Addressing Construction Worker Mental Health Using Lean Approaches

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2025-09

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Executive Summary

Construction workers often face rising levels of stress, anxiety, and emotional strain with limited resources or organizational support. While mental health is gaining visibility across industries, the construction sector still lacks data-driven insights into how worksite conditions and management practices affect worker mental health.

This report presents findings from a research project funded by the Lean Construction Institute (LCI), led by a cross-disciplinary academic team in collaboration with an industry advisory board. This research project examines:

- *The prevalence and characteristics of mental health challenges among construction workers in the United States.*
- *The critical relationship between mental health and psychological safety, safety climate, and collective decision making.*
- *How Lean Construction practices are related to construction worker mental health.*

Building on the research focus outlined above, the project team developed a structured survey through a two-step approach. First, a review of academic literature, government reports, and construction-specific mental health programs was conducted to assess the current state of construction worker mental health and to inform the development of valid measurement items. This was followed by an interactive process including five meetings with an advisory board formed by a panel of nine construction professionals to identify key mental health challenges and explore ways to characterize lean practices and discussions with a consultant with background in organizational management. The resulting survey comprised 37 questions across four key dimensions: demographics, mental health measures, psychological safety climate, and the implementation of lean construction practices.

The survey was distributed across a broad range of trades, professions, and geographic regions in the US to capture a representative understanding of mental health conditions among construction workers. With 282 complete responses collected, a three-phase data analysis was conducted: 1) Univariate analysis was applied to assess the current state of mental health; 2) Bivariate analysis was implemented to explore potential influencing factors contributing to mental health issues; and 3) structural equation modeling (SEM) was conducted to establish and evaluate a framework associating mental health with lean construction management practice. This report focusses on the discussion of the first two analyses.

The analysis results include several key findings for construction managers to view as warning signs and opportunities to proactively improve construction workers' mental health.

- **Mental health risks on site are more common and more damaging than we realized**

Over one-third of interviewed workers (36%) reported that their jobs are more stressful than they had ever imagined. Around 30% workers fear that the stress they endure on the job may lead to

physical or mental illness. These levels of chronic stress carry implications for safety, absenteeism, and long-term workforce sustainability.

- **Signs of burnout and depression are widespread across the workforce**

More than half of the respondents (56%) indicated they had little interest or pleasure in doing things at least several days in the past month. Nearly half (46%) reported feeling down, depressed, or hopeless over the same period. These indicators suggest that mental health challenges are not isolated cases but widespread concerns.

- **Gaps in psychological safety limit team performance and innovation**

While 76% of respondents feel "safe to bring up problems and tough issues", 59% were uncertain or disagreed with the statement that "it is safe to take risks on this team". This suggests that although workers feel safe to contribute or raise issues in general, more effort is needed to cultivate an open atmosphere for voices which might challenge the status quo.

The survey also found that management methods and tools rooted in Lean thinking are associated with better mental health indicators.

- **When workers perceive high safety commitment from managers, their stress level tends to be low**

For workers who strongly agree that "management places a strong emphasis on workplace health and safety", 24% strongly agree that "I fear that the amount of stress in my job will make me physically or mentally ill". However, when workers strongly disagree that "management places a strong emphasis on workplace health and safety", 71% strongly agree that "I fear that the amount of stress in my job will make me physically or mentally ill". Safety commitment from management is associated with workers' level of stress.

- **Workers who participate in regular team meetings have a higher sense of belonging**

For workers who strongly agree that "my unit/workgroup meets to discuss issues related to work and social aspects of the workplace", 100% strongly agreed or agreed that they felt "I belong in my work group" or "I am connected my work group". For workers who strongly disagree that their unit/workgroup meets to discuss work and social aspects, only 21% strongly agreed or agreed that "I am connected my work group". Regular meetings discussing work and social aspects generate a sense of belonging for workers.

- **Clear goals help alleviate workers' stress**

For workers who strongly disagreed that their work is more stressful than expected, 100% reported that they clearly understood what their team is supposed to accomplish. When workers strongly agree with the stress statement, only 60% understood their team goals. This suggests that ambiguity of team goals can be a driver of stress.

- **Lean tools improving task visibility promote worker belonging**

For workers who never used visual tools to track task completion, 63% strongly agreed or agreed that "I am treated as a valued member of my work group." The ratio increased to 93% when visual tools are used.

With a better understanding of the current status and informed Lean Construction strategies construction companies can start to take actions to improve the mental health of construction workers. This research encourages construction leaders to treat mental health as a core element of positive jobsite culture, safety, and well-being which are part of a foundation for operational and project success.

1 Introduction

Construction industry has long been defined by its resilience, demanding environments, and a workforce proud of its hands-on contributions to building the physical backbone of our society. However, beneath this reputation lies a pressing and often overlooked issue: the mental health of construction workers (Nwaogu et al. 2022). The inherently dynamic, high-pressure, and sometimes hostile nature of construction projects exposes workers to elevated levels of stress compared to other industries (Milner et al. 2017). Compounding this issue is the male-dominated culture of construction, where toughness is valued and seeking help is often stigmatized as a sign of weakness, which further discourages workers from addressing mental health concerns (Alves et al. 2025).

Exposure to psychosocial stressors such as excessive workloads, poor communication, job insecurity, and inadequate support can lead to anxiety, depression, burnout, and even suicidal intention (Li et al. 2022). These challenges undermine workers well-being and compromise project performance (Liang et al. 2021), eventually leading to major loss in revenue. Research found that, mental health-related presenteeism and absenteeism cost employers approximately £43 billion annually in the UK (Ajayi et al. 2019). Improving mental health among construction workers is therefore not just a matter of individual well-being, but a strategic priority that can enhance workforce stability, safety, and overall industry performance.

1.1 Research Needs

In recent years, a combination of heightened job demands, physical strain, social isolation, and a culture that stigmatizes vulnerability has pushed mental health issues to the forefront. Suicide rates in construction are among the highest across all industries (Cheung et al. 2022). National statistics reveal a concerning fact: construction workers, despite representing only 7.4% of the US workforce, account for more than 17.9% of deaths by suicide (Harris et al. 2025). This sobering figure cannot be dismissed as isolated or inevitable. It is a signal that systemic change is needed.

Despite this, industry focus has remained largely on physical safety and injury prevention, with far less emphasis on the psychological toll of work conditions—such as chronic stress, depression, and a diminished sense of belonging. Around the time of the COVID-19 pandemic, attention shifted to mental health issues, and construction has followed that trend by creating programs that address mental health concerns of its workforce. Associated General Contractors (AGC) of America and the Lean Construction Institute (LCI) are two of the organizations that have focused on reducing the stigma of mental health challenges via broad campaigns focusing on respecting people in the construction industry and being attentive to signs of mental health issues.

1.2 Research Objectives and Tasks

The research objectives are to: (1) assess the current mental health status of construction workers, and (2) examine how lean construction practices influence it.

The goal of this study is to investigate the patterns between lean practices and worker mental health. To achieve this goal, the research team developed a structured questionnaire grounded in a review of academic literature, industry reports, and mental health programs. The overall research task breakdown is illustrated in Figure 1.
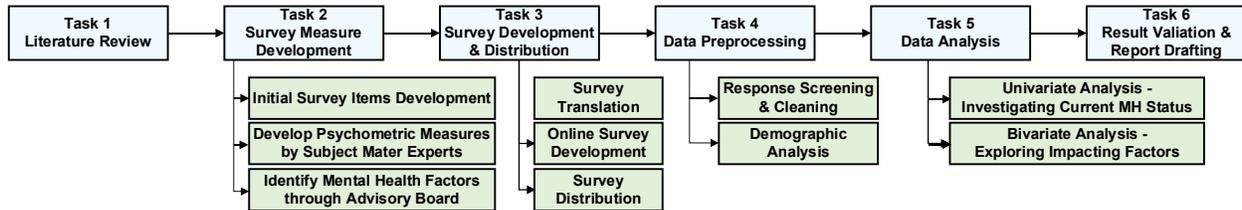
Figure 1. Research Tasks

During Task 1, the research team reviewed academic literature, industry reports, and construction-specific mental health programs to evaluate existing findings of construction worker mental health and to identify potential measures to gauge various dimensions of mental health status. In Task 2, the literature review efforts were further informed to develop a questionnaire survey for construction workers. In Tasks 1 and 2, the team had the support of a consultant, Dr. Amy Randel (Professor of Management, San Diego State University), to select questions already validated in the literature to address mental health topics. The goal of using these validated questions, and related scales, was to allow for future comparisons between the data collected in this study and others already published.

Also, as part of Task 2, the PIs invited a group of subject matter experts (SME) associated with the LCI to discuss topics that should be considered as part of the survey and also to frame questions to capture lean construction practice. Through a series of advisory board meetings with these construction professionals, the main topics to be addressed in the survey questions were selected, and through an interactive process with the advisor board (AB) and the consultant, the survey was finalized.

In Task 3, the finalized questionnaire was translated into Spanish, and both were coded in Qualtrics. Once the survey was finalized and coded in Qualtrics, it was submitted, alongside the recruitment material and training certificates of the team members, to the Institutional Review Board (IRB) of San Diego State University (SDSU). After the IRB review, the study was deemed exempt. The survey was distributed nationwide through newsletters (e.g., LCI, AGC), LinkedIn, and the PIs and AB members networks. The questionnaire distribution was open for responses for eight months from August 2024 to March 2025. A total of 467 responses were received, with 282 usable responses.

In Task 4, the raw data was screened, and demographic patterns were identified in responses. During Task 5, a two-phase data analysis approach was used including univariate analysis to evaluate the baseline mental health conditions and bivariate analysis to explore potential influencing factors. Finally, during Task 6, the PIs interviewed construction field managers to

further explain the findings. A total of eight construction professionals were involved in the interview. Their job roles include project engineer, superintendent, project manager, president, union representative, and career connection specialist. During Task 6, Sol Skinnarland (Associate Professor, Østfold University College, Norway), with a background in organizational management and human factors in Construction, joined the PIs during the interviews. Comments from interviewees were used to support the discussion presented in Chapter 5 to support the research findings.

The report presents the results obtained from the survey responses and suggest practical recommendations for construction leaders to align lean implementation as means to support improved worker mental health.

2 Mental Health Initiatives in Construction Industry

The construction industry has gradually acknowledged the mental health challenges faced by its workforce. According to the Centers for Disease Control and Prevention, in 2021, the construction industry had the second-highest rate of suicide among its workers, surpassed only by mining, quarrying, and oil and gas extraction workers. Fifty-six out of every 100,000 male construction workers died by suicide in 2021, compared to 32 per 100,000 male workers in all industries. This rate was roughly four times the national average and almost six times the rate of all construction fatalities combined (Sussell et al. 2023).

In response to growing concerns, a wide range of stakeholders from national associations to regional organizations have initiated efforts to promote worker s' mental well-being. This section provides an overview of current efforts across the industry aimed at addressing mental health challenges. Specifically, this research reviewed typical efforts from national initiatives by the AGC; regional and state-level actions in New York; and industry-driven efforts led by LCI due to their leading impact in the community. Some representative programs from these organizations were summarized in Table 1.

In recent years, the construction industry has shown growing recognition of the urgent need to address workforce mental health challenges. Existing efforts primarily focused on raising awareness or offering reactive interventions after symptoms emerge, while little attention has been given to proactive strategies for preventing mental health issues. In particular, there is limited understanding of how site-level management practices influence psychosocial conditions and mental health. Additionally, little is known about which worker populations are most at risk or how jobsite culture can be redesigned to build long-term psychological resilience. Addressing these gaps calls for a shift from awareness to the adoption of evidence-based, preventive measures integrated into daily construction practice.

Table 1. Existing Mental Health Initiatives

Organization	Program	Launched	Reference
AGC	Regional Chapter Initiatives and Field-Level Outreach "HOPE" program (Hang On, Pain Ends) by AGC of Missouri Webinars and jobsite visits focused on building psychological safety and leadership accountability in field operations by AGC of California	2021	(AGC of Missouri) 2021; AGC of California 2023)
	Mental Health & Suicide Prevention Task Force	2022	(AGC 2022a)
	Public Awareness Campaigns and Industry PSAs	2022	(AGC 2022b)
	Strategic Partnerships for Behavioral Health Support	2023	(Youturn Health 2023)
	Mental Health Toolbox Talks and Resource Libraries	2024	(AGC 2024)
	Online Mental Health & Suicide Prevention Course	2025	(AGC 2025)
New York State	New York City Department of Health and Mental Hygiene programs	2019	(Mayor's Office of Labor Relations (OLR) 2019)
	"Get Construction Talking" Campaign by The B1M and Procore	2023	(The B1M 2023)
	"Building Hope Through Action" Program	2024	(NYS Office of Mental Health 2024)
	Business Trades Employers' Association (BTEA) Advocacy	2024	(Raffetto 2024)
LCI	Respect for People 2021: Bringing Out the Best in Each Other	2021	(LCI 2021)
	Respect for People 2022: Mental Health, Well-being, and Us	2022	(LCI 2022)
	Respect for People 2023: Supporting Employee Mental Health	2023	(LCI 2023)

This research introduces a comprehensive, field-informed survey co-developed with industry experts. The survey investigates worker mental health status, background characteristics, psychosocial work environments, and the implementation of lean practices on jobsites. The goal is to provide actionable insights that deepen industry understanding of the relationship between management practices and worker mental health, thus enabling earlier and more effective preventive interventions.

3 Research Method

The research method includes the survey questionnaire development, survey distribution, data collection, and interviews.

3.1 Survey Questionnaire Development

The research team employed a structured and iterative questionnaire development process in collaboration with an academic consultant and an industry advisory board. This process consisted of two key steps.

Step 1 - Literature review and expert consultation: A literature review was conducted to identify validated psychosocial constructs relevant to construction workers, with guidance from an academic expert in organizational behavior.

Step 2 - Advisory board meetings: An advisory board with nine professionals from the construction industry was engaged to identify key issues impacting construction worker mental health and to explore potential areas of investigation.

Following these two steps, the final version of the survey questionnaire was developed as shown in Figure 2. The complete instrument is provided in Appendix A. In developing the questions, the psychological measures and statements of parts II and III were more influenced by step one (i.e., literature review and expert consultation), whereas the items and statements related to parts I and IV were more influenced by step two (i.e., advisory board meetings).
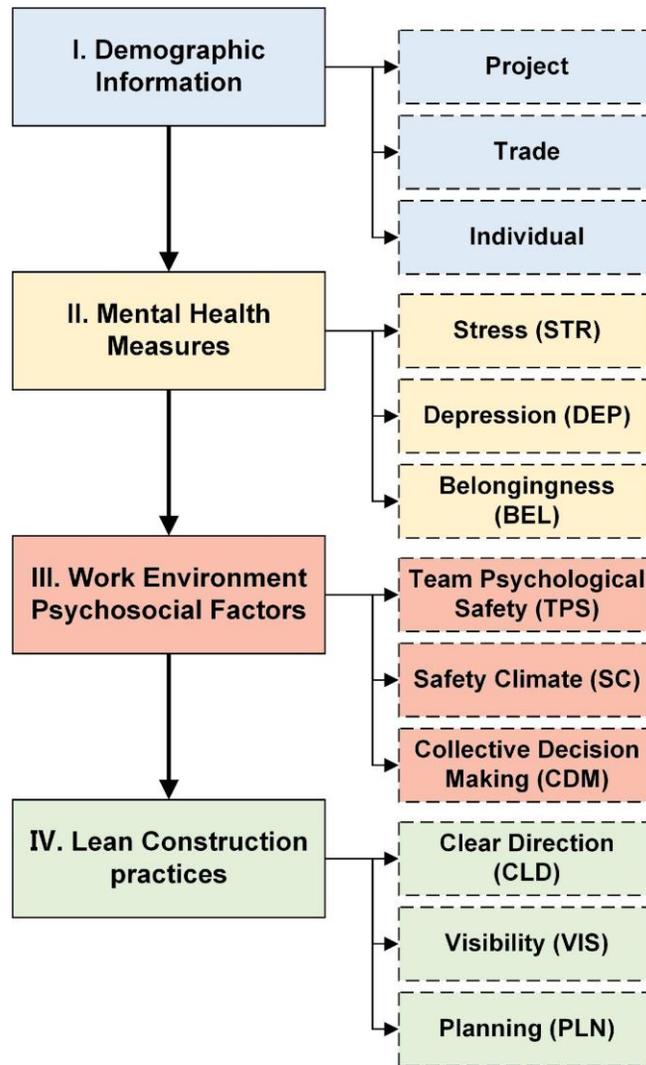
Figure 2. Structure of Survey Questionnaires

3.1.1 Literature Review

The mental health and work-related measures in the questionnaire were developed based on a literature review supported by expert consultation. The literature review began in late 2023, prior to the first meeting with the advisory board, and continued throughout 2024 as the study progressed. During this period, the research team focused on reviewing studies related to the mental health and well-being of construction workers, as well as collecting relevant statistics specific to the construction industry. The reviewed materials included peer-reviewed scientific publications, government-issued reports, and industry-specific programs addressing worker mental health and well-being.

