Safety Culture, Green Construction, and a Multi-Ethnic Workforce:
A Case Study

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Introduction

The problem: Annual injury and fatality rates in the US construction industry are currently higher and perhaps among the highest of all US industry sectors (NIOSH, 2014, Gillen et al. 2014). Perhaps more important, the high rates in the construction industry have failed to decline despite concerted federal safety agency and industry efforts over a number of years (Gillen et al., 2014; NIOSH, 2008). In addition, there is little current scientific evidence about which factors might be contributing the most to injury and fatality rates or about which factors might be the most amenable to intervention.

Safety culture defined: Safety culture has become, in some sense, a label attached too much of the entire constellation of efforts that have been accomplished to address work safety in construction and in other industries. Although the first safety culture studies of the construction industry were completed thirty-five years ago, safety culture has not yet been clearly defined. (Cox and Flin, 1998; Pidgeon, 1991; Smith et al., 1978). A frequent question is "what's the difference between safety culture and safety climate?" One way that has been suggested to discriminate between the two has been to view safety climate as a static measurement or photograph of the dynamic process that is safety culture (Hecker and Goldenhar, 2014).

Safety culture case examples: In an attempt to find new ways to improve safety, a few case studies focused on safety culture or safety climate have been accomplished recently on large construction projects. For example, safety culture and climate were carefully documented during the construction of London's 2012 Olympic Park in order to learn from and

transfer ideas and process improvements to construction projects throughout the United Kingdom (Finneran et al, 2012; Cheyne et al., 2011). In another example, prompted perhaps by eight workplace fatalities, an extensive safety culture and climate assessment was conducted during the construction of the 2006-09 Las Vegas City Center, then the largest commercial construction project in US history (Gittleman et al., 2010). This paper on the Omni hotel project is another case study of a large construction project that is intended to investigate and document the development of a safety culture.

Can better safety culture or climate produce better safety performance? Several recent studies have examined the value of measuring safety climate to predict safety performance and safety outcomes. For examples, three meta-analyses have tested pathways between safety climate, related constructs, safety behaviors, and injuries (Nahrgang et al. 2010; Christian et al. 2009; Clarke, 2006). To varying degrees, these wide-ranging analyses of multiple studies have found evidence to support a relationship between safety climate, safety performance, and safety outcomes. While the evidence for safety climate predicting safety performance is not unanimously strong across the numerous studies that have been conducted, there is clearly evidence to suggest potential value in aiming to improve safety culture to reduce workplace injuries. At the same time, traditional measures used for safety performance may be problematic.

Measures of safety performance may be lagging indicators: There is evidence that the traditional measures of safety performance, such as rates of fatalities, lost time injuries or worker compensation claims may be problematic because they are lagging indicators. Lagging indicators are changes that lag or take place only long after the workplace problems that create them have begun to occur. In addition, they are unlikely to show improvement until months to years after changes that actually improved safety have been implemented and succeeded (Clark, 2006). Existing measures of safety culture or climate are also problematic, perhaps even more so. Indeed, even definitions sufficient to discriminate between safety culture and climate are difficult to agree on (Hecker & Goldenhar, 2014). As a result, there are very few good studies indicating that either workplace culture or climate improvements can improve workplace safety performance.

The Dallas Omni Hotel project: After a May 2009 citywide referendum that supported a city-owned convention center hotel, the Omni Hotel project formally began on September 15th 2009. The hotel officially opened two years and almost two months later, on November 11, 2011, sixty-one days ahead of schedule. The hotel complex was constructed at a total cost of $331.6 million and came in under budget. Construction work was completed 61 days ahead of schedule and within its budget (ENR, 2013). The Omni Hotel's 1,001 rooms are located in a 19 story, boomerang-shaped tower. An adjoining, four story podium houses 80,000 square feet of meeting rooms and public spaces including five culinary venues, a full service spa, a fitness center and a rooftop pool (David, 2014; City of Dallas, 2014; ENR, 2013)

