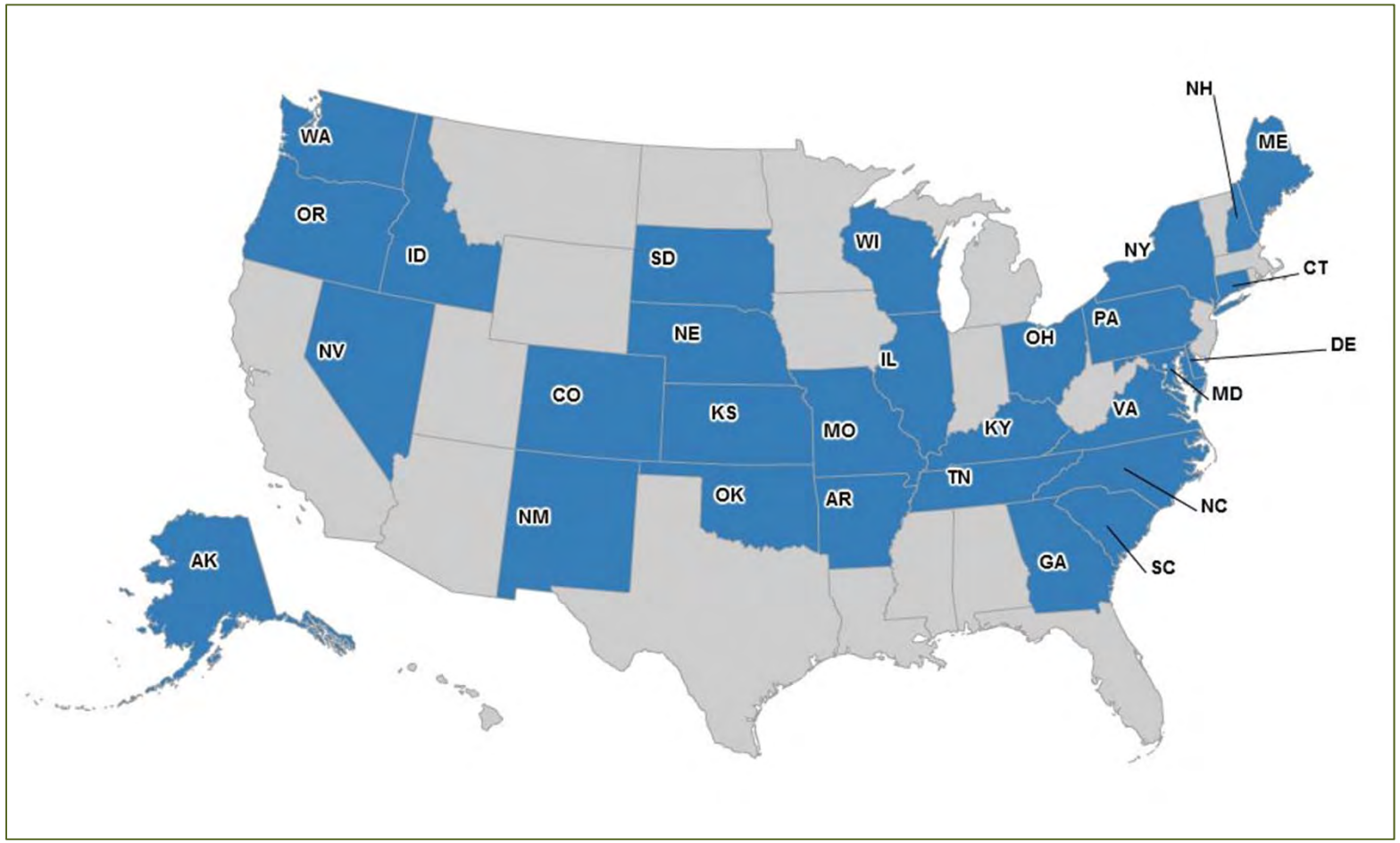
Methodology – Survey



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

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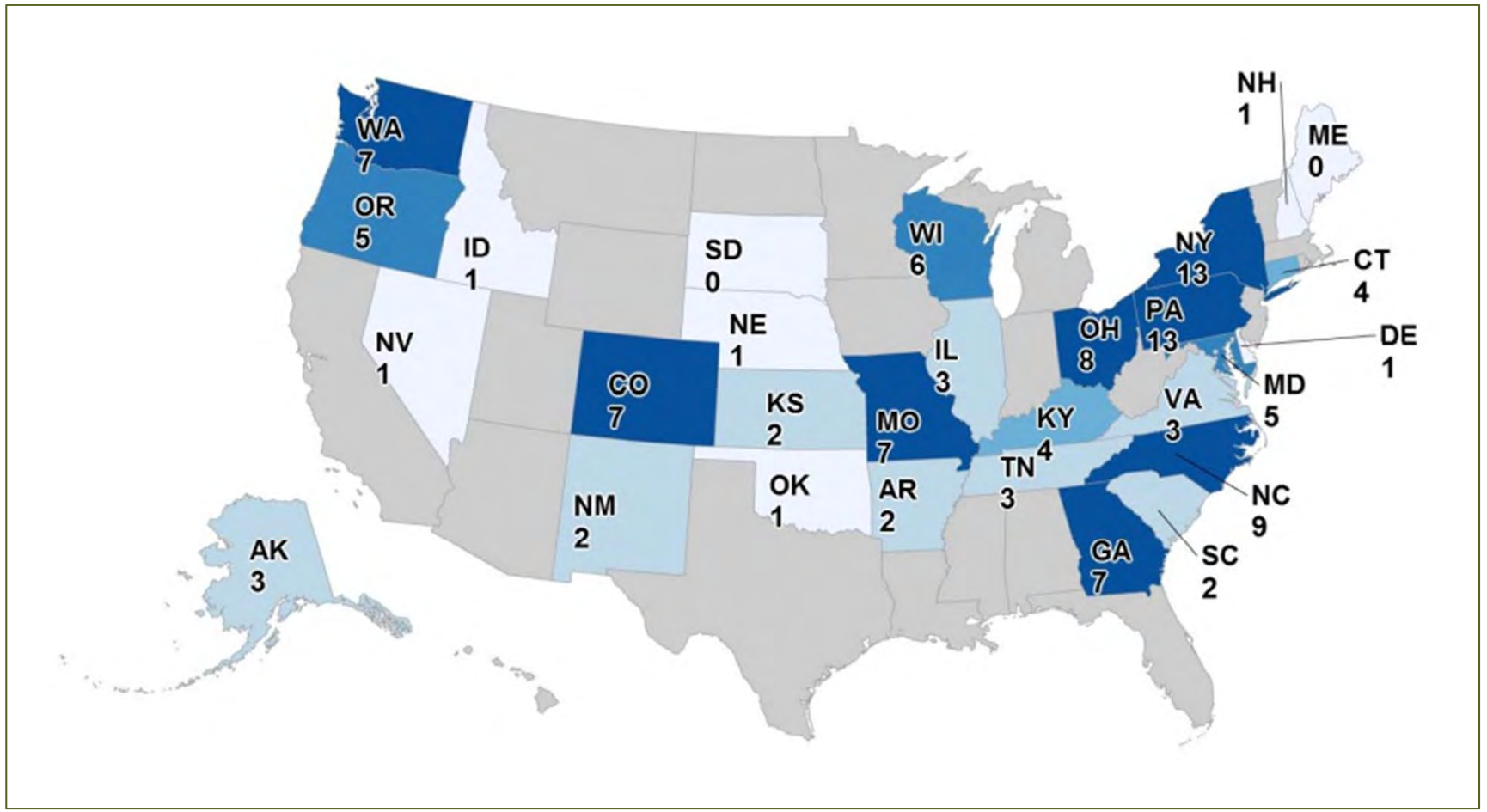
Results – Response Distribution



Owner responses (n=121), response rate 35.1%

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Results – Response Distribution

	Small	Medium	Large	Total
Public University	17	46	24	87
Private University	21	13	0	34
Total	38	59	24	121

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Results – Ranking Criteria for Selecting Contractors

Criterion	1st	2nd	3rd	4th	5th	6th	7th	Mean Rank
Satisfaction with work from past project experience	28	28	31	17	2	3	1	2.5
Prequalification requirements	25	26	22	11	9	10	5	3.0
Project bid price	50	20	13	9	13	13	2	2.7
Long-term contracting agreements	0	3	2	6	9	12	64	6.3
Contractor safety record	0	2	9	19	34	28	11	5.1
Technical ability of contractor	13	26	23	27	10	8	1	3.2
Trust in contractor personnel	5	10	11	17	28	24	9	4.5

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Results – Ranking Criteria for Selecting Designers

Criterion	1st	2nd	3rd	4th	5th	6th	7th	Mean Rank
Satisfaction with work from past project experience	42	39	18	13	2	0	0	2.1
Prequalification requirements	48	18	22	13	10	3	0	2.4
Design fees	2	11	18	16	31	16	9	4.4
Long-term contracting agreements	3	4	8	4	12	28	41	5.7
Designer's active involvement in construction safety	0	0	2	10	17	32	33	5.9
Technical ability of contractor	19	28	26	21	9	7	1	3.0
Trust in contractor personnel	5	15	18	30	20	9	8	4.0

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Results – Statistical Test

- Ordered contingency tables (2 x k)

Agreement/ Disagreement

Other Response

Rank	Level	Option A	Option B	Total
	Level 1	a_1	b_1	n_1
	Level 2	a_2	b_2	n_2
	…	…	…	…
	Level k	a_k	b_k	n_k
	Totals	A	B	N

Reference: Le, C. T. (1998). Applied Categorical Data Analysis. New York, NY, John Wiley & Sons.

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

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Questions?

- Thank you

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