In the initial phase of developing the psychological measures, the research team identified a preliminary set of constructs relevant to mental health within construction work environments. These constructs included stress, depression, anxiety, belonging, loneliness, psychological safety,

and burnout/emotional exhaustion, among other elements that support/hinder mental health in work environments. To evaluate these areas, the team drew upon established psychological instruments, including: (1) the Mental Health Test developed by Mental Health America (Kroenke et al. 2001, 2007), and (2) mental health warning signs commonly recognized within the construction industry. The initial version of the measures related to mental health and work environment contained 39 survey items and served as the foundation for subsequent consultation and refinement with both the mental health consultant and the advisory board. A full list of these initial items is provided in Appendix B.

To balance content coverage with practical survey length, the research team considered two factors: first, potential overlap among the initial survey items; second, the need for a concise questionnaire suitable for field distribution. To address this, the team conducted an additional literature review and held follow-up consultations with the project consultant and advisory board to identify the most essential mental health dimensions.

As summarized in Table 2, the final survey instrument was streamlined to include 19 items across six constructs, which are grouped into two categories: "mental health measures" and "work environment psychosocial factors". The definitions and corresponding sources for each construct are outlined below.

Regarding the mental health measures, the team selected the following.

- Stress (STR) measured using items adapted from Solomon et al. (2022) by asking respondents to reflect on whether their job was more stressful than expected and whether that stress posed a risk to their health.

- Depression (DEP) was measured using two items from Patient Health Questionnaire (PHQ), based on the work of Kroenke et al. (2001, 2007), which asked workers about loss of interest and feelings of hopelessness over the past month.

- Belonging (BEL) was assessed using high-loading items from Chung et al. (2020), focused on how valued and connected workers felt within their teams.

Regarding the work environment psychosocial factors, the team selected the following.

- Team psychological safety (TPS) was measured using a four-item adaptation of Edmondson's (1999) original scale, following a more recent refinement by Madrid et al. (2024). These items evaluated whether workers felt safe raising concerns, if they believed their skills were recognized, and if they trusted others not to undermine them.

- Safety climate (SC) was measured using three items adapted from the framework developed by Neal and Griffin (2006). These items assessed how workers perceive their management's

commitment to health and safety and whether safety is prioritized, emphasized, and viewed as important by leadership.

- Collective decision making (CDM) was assessed using four items adapted from Nolan et al. (2022), focusing on the degree to which workers perceive inclusiveness and shared input in daily operations. The items asked workers whether their teams make decisions collaboratively, whether they have a say in how work is done, and whether team members are involved in important discussions. One item specifically addressed whether the group meets to discuss both work-related and social matters. This construct captures how participatory a work environment feels, which is closely tied to worker autonomy, voice, and engagement.

Table 2. Mental Health Measures (Part II) and Work Environment Psychosocial Factors (Part III)

Construct	Label	Survey items	Reference
Stress	STR1	My job is more stressful than I had ever imagined.	(Solomon et al. 2022)
	STR2	I fear that the amount of stress in my job will make me physically or mentally ill.	
Depression	DEP1	Little interest or pleasure in doing things.	(Kroenke et al. 2007)
	DEP2	Feeling down, depressed, or hopeless.	
Belonging	BEL1	I am treated as a valued member of my work group.	(Chung et al. 2020)
	BEL2	I belong in my work group.	
	BEL3	I am connected to my work group.	
Team Psychological Safety	TPS1	It is safe to take a risk on this team.	(Edmondson 1999; Madrid et al. 2024)
	TPS2	Members of this team are able to bring up problems and tough issues.	
	TPS3	No one on this team would deliberately act in a way that undermines my efforts.	
	TPS4	Working with members of this team, my unique skills and talents are valued and utilized.	
Safety Climate	SC1	Management places a strong emphasis on workplace health and safety.	(Neal and Griffin 2006)
	SC2	Safety is given a high priority by management.	
	SC3	Management considers safety to be important.	
Collective Decision Making	CDM1	My unit/workgroup makes decisions as a group.	(Nolan et al. 2022)
	CDM2	Members of my unit/workgroup have a lot of say about how things are done.	
	CDM3	If an important decision is to be made, all members of my unit/workgroup can have a say.	
	CDM4	My unit/workgroup meets to discuss issues related to work and social aspects of the workplace.	

Except for one question, five-point Likert scale answers ranging from strongly disagree to strongly agree were provided with all statements listed in Table 2. The exception is "Over the last month, how often have you been bothered by the following problems?" Four-point scale answers (1 = not at all, 2 = several days, 3 = more than half the days, 4 = nearly every day) were provided for this statement.

3.1.2 Advisory Board and Expert Consultation

In parallel with step one, the research team collaborated with an advisory board to ensure that the questionnaire reflected the lived experiences and operational realities of construction workers. The advisory board played a critical role in contextualizing the survey content, offering practical insights into jobsite conditions, identifying key factors influencing worker mental health, and assessing the clarity, relevance, and applicability of the survey questions.

The advisory board was composed of nine senior professionals representing diverse sectors of the architecture, engineering, and construction (AEC) industry in the United States. Members included representatives from LCI (1), construction management consulting (2), architecture (2), general contractor (1), specialty contractor (1), insurance (1). All members had over 15 years of experience implementing lean practices and working closely with construction workers in the field. Additional background information on advisory board members is provided in Appendix C.

The advisory board meetings primarily focused on the development of two sections of the survey: demographic information relevant to worker mental health and contextual factors related to lean practices. Between March and May 2024, the research team held five meetings with the advisory board, each lasting at least one hour.

The research team engaged Dr. Amy Randel, Professor of Management at San Diego State University, as a research consultant. With her expertise in organizational behavior, Dr. Randel advised the research team in identifying literature that included validated psychological constructs and scales commonly used in the study of workplace mental health across industries. Rather than developing new measurement tools, the team prioritized selecting survey items that had been employed in previous studies. This approach was intended to ensure alignment with the broader academic literature and to facilitate future cross-industry comparisons.

As shown in Table 3, this initial version included 18 types of demographic information grouped into four categories: company, project, trade, and individual characteristics. This draft served as the basis for discussion and feedback during the advisory board session.

Table 3. Initial Draft of Demographic Survey Items

Category	Survey items
Company	Total number of employees or annual revenue (company size)
	Geographic region of the company
	Organizational role: general contractor or trade partner
Project	What state are you currently working in?
	Project size
	Project ownership type (public or private)
	Contract type
Trade	Construction trade (e.g., electrical, piping, roofing)
	Task complexity
	Level of safety risk
	Minimum and maximum crew size on the current project
Individual	Union affiliation (union or non-union)
	Job title or position
	Age
	Highest level of educational attainment
	Caregiving responsibilities (average hours per week)
	Average weekly working hours
	Daily commuting time

During the meetings, the advisory board members pointed out that workers may not have detailed knowledge about company or project-level information. As a result, they recommended keeping only one question related to project location. Questions such as those assessing safety risk levels were also removed due to ambiguity or limited access of the information by workers.

Additionally, although the initial draft included a question about the worker's age, the board advised replacing it with a question about years of experience in the construction industry. This recommendation was based on two key considerations: first, age may be perceived as sensitive and raise concerns about personal identification; second, years of experience provides a more accurate reflection of a worker's career stage and industry exposure.

The board further refined the wording and response options to ensure the questions were clear, easy to read, and reflective of everyday jobsite practice. To improve the feasibility of survey distribution, particularly to keep the survey short, the board helped streamline the demographic section down to nine questions, which are presented in the final version in Table 4.

Table 4. Final Version of Demographic Survey Items after Advisory Board Review

Category	Survey items
Project	What state are you currently working in?
Trade	What is your primary construction trade?
	How many people do you directly manage?
Individual	What type of job do you have? (Union/Non-union)
	How many years of work experience do you have in construction?
	How do you identify your gender?
	Which racial and ethnic groups do you identify? Please select all that apply
	Is English your primary language?
	How many hours per day do you spend commuting to and from work?

To develop Part IV of the survey, the process began with an initial list of lean practices compiled through a comprehensive literature review. As shown in Table 5, this list included 31 lean tools and methods applied in construction commonly, such as visual communication, planning and control, and site organization.

The research team discussed with the advisory board to select the lean practices that may have potential connection with worker mental health. For instance, the advisory board noted that poor communication or misinformation on the jobsite can contribute to feelings of exclusion and even foster bullying behaviors. Similarly, a lack of clear goals may lead to confusion-induced stress. As a result, those lean practices that provide clear direction and transparent information flow were included as high-priority candidates.

The board also emphasized that frontline workers often have limited control over their work, which may contribute to stress and disengagement. Therefore, lean practices that emphasize worker empowerment, such as the Last Planner System (LPS), were also selected. Similarly, practices that provide simple and accessible channels for workers to suggest improvements, which is a core component of the Kaizen philosophy, were considered critical reflections to Respect for People.

Recognizing that many lean practices may be unfamiliar or abstract to workers, the research team and the advisory board focused on translating these concepts into direct and specific descriptions of actions. For example, rather than asking whether the Last Planner System is used, the survey instead asks, "Do you replan in daily huddles due to changing work conditions?" This strategy helps ground lean principles in real-world experiences and scenarios that are recognizable to workers.

After discussing and reviewing the descriptions one by one for a few iterations, the research team refined the survey questions on lean practices. As summarized in Table 6, Part IV Lean Practices was streamlined to ten items, grouped into three thematic categories: Clear Direction, Visibility, and Planning.

Table 5. Initial Draft of Lean Tools and Practices

Lean practices type	Tool
Visual Communication	White Board Tracking Completion
	Label Supplies/Materials
	Label Working Areas (Who is working on what, when, and where)
Planning and Control	Master Schedule (CPM)
	Last Planner System (LPS)
	Takt Planning
	Line of Balance (LOB)
	Location-Based Scheduling (LBS)
	Pull System
Site Organization	5S
Equipment and Materials	Kanban
	Just-in-time (JIT)
Continuous Improvement Tools	Kaizen
	Plan-Do-Check-Act (PDCA)
	Gemba Walk
	A3
	Construction Process Analysis
	Wrapping Up
Root Cause Analysis	5 Whys
	Ishikawa (Fishbone Diagram)
	Pareto Analysis
	Bottleneck Analysis
Quality Control & Empowerment	Andon
	Jidoka
Flow Optimization	One Piece Flow
	Continuous Flow
	Cellular Manufacturing
	Space Optimization
Collaboration and Integration	Integrated Project Delivery (IPD)
	Target Value Design (TVD)
	Co-location

Table 6. Final Survey Items on Lean Practices

Category	Survey items	Label
Clear direction	Rate your agreement with the following statements:	
	- It is clear what this team is supposed to accomplish.	CLD1
	- The team spent time making sure every team member understands the team objectives.	CLD2
	- The team has invested plenty of time to clarify our goals.	CLD3
Visibility	On a weekly basis, how often do you or your crew…	
	- Use a white board/stand up board/virtual plan to track completion?	VIS1
	- Know who is working on what, when, and where?	VIS2
	- Replan in daily huddles due changing work conditions (Definition: Daily huddle: short meeting before or after work shift to discuss the tasks of the day)?	VIS3
Planning	Rate your agreement with the following statements:	
	- Forepersons are empowered to plan.	PLN1
	- We have productive, efficient flow (not hurry up and then wait).	PLN2
	- There is an easy and clear channel for workers to provide suggestions for improvement? (For example, a suggestion box, a white board.)	PLN3
	- The rules for site organization are easy to follow. For example, workers know where to locate material, equipment, restrooms, and work areas on the project site.	PLN4

3.2 Data Collection

3.2.1 Survey Development and Distribution

The survey plan was approved by the IRB of SDSU in August 2024. The questionnaire was designed and administered in digital format using the Qualtrics platform. Participants accessed the survey by scanning a QR code. The survey was initially developed in English and subsequently translated into Spanish with the support of Professor Lorena Carina Broca Dominguez from Universidad LaSalle, Oaxaca, a native Spanish speaker with a background in construction. The translation process involved detailed discussions with one of the project's principal investigators, Dr. Thais Alves, to ensure that the meaning and intent of each question were accurately preserved in the Spanish version.

The research team distributed the survey indirectly by contacting construction companies via the advisory board members, the research team leaders' professional contacts, and industry associations. They were asked to share the QR code with construction workers or site managers, who could then choose whether to participate voluntarily. Respondents completed the survey anonymously using their personal mobile devices. Before starting, they were informed that their participation was entirely voluntary, their responses would remain confidential, and no identifying information such as their name, company, or project would be collected. This assurance of anonymity was intended to encourage open and honest participation, free from concerns about potential repercussions from supervisors or employers. By March 2025, a total of 467 responses were received. Built-in screening logic was applied at the beginning of the questionnaire to ensure

eligibility. The survey was automatically terminated if the respondent met any of the following exclusion criteria: (1) Under the age of 18; (2) Not currently employed in a construction project, shop, or company; and (3) Not participating voluntarily. Respondents were also informed that they could exit the survey at any time without consequence.

After data collection, incomplete responses and those with a completion time of less than 200 seconds were treated as invalid and excluded. After applying these eligibility checks, a total of 282 complete responses were identified for further analysis.

3.2.2 Demographic Analysis

This section presents the demographic statistics of the respondents. Tables 7-11 list the respondent counts breakdown by various factors. As shown in Table 7, from the geographical perspective, a majority of the respondents are from Michigan, California, Ohio, each state has more than 50 responses. In addition, Table 8 shows that the respondents represented a range of construction trades, including Earthwork/Highway/Road building (20.2%, 57), Piping/Plumbing (15.6%, 44), Mechanical/HVAC (11.7%, 33), Steel (9.2%, 26), Concrete (8.9%, 25), Electrical (3.5%, 10), and Drywall/Masonry (1.1%, 3). Additionally, a number of participants self-identified under "Other" categories, including General Contractor (7.4%, 21) and Construction Management (2.8%, 8).

Table 7. Geographic Distribution of Survey Respondents

State	Counts	State	Counts
Michigan	91	Connecticut	2
California	54	Georgia	2
Ohio	52	Nevada	2
New York	10	North Carolina	2
Texas	10	Hawaii	1
Arizona	7	Idaho	1
Massachusetts	6	Illinois	1
Tennessee	5	Iowa	1
Virginia	5	Louisiana	1
Wisconsin	5	Maryland	1
Indiana	4	Montana	1
Colorado	3	New Jersey	1
Kentucky	3	New Mexico	1
Oregon	3	Washington	1
South Carolina	3	Washington, D.C.	1
Alabama	2	-	-

Table 8. Construction Trade Distribution of Survey Respondents

Construction Trade	Counts
Earthwork/Highway/Road building	57
Piping/plumbing	44
Mechanical/HVAC	33
Steel	26
Concrete	25
Electrical	10
Drywall/Masonry	3
Other	84

Table 9 shows that the vast majority of respondents identified as White (80.9%, 228), followed by Hispanic or Latinx (5.7%, 16) and Black or African American (2.5%, 7). Table 10 shows that the majority of respondents identified as male (85.1%, 240), with a smaller proportion identifying as female (13.8%, 39). A more detailed breakdown of the "Other" category for construction trade, race, and gender is provided in Appendix D. Table 11 shows that the largest group reported over 20 years of experience (31.9%, 90), followed by those with 1–5 years (29.4%, 83), 10–20 years (21.6%, 61), and 5–10 years (17.0%, 48). Overall, the demographic background of the respondents covers a wide range, which contributes to supporting the validity and representativeness of the findings.