The Dallas Omni Hotel project's construction phase achieved substantial statewide and nationwide recognition and acclaim. In 2012, the TEXO professional construction association (that represented commercial contractors in North and East Texas) bestowed four distinguished building awards on the Omni project including 1) Balfour/Russell/Pegasus Joint Venture received the Design and Build Award for projects over $30 million , 2) Walker Engineering received the Electrical 3 Award for projects over $10 million, 3) The Brandt Companies received the Mechanical 3 Award for projects over $10 million, and 4) the KPost Company received the Exteriors Award (TEXO, 2012). Also, in 2013, the Omni Dallas became the first and only Leadership in Energy and Environmental Design (LEED) gold-certified hotel in Texas, and the largest LEED gold-certified new construction hotel in the United States outside of Las Vegas.

According to city documents, the project was noteworthy for being accomplished with "no major injuries/low accident ratio" and for the "3000+ project jobs created" during the construction phase (City of Dallas, 2010). Managers associated with the construction of the Omni Hotel suggested to the authors that there were innovative aspects to the safety culture at Omni and offered to cooperate in a research case study.

According to members of the Omni construction management team, the Omni project was unique in that the level of safety and health performance was above and beyond anything they had experienced on projects of this size. This research project was designed to document the development and experience of a model positive safety culture during the Dallas Omni hotel construction project through manager and safety supervisor interviews.

Methods

Interviews: A list was developed of appropriate, conveniently available individuals who worked as managers on the Omni Hotel Project who could be expected to have an understanding of the safety and health aspects of the construction phase of the project. Interviews were scheduled and conducted on the basis of willingness to participate. The first set of interviews was conducted in July of 2013. Three project managers and one general superintendent were interviewed who all worked for the general contractor in management roles with some relationship to safety on the project. A second set of interviews was conducted between February and April of 2014 and included five additional individuals, all associated with safety management for the project's subcontractors. These interviewees were selected from a list of twelve safety supervisory staff associated with various subcontractors (e.g. electrical, roofing, doors, etc.).

The supervisor interviews were conducted using a specific questionnaire covering eight items to get the conversation going. Neutral probes and follow-ups were employed to elicit depth, details and continuing exchange (Rubin and Rubin, 2005; Geertz, 1973). All of the interviews were recorded and transcribed. Informed consent was obtained prior to each interview. The research protocol was approved by the CDC human subjects research IRB.

Data analysis: Text files were created from the recorded interviews. Using standard qualitative analysis, major themes and subthemes were identified. Text excerpts were selected from the interviews to depict the major themes and subthemes. Wherever possible, the themes and issues were organized to depict interrelationships.

Results

Interview subjects: Demographics for the nine interview subjects are shown in Table 1. All the interviewees were male. Most were aged between 45 and 55 years. The three project managers and the general superintendent all worked for the sole general contractor on the project. The five safety supervisors worked for subcontractor firms that specialized in various commercial building construction areas (i.e. roofing, electrical, doors, etc.).

Table 1. Interview subject demographics

Position Type and Job Title	Industry Area	Age
General Contractor:		
General Superintendent	-	-
Project Manager	-	-
Project Manager	-	-
Assistant Project Manager	-	-
Subcontractors:		
Safety Site Manager	Electrical	55
Safety Coordinator	Specialties[*]	53
General Superintendent	Glass	50
Superintendent	Door Install	53
Safety Manager	Roofing	45

* Installation of wall protection, floor accessories, curtains, grills, louvers, joint covers, etc.

Safety culture elements evident in the interviews: There were a number of safety culture-type program elements that recurred across the interviews. The elements included daily safety meetings, weekly safety trainings, periodic walk-throughs with managers, and other activities.

Themes evident in the interviews: Over a half dozen major themes were identified and tracked in the interview material. These themes are listed in Table 2.

Table 2. Themes associated with Omni interview subject perceptions of safety culture

Theme
1. Strong, top-down management and owner commitment
2. Safety culture developed incrementally
3. Non-punitive, positive and incentive-based safety culture
4. Accountability, empowerment, involvement was encouraged among supervisors and employees
5. Cross benefits to both safety and production
6. Synergy between safety and the concurrent LEED project
7. Transferring safety culture best practices to other worksites

Theme #1: Strong, top-down management and owner commitment: One of the elements mentioned by more than one interviewee was the presence of both owner/client and top management commitment from the start of the project.

