**Supplementary Materials and Data**

**Table S1: Safety Climate Questions.**

These questions were a subset of questions adapted from Zohar D, Luria G. A Multilevel Model of Safety Climate: Cross-Level Relationships Between Organization and Group-Level Climates. Journal of Applied Psychology. 2005;90(4):616-628 safety climate scores

|  |  |
| --- | --- |
| **Worksite/Organizational Level** | **Subcontractors/Group Level** |
| On my current site, * the general contractor uses any available information to improve existing safety rules.
* the general contractor tries to continually improve safety levels in each department.
* the general contractor listens carefully to our ideas about improving safety
* the general contractor reacts quickly to solve the problem when told about safety concerns.
 | With my current subcontractor, * unsafe working conditions are identified and improved promptly.
* equipment is well maintained.
* action is taken when safety rules are broken.
* job hazard analyses are frequently performed with me.
* time and money are spent on improving safety.
 |

The Likert 5-point response scale verbal anchors for these safety climate questions were Strongly disagree, Disagree, Neither agree nor disagree, Agree, and Strongly agree with 1 being strongly disagree (lower safety climate) and 5 being strongly agree (higher safety climate).

Table S2: Trades represented in the 43 companies who completed the ACES survey. Specific Trades were collapsed into these general categories.

|  |  |
| --- | --- |
| Trade | Number of Companies |
| Laborer | 8 |
| Carpentry  | 6 |
| Electrical | 7 |
| Civil, Concrete, and Earthwork  | 6 |
| Pipefitters | 4 |
| Metal Work | 4 |
| Masonry | 2 |
| HVAC | 2 |
| Waterproofing/Roofing | 2 |
| Finishing Trades | 2 |

Table S3: Surveyed worker demographics.

|  |  |  |
| --- | --- | --- |
|  | Workers on the Worksites | Workers of Subcontractors with ACES Score |
| Total | 1426 | 635 |
|  |  |  |
| Workers per [Mean & S | 59 (46) | 14 (13) |
|  |  |  |
| Age[N] | 40 (11) [1330] | 40 (11) [598] |
|  |  |  |
| Gender [N (%)] |  |  |
| *Male* | 1281 (94%) | 575 (94%) |
| *Female* | 70 (5%) | 27 (4%) |
| *Other* | 9 (1%) | 8 (1%) |
|  |  |  |
| Race/ethnicity [N (%)]  |  |  |
| *Hispanic or Latino* | 111 (8%) | 38 (6%) |
| *White* | 970 (72%) | 455 (75%) |
| *Black* | 162 (12%) | 66 (11%) |
| *Native Hawaiian* | 4 (1%) | 3 (0.5%) |
| *Asian* | 16 (1%) | 9 (1.5%) |
| *American Indian* | 26 (2%) | 6 (1%) |
| *Other* | 60 (4%) | 23 (4%) |
|  |  |  |
| Job Title [N (%)] |  |  |
| *Foreman* | 250 (18%) | 120 (20%) |
| *Apprentice* | 295 (22%) | 136 (22%) |
| *Journeyman* | 676 (50%) | 290 (47%) |
| *Other* | 130 (10%) | 66 (11%) |
|  |  |  |
| Union [N (%)] |  |  |
| *Member* | 1200 (88%) | 551 (90%) |
| *Non-member* | 162 (12%) | 63 (10%) |



**ACES Prequalification Tool**



**Instructions**

This ACES (Assessment of Contractor Safety) Tool, created by the Occupational Biomechanics and Ergonomics Lab at Northeastern University, has the objective of creating a prequalification tool based on leading indicators of safety. The tool will ask questions regarding your company’s safety policies, the beliefs and values your company has about safety, and other details about your company.

Most questions have a set of corresponding question categories. Please select your answer by marking the box that corresponds to your answer. Please select only one category per question unless you are asked to “select all that apply.”

After completing the ACES Prequalification Tool, use the ACES Scoring Guide to calculate your company’s score.

**Section 1: Employee and Management Involvement and Relationships**

1. **How often do workers provide input in planning daily activities?**

[ ] 1 Never
[ ] 2 Occasionally
[ ] 3 Half of the time
[ ] 4 Most of the time
[ ] 5 Always

[ ] 6 I don’t know

1. **How often do workers give input in decisions affecting their safety and health at work?**

[ ] 1 Never
[ ] 2 Occasionally
[ ] 3 Half of the time
[ ] 4 Most of the time
[ ] 5 Always

[ ] 6 I don’t know

1. **Does your company have a defined employee involvement plan (i.e., safety committee, feedback program, etc.)?**

[ ] 1 Yes

[ ] 2 No

[ ] 3 I don’t know

1. **There is a high level of trust between the field workers and their immediate supervisor at this company.**