Table 9. Race Distribution of Survey Respondents

Race	Counts	Percentage
White	228	80.85%
Hispanic or Latinx	16	5.67%
Black or African American	7	2.48%
Asian	5	1.77%
Middle Eastern or North African	3	1.06%
Others	23	8.16%

Table 10. Gender Distribution of Survey Respondents

Gender	Counts	Percentage
Female	39	13.83%
Male	240	85.11%
Non-binary/Other	1	0.35%
Prefer not to say	2	0.71%

Table 11. Work Experience Distribution of Survey Respondents

Years of Experience	Counts	Percentage
Above 20 years	90	31.91%
Between 1 and 5 years	83	29.43%
More than 10 years but less than 20	61	21.63%
More than 5 years but less than 10	48	17.02%

3.3 Data Analysis Methods

After collecting the survey data, the research team conducted a comprehensive analysis to identify key factors influencing construction worker mental health and evaluate the connection between lean practices and mental health measurements. Two types of analyses were developed and are shared in this report: univariable distribution analysis and bivariate analysis.

- **Method 1: Univariable Distribution Analysis**

This method provided an overview of the initial results by presenting the distribution of responses for each individual survey item. These findings are summarized in Chapter 4.

- **Method 2: Multivariate Analysis**

It aimed to explore whether any factors captured in the survey were associated with differences in mental health measurements. This analysis focused on responses from Part II. Mental Health Measures, which included seven items related to stress, depression, and belonging. Respondents were grouped according to variables from other sections of the survey: Part I Demographics, Part III Work environment psychosocial factors, and Part IV Lean Practices. For example, to investigate whether union membership is associated with mental health outcomes, respondents were divided into two groups: union and non-union workers, and their responses to all seven mental health items were compared. The results of this specific comparison are presented in Section 5.1. Similar bivariable comparisons were conducted across all relevant survey variables, and findings that revealed practically notable differences between groups are discussed in Chapter 5.

3.4 Interviews Design and Procedure

To verify and evaluate the findings and insights from the structured survey, the research team performed seven interviews with eight construction practitioners. The interviews were conducted from June to August in 2025. The eight interviewees include one project engineer, three senior project superintendents, one assistant project manager, one president of a construction company, and two union leaders. The first six interviews involved one participant each, and the final interview involved two participants. Each interview lasted around an hour, with a minimum of 57 minutes and a maximum of 70 minutes. The interview questions were developed based on the survey findings and can be found in Appendix E.

This set of interview questions was designed to examine how management practices such as clear direction, planning, and visibility directly or indirectly influence construction workers' mental health. The questions are organized into seven themes, each reflecting a potential pathway through which management practices affect well-being. Within each theme, two types of questions are posed: (1) inquiries into how specific management practices are implemented in the interviewee's project, and (2) reflections on how these practices influence mental health. In addition to sharing general perceptions, respondents are also asked to provide specific examples from their work experience. Beyond the seven themes of questions, the final part of the interview includes

additional discussion questions designed to elicit practical insights and implications for mental health. For example, participants are invited to reflect on effective approaches to improving worker mental health, strategies for addressing mistakes, and the ways in which mental health affects project outcomes.

4 Current Status – Survey Results

To better understand the mental health challenges in the construction industry, we conducted a national survey targeting frontline construction workers and managers across various trades and geographic regions. The key findings from the survey included:

- *High levels of job stress and depressive symptoms among workers*
- *Limited psychological safety preventing open communication on jobsites*
- *Lack of clarity in team goals contributing to confusion and stress*
- *Perceived lack of voice in decision-making processes*
- *Management inconsistency in demonstrating safety as a core value*
- *Underuse or inconsistent application of lean practices and mixed workers' perception about open channel for suggestions*

Detailed statistics and insights are discussed in the following sections.

4.1 Stress and Depression

Survey results indicate that job-related stress and depressive symptoms are prevalent among construction workers. When asked whether their job is more stressful than they had anticipated, 36% of respondents agreed or strongly agreed (Figure 3). Additionally, 30% agreed or strongly agreed with "the amount of stress in my job will make me physically or mentally ill". These findings suggest that stress is not an isolated issue, but a widespread and potentially harmful condition affecting a substantial portion of the workforce.

Notably, 42% and 34% of workers responded neutrally to these two questions. As pointed out by members of the advisory board, the portion of responses staying in the middle should not be ignored. Not disagreeing with the statements may suggest that the respondents are not feeling OK, but they do not feel comfortable acknowledging the stress when toughing-up is highly regarded in the prevalent culture of the construction industry.
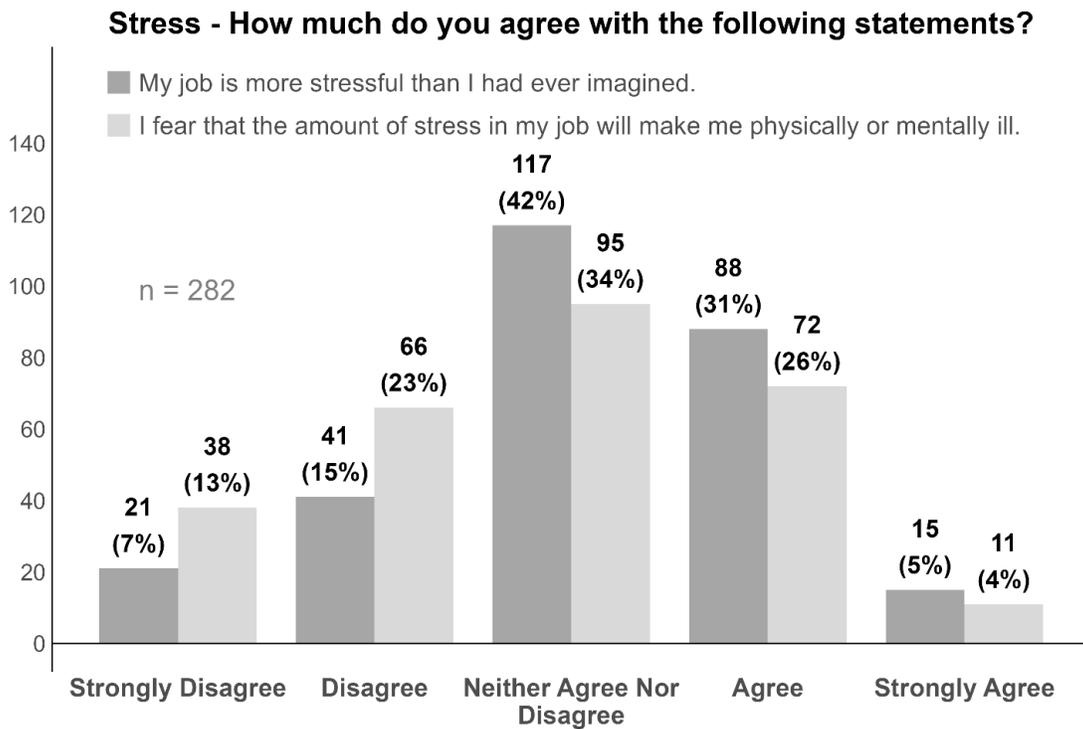

Figure 3. Distribution of Responses to Stress-Related Statements

When workers were asked how often they experienced little interest or pleasure in doing things over the past month, as shown in Figure 4, more than half (56%) reported being affected:

- *34% on several days*
- *15% on more than half the days*
- *7% nearly every day*

Similarly, when asked how often they felt down, depressed, or hopeless, 46% of respondents indicated experiencing these emotions:

- *36% on several days*
- *7% on more than half the days*
- *3% nearly every day*

These findings provide a clear indication of widespread emotional disengagement among construction workers. If left unaddressed, the commonly felt high level of stress may result in serious safety risks.

Even more concerning is the group of workers who reported experiencing these depressive symptoms nearly every day. This level of emotional distress indicates the presence of severe mental health conditions or clinical depression. These statistics highlight the urgent need for mental health support and proactive intervention strategies in the construction industry (Siu et al. 2004).
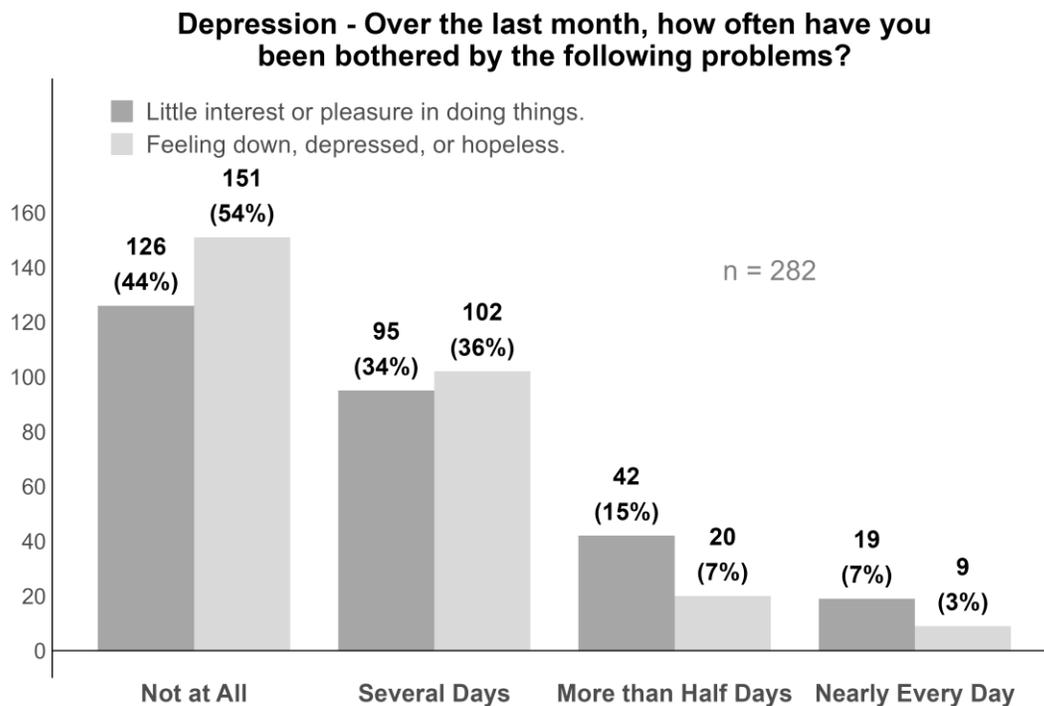

Figure 4. Distribution of Responses to Depression-Related Statements

4.2 Team Belonging

The survey results show a strong sense of inclusion: most workers feel accepted and respected within their immediate teams. Across three key measures of belonging—feeling valued by their work group, feeling a sense of belonging within the group, and feeling connected to the group—nearly three-quarters of respondents reported positive experiences (agreed or strongly agreed with the statements). This suggests that a widespread sense of belonging is present among the respondents.

However, as shown in Figure 5, approximately one-quarter of workers responded neutrally or disagreed with these statements, highlighting gaps in inclusion that warrant attention. These findings point to opportunities to foster a more inclusive jobsite culture and strengthen the sense of belonging for all team members. A strong sense of belonging can enhance team morale and collaboration, and also play a critical role in attracting and retaining workers. This is especially crucial at the time when the construction industry continues to face a shortage of skilled workers.
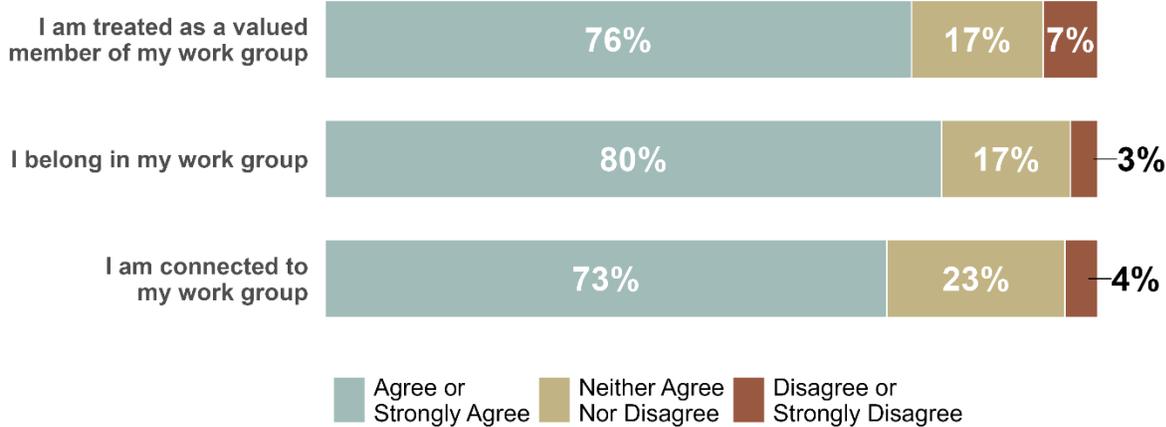

Figure 5. Distribution of Responses to Belonging-Related Statements

4.3 Psychological Safety

Our survey results indicate that while elements of teamwork and inclusion are present, psychological safety on construction jobsites remains limited. Many workers still hesitate to speak up, take risks, or express concerns. This phenomenon highlighted the need for stronger trust and openness across teams. When asked whether it is safe to take a risk on their team, 59% were uncertain (neither agreed or disagreed) or disagreed with the statements. However, when asked whether members of their team are able to bring up problems and tough issues, as shown in Figure 6, 76% of workers agreed or strongly agreed, indicating a relatively open environment for daily operational feedback.

This gap reveals an important distinction: while surface-level communication may be encouraged, deeper psychological safety such as the freedom to express vulnerability or challenge existing practices might be limited. Feedback may be welcomed only within certain boundaries, and workers may still feel hesitant to speak up in ways that involve interpersonal and/or interorganizational risks. As some interviewees pointed out, tough questions were not always welcomed or handled well in meetings. Some inquirers were not invited back to the meetings. Experiencing it personally or witnessing colleagues being excluded creates a feeling of reluctance when individuals want to voice their opinions in the future.
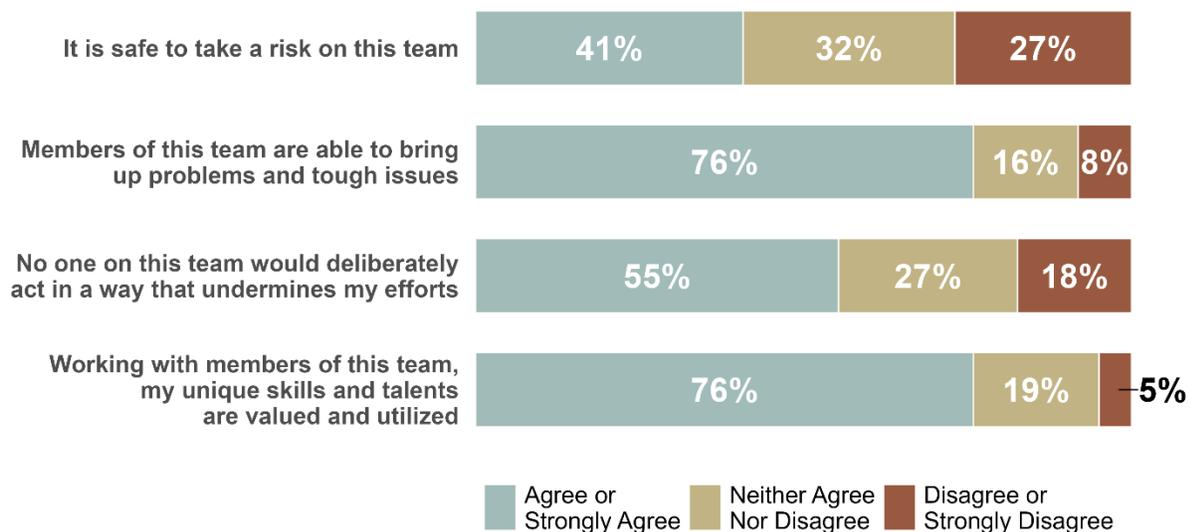
Figure 6. Distribution of Responses to Team Psychological Safety Statements

Additionally, when asked whether "no one on this team would deliberately act in a way that undermines my efforts," nearly half of respondents (45%) either disagreed or remained neutral. This might point out to a sense of psychological insecurity among workers, where individuals feel the need to protect themselves rather than fully trust their teammates. Such perceptions can hinder collaboration and suppress open communication. One possible contributor to this distrust is the fragmented nature of construction sites, where workers often come from different subcontracting

teams with limited prior interaction. The absence of mutual understanding across these groups can lead to friction, misaligned expectations, or even blame-shifting under pressure, which further undermines team cohesion and jobsite effectiveness.

4.4 Safety Commitment by Leadership

The survey results suggest that construction leaders broadly recognize the importance of safety. As shown in Figure 7, 71% of workers agreed or strongly agreed that management places a strong emphasis on workplace health and safety. When asked whether safety is given a high priority by management, 81% of workers agreed or strongly agreed with the statement. An even higher percentage (85%) believe that their management considers safety to be important, indicating that workers perceive strong alignment regarding the importance of safety at the leadership level.