> *"...they (owner/client) have an absolute expectation that the management at the highest levels are intimately- personally- involved and held accountable to what goes on our job site. That's a little bit different than most of us are used to in our business."* General Contractor Superintendent

> *"... I guess the key is that it actually is coming from the top-down, it's coming from the general contractor, and they're making it more of a community effort more than, like I said- or just having it individualized per subcontractor- they're making it a job-wide effort."* Subcontractor Safety Supervisor

Theme #2: Safety culture developed incrementally: The development of safety culture at Omni was also perceived as iterative, as an everyday process of working out new ideas and safer, better ways of doing things. Interviewees communicated a sense that various things were tried and then monitored to see how they worked and then changed to make them work better.

> *"It started off "Let's try this, monitor it." It was probably more than two months, it was probably three or four months- and until it got to where we landed. But we saw the positives from each evolution and then we added to it is basically what happened. And it was a lot of good guys finally speaking up, saying "Hey, this is what I think." It was basically the safety guys from each subcontractor on site as well as some of their foremen or superintendents. So, we kind of got their management production side as well as their safety side, and it wasn't just safety guy or a production guy that was contributing."* General Contractor Project Manager

There was a clear suggestion by one interviewee that personal initiative was a major factor in how things turned out.

> *"... let's change the boring, predictable job safety script – instead, let's try to make this real for people, and let's try everything we can think of to get them involved and incentivized, -- plus, let's also shake up the subcontractors and their supervisors and employees and get them on the bus, and let's not worry about who pays for what, instead let's be magnanimous and let's keep trying things until something works."* General Contractor Project Manager

Theme #3: Non-punitive, positive and incentive-based safety culture: Both managers and safety supervisors agreed that an emphasis on non-punitive, positive, incentive-based features was crucial.

"Within that meeting, typically what would happen in the past was that my counterpart would stand up and say "We had 50 ladder violations" or "We had ten ladder violations" and pretty soon he would just come down on everybody, and it was a lot of cursing and a lot of getting on people. When I took that role, I turned it into, like, an educational opportunity. I partnered with one of the subcontractor's safety professionals and we come up with a- six elite pillars for leadership. And we kind of went through one pillar a week- we did this for six weeks- and then the seventh week we kind of did a recap, and we did questions and whoever answered the right question got a $50 gift card." General Contractor Project Manager

"When we first picked up- started the job, the first couple of safety- monthly safety meetings it was kind of your standard, you know, stand in the parking lot at 7 or 6:30 in the morning, the guys are not really paying attention, … even though we did everything in Spanish and English, you know, it's 45 minutes, 30 minutes, an hour- however long it was- but the guys are just standing there not really getting anything out of it. And once we started to change things- you know, an example was (name) said "Hey, let's get these guys involved and not we're just talking to a brick wall. Let's get them engaged where we give them topics a week or two before, they study the issues, they form teams, and then these teams basically compete for, basically, recognition and for lunch." And that was, you know, it went from a monthly meeting of guys just standing around half-asleep to a monthly meeting of guys raising their hands, arguing, fighting to be the first one to answer the question that- where, you know, you'd ask at the beginning of the job "Hey, does anybody know how to, you know, properly use a ladder?" and you'd get crickets versus "I do! Me! Me! Me!" It's pretty cool, you know? Pretty neat to see. So when you see that kind of change almost overnight, that's pretty noticeable" General Contractor Project Manager

<u>Theme #4: Accountability, empowerment, involvement</u>: Another set of features emphasized by both the general contractor's managers and the subcontractor's safety supervisors was the importance of encouraging accountability, empowerment and involvement. The example below illustrates how a general contractor manager encouraged accountability and involvement while empowering a subcontractor supervisor.

