Fitting In: Analyzing the Fit of Safety Vests in the Construction Industry

Lizette Galvez Puentes
California Polytechnic State University
San Luis Obispo, California

The construction industry continues to be a male-dominated industry; however, recent decades have seen a change of demographic, including an increase of women leadership. With the changing demographics, there is a lack of awareness and proactive integration of properly fitting safety vests to accommodate different body types. A properly fitting safety vest is crucial in upholding the safety of individuals working on a construction site, where certain genders are more frequently caught on jobsite material. These circumstances hinder the purpose and functionality of the safety vest’s primary functions, which, for the wearer, is increased visibility and the comfort to carry out their duties. The findings of this study show that improperly fitting safety vests impact the sense of belonging of different genders by creating a workplace environment that is not welcoming. This matter corresponds with the impacts on confidence, self-esteem, and perception of abilities, whom respondents feel are adversely affected. The majority of respondents believe a properly fitting safety vest is crucial for the construction industry, however a majority have not asked their companies to provide one, specifically women. If provided with one that was designed to fit their body type, respondents are in favor of wearing it over the standard industry sizes.

Key Words: Safety Vests, Women in Construction, Inclusive Workplace, Safety, Confidence

Introduction

As of January 2021, individuals identifying as women only made up 10.9% of the construction industry; however, the number of women industrywide has been increasing each year (U.S. Bureau of Labor Statistics). Various companies purchase and supply personal protective equipment (PPE) designed to fit the standard male body type. As stated by Lim (2020), this can be explained “by the fact that the industry stakeholders are not mindful of the PPE issues confronting female workforces,” which pushes particular body types to wear safety vests that do not fit their bodies. Additionally, ‘One size fits all’ has been reported as a common strategy adopted by employers in purchasing their PPE,” (Lim, 2020) resulting in one vest option to accommodate all body types, contributing to gender exclusion.

The main purpose of personal protective gear such as safety vests is its high visibility, color, and reflective material features that allows for individuals to be seen on a construction site (Staffing, 2014). According to The Safety Standards of Construction Work, PPE is required for "Employees, whose duties are regularly performed in areas and under circumstances when they are exposed to the danger of moving vehicles, shall wear work vests of highly visible materials, or equivalent distinguishing apparel" (OSHA, 1984). This can be crucial in hectic construction site environments that often have substantial amounts of moving vehicles, machinery, and overhead cranes, where the safety vest serves a vital role in upholding the safety of all team members on site. When individuals are provided with improper fitting of personal protective equipment, their safety may be compromised. A loose-fitting vest has the potential to become caught on an array of on-site materials including lumber, rebar, and equipment (Stephen, 2020). Oversized vests also carry the potential to slip off and remove reflective coverage that may safeguard against site hazards (Stephen, 2020).
The purpose of the study is to determine the ways in which safety vests either fit or do not fit worker’s bodies and how the fit impacts worker safety, confidence, and perceptions on a construction project. Additionally, this study will seek to identify what specifications or features should be considered in a redesigned safety vest that fits various body types. Potential benefits associated with the study include determining ways in which safety vests can be redesigned to appropriately fit worker’s bodies and create a more inclusive culture within the construction industry.

**Literature Review**

**Personal Protection Equipment**

Up to the mid-1930’s, personal protective equipment, particularly hard hats, were not required on a construction job site (Solutions, 2018). This enactment was not until the construction of the Golden Gate Bridge in San Francisco, California, one of the first recognized large-scale construction projects in the nation. Following the numerous fatalities on this project, personal protective gear such as sand-blast respirator outfits, glare-free goggles, fall protection safety belts and lifelines became enforced (Solutions, 2018).

PPE is intended to minimize hazard exposure and reduce the risk of injuries on a construction job site for all personnel. Protective coverage includes items such as gloves, safety glasses, hard hats, earplugs, and safety vests. According to the Occupational Safety and Health Administration (OSHA), these items should be properly sized and designed to ensure the comfortability of the user. By providing personal equipment that does not properly fit an individual, “it can make the difference between being safely covered or dangerously exposed” (U.S. Department of Labor). Moreover, “when engineering, work practice, and administrative controls are not feasible or do not provide sufficient protection, employers must provide personal protective equipment to their workers and ensure its proper use” (U.S. Department of Labor).