The gap observed in these responses suggests that while safety is emphasized in principle, it may not always be consistently demonstrated through actions or reinforced visibly on the jobsite.
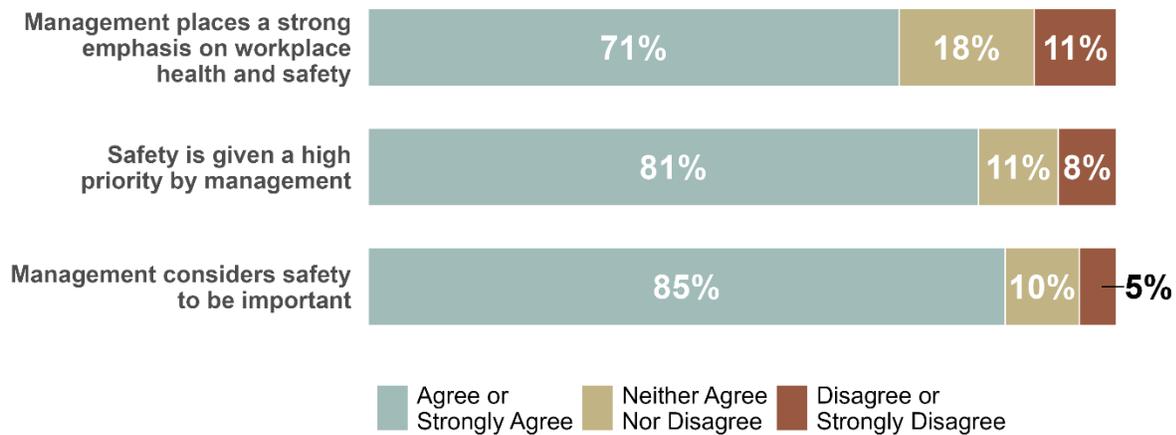
Figure 7. Distribution of Responses to Safety Climate Statements

4.5 Decision-Making

The survey results suggest that while many workers experience some level of involvement in team decisions, a considerable portion still feel left out of the process. Across all four questions related to group decision-making, as shown in Figure 8, a consistent pattern emerged: approximately three in five respondents agreed or strongly agreed that they are involved, while around one-quarter remained neutral, and between 8% and 16% disagreed. For example, when asked whether their unit or workgroup makes decisions as a group, 61% of workers agreed or strong agreed, while 25% were neutral and 14% disagreed. These responses suggest that there is a need to engage the workforce who may feel disconnected from how work is organized and executed.
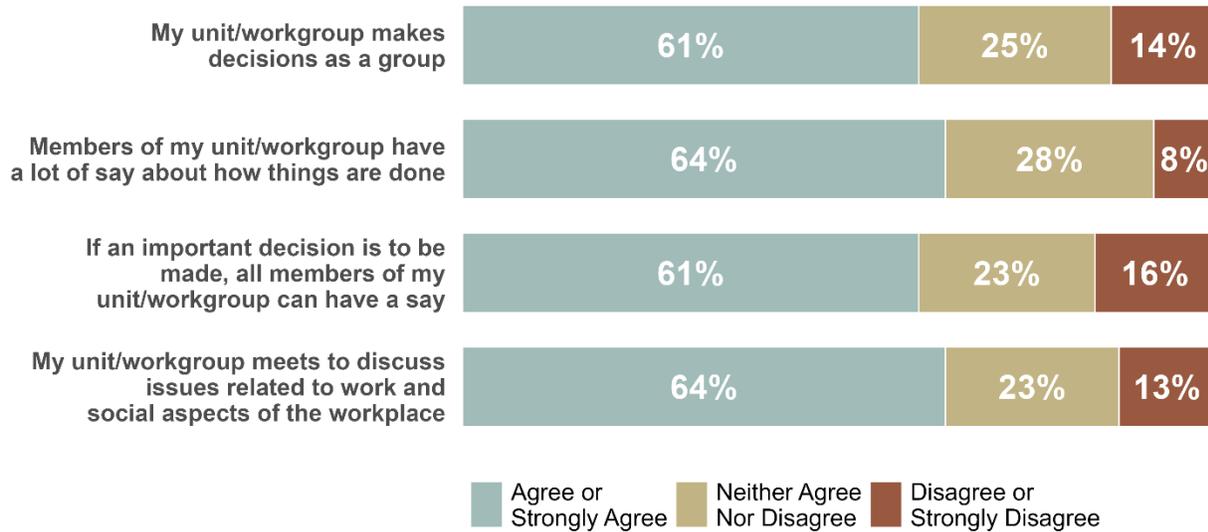
Figure 8. Distribution of Responses to Collective Decision-Making Statements

4.6 Clear Direction

The survey results suggest that while most workers understand what their team is expected to accomplish, many feel that insufficient effort has been made to ensure alignment of the details. As shown in Figure 9, a large majority of respondents (83%) agree or strongly agree that their team's overall purpose is clear. Additionally, 66% agree or strongly agree that the team spent time making sure every team member understands the objectives. However, a lower percentage believe that time has been invested to clarify goals or ensure all members fully understand the objectives which somehow contradicts the previous result. Only 59% workers agree that their team has spent enough time clarifying goals, while the remaining 41% are either unsure or disagree. Even when overall objectives are understood, investing time to build shared clarity across the team is essential to improving coordination, reducing miscommunication, and driving project success.

Figure 9. Distribution of Responses to Clear Direction Statements

4.7 Lean Practices Implementation

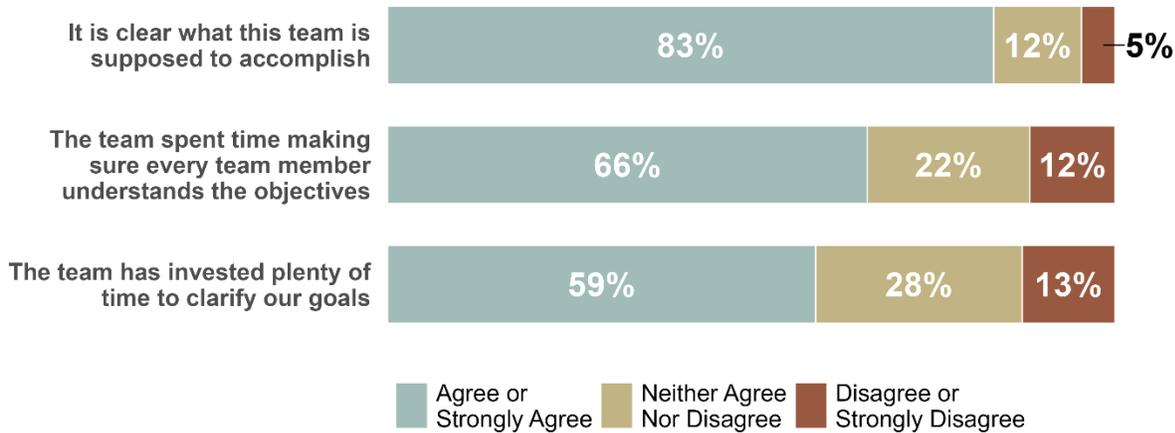In general terms, lean is a management approach focused on reducing waste, improving flow, and maximizing value through collaboration and continuous improvement. Survey results suggest that some lean practices such as empowering forepersons to plan and maintaining clear site organization are well established in the field. However, other practices, including visual management, promoting a reliable workflow, and accessible channels for worker feedback, are applied inconsistently as reported by survey respondents. These gaps point to the opportunities to expand lean implementation.

4.7.1 Sharing Information

Figure 10 shows that when asked how often they use a white board, stand-up board, or virtual plan to track task completion, only 31% of respondents reported using these tools "often" or "very often," while 43% said they use them "rarely" or "never." The underutilization of visual management tools may be a contributing factor to the lack of task clarity across teams.
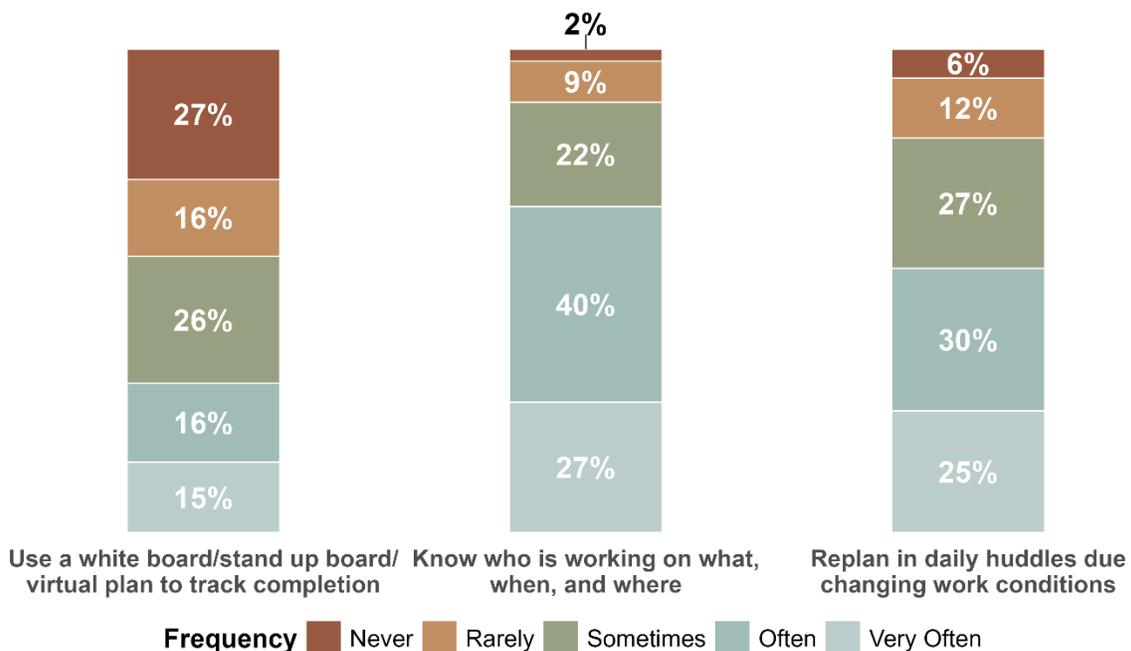
Figure 10. Distribution of Responses to Visualization Statements

When workers were asked whether they know "who is working on what, when, and where," 67% reported that they often or very often know who is working on what, when, and where, whereas 11% reported they "never" or "rarely" know, and an additional 22% responded "sometimes." This means that approximately one-third of the workforce lacks clear understanding of task assignments. This finding aligns with earlier results indicating that one-third of workers feel their teams have not invested enough time to clarify goals (see Figure 9). This issue appears to be closely related to the limited use of visual planning tools and insufficient structured communication around task execution as indicated by results related to the use of visual tools.

In contrast, more than half of respondents (55%) reported that their teams often or very often replan in daily huddles in response to changing site conditions. Daily huddles enable teams to align daily tasks, adjust plans in real time, and reduce miscommunication.

4.7.2 Planning Tools

Survey results highlight positive progress in key lean practices at the field level. As shown in Figure 11, a large majority of respondents (77%) agree that forepersons are empowered to plan, which indicates a successful implementation of decentralized planning principles from LPS. Empowering forepersons is critical for project performance and for building trust. In one of our interviews, a leader responsible for more than 200 individuals emphasized that it is impossible to directly oversee every worker and every detail of a project, which will create tremendous stress for him. Instead, empowering forepersons to plan—by encouraging them to speak up, observe ongoing issues, and address problems before they escalate—creates a more efficient and responsive project environment while reducing the decision-making burden.

Similarly, 76% agree that site organization rules are easy to follow, aligning with 5S practices that promote visual order, efficient material handling, and safer work environments. In fact, during the interview phase, the use of 5S came up as a great example of a simple but impactful method to help organize the project site, improve the flow of activities and the safety of workers. One interviewee mentioned that being at a clean and organized jobsite is pleasant. Another manager pointed out that having standardized working methods or placement of tools enable people to start the work quickly and avoid the stress of figuring out the working methods or looking for tools on the spot. Additionally, interviewees also indicated that the implementation of 5S contributes to a cleaner and more orderly, and safer workplace. In response to the question, "What is important to you to feel physically and mentally safe on this project?" one interviewee emphasized that a well-organized project is closely linked to physical safety. After applying 5S, their project site became cleaner, more orderly, and ultimately safer. Reduced clutter minimized physical hazards, which in turn might have alleviated workers' stress and concerns about injury.
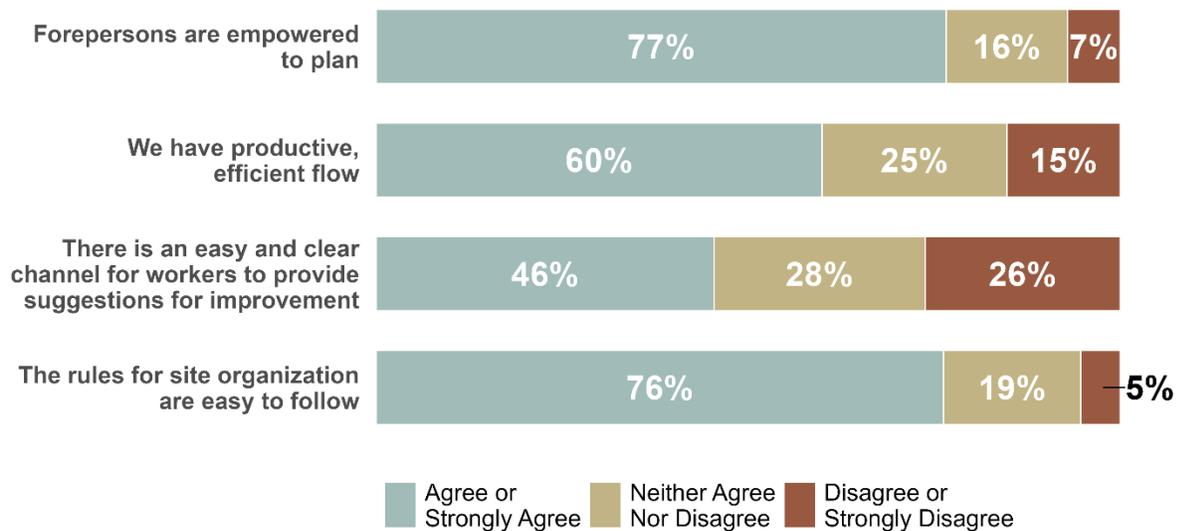
Figure 11. Distribution of Responses to Planning Statements

However, limitations remain in other critical areas. While 60% of respondents feel their teams achieve productive, efficient flow, the other 40% is uncertain or disagree with this statement suggesting that many jobsites continue to experience disruptions, inconsistent pacing, or "hurry up and wait" scenarios. These numbers highlight an opportunity to use tools and techniques to improve workflow reliability. In addition, fewer than half (46%) of respondents reported having a clear and accessible channel for providing suggestions, while over a quarter (26%) disagree entirely. This points to an opportunity to create and sustain a continuous improvement culture, where frontline input is better received and utilized as appropriate.

5 Impacting Factors

While mental health concerns in construction are widespread, they do not affect all workers in the same way. Certain workforce segments face disproportionate high levels of stress, depression symptoms, or feel disconnected from their teams. Results are often tied to factors like job roles, years of experience, team structure, commute time, or perceived support from leadership. These patterns are not only critical for understanding mental health, they also reveal potential vulnerabilities associated with certain groups, which in turn might impact overall workforce stability and long-term sustainability, safety performance, and operational continuity.

This section explores how mental health outcomes vary across the construction workforce based on survey responses. The analyses identify specific groups who may be at elevated risk of burnout, disengagement, or turnover, including:

- *Non-union workers, who reported higher levels of stress*
- *Supervisors and forepersons, who reported experiencing growing pressure as team size increases*
- *Mid-career professionals, who appear to experience low levels of belonging despite accumulated experience*
- *Long-commute workers, who reported greater emotional fatigue and reduced engagement*
- *Workers who perform under ambiguous team goals tend to have higher level of stress*

Additionally, results suggest ways in which mental health indicators can be improved through actions taken by management:

- *Management's commitment to safety helps alleviate workers' stress.*
- *Lean tools improving task visibility promote worker belonging.*

Each of these findings carries implications for construction managers and their ability to impart change on the well-being of construction workers who are most at risk. These results allow companies to move beyond one-size-fits-all solutions and focus their resources on where the impacts will most likely yield the best results.

In an industry where labor availability, productivity, and project reliability are critical elements, knowing where mental health challenges are concentrated is a major step to improve workers' well-being.