[ ] 1 Strongly agree
[ ] 2 Agree
[ ] 3 Neither agree nor disagree
[ ] 4 Disagree
[ ] 5 Strongly disagree

1. **There is a high level of trust between foremen and company management at this company.**

[ ] 1 Strongly agree
[ ] 2 Agree
[ ] 3 Neither agree nor disagree
[ ] 4 Disagree
[ ] 5 Strongly disagree

1. **Communication is open and employees feel free to voice concerns and make suggestions to management.**

[ ] 1 Strongly agree
[ ] 2 Agree
[ ] 3 Neither agree nor disagree
[ ] 4 Disagree
[ ] 5 Strongly disagree

1. **Which statement about management leadership best describes your company?**

[ ] 1 Managers always follow the safety rules.
[ ] 2 Managers mostly follow the safety rules.
[ ] 3 Managers follow some of the safety rules.

[ ] 4 Managers follow only basic safety rules.

[ ] 5 Managers do not follow any basic safety rules.

**Please indicate the extent to which you agree or disagree with each of the following statements:**

|  | **Strongly agree** | **Agree** | **Neither agree nor disagree** | **Disagree** | **Strongly disagree** |
| --- | --- | --- | --- | --- | --- |
| 1. Safety expectations are clearly defined in policies, procedures, and guidelines, and communicated consistently across the company (and to all business partners).
 | [ ] 1 | [ ] 2 | [ ] 3 | [ ] 4 | [ ] 5 |
| 1. Those in charge of safety have the authority to make the changes they have identified as necessary.
 | [ ] 1 | [ ] 2 | [ ] 3 | [ ] 4 | [ ] 5 |
| 1. Everyone has the tools and/or equipment they need to complete their work safely.
 | [ ] 1 | [ ] 2 | [ ] 3 | [ ] 4 | [ ] 5 |
| 1. Workers and foremen have the information they need to work safely.
 | [ ] 1 | [ ] 2 | [ ] 3 | [ ] 4 | [ ] 5 |
| 1. Safety is on the agenda of regular planning meetings with site superintendents.
 | [ ] 1 | [ ] 2 | [ ] 3 | [ ] 4 | [ ] 5 |
| 1. We include the cost of safety in our bids.
 | [ ] 1 | [ ] 2 | [ ] 3 | [ ] 4 | [ ] 5 |
| 1. Safety performance is a primary factor in hiring foremen.
 | [ ] 1 | [ ] 2 | [ ] 3 | [ ] 4 | [ ] 5 |

**Section 2: Company Practices**

1. **At a minimum, how often are formal safety inspections conducted on site?**

[ ] 1 Never
[ ] 2 Monthly
[ ] 3 Weekly
[ ] 4 Daily
[ ] 5 I don’t know

1. **How often are workers involved in routine inspections, such as checking equipment, excavations, and walkthroughs?**

[ ] 1 Never
[ ] 2 Occasionally
[ ] 3 Half of the time
[ ] 4 Most of the time

[ ] 5 Always

[ ] 6 I don’t know

1. **Inspections result in prompt correction of hazards.**

[ ] 1 Never
[ ] 2 Occasionally
[ ] 3 Half of the time
[ ] 4 Most of the time

[ ] 5 Always

[ ] 6 I don’t know

1. **Who completes inspections? (Please check all that apply.)**

[ ] 1 Project Manager

[ ] 2 Site Supervisor

[ ] 3 Safety Manager

[ ] 4 Foremen

[ ] 5 Workers

1. **The plan for every new job is reviewed by a team that includes field workers.**

[ ] 1 Strongly agree
[ ] 2 Agree
[ ] 3 Neither agree nor disagree
[ ] 4 Disagree
[ ] 5 Strongly disagree

1. **Equipment is routinely inspected by workers who use it.**

[ ] 1 Strongly agree
[ ] 2 Agree
[ ] 3 Neither agree nor disagree
[ ] 4 Disagree
[ ] 5 Strongly disagree

1. **How often do safety inspections occur towards the end of a job (when there may be time pressure)?**