**Origins and Purpose of Safety Vests**

Safety vests did not originate until the 1930’s following a crate incident in California where an individual named Bob Switzer suffered permanent eye injuries. After experimenting with reflective materials, Switzer and his brother went on to create a safety vest with fluorescent paint known as “Day Glo” that had the capacity to shine even in broad daylight (Stephen, 2020). In order to increase worker visibility and reduce struck-by injuries due to the lack of visibility of workers, OSHA has mandated those individuals working in highways and road construction, flaggers, excavation site workers, and remaining job site personnel must wear vests that abide to ANSI/ISEA 107-2015 standards (Klamecki, n.d.). The ANSI/ISEA 107-2015 standard declares, “wearing safety vests is mandatory for workers visibility in at night, in low light conditions and in poor weather conditions” (Stephen, 2020). Furthermore, it describes these standards are meant to enforce visibility requirements that are broken up into three different classes of safety vest, each based on different amounts of fluorescent material and reflective tape coverage. In construction, workers are required to wear Class Two or Three vest, which provides the most amount of reflective material to combat the multitude of hazards on a construction site (Contributor, 2020).

As safety vests have been modified and altered throughout the decades, so has construction demographics in terms of the workforce. By the mid-1970s, the industry began to see the emergence
of women into the male-dominated industry. Similarly, immigration patterns began to emerge that welcomed individuals of different ethnic patterns with varying statures to that of the typical white male figure (Ontario Women’s Directory, 2006). Despite the changing market, PPE manufacturers and suppliers continued to produce gear such as safety vests that solely suit a particular body type with the assumption that one size fits all.

**Correlation Between Clothing and Safety**

Clothing serves numerous functions based on their comfortability which contributes to the level of self-confidence experienced by an individual (Min, 2015). When a piece of clothing feels as though it fits the individual properly, this can result in positive perception of one’s self and self-acceptance. Through Min’s (2015) research, these positive feelings are also “positively related to self-perceived emotion, sociability, and work competency,” which highlight the importance of promoting positive perception of work clothing to reach high workplace satisfaction.

Finding adequate clothing in the workforce for women working in blue-collar jobs continues to be difficult. Fargo, director for the International Safety Equipment Association (ISEA) claims “Numerous anthropomorphic studies have identified the differences in body part measurements between men and women. It is known that female hands tend to be smaller, with shorter, narrower fingers than males” (Fargo, 2013. Although this is proven, Fargo believes women still end up wearing ill-fitting PPE due to the culture of the industry they find themselves in. Oftentimes, “women do not want to draw attention to them-selves by speaking up, or perhaps they are not part of the decision-making process.” The one-size-fits-all mentality is inherited through purchasing departments who make PPE decisions and often look to buy solely in bulk. However, these bulk purchases may pose hazards to individuals who find the protective apparel to be too loose, tight, or even fall off, and ultimately affect their comfort.

Gender aside, safety vests have proven to be vital in reducing workplace injuries on a construction site. From 2011 to 2015, “nearly 804 construction workers have died due to struck-by injuries” (Stephen, 2020). Of those injuries, “57% of the struck-by vehicle deaths happened in the workplaces because of not wearing safety vests, 20% of deaths occurred in the roadways, and 96% of the deaths occurred due to struck by an object or equipment” (Stephen, 2020). OSHA states the design of these vests must “meet the needs for durability, functionality, comfort and other working hazards”. When vests lack in comfortability, this can serve as a distraction while working where “even loose vests can get caught inside the machines and cause danger instead of protecting you” (Stephen, 2020).

**Gender and PPE**

Only a select number of commercial general contractors have recognized the need for PPE tailored to genders other than male. Skanska, a multinational construction and development company, has recognized this issue and paired with New York-based Colony Hardware to sample a multitude of safety vests and gloves. To fulfill their women cohorts' needs, they gathered feedback from multiple offices nationwide that required female employees to try on the vest and send them back with tailored requests (Milligan). Through these efforts, Skanska arrived at multiple design options that included tapered mesh vests adaptable to different climates. Skanska’s workforce went on to say, “this change was necessary, as it allows them to do their jobs better and more safely while feeling more confident in the company’s acknowledgment that women belong in this industry and are here to stay” (Milligan). Milligan goes on to say that safety, well-being and success on a jobsite can only be distributed with a collaborative and inclusive environment. The industry is composed more and more
of talented individuals such as women, where barriers such as improperly fitting PPE may affect their retention.