5.1 Union vs Non-union

Survey results indicate a pattern: non-union workers reported higher levels of job-related stress than their union counterparts. When asked whether their job is more stressful than they had ever imagined, as shown in Figure 12, 42% of non-union workers agreed or strongly agreed, compared to 32% of union workers. Additionally, 35% of non-union workers say they fear stress could make them physically or mentally ill, which is higher than the 24% reported by union workers.

This finding has several potential business implications:
- *Non-union workers may be more vulnerable to burnout, absenteeism, and turnover.*
- *Elevated stress among non-union crews may reflect gaps in support systems, communication structures, or worker protections on certain projects.*
- *Contractors relying heavily on non-union labor might need to consider investing more proactively in field-level planning, supervision, and engagement to mitigate these risks.*

These findings suggest that workforce structure is not just a contractual or operational issue, it is also an important factor contributing to workforce health and well-being. Stress reduction should be viewed not just as a wellness initiative but as a core risk management strategy to sustain a healthy and productive workforce over the long run.
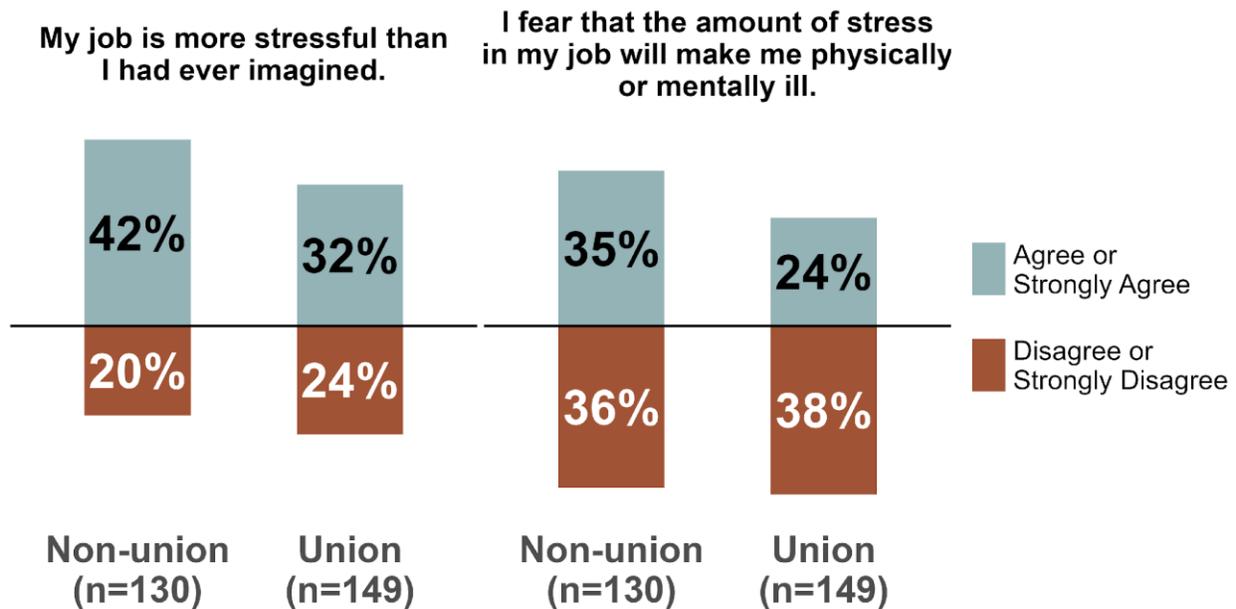
Figure 12 Comparison of Perceived Job Stress Between Union and Non-Union Construction Workers

5.2 Number of People Managed

The data shows that as construction professionals take on higher levels of supervisory responsibilities, the likelihood of them experiencing serious job-related stress increases. As shown in Figure 13, while only 16% of respondents who reported that they do not manage others agreed or strongly agreed that the stress in their job might make them physically or mentally ill, the percentage climbs noticeably among those managing others, peaking at 41 % for those managing 11-20 people:

- *36% of those managing 1 – 5 people*
- *33% of those managing 6 – 10 people*
- *41% of those managing 11 – 20 people*
- *36% of those managing more than 20 people*

Figure 13. Relationship Between Number of Direct Reports and Fear of Job Stress Leading to Physical or Mental Illness

The pattern becomes even more pronounced when workers were asked whether their job is more stressful than they had ever imagined. As shown in Figure 14, and similar to results in Figure 13, only 18% of workers without direct reports expressed concern. However, in contrast:

- *40% of those managing 1‑5 people*
- *57% of those managing 6‑10 people*
- *52% of those managing 11‑20 people*
- *48% of those managing more than 20 people*
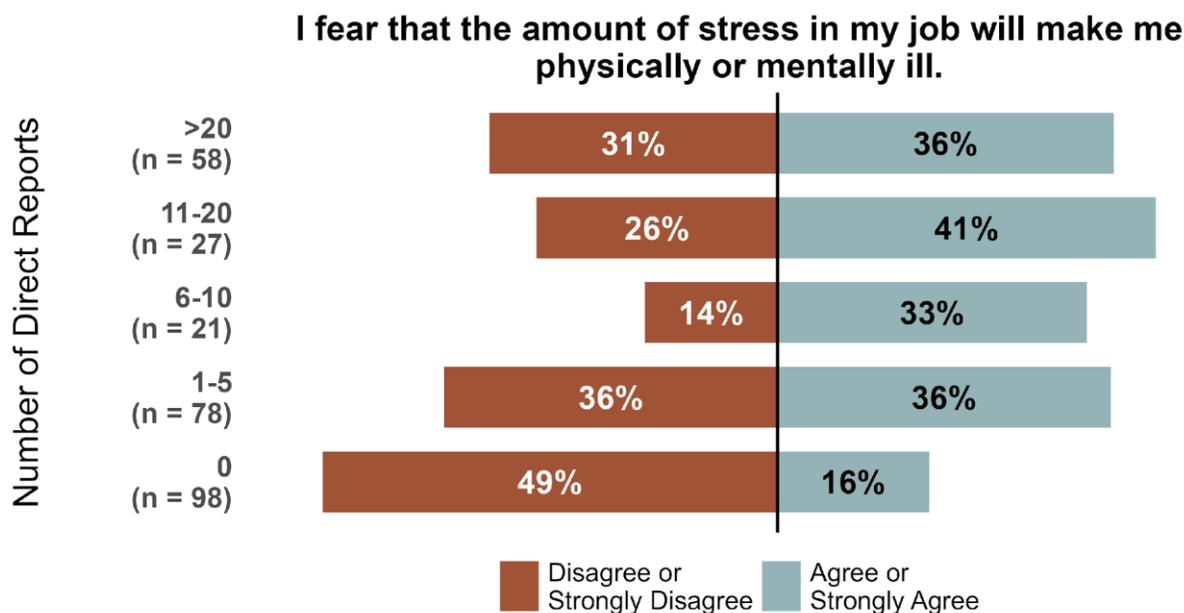
Notably, workers managing 6–10 people (57%) are more than three times as likely to experience high levels of stress compared to those who are not managing others (18%).

My job is more stressful than I had ever imagined.

Number of Direct Reports	Disagree or Strongly Disagree	Agree or Strongly Agree
>20 (n = 58)	12%	48%
11-20 (n = 27)	11%	52%
6-10 (n = 21)	5%	57%
1-5 (n = 78)	21%	40%
0 (n = 98)	36%	18%
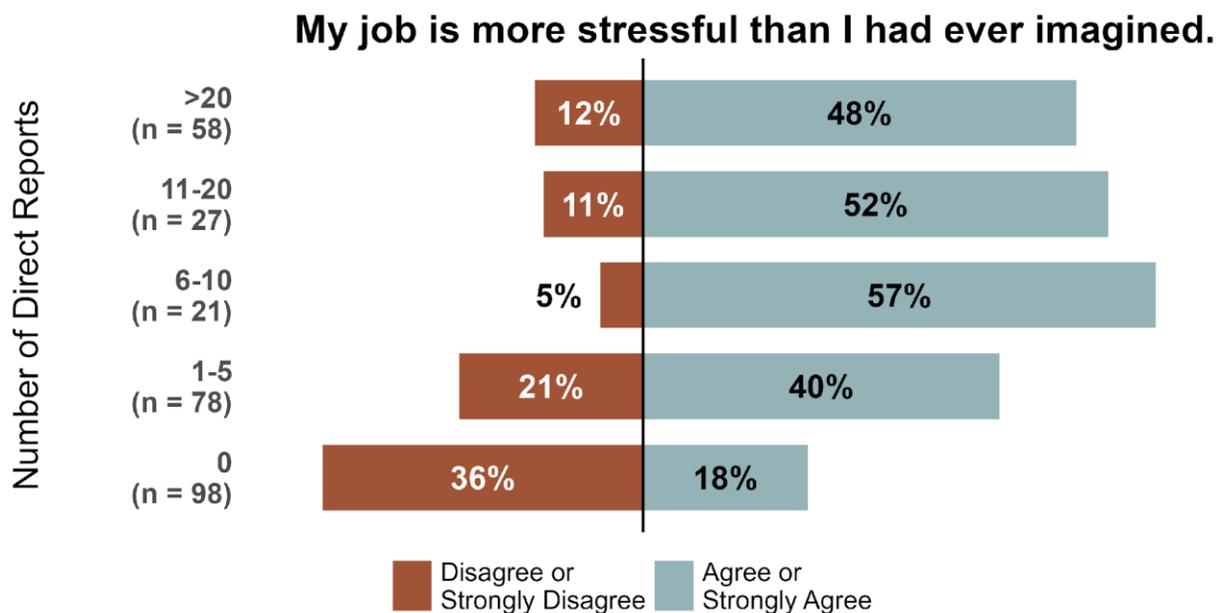
Figure 14. Relationship Between Number of Direct Reports and Perception of Job Stress Exceeding Expectations

This trend suggests that mid-level field leaders such as forepersons and site supervisors face rising stress levels as team size grows. These roles are essential to daily execution and project flow, yet their mental health burden is rarely addressed directly.

The business implications of these elevated levels of stress are:
- *Supervisory burnout can affect jobsite coordination, team morale, and decision-making under pressure.*
- *Turnover among field leaders is particularly disruptive, often creating knowledge gaps and rework risks.*

- *Providing leadership training, support systems, and practical tools to manage stress could improve both individual well-being and team performance.*

These findings underscore the importance of recognizing mental health not only among rank-and-file workers, but also within the frontline leadership ranks who carry important operational responsibility.

5.3 Years of Working Experience in Construction

Results indicate that years of experience in construction has a dual impact on mental health, influencing job stress and sense of belonging in distinct and contrasting patterns. These findings offer important signals to construction leaders on where hidden risks lie within their workforce, and which segments require more focused support.

5.3.1 Stress Increases with Time in the Industry

As shown in Figure 15, when workers were asked whether their job is more stressful than they had ever imagined, the results showed a clear upward trend tied to experience:

- *22% of those with 1–5 years of experience agreed or strongly agreed.*
- *38% for those with 5–10 years of experience agreed or strongly agreed.*
- *43% for 10–20 years of experience agreed or strongly agreed.*
- *46% for those with 20+ years of experience agreed or strongly agreed.*

Figure 15. Relationship Between Years in Construction Industry and Perception of Job Stress Exceeding Expectations

This pattern suggests that stress in construction is not just a function of inexperience. It accumulates over time. Workers with more years on the job may face growing responsibility, physical wear, and/or long-term exposure to high-pressure environments without adequate relief or recognition.

From a business standpoint:

- *Chronic stress among veteran workers can degrade productivity, decision-making, and jobsite safety—especially in leadership or specialist roles.*
- *Older, more experienced workers are also harder to replace, making stress-driven attrition a major operational risk.*
- *Firms should consider targeted strategies to reduce long-term mental strain, including better planning systems, more autonomy, or phased workload models for senior staff.*

5.3.2   Mid-Career Workers Feel the Least Connected

While senior workers report higher levels of stress, mid-career workers (5–10 years) showed the lowest levels of belonging. Figure 16 shows that across all three belonging indicators: feeling valued, belonging to the work group, and being connected to their work group, this group scored lower than both their more junior and more senior counterparts.

- *Workers with 5–10 years of experience showed the lowest sense of team belonging*
- *Followed by those with 1–5 years and 10–20 years*
- *Workers with 20+ years reported the highest levels of belonging across all measures related to belonging to their teams and being value by peers*
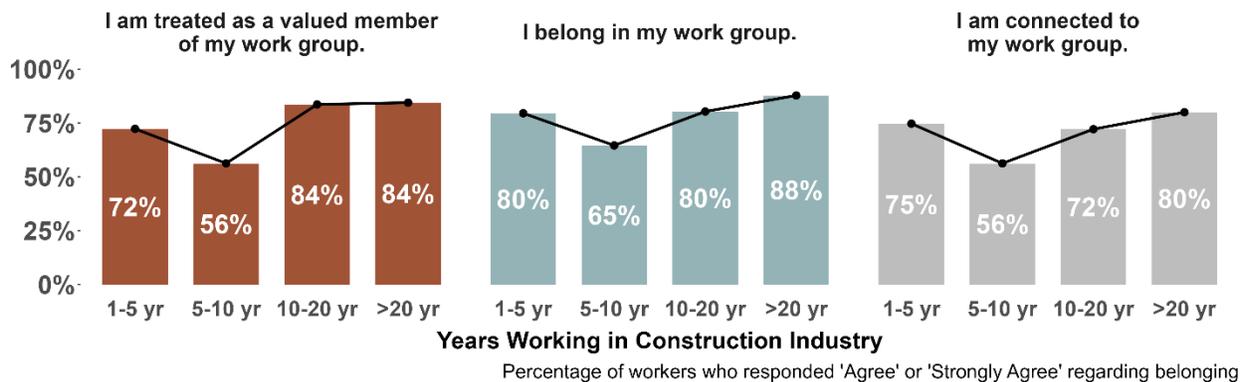
Figure 16. Relationship Between Work Experience and Perceived Belonging

This suggests that mid-career professionals may be operating in a cultural gap. These workers might be experienced enough to be promoted and carry more responsibility, but not yet fully integrated into existing leadership networks and/or receiving proper training and support to manage their assigned responsibilities. Without proper preparation, sense of inclusion or recognition within higher ranks of leadership, this group may become disengaged.

For construction businesses:

- *Mid-career attrition might result in the loss of future leaders who already understand the work and the companies they work for.*

- *Investing in mentorship, leadership pathways, training programs, and intentional team-building for this group might yield high returns in terms of retention, productivity, and morale as they manage their work and that of their direct reports.*

Respondents reported a high sense of Belonging (most answers agree or strongly agree at 72% or higher levels) which is perceived by the pride construction workers and professionals take in the work they do. Consequently, the display of a strong sense of belonging isn't just a cultural value, it can also be seen as a performance multiplier when nurtured strategically to improve engagement and consequently the performance of highly connected teams.

Together, these patterns highlight that mental health challenges are not uniform across the workforce. Companies that understand the challenges faced by different groups and support their teams based on experience level, and managerial responsibilities, will likely be better positioned to retain talent and build a resilient field leadership over time.

5.4 Commute Time

Commute time is typically viewed as a personal inconvenience, but the survey data makes it clear: commuting has a measurable impact on worker mental health, and potentially on day-to-day jobsite performance.