[ ] 1 Never
[ ] 2 Occasionally
[ ] 3 Half of the time
[ ] 4 Most of the time

[ ] 5 Always

[ ] 6 I don’t know

1. **How often are Job Hazard Analyses conducted?**

[ ] 1 Daily

[ ] 2 Weekly

[ ] 3 Once per project

[ ] 4 When new tasks are introduced

[ ] 5 Only as needed

[ ] 6 We do not conduct Job Hazard Analyses

**Please indicate the degree to which you agree or disagree with each of these statements:**

|  | **Strongly agree** | **Agree** | **Neither agree nor disagree** | **Disagree** | **Strongly disagree** |
| --- | --- | --- | --- | --- | --- |
| 1. Workers are encouraged to give input into the hazard analysis for their own jobs.
 | [ ] 1 | [ ] 2 | [ ] 3 | [ ] 4 | [ ] 5 |
| 1. Workers are comfortable reporting hazards.
 | [ ] 1 | [ ] 2 | [ ] 3 | [ ] 4 | [ ] 5 |
| 1. Workers are encouraged to make suggestions on how to improve safety on projects.
 | [ ] 1 | [ ] 2 | [ ] 3 | [ ] 4 | [ ] 5 |

1. **What are the mechanisms in place for workers to report hazards? (Please check all that apply.)**

[ ] 1 Tell the foreman

[ ] 2 Tell the site supervisor

[ ] 3 Report to safety huddle/pre-task meetings the next day

[ ] 4 Submit via phone app

[ ] 5 Tell on-site safety rep

[ ] 6 Joint walk-arounds

[ ] 7 I don’t know

1. **Workers are rewarded for reporting hazards.**

[ ] 1 Never
[ ] 2 Occasionally
[ ] 3 Half of the time
[ ] 4 Most of the time

[ ] 5 Always

1. **Our company has a defined program for communicating inspection results.**

[ ] 1 Strongly agree
[ ] 2 Agree
[ ] 3 Neither agree nor disagree
[ ] 4 Disagree
[ ] 5 Strongly disagree

1. **What is the procedure for sharing the results of the routine safety inspections with all workers? (Please check all that apply.)**

[ ] 1 Newsletter/email

[ ] 2 Posters

[ ] 3 Safety committee

[ ] 4 Paystub

[ ] 5 Toolbox talks/safety meetings

[ ] 6 Foremen meetings

[ ] 7 Inspection software

[ ] 8 We do not share results with workers

[ ] 9 I don’t know

1. **How often does management share the company’s injury statistics with workers?**

[ ] 1 Never
[ ] 2 Occasionally
[ ] 3 Half of the time
[ ] 4 Most of the time

[ ] 5 Always

[ ] 6 I don’t know

1. **Do you complete root cause investigations of the following? (Please check all that apply.)**

[ ] 1 Near misses

[ ] 2 OSHA Recordable Cases

[ ] 3 DART incidents

[ ] 4 Property loss

[ ] 5 No, we do not do them

[ ] 6 I don’t know

1. **To what extent are injury data analyzed and used for injury prevention?**

[ ] 1 Data trends are always fully analyzed and displayed; root causes are always identified

[ ] 2 Data trends are usually analyzed and displayed; root causes are sometimes identified

[ ] 3 Data is collected and analyzed centrally, and root causes are identified only in a satisfactory manner

[ ] 4 Data is collected and analyzed centrally and root causes are not well identified

[ ] 5 Little or no effort is made to analyze data regarding trends and causes

[ ] 6 I don’t know (not in my job duties)

1. **Those who act safely receive formal or informal recognition such as a verbal thank you or being mentioned by name to supervisors or managers.**

[ ] 1 Strongly agree
[ ] 2 Agree
[ ] 3 Neither agree nor disagree
[ ] 4 Disagree
[ ] 5 Strongly disagree

1. **Our company refuses to ignore safety rules when work falls behind schedule.**

[ ] 1 Strongly agree
[ ] 2 Agree
[ ] 3 Neither agree nor disagree
[ ] 4 Disagree
[ ] 5 Strongly disagree

1. **How often are workers kicked off a site?**

[ ] 1 Never
[ ] 2 Occasionally
[ ] 3 Half of the time
[ ] 4 Most of the time

[ ] 5 Always

[ ] 6 I don’t know

**Section 3: Training**

1. **What is the minimum amount of safety training received by site supervisors? (Please check all that apply.)**

[ ] 1 OSHA 10

[ ] 2 OSHA 30

[ ] 3 STS

1. **What percentage of the on-site workforce has received OSHA 10 training?**

[ ] 1 80% or more
[ ] 2 From 60% to less than 80%
[ ] 3 From 40% to less than 60%
[ ] 4 From 20% to less than 40%
[ ] 5 Less than 20%

1. **What percentage of your project management staff has received OSHA 10 training?**

[ ] 1 80% or more
[ ] 2 From 60% to less than 80%
[ ] 3 From 40% to less than 60%
[ ] 4 From 20% to less than 40%
[ ] 5 Less than 20%

1. **Does your company conduct ongoing health & safety training for supervisors, including foremen?**

[ ] 1 Yes

[ ] 2 No

1. **We require our foremen to have the following: (Please check all that apply.)**