"And one of the guys had a crew working out in the field and they were up on top of ductwork trying to get some fire caulking done. Well, our vice-president … saw the guy up there- he gets down and he calls me and lets me know what happened. Well, I call the superintendent for the company and ask him "What are you going to do, how are you going to proceed with this?" Well, he keeps saying "Well, I don't know if the guy's run off the job yet or not." I say "Well, is he? You need to tell me if you're removing him from the job site."… "It's not about what I'm doing, it's about what you're doing- you're the manager of your crew, you need to tell me what you're going to do." So, it took him about a ten minute conversation to get him to wrap his head around I wasn't telling him what to do, he was going to have to come up with a game-plan on how to fix this problem. …what actually happened was he nominated himself to come out for three weeks every morning for three minutes and talk about safety before his crew started? And then he also started- he said "I'm going to go back through and I'm going to inspect all their harnesses again." So, there was way more- he did way more than I would have ever said, and I would've ever gained by saying "Hey, just get rid of the guy and we've solved the problem." So the influence became- he was out in the field inspecting safety, talking about safety for three weeks every day, rather than we got rid of a guy. If we would've gotten rid of the guy, maybe they would have had a safety meeting, but they didn't- that would never have transpired. The three weeks of training, the three weeks of showing up and talking about it and inspecting, that would have never happened. So it's just a cultural shift." General Contractor Project Manager

There was also a sense that accountability, empowerment and involvement were important to develop among employees as well.

"…I broke down GFCIs and how they work and what, potentially, they save you from, and then why they're important. And then, I also brought the GFCI to the house by saying "Have you ever had your kids a bounce house, or something along those lines, and you had power hooked up and you didn't check

for the GFCI, what would it make you feel like if you had this knowledge and you didn't do anything, if something were to have happened?" … At the end of the orientation these six guys come up and they say, "Can I have a word with you?" and I was like "Oh crap, what did I say?" … they said "We went to your competitor's job site last week and we went through their orientation and they made us- get clear to us that we have to use GFCIs." I said "Okay, what did you get out of it?" and he said, "Well, we asked why, and the answer was 'Because I said so.'" And they said, "We want to thank you for breaking GFCIs down the way you have, 'cause we understand now, and we understand why it's important, and we're going to use them from here on out." General Contractor Project Manager

"Probably made us more aware of not only observing more safety items, but I guess as far as our training- our employees- being able to show, you know- have them better trained…Made us more aware, I think, or made our employees more aware of safety items. … Instead of being, you know, more of an individual, you know, company's responsibility, they brought it out as more of a community responsibility to watch out for safety. 'Cause it wouldn't be like, you know, "your company's responsible for your safety," it's "we're all responsible for all of our safety." … I've been in construction for many years and I've not experienced that. And I actually appreciated wanting more of that type of safety." Subcontractor Safety Supervisor

"Not everybody's wearing a safety vest and, you know, so I think having these meetings and having somebody accountable- holding somebody accountable for those things… if there was an incident, they would pull the foremen in- the workers in, or whatever- and have a meeting with them- talk with them- and it wasn't always about throwing them off the job- what they did wrong and whether we have to look for to not let that happen again." Subcontractor Safety Supervisor

Theme #5: Cross benefits to both safety and production: Some of the general contractor managers noted that an improved safety culture also led to improvements in production.

"You get buy-in; you get more production, they're happy to be there, they don't really want to be somewhere else. So, that –all those things together really facilitated a culture that was really different from what they were exposed to." General Contractor Project Manager

"Other than I could tell them that "Hey, it's- if you get it implemented up front and you get it implemented right, it's cheaper, it's more effective, and at the end of the day, I mean you know, you're going to have a safe job site, you know? A safer job site than you would otherwise." I truly believe that …" General Contractor Project Manager

Theme #6: Synergy between safety and the concurrent LEED project: There was some disagreement about whether there was any importance to potential synergy between safety and the requirements of the Leadership in Energy and Environmental Design project. One of the two general contractor managers whose interviews touched on this issue felt there was not any important effect on safety, while the other believed the LEED project made a difference in safety.