Figure 17 shows that for workers with commutes of less than 30 minutes, mental health indicators are substantially more favorable.
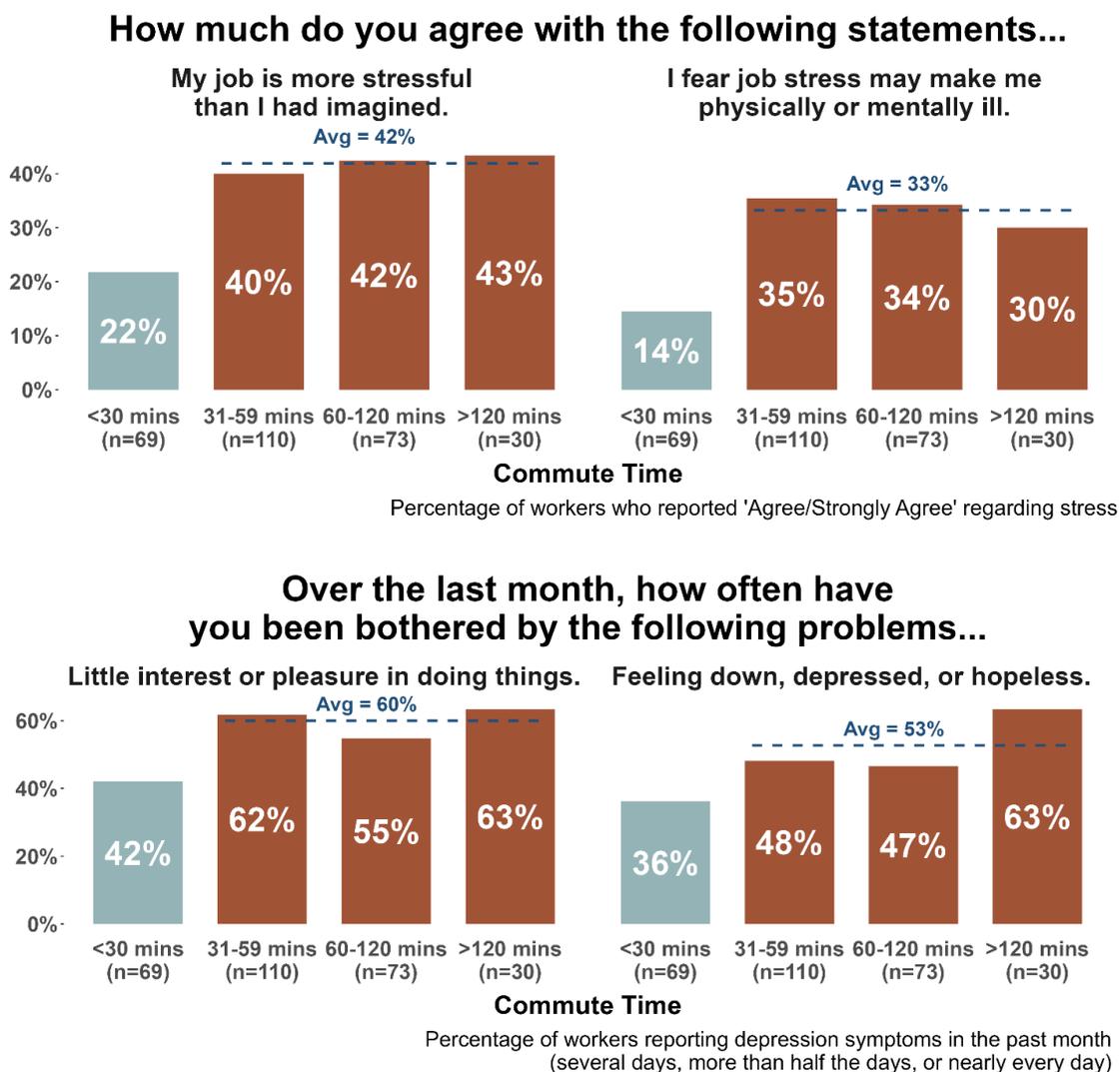
Figure 17. Relationship Between Commute Time and Mental Health Indicators

Comparing this to workers with longer commutes, ranging from 31 minutes to 2 hours, we see a consistent increase in the negative outcomes, as shown in Table 12. This difference is not marginal; it is consistent across all indicators. The additional commute time appears to double the likelihood of severe job stress and raise the risk of depression. These symptoms may manifest as presenteeism,

reduced focus, or low team energy on the jobsite, all these factors can have a direct impact on productivity and safety.

Table 12. Mental Health Status for Groups with Different Commute Time

	Commute time vs. Average level	
Statements	**<30 minutes**	**Over 30 minutes up to 2 hours**
How much do you agree with the following statements…		
My job is more stressful than I had imagined	22% (answered either "agree", or "strongly agree")	Average of 42% (for commutes between 30 minutes and 2 hours)
I fear that the amount of stress in my job will make me physically or mentally ill	14% (answered either "agree", or "strongly agree")	Average of 33% (for commutes between 30 minutes and 2 hours)
Over the last month, how often have you been bothered by the following problems…		
Little interest or pleasure in doing things	42% (answered either "several days", "more than half days", or "nearly every day")	Average of 60% (for commutes between 30 minutes and 2 hours)
Feeling down, depressed, or hopeless	36% (answered either "several days", "more than half days", or "nearly every day")	Average of 53% (for commutes between 30 minutes and 2 hours)

From a business perspective, the implications are wide-reaching:
- *Projects drawing labor from wider geographic areas might experience higher rates of burnout and absenteeism* (Gimenez-Nadal and Molina 2019).
- *Field leaders may misattribute declining performance to attitude or motivation, rather than unrecognized physical and emotional exhaustion caused by commute-related stress. For example, less time with family or taking care of family, sleep deprivation, and/or symptoms associated with higher risk of chronic diseases.* (Gimenez-Nadal and Molina 2019)

Contractors and project managers can potentially take several steps to mitigate these effects:
- *Prioritize project assignment locally when possible, especially for projects with demanding timelines or safety-critical scopes.*
- *Provide on-site or near-site housing options for remote or long-distance workers.*
- *Stagger shift starts times to reduce traffic-related stress and fatigue.*
- *Monitor mental health signals among long-commute workers more closely, as they may face challenges less visible.*

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As labor shortages persist and productivity remains under scrutiny, long commutes should be recognized not just as a scheduling detail, but as a real and addressable risk to workforce performance, reliability, and retention.

5.5 Safety Commitment from Management

In construction, safety is often described as a core value. But whether that value translates into daily practice matters greatly to workers. Results indicate a direct link between workers' perception of management's commitment to health and safety and their own mental well-being. When that commitment is questioned or missing, workers report higher levels of stress and emotional disengagement.

As shown in Figure 18, for those who strongly agree (n=91) and agree (n=109) that "management places a strong emphasis on workplace health and safety", there are fewer respondents indicating that "I fear that the amount of stress in my job will make me physically or mentally ill", respectively 24% and 23% from the total responses for strongly agree and agree. However, when compared to those who disagree (n=24) or strongly disagree (n=7) with the statement that "management places a strong emphasis on workplace health and safety", 50% and 71% of respondents indicated that they fear that the amount of stress in my job will make them physically or mentally ill.
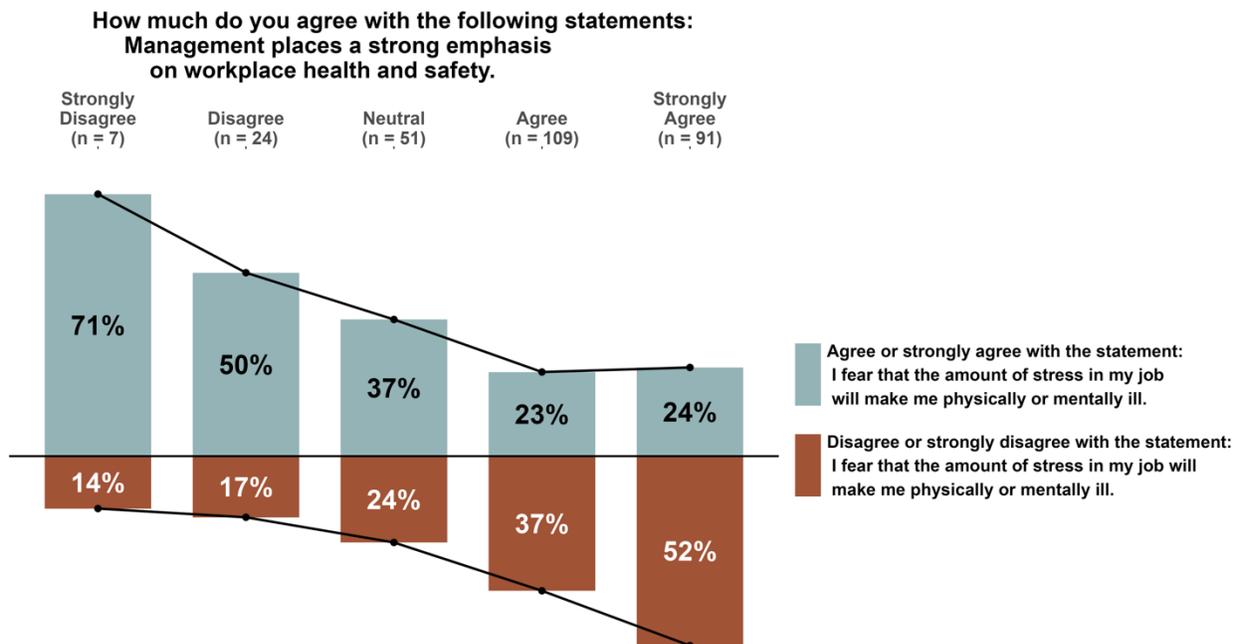

Figure 18. Perceived Emphasis on Health and Safety by Management and Its Association with Stress-Related Health Concerns

In summary, respondents' perception of how much emphasis management places on workplace health and safety appears to affect how they see their job affecting their level of stress to the point

that it would make them physically or mentally ill. The higher the perception that management places a strong emphasis on workplace health and safety the less likely the respondents are to agree or strongly agree with the statement 'I fear that the amount of stress in my job will make me physically or mentally ill' and vice-versa.

Similarly, Figure 19 shows that the share of workers reporting a loss of interest or pleasure in daily activities (several days, more than half of the days, and nearly every day over the past month) climbed from 36% among those who strongly agree that 'management places a strong emphasis on workplace health and safety' to 86% of those who strongly disagree with this statement about the management emphasis on safety. In other words, the more confidence people have in their management emphasis on workplace health and safety, the more likely they are not to experience symptoms associated with depression as measured by their level of interest or pleasure in doing things.
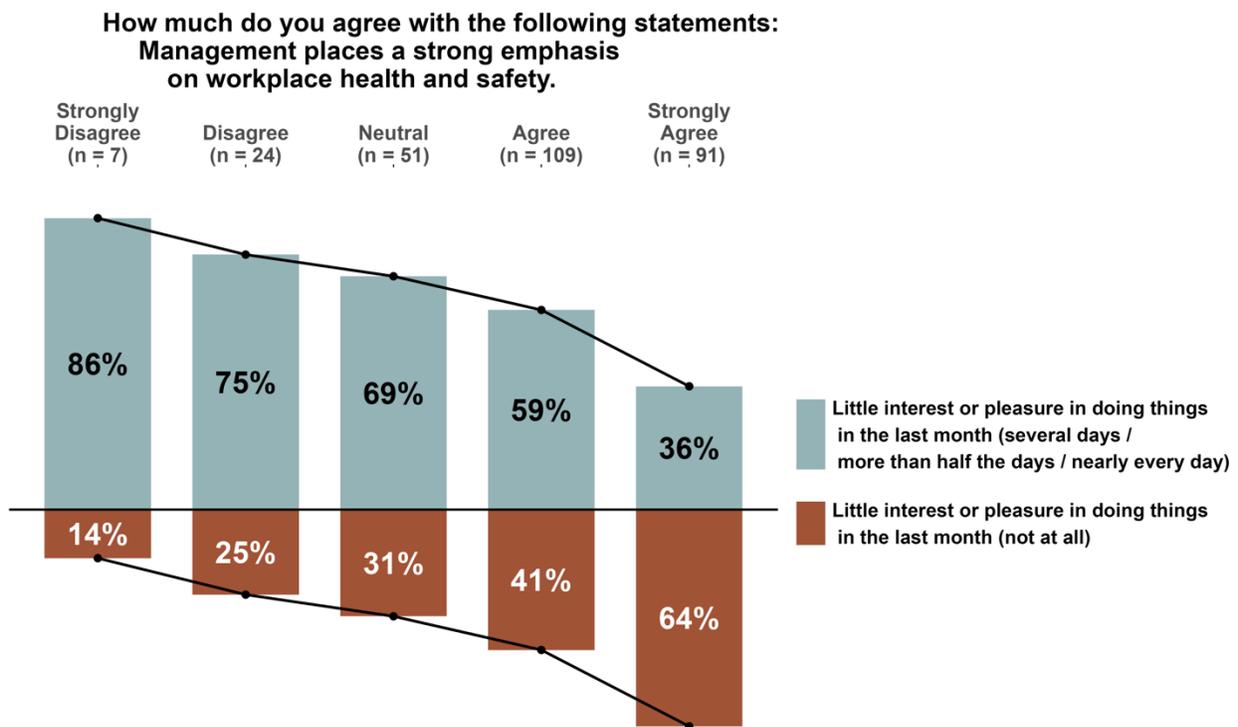
Figure 19 Perceived Emphasis on Health and Safety by Management and Its Association with Loss of Interest in Daily Activities

This pattern underscores a simple but often overlooked fact: workers' belief in leadership's values put in practice on site has real consequences for how they feel, engage, and perform. It is not enough for safety policies to exist on paper or posters, they must be consistently reinforced by action, behavior, and responsiveness from site leadership.

For construction businesses, the implications are strategic:

- *By placing strong emphasis on workplace health and safety, management can help workers reduce their stress level and have more interest or pleasure in doing things.*
- *Workers who perceive that management does not prioritize safety are more likely to disengage, leading to higher turnover, more frequent absences, and a greater likelihood of safety incidents.*

In short, perceived safety culture is not just about compliance, it is about credibility.

5.6 Regular Team Discussions

Results indicate a clear relationship between participation in regular team meetings and workers' sense of belonging on the job. Among those who strongly agreed that their unit meets to discuss work and social matters, 92% agreed or strongly agreed that they were treated as valued members, and 100% agreed or strongly agreed that they felt both a sense of belonging and connection to their group (shown in Figure 20). These numbers drop as respondents indicated lower levels of agreement with the statement 'my unit/workgroup meets to discuss issues related to work and social aspects of the workplace'. Among those who disagreed with the statement, only 55% felt valued, and 45% felt connected. For those who strongly disagreed, only 21% felt they were treated as valued members or felt connected to their work group.

This trend highlights how consistent, inclusive dialogue at the work group level reinforces relationships and a strong sense of belonging. Workers who feel welcomed into the rhythm of team communication are more likely to feel supported, appreciated, and integrated.
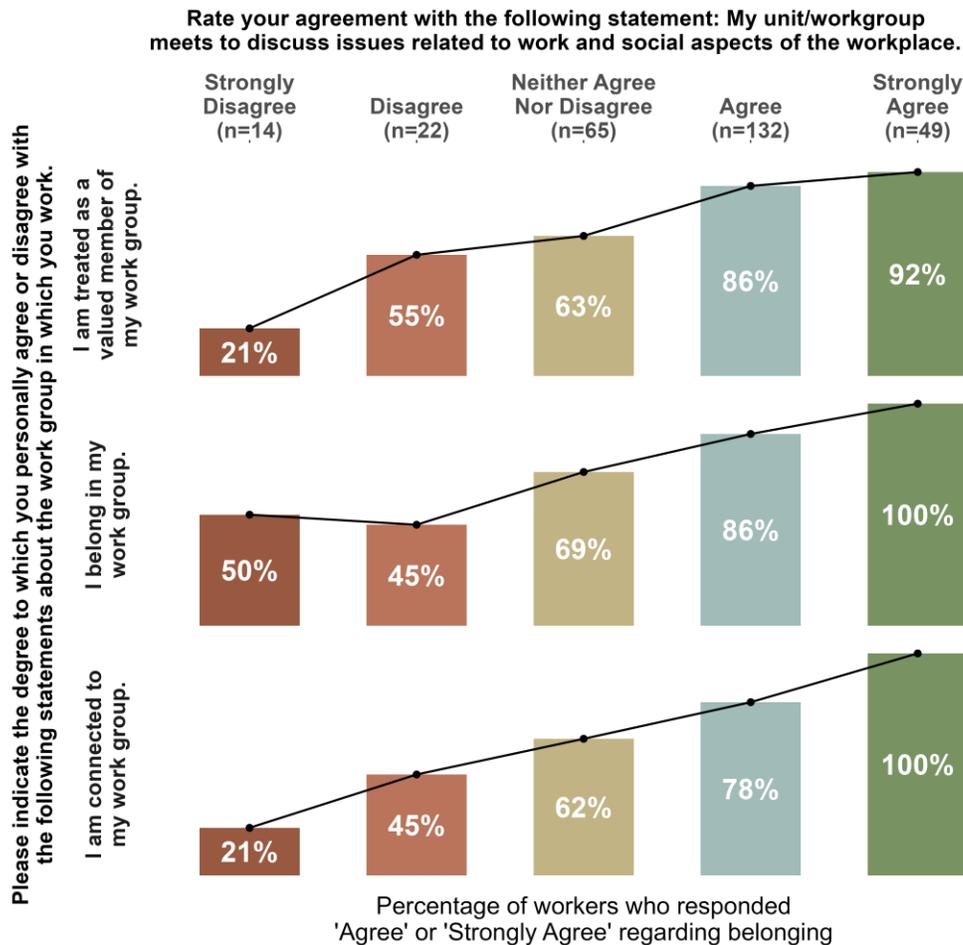
Figure 20. Association Between Regular Team Discussions and Workers' Sense of Belonging

For construction leaders, the implications are clear:

- *Simple practices like regular crew check-ins, such as daily huddles, that include both work planning and opportunity to engage in conversations with team members can have a meaningful impact on how connected workers feel to their work groups.*
- *In high-turnover segments or projects with diverse crews, regular discussion forums may offer a scalable way to strengthen team cohesion.*

When teams talk, workers connect. And in a high-pressure environment like construction, that sense of connection can be the difference between simply showing up but being disengaged (presenteeism) and showing up committed to deliver what is required of each team and the project at large.