[ ] 1 First Aid

[ ] 2 CPR

[ ] 3 Emergency Rescue

[ ] 4 OSHA 10

[ ] 5 OSHA 30

1. **Do you require foremen to have leadership training?**

[ ] 1 Yes

[ ] 2 No

1. **When a worker is new to our company, we require them to… (Please check all that apply.)**

[ ] 1 Attend an on-site orientation safety meeting

[ ] 2 Attend generic safety briefings

[ ] 3 Watch a safety video

[ ] 4 Attend training on company policy/workers’ rights

[ ] 5 Complete their on-site orientation as required by the company/general contractor

1. **How often does your company conduct safety toolbox talks?**

[ ] 1 Once per day

[ ] 2 Once per month

[ ] 3 Once per week

[ ] 4 As needed

[ ] 5 Never

[ ] 6 I don’t know

1. **How often do you conduct stretch and flex sessions?**

[ ] 1 Daily

[ ] 2 Weekly

[ ] 3 Monthly

[ ] 4 Once per project

[ ] 5 Only on sites that the GC requires stretch & flex sessions
[ ] 6 We do not conduct stretch and flex sessions

[ ] 7 I don’t know

1. **Is more than one language spoken among your employees?**

[ ] 1 Yes

[ ] 2 No

1. **Do you provide safety training in more than one language (other than English)?**

[ ] 1 Yes

[ ] 2 No

1. **Do you provide safety information materials (posters, pamphlets) in another language other than English?**

[ ] 1 Yes

[ ] 2 No

**Section 4: Safety Program Evaluation**

1. **How often does your company review and modify the safety and health program to correct deficiencies? (Please select all that apply.)**

[ ] 1 We modify and review our safety and health programs on an ongoing basis

[ ] 2 When we start a new job

[ ] 3 When the general contractor requires it

[ ] 4 Periodically, such as once a year

[ ] 5 When an OSHA standard changes

[ ] 6 I don’t know

1. **Do you conduct safety climate surveys among your workers?**

[ ] 1 Yes

[ ] 2 No

**Please indicate the degree to which you agree or disagree with the following statements regarding how your company is prepared for an emergency:**

|  | **Strongly agree** | **Agree** | **Neither agree nor disagree** | **Disagree** | **Strongly disagree** |
| --- | --- | --- | --- | --- | --- |
| 1. There is a crisis management or emergency action plan.
 | [ ] 1 | [ ] 2 | [ ] 3 | [ ] 4 | [ ] 5 |
| 1. Workers have the resources needed to handle emergencies
 | [ ] 1 | [ ] 2 | [ ] 3 | [ ] 4 | [ ] 5 |
| 1. All personnel know how to use emergency equipment.
 | [ ] 1 | [ ] 2 | [ ] 3 | [ ] 4 | [ ] 5 |

1. **Does your company employ a safety director?**

[ ] 1 Yes, we have a full time Safety Director on staff.

[ ] 2 We have an employee assigned to safety who also has other duties.

[ ] 3 We have an external provider for safety services.

[ ] 4 We receive safety services through our insurance carrier.

[ ] 5 No, we do not have a Safety Director on staff.

**Section 5: Company Programs

Special Program Elements**

|  |  |
| --- | --- |
| 1. Does your company have a “return to work” program for employees who have been injured?
 | [ ] 1 Yes [ ] 2 No |
| 1. Does your company have a substance abuse policy that prohibits drug and alcohol use?
 | [ ] 1 Yes [ ] 2 No |
| 1. Does your company require all candidate employees to submit to a drug test before being hired?
 | [ ] 1 Yes [ ] 2 No |
| 1. Does your company perform drug and alcohol testing following EVERY employee work-related injury or accident?
 | [ ] 1 Yes [ ] 2 No |
| 1. Does your company have a reasonable suspicion drug and alcohol testing program?
 | [ ] 1 Yes [ ] 2 No |

1. **Is your company a member of the SHARP program?**

[ ] 1 Yes

[ ] 2 No: I know about SHARP, but my company is not a member

[ ] 3 I don’t know what the SHARP program is

1. **Does your company participate in the OSHA Voluntary Protection Program?**

[ ] 1 Yes

[ ] 2 No

[ ] 3 I don’t know

1. **Are you part of an OSHA partnership program?**

[ ] 1 Yes

[ ] 2 No

[ ] 3 I don’t know

1. **If you hire temp workers, please indicate the degree to which you agree or disagree that temp workers are evaluated for their safety knowledge/skills.**

[ ] 1 Strongly agree

[ ] 2 Agree

[ ] 3 Neither agree nor disagree

[ ] 4 Disagree

[ ] 5 Strongly disagree

[ ] 6 Do not hire temp workers