The lack of gender-tailored PPE such as safety vest seems to be a global issue. Studies present many problems with the current vest design such as “the need to make alterations or adjustments to ill-fitting PPE, the lack of adequate training or proper use of PPE in their job tasks, and ill-fitting PPE has hampered their work in some way” (Lim, 2020), which is consistent with studies in the United States. Additionally, these findings suggest there is a need for “training organizations and employers to review their organizational health and safety protocols and training curriculums,” in order to provide awareness on the importance of properly fitting PPE and the continued lack of accessibility. The lack of awareness of these topics by PPE manufactures and employees is a high reason for this lack of access.

Methodology

To evaluate the current fit of industry safety vests, an anonymous online survey comprised of twenty questions was utilized. The research method was both qualitative and quantitative, and employed multiple choice questions, 5-point Likert scale questions, and free-response questions to determine how the vests make the users feel and the improvements the users would like to see in the vests. Additionally, questions about the ways safety vests fit their body, how that has impacted them professionally, and about the features that should be included in a redesigned safety vest. Using a data feminist and grounded theory approach, thematic analysis was utilized to analyze and code the free response questions, in order to present essential themes and patterns from the data.

The targeted participants included anyone currently employed in the construction industry. The anonymous online survey was first sent out to a convenience sample of known industry members, and responses grew using exponential non-discriminative snowball sampling as the original respondents shared the link with friends and coworkers. Additionally, social media (LinkedIn and Instagram) was used to solicit additional responses.

Results

The first section of research findings asked individuals for background and experience information. Out of 256 total survey respondents, 67% identified as female, 32% identified as male, 0.5% identified as non-binary, and 0.5% preferred not to answer. The majority (78.9%) of these individuals had a range of experience from as little as 3 years to over 20 years working in the construction industry. Of the respondents, 6.6% were field engineers, 18% project engineers, 5.9% assistant project managers, 16.8% project managers, 5.1% superintendent, 0.8% assistant superintendent, 1.2% craft trades, and the remaining listed as “other” positions that were not defined. Respondents varied from full-time employed individuals to student summer internships. Respondents were also asked to state how often they were in the field; from the responses, 31.9% were in the field every day, 28.8% 2 to 3 times a week, 8.7% once a week, 9.7% 2 to 3 times a month, 7% once a month, and 13.6% only a few times a year.

The second section of the survey asked participants about the safety vests they currently wear and used a 5-point Likert scale to determine how well the vests fit. When respondents were asked to identify the way that safety vests fit their body, only 35.3% believe their safety vest to fall within the scale of “just right - perfect fit” for the shoulders body part. Concerningly, overall length (40.2%),
arm/underarm opening (39.6%), waist (24.6%), hips (30.3%) and chest (37.4%) fall within this scale as well. These results suggest the areas at the shoulders, waist, and hips have the least satisfaction for comfort for a majority of the respondents (see Figure 1).

In a separate question, respondents were asked if they had ever asked their companies to provide them with a different size or style of safety vest. In these results, where 72% answered no. Of this percentage that answered no, 67% identified as females, 31.9% as male, 0.55% as non-binary, and 0.55% who preferred not to answer. This demonstrate females to be less likely to ask their company for a vest that fits them.

Figure 1: Identification of the fit of safety vests

Figure 2 inquired the participants to identify how the safety vest impacts them personally and how much they agree with each statement. Only 38.6% of individuals “agree” or “strongly disagree” that their safety vest makes them feel confident. Only 6% feel feminine while wearing it, while 41.6% “strongly agree” or “agree” their safety vest impacts the way people perceive their abilities.
Figure 2: The personal effects of safety vests

Figure 3 asked respondents to rank the following items based on their level of personal importance while working on a construction site. A majority (94.4%) feel one's personal safety is “extremely important” when working on a construction site. Additionally, 85.2% found self-confidence to fall within the parameters of “extremely important” and “somewhat important,” as well as sense of belonging (89.7%), other people’s perceptions of my abilities (77.8%), not being self-conscious (70.1%), and a vest that fits (84.3%).

Figure 3: Elements that are of importance on a construction site
Figure 4 breaks down the design specifications respondents feel are the most important on a safety vest. The specifications that were of the greatest importance for respondents were the front zipper (84.1%), pen pocket at chest level (80.4%), pockets inside of vest (78.4%), other pockets at waist (86.3%), and Velcro at pockets (78.4%).