5.7 Team Goal Clarification

The survey shows a pattern between team goal clarity and perceived job stress among construction workers. Workers who clearly understand their team's objectives tend to report lower levels of stress, while those who lack this clarity are more likely to feel overwhelmed.

As shown in Figure 21, among the 21 respondents who strongly disagreed that their job is more stressful than expected, 100% reported that they clearly understood what their team was supposed to accomplish (they agreed or strongly agreed with the statement "It is clear what this team is supposed to accomplish").

In contrast, among the 88 workers who agreed that their job is more stressful than they had imagined, 82% reported clarity on their team's goals. Notice that, for those who strongly agreed that their job is more stressful than expected, this number dropped further to 60%.

This pattern suggests that a critical insight: ambiguity around team goals can be a main driver of job-related stress. Workers who are unsure about what their team is trying to achieve may feel more stressed, depressed, and not have a sense of attachment or belonging to their work groups.
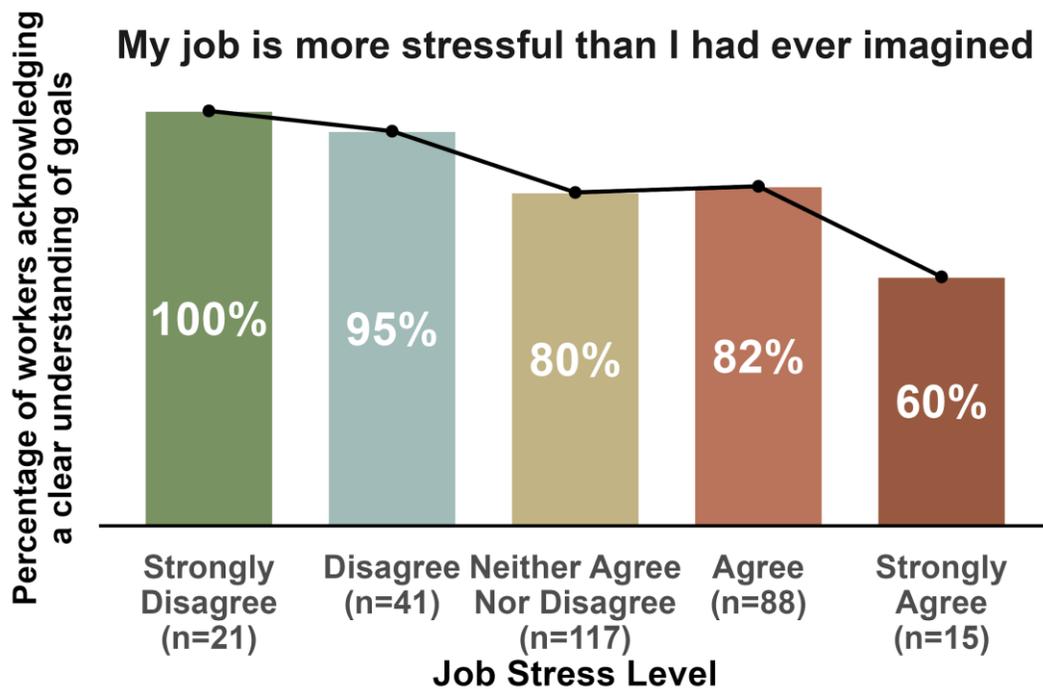
Figure 21. Relationship Between Team Goal Clarity and Perceived Job Stress

Implications for construction management:

- *Unclear goals can amplify stress, which might lead to additional challenges in dealing with the project members.*
- *Teams lacking direction may experience coordination issues, rework, or lower productivity.*
- *Field leaders should prioritize communicating team goals clearly and consistently, especially at the start of new tasks or phases of work.*
- *Regular goal-alignment check-ins can help reinforce clarity and reduce preventable stress, particularly on fast-paced or complex projects.*

In short, clear team goals are essential for both well-being and performance. Making sure every worker knows what their team is trying to achieve is a simple and powerful way to reduce stress on the job. This pattern represents that when everyone can see what is being tracked and accomplished, that contributes to a more a transparent, fair job site.

5.8 Lean Practices vs. Belonging

Survey results indicate a strong and consistent relationship between the use of lean visibility tools, such as whiteboards, stand-up boards, or virtual plans, and workers' sense of belonging on the job. As the frequency of using these tools increases, so does the proportion of workers who feel valued and connected to their teams.

As shown in Figure 22, among the 76 respondents who reported never using visualization tools to track task completion, 63% agreed or strongly agreed with the statement "I am treated as a valued member of my work group," and 59% felt "connected to their work group."

In contrast, among the 41 respondents who reported very frequent use of visibility tools, the sense of belonging rose sharply as 93% said they felt valued, and 88% felt connected to their team. These findings suggest that visibility tools do more than support coordination; they also support social engagement and inclusion within work groups.
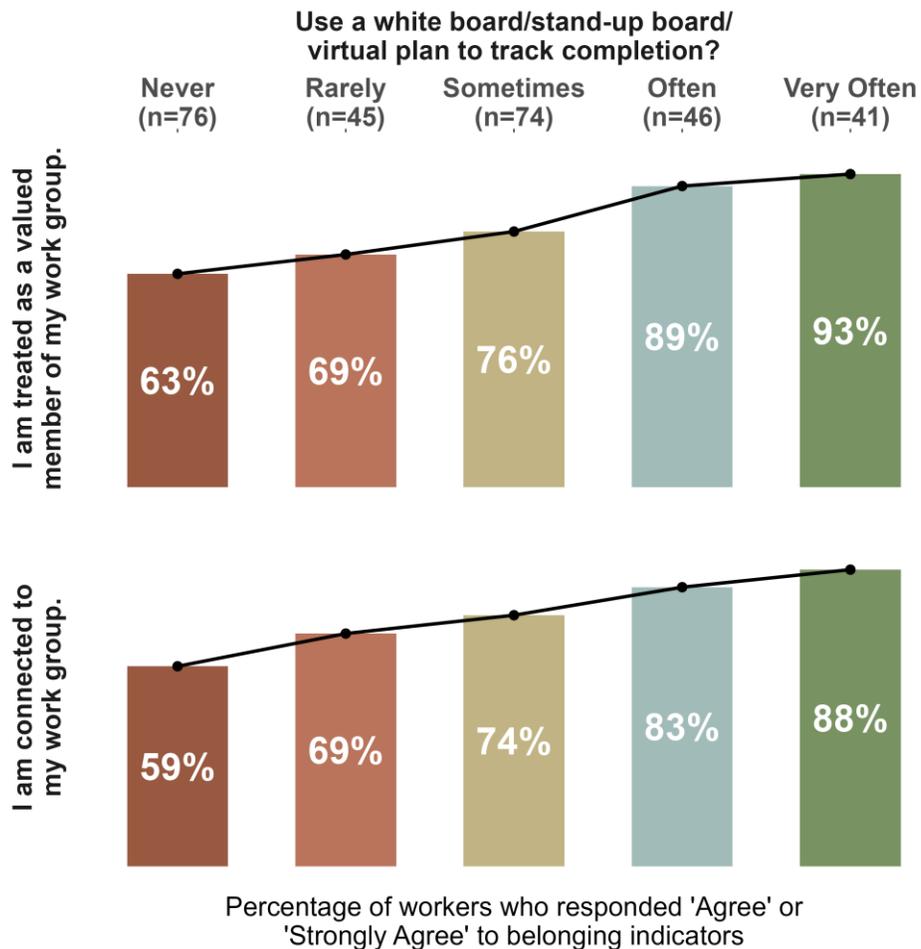
Figure 22. Relationship Between Use of Lean Visibility Tools and Workers' Sense of Belonging

The implications for construction teams are:

- *Visual tools help workers feel informed, valued, and involved, reinforcing their role in the team.*
- *Simple practices like daily updates on a whiteboard or virtual task tracker can elevate trust and cohesion without requiring major investment.*
- *Transparency in task tracking promotes psychological safety and reduces isolation, as workers feel value and belonging to their work groups.*
- *Supervisors should treat visual tools as both operational aids and engagement strategies, especially on complex or fast-paced projects which require constant communication among work groups from multiple specialties.*

6 Interviews Findings

The interview questions were developed to evaluate and support the survey findings and further seek for practical guidelines to improve construction worker mental health status. Specifically, the interviews aimed to:

- *Explore the link between mental health impacting factors and workers' backgrounds*
- *Explore the connection between psychosocial environment factors and worker mental health*

Detailed interview findings and insights are discussed in the following sections.

6.1 Mental Health Impacting Factors

The survey results discussed in Chapter 5 revealed that certain groups of workers experience more severe mental health challenges. This is especially prominent for members in non-union organizations or with long commuting times. The interviews observed similar patterns and extracted deeper insights on how such demographic factors contribute to variations in mental health outcomes.

6.1.1 Union and Non-union Organizations

The survey found that union workers tend to experience lower stress levels and a stronger sense of belonging. The research team observed similar patterns during the interviews. Unions might have more structured systems to provide comprehensive resources that support workers' needs at work and in their personal lives. One interviewee noted that union workers and their families have free access to financial, legal, and mental health supporting resources. Such system facilitates a strong sense of belonging and allows workers to focus on their jobs without being impacted by extra concerns.

Unions also establish dedicated mechanisms to hear workers' concerns, and project organizations might be more motivated to address them due to the collective influence of the union. Knowing their voices are acknowledged might make workers more comfortable speaking up and might contribute to a stronger sense of safety and belonging. While this was shared during the interviews, additional research is needed to establish these links within construction workers and their unions.

6.1.2 Commute Time

Commute time has a substantial impact on mental health. Interviewees' comments appear to support the results from the survey that workers with long commutes tend to experience poorer well-being because:

- *Extended commuting reduces the time for rest and recovery.*
- *It sacrifices workers' time with their families.*
- *Labor productivity decreased due to reduction in rest time, resulting in workload stress.*

In addition, interviewees noted that younger workers are more flexible and can relocate closer to projects, whereas those with families are often left to deal with long daily commutes.

6.2 Psychosocial Environment Factor on Mental Health

Team psychological safety means workers can openly share their thoughts without fear of punishment (Edmondson 1999). However, interviews revealed that in many cases, workers are not allowed or encouraged to speak up. One interviewee even described facing retaliation for raising concerns.

Interviewees frequently noted that when their voices are not acknowledged, stress levels increase. When workers can voice their concerns, small problems can be addressed early before they escalate. However, when concerns are ignored, these minor issues often develop into more serious challenges, requiring post-hoc fixes that increase workload and pressure.

Interviewees also noted that when workers' voices are valued and taken seriously, they feel respected and included, which strengthens their sense of belonging and support within the team.

According to the interviewees, when management strongly emphasizes workplace health and safety, it helps workers reduce stress and stay focused on their tasks. This is because working in a dangerous environment and fearing injury already creates considerable stress for workers. In contrast, when proactive and comprehensive safety measures are implemented, workers feel reassured, and their stress is reduced.

Collective decision-making allows multiple parties to participate in the planning and decision process. However, the participation scope is limited in existing practice. One interviewee noted that planning meetings often involve only those directly related to the job, while other relevant stakeholders are excluded. According to the interviews, collective decision-making influences several aspects of worker mental health, as discussed next.

Participation in planning provides workers with a sense of control and clear direction, which helps reduce stress. In contrast, when workers are excluded from planning, they often lack awareness of task requirements, which increases the likelihood of mistakes and improves stress. One interviewee noted that this negative effect is magnified when workers are held accountable for task outcomes despite having been excluded from the planning process.

When workers are involved in decision-making, they feel a stronger sense of belonging and ownership in the project. Most of interviewees noted that participating in the planning process makes them feel valued and engaged. Contributing useful solutions during planning reinforces their sense of being needed and strengthens their connection to the team.

7 Conclusions

Mental health challenges in the construction industry have received growing attention in recent years. However, current efforts remain largely focused on raising awareness and implementing reactive measures after problems have already emerged. There is limited understanding of which worker demographics are most vulnerable and how site-level practices affect mental well-being.

This study presents an industry-centered investigation into the mental health landscape of construction workers. Guided by an industry advisory board and supported by the LCI, the research team developed a comprehensive survey to assess mental health status, demographic characteristics, psychosocial work conditions, and the extent of lean practice implementation on jobsites. A total of 282 survey responses were collected from construction workers across various trades and geographic regions in the US. Two analytical methods were used to generate insights: (1) univariate distribution analysis, and (2) multivariate analysis.

Univariate analysis reveals the widespread presence of mental health concerns on construction jobsites:
- *36% of respondents reported their job was more stressful than expected.*
- *30% feared that job-related stress could lead to physical or mental illness.*
- *56% reported experiencing little interest or pleasure in activities for several days in the past month.*
- *46% reported feeling down, depressed, or hopeless during the same period.*

These findings define a clear and pressing reality: poor mental health is not an isolated problem but a pervasive condition among construction workers, warranting systemic attention and industry-wide mental health interventions.

Multivariate analysis identified several high-risk worker groups:
- *Non-union workers reported higher levels of stress compared to union-affiliated workers.*
- *Supervisors and forepersons faced increasing pressure as team size increases.*
- *Mid-career professionals reported a diminished sense of belonging despite their experience.*
- *Long-commute workers reported greater emotional fatigue and disengagement.*

These findings suggest that mental health challenges in construction stem from diverse sources including insufficient support, organizational pressures, and individual circumstances. As such, a one-size-fits-all approach is inadequate; instead, a range of targeted, multi-level interventions is essential to effectively address the varied needs of these vulnerable groups.

Multivariate analysis further indicates that a more supportive psychosocial work environment is strongly linked to improved mental health outcomes:
- *A strong and visible safety commitment from management was linked to lower stress and higher emotional engagement.*

- *Teams with regular group discussions reported stronger feelings of belonging.*
- *Lack of clarity around team goals was associated with elevated levels of job-related stress.*
- *Lean tools that improve task visibility were positively associated with workers' sense of belonging.*

These results suggest that a goal-oriented, openly communicative, and safety-focused work environment plays a critical role in promoting mental well-being on construction sites. These findings demonstrate that lean practices can effectively improve worker mental health by shaping a more supportive psychosocial work environment. Specifically, practices that promote goal clarity, transparent communication, and inclusive team involvement are shown to reduce stress and enhance overall well-being. This highlights the dual benefit of lean construction: not only does it improve project performance, but it also cultivates a healthier and more resilient workforce.

In addition, this research moves beyond prior reactive approaches to mental health by offering practical, data-driven strategies that construction firms can adopt to proactively support workforce well-being. First, organizations should strengthen goal clarity and transparent communication across all project levels. Site leaders must be equipped to deliver clear aims, maintain consistent messaging, and support inclusive decision-making to promote psychological safety and build team trust. Second, targeted interventions are needed for high-risk worker groups such as non-union employees, mid-career professionals, and long-commute workers through open communication, flexible scheduling, and peer-support systems. Third, lean practices like the LPS and Kaizen should be leveraged both to improve project efficiency and to enhance worker mental health. By empowering employees and enabling meaningful feedback, these tools can serve as dual-function mechanisms that drive both project performance and mental health improvement. Together, these strategies highlight the potential of integrating lean principles with mental health initiatives to create safer, more resilient, and more engaged construction teams.

Acknowledgements

Appendixes

Appendix A – Survey Questionnaire

Addressing Construction Worker Mental Health Using Lean Approaches

Dear survey respondent,

We are asking you to participate in a research study, funded by the Lean Construction Institute, about the impact of management practices on construction worker's mental health. We are asking construction workers, construction equipment operators, forepersons, and superintendents to volunteer to participate in this study because you are part of the construction workforce building current projects.

As a volunteer to answer this survey you might want to participate in this study to provide your opinions about how current management practices used in the project/shop/company you currently work for affect your well-being. However, you might not want to answer the survey questions because it involves questions about stress, depression, and how you feel in terms of being part of a team at this project site (belongingness).