"I don't really think it (LEED project) did and I know there's been lots of debate about it… Okay, is it a little safer? Yeah, that's probably a little safer, the guys are exposed a little bit less, but, you know, it's fractional, I think, I don't think it's significant." General Contractor Project Manager

"So for that side of it, I think it's way more- it's so much more positive to have a LEED project, especially talking about the indoor air quality aspect, than it is any time. I mean the sanders- the guys that were doing the sanding on that project- all used the vacuum attachments, and that's typically not something you normally can push the guys into at a regular job, but being that it's lead and that the IAQ plan requires it, you can push them and then all of a sudden you've got a much cleaner environment for the guys to work in." General Contractor Project Manager

Of the four subcontractor safety supervisors whose interviews discussed the impact of the LEED project on safety, three said there was no effect and one said there was. An excerpt from the single supervisor said there was important synergy from the LEED project follows.

> "… but it was probably the- one of the most enjoyable jobs that I've ever had the pleasure of working on just by the pure fact that it was the cleanest job I'd ever been on. And I saw the benefit of working on a clean, you know, a kept job site. And it wasn't a "beat you over the head" keep it clean thing, everybody participated; it just helps all the way across the board moral- it was just amazing. … and the LEED was instrumental in keeping that project clean." Subcontractor Safety Supervisor

Theme #7: Transferring these safety culture best practices to other worksites: Both project managers and safety supervisors commented about what needed to happen in order for the best parts of the Omni safety culture to be developed at other worksites.

> "Now, to fly in and see that is one thing. To fly in, see it, and understand it and then believe in it and take it back is a different thing. So, we were able to push a lot of the nation into doing some of the things we were doing there at the Omni, but it really takes the right person to believe in it, and that's what it takes to push the agenda. I mean, here's the deal about that- you got to be a leader, right? And a leader's got to have a plan, he's got to be bought into his plan, he's got to be charismatic about his plan." General Contractor Project Manager

Differences between management and subcontractor interviewees: Aside from the different perceptions about of the synergy from the LEED project, there was general agreement between all of the interviewees about all of the themes. For all the themes, including perceptions about the influence of the LEED project, the four general contractor interviewee responses resembled those obtained from the five subcontractor interviewees.

Discussion

Based on the discussions that took place with both project managers and subcontractors, there is evidence to suggest that practices for developing a strong safety culture can be identified from the approach to safety management that was used during the construction of the Omni Hotel in Dallas. Additionally, this research effort can be seen as successful in that it was able to identify a number of important research questions and it was able to proceed to explore those questions within a viable subject group, a small group of managers and supervisors.

   Safety culture factors: The themes identified in our small interview study essentially covered all eight of the factors that were recently identified as important for safety culture (Gillen et al., 2014). In the Gillen study, a group of 72 safety experts and construction safety stakeholders met and reached a consensus about these leading indicators or factors thought to be associated with safety culture or climate: 1) supervisory leadership, 2) safety as a value/safety alignment, 3) management commitment, 4) employee empowerment /and involvement/foster an open, positive safety culture, 5) accountability, 6) communication, 7) training, and 8) owner/client Involvement (Gillen et al., 2014).

This case study suggests that a strong worksite safety culture can be built on construction projects. Additionally, cultivating a positive safety culture has the potential to benefit not just work safety but also workplace morale along with work production and work quality.

The few meta-analytic reviews of safety culture in the research literature suggest there are mixed relationships between stronger worksite safety culture indicators and traditional work safety indicators like rates of workplace injury and injury absence (Clark, 2006). Additionally, there is some evidence that workplace safety culture, whatever it may be, can be improved if the right interventions are used. Interventions that improve safety culture are believed to promote workplace environments that: 1) are informed, relying on good information; 2) report incidents, 3) are just and generate trust, and, 4) are flexible and are able to learn (Reason, 1997). The evidence from the interviews of project managers and

subcontractors on the Omni project suggest such a culture was created at the building site, and that the improved safety culture that developed on this project may transfer to future projects for the contractors involved.

Limitations: The number of interviews collected was small