Through this series of results, there was a grand consensus within all respondents (77.3%) that believe a properly fitting safety vest is crucial for the construction industry, and if their company provided them with one designed to fit their body type that they would choose to wear it (82.8%). This indicates the respondents hold their safety and of others in high regard, and favor wearing a vest that fits them comfortably over an industry standard sized vest.

**Analysis**

Respondents were encouraged to add any additional fit and size suggestions, or their personal impact from safety vests in a series of free response opportunities at the end of each section of questions, resulting in an additional 232 inputs, with the bulk of them alluding to similar concerns and suggestions. Through the analysis of the written responses, two major themes emerged: (1) the concern for one’s safety and wellbeing; (2) the sense of belonging in the workplace. A separate commonality presents a sense of frustration for the lack of appropriately sized safety vests and lack of awareness for the issues these individuals face. Not only is it an added nuisance to these individuals but a distraction that may place them at risk, which brings to light the concern for safety. One individual shared “My safety vest catches on sharp edges all of the time... I never realized how much of a hazard it can be until I started to experience it,” and “feel like I can get snagged on hooks and...”
sharp objects/corners much more easily.” This response directly correlates with the results seen in Figure 3, which asserts personal safety is extremely important to them.

Other respondents claim when they put on a type of safety vest, their perception by others of importance or knowledge is directly affected, reinforcing to a second major theme of (un)belonging in the workplace. One respondent shared “being told by men on the work site that I look like a "child" because of my oversized vest has often made interaction with them difficult i.e., they don't take me seriously despite being the lead engineer on a project.” A separate respondent who has worn a poorly fitting vest stated “it makes you feel like a child wearing a hand-me-down. The oversized vest makes you physically feel and appear smaller and that you don’t fit the ‘shoes’ for the job.” These responses equate to the results seen in Figure 3 that demonstrate an overwhelming (89.7%) of respondents who find their sense of belonging to be either somewhat or extremely important.

Respondents present a major barrier due to the price that comes with customizing vests, making implementation difficult. Instead of treating safety vests as essential equipment, it is seen as something that must be purchased in bulk for the cheapest and ‘mostly fit’ approach and oftentimes only available for purchase in bulk by vendors. Employers must and need to take more sizes and fits into consideration. Alternatively, select companies have acknowledged the issue and have acted proactively. A respondent states, “Providing women with properly fitting safety vests was prioritized on my project by my executive who is female. We have 17 female employees on site, so she ordered all of us women’s fit vest that are cinched in the back at the midline.” Others attempted to create prototypes but were then faced with the monetary barriers and feasibility but have expressed their hope for the adoption of them in the future, and pledge to “keep pushing.”

**Conclusion**

This study brought to light various concerns and discomforts about the sizing of safety vests. Based on previous research, the fit of safety vests is outdated and must accommodate the changing gender demographics within the construction industry. The implementation of a safety vest that considers varying body types is crucial for personal and professional growth in the construction industry, and directly impacts their safety if neglected, as illustrated in the survey results and written responses. By neglecting other genders on a construction site, respondents feel their sense of belonging in the industry is negatively affected and can undermine their abilities and other people’s perceptions of them, even when holding crucial leadership roles such as a lead engineer. The study brought attention to the negative affects clothing may have when it does not feel comfortable, where the majority of respondents agree they do not feel confident when wearing their safety vest. Furthermore, there is consensus that safety has not been acknowledged sufficiently where those who identify as female face hazards such as getting caught on jobsite materials. It is evident comfort and confidence are lacking, contributing to gender exclusion in the workplace. Safety is a priority in the eyes of the respondents and has not been addressed to consider other body types, as opposed to the standard male body.

This study presents multiple opportunities for future research given the high amount of feedback provided. An initial route may be tailored to encompass the specifications and preferences provided through the free response portions to create a prototype. A great concern was for the placement of pockets which should be designed for items regularly used in the industry now such as iPad, cell phones, tape measure, flashlight. Additionally, pockets should take into consideration items that are fundamental to other genders that include products such as tampons and sanitary napkins. The study and survey failed to acknowledge the presence of plus sizes and petite sizes, given the purchase of safety vest is itemized by the standard sizes of SM-XL. Pregnant individuals have also
been excluded from this study. There is a lack of maternity safety vests which forces workers to “size up to a ridiculous size that doesn't fit anywhere else but the baby bump,” instead of providing adjustment options, such as waist cinching, for their current vests.

References