During this study, you will be initially asked to answer survey questions related to your demographic background. These questions will be followed with questions about stress, depression, and how you feel in terms of being part of a team at this project site/organization (belongingness). Finally, you will answer questions about how the team you work with makes decisions in your current project and communicates these decisions, how safe you feel at your current work, and practices and methods that might be used by the project/shop/company you work for. The time expected to complete this survey is between 15 and 20 minutes.

Expected Risks
Respondents might be triggered by some of the questions of this survey and/or become aware of situations where they have experienced actions, workplace practices, or environments that caused distress.

What if I Am Injured During My Participation?
San Diego State University and the San Diego State University Research Foundation do not have a program or any policies for compensating subjects for injury or complications related to human subjects research but the study personnel will assist you with getting treatment as appropriate.

Data Management

The data collected for this study will be shared in publications and presentations in aggregated format. The data might be made available to other researchers.

Benefits
We expect that the data collected from multiple participants will inform organizations in the construction industry to improve the mental health and well-being of construction workers.

Participation
Your participation in this survey is voluntary and you can refuse to continue to answer the survey without any negative consequences. There is no cost associated with participation in this study.
If you have further questions, contact: Dr. Thais Alves (talves@sdsu.edu) or Dr. Min Liu (mliu92@syr.edu). If you have questions regarding your rights as a research participant, to offer input, or to share concerns about the research contact the SDSU Human Research Protection Program at: irb@sdsu.edu or 619-594-6622.

Thank you for your interest in this study,

Dr. Thais Alves (San Diego State University) and Dr. Min Liu (Syracuse University)

A. Are you older than 18 years of age?
a. Yes   b. No

If you select "No", at the moment you do not qualify to participate in this study. Thanks for your interest in this survey.

B. Are you currently working in a construction project/shop/company as a:
a. Worker
b. Equipment operator
c. Foreperson (Works close to the workers, in charge of a smaller crew, controls the work.)
d. Superintendent (Works with a larger number of people, interfaces directly with project managers.)
e. Project engineer
f. Project manager
g. Manager (Safety, Materials, or other management position directly dealing with workers)
h. I am not working in any of these roles

If you are not working in any of these roles, at the moment you do not qualify to participate in this study. Thanks for your interest in this survey.

C. Do you agree to voluntarily participate in this survey?
a. Yes   b. No

If you select "No", at the moment you do not qualify to participate in this study. Thanks for your interest in this survey.

Simply provide what you feel is the best answer based on your current project/job and your personal experience and opinion for your scope of work. In this survey, foreperson and superintendent are defined as below:

- **Foreperson - works close to the workers, in charge of a smaller crew, controls the work.**
- **Superintendent - works with a larger number of people, interfaces directly with project managers.**

1.1 What state are you currently working in (e.g. NY)?
_____

1.2 What type of job do you have?
A. Union   B. Non-union   C. I am not sure

1.3. How many people do you directly manage?
A. 0 (I do not manage others)   B. 1-5   C. 6-10
D. 11-20   E. More than 20

1.4. What is your primary construction trade?
A. Piping/plumbing   B. Steel
C. Mechanical/HVAC   D. Roof
E. Drywall/Masonry   F. Electrical
G. Earthwork/Highway/Road building   H. Concrete
I. Other (please specify) _____

1.5. How many years of work experience do you have in construction?
A. Between 1 and 5 years   B. More than 5 years but less than 10
C. More than 10 years but less than 20   D. Above 20 years

1.6. How do you identify your gender?
A. Male   B. Female   C. Non-binary/Other   D. Prefer not to say

1.7. Which racial and ethnic groups do you identify? Please select all that apply:
A. American Indian or Alaskan Native   B. Asian
C. Black or African American   D. Hispanic or Latinx
E. Middle Eastern or North African   F. Native Hawaiian or Pacific Islander
G. White   H. Prefer to self-describe: _____
I. Prefer not to say

1.8. Is English your primary language?
A. Yes   B. No

1.9 How many hours per day do you spend commuting to and from work?
A. Less than 30 minutes   B. Between 31 and 59 minutes
C. Between one hour and 2 hours   D. Over 2 hours

2.1 How much do you agree with the following statements?
A. My job is more stressful than I had ever imagined. (STR1)

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

B. I fear that the amount of stress in my job will make me physically or mentally ill. (STR2)

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

2.2 Over the last month, how often have you been bothered by the following problems? (DEP1)
A. Little interest or pleasure in doing things. (DEP1)

1: Not at all	2: Several days	3: More than half days	4: Nearly every day

B. Feeling down, depressed, or hopeless. (DEP2)

1: Not at all	2: Several days	3: More than half days	4: Nearly every day

2.3 Please indicate the degree to which you personally agree or disagree with each of the following statements about the work group in which you work:
A. I am treated as a valued member of my work group. (BEL1)

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

B. I belong in my work group. (BEL2)

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

C. I am connected to my work group. (BEL3)

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

3.1 Rate your agreement with the following statements:
A. It is safe to take a risk on this team. (TPS1)

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

B. Members of this team are able to bring up problems and tough issues. (TPS2)

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

C. No one on this team would deliberately act in a way that undermines my efforts. (TPS3)

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

D. Working with members of this team, my unique skills and talents are valued and utilized. (TPS4)

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

3.2 Rate your agreement with the following statements:
A. Management places a strong emphasis on workplace health and safety. (SC1)

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

B. Safety is given a high priority by management. (SC2)

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

C. Management considers safety to be important. (SC3)

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

3.3 Rate your agreement with the following statements:
A. My unit/workgroup makes decisions as a group. (CDM1)

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

B. Members of my unit/workgroup have a lot of say about how things are done. (CDM2)
1: Strongly disagree   2: Disagree   3: Neither agree nor disagree   4: Agree   5: Strongly agree

C. If an important decision is to be made, all members of my unit/workgroup can have a say. (CDM3)
1: Strongly disagree   2: Disagree   3: Neither agree nor disagree   4: Agree   5: Strongly agree

D. My unit/workgroup meets to discuss issues related to work and social aspects of the workplace. (CDM4)
1: Strongly disagree   2: Disagree   3: Neither agree nor disagree   4: Agree   5: Strongly agree

Rate your agreement with the following statements:
4.1 It is clear what this team is supposed to accomplish. (CLD1)
1: Strongly disagree   2: Disagree   3: Neither agree nor disagree   4: Agree   5: Strongly agree

4.2 The team spent time making sure every team member understands the team objectives. (CLD2)
1: Strongly disagree   2: Disagree   3: Neither agree nor disagree   4: Agree   5: Strongly agree

4.3 The team has invested plenty of time to clarify our goals. (CLD3)
1: Strongly disagree   2: Disagree   3: Neither agree nor disagree   4: Agree   5: Strongly agree

On a weekly basis, how often do you or your crew…
4.4 Use a white board/stand up board/virtual plan to track completion? (VIS1)
1: Never   2: Rarely   3: Sometimes   4: Often   5: Very often

4.5 Know who is working on what, when, and where? (VIS2)
1: Never   2: Rarely   3: Sometimes   4: Often   5: Very often

4.6 Replan in daily huddles due changing work conditions (Definition: Daily huddle: short meeting before or after work shift to discuss the tasks of the day)? (VIS3)
1: Never   2: Rarely   3: Sometimes   4: Often   5: Very often

Rate your agreement with the following statements:
4.7 Forepersons are empowered to plan. (PLN1)
1: Strongly disagree   2: Disagree   3: Neither agree nor disagree   4: Agree   5: Strongly agree

4.8 We have productive, efficient flow (not hurry up and then wait). (PLN2)
1: Strongly disagree   2: Disagree   3: Neither agree nor disagree   4: Agree   5: Strongly agree

4.9 There is an easy and clear channel for workers to provide suggestions for improvement? (For example, a suggestion box, a white board.) (PLN3)
1: Strongly disagree   2: Disagree   3: Neither agree nor disagree   4: Agree   5: Strongly agree

4.10 The rules for site organization are easy to follow. For example, workers know where to locate material, equipment, restrooms, and work areas on the project site. (PLN4)
1: Strongly disagree   2: Disagree   3: Neither agree nor disagree   4: Agree   5: Strongly agree

Appendix B – Established Mental Health Assessments

Instrument	Number	Survey items
Mental Health America. Patient Health Questionnaire (PHQ-9) (Kroenke et al. 2001)	1	Little interest or pleasure in doing things
	2	Feeling down, depressed or hopeless
	3	Trouble falling asleep, staying asleep, or sleeping too much
	4	Feeling tired or having little energy
	5	Poor appetite or overeating
	6	Feeling bad about yourself - that you're a failure or have let yourself or your family down
	7	Trouble concentrating on things
	8	Moving or speaking so slowly that other people could have noticed
	9	Thoughts that you would be better off dead or of hurting yourself in some way
Mental Health America. Anxiety Test (GAD-7) (Kroenke et al. 2007; Spitzer et al. 2006)	1	Feeling nervous, anxious, or on edge
	2	Not being able to stop or control worrying
	3	Worrying too much about different things
	4	Trouble relaxing
	5	Being so restless that it is hard to sit still
	6	Becoming easily annoyed or irritable
	7	Feeling afraid, as if something awful might happen
AGC, Suicide Prevention Toolbox Talk: Signs of Depression (AGC 2022c)	1	Loss of interest in activities you once enjoyed
	2	Significant with loss or gain due to change in appetite
	3	Feel worthless or guilty
	4	Trouble sleeping or sleeping too much
	5	Unable to concentrate or make decisions
	6	Fatigue
	7	Recurring thoughts of death or suicide
AGC. Suicide Prevention Toolbox Talk: Signs of Anxiety (AGC 2022c)	1	Uncontrollable worry
	2	Excessive nervousness
	3	Difficulty sleeping
	4	Upset stomach
	5	Increased heart rate
	6	Muscle pain, tightness, soreness
	7	Avoidance
LCI. Respect for People: Respect22 Resources – Warning Signs (LCI 2022)	1	Increased tardiness and absenteeism
	2	Decreased productivity
	3	Decreased self-confidence
	4	Isolation from peers
	5	Agitation and increased conflict among co-workers

	6	Increased feelings of being overwhelmed
	7	Decreased problem solving ability
	8	Legal and illicit substance abuse
	9	Near hits, incidents and injuries

Appendix C –Advisory Board Members

- **Cynthia Tsao** is a lean project delivery specialist with over 25 years of experience in the AEC industry, recognized for her expertise in production planning, team alignment, and industry training initiatives.
- **Julie Dolan** has over 35 years of experience in the AEC industry, with a focus on lean construction and client success, and is recognized for her leadership in fostering collaboration among project stakeholders to enhance team performance and outcomes.
- **Henry Nutt** is a senior preconstruction executive with over 34 years of experience in the skilled trades, recognized for his leadership in lean construction, workforce development, and advocacy for mental health and inclusion within the construction industry.
- **Sean Graystone** has over 40 years of experience in industrial, commercial, and residential construction, recognized for his expertise in lean construction and collaborative project delivery aimed at fostering safer and more supportive industry environments.
- **Felipe Engineer-Manriquez** is a lean and agile specialist with over 20 years of experience in the construction industry, recognized for his contributions to the application of Scrum methodologies in design and construction practice.
- **Dave Hagan** has over 15 years of experience in lean and integrated project delivery, currently serving as Executive Director of Continuous Improvement at The Devenney Group Ltd Architects, where he leads lean implementation in healthcare design and construction.
- **Maryann Fiala** has over 25 years of experience in membership engagement and organizational development, and currently serves as a member advocate at the Lean Construction Institute, where she leads efforts to strengthen member value and support industry-wide transformation.
- **Tammy McConaughy** has 16 years of experience in lean implementation within the AEC industry. She leads education and certification programs at the Lean Construction Institute to support industry-wide lean adoption.
- **Brittanie Campbell** has over 14 years of experience in the engineering and construction management industry, specializing in project controls and schedule management. She currently leads the Construction Project Management Unit at American Family Insurance, with a focus on innovation and industry best practices.

Appendix D – Expanded Demographics of the "Other" Category

- **Specific construction trades breakdown of "Others" category**

Construction Trade	Counts	Construction Trade	Counts
General Contractor	21	Heavy Highway	1
Construction Management	8	Interior/Exterior Finishes	1
Carpenter	4	Landscaping/Demo/GC	1
Administration	2	MDOT Contract Signs	1
Bridge Construction	2	Operations Management	1
Heavy Civil	2	Overall Project Management	1
Ironworker	2	Pavement Marking	1
Owner	2	Pipefitting	1
Superintendent	2	Road Construction	1
All Trades	1	Road Signs, Guardrail, Fencing	1
Asphalt	1	Safety	1
Bridge Building	1	Sewer & Water	1
Bridge Work	1	Sheet Metal Worker	1
Commercial Construction	1	Signage	1
Concrete Cutting	1	Signs and Concrete	1
Construction Manager / Owners Rep	1	Traffic Control/Permanent Signs	1
Consultant - Inspection & Testing	1	Traffic Technician	1
Crane and Rigging	1	Trenchless technology	1
Environmental Civil	1	Turn Over Manager	1
Epoxy Overlays	1	Utility	1
Fast Food/C Store Building, Ground up	1	Waterproof Coatings	1
GC/CM	1	Waterproofing	1
Heavy Equipment Technology	1	NA	3
Total		84	

- **Specific race breakdown of "Others" category**

Race	Counts
Hispanic or Latinx, White	5
Prefer not to say	5
American Indian or Alaskan Native, Black or African American, Middle Eastern or North African, Native Hawaiian or Pacific Islander	1
American Indian or Alaskan Native, Black or African American, White	1
American Indian or Alaskan Native, Hispanic or Latinx	1
Asian, Black or African American, Hispanic or Latinx, Middle Eastern or North African, Native Hawaiian or Pacific Islander	1
Asian, Native Hawaiian or Pacific Islander	1
Asian, White	1
Black or African American, Hispanic or Latinx, White	1
Black or African American, Hispanic or Latinx, White, Prefer to self-describe: Blackfoot Indian	1
Black or African American, White	1
Native Hawaiian or Pacific Islander, White	1
Prefer to self-describe: Canadian	1
Prefer to self-describe: I am American	1
Prefer to self-describe: White European immigrant.	1
Total	23

- **Specific gender breakdown of "Others" category**

Gender	Counts
Non-binary/Other	1
Prefer not to say	2
Total	3

Appendix E – Interview Questions

Theme	Interview Questions
Clear Direction - Belongingness	1. How is information shared about this project with your own team? How is information shared about this project with the project team (including other trades/companies)?
	2. Do you have enough information to do your work? Do you have enough information to know about the status of the project?
	3. How does the way information is shared in this project impact how you relate to others in your team and to the project team at large?
Clear Direction - Team Psychological Safety - Depression	1. Do you feel comfortable to express concerns and bring up tough issues in meetings with your team?
	1.1 Can you give one example of a situation where you expressed your concerns or brought up tough issues to your team?
	1.2 How do you feel when your concerns are not heard?
	2. Do you feel comfortable to express concerns and bring up tough issues in meetings with your project team?
	2.1 Can you give one example of a situation where you expressed your concerns or brought up tough issues to your team?
	2.2 How do you feel when your concerns are not heard?
Clear Direction - Collective Decision Making - Stress	1. Do you participate in the planning process? How do you feel when you are or are not invited to participate in the planning process?
	2. Can you give an example of how collectively making decisions in a meeting impacts your level of stress?
Planning - Psychological Safety - Depression	1. How do you as a manager foster an environment where team/project team members feel safe to voice their concerns and share their ideas during planning meetings? Can you please share an example?
Planning - Collective Decision Making - Stress	1. Which, if any, planning activities are you involved in? And how does this involvement affect you on a personal level?
Visibility vs Belongingness via Safety Climate	1. How are work, task, and project progress communicated in the project?
	2. What is important to you to feel connected to your team?
	3. What is important to you to feel physically and mentally safe in this project?
Visibility vs Depression and Stress via Safety Climate	1. What is your view on 'visibility' in terms of contributing to a positive safety environment? For example, does seeing real-time progress and safety priorities on display, like safety stats or daily goals, affect how safe you feel?
Interview Questions for Further Discussion	1. If you could make one or two practical changes tomorrow to improve workers' mental well-being, rank the changes and explain why.
	2. How does your team handle situations when someone makes a mistake, misses a deadline, or experiences a slow down in productivity?
	3. What would be a typical warning sign indicating that members of your team need support for their well-being?

4. Have you seen team members' well-being affect project performance? Can you give an example to illustrate how this happened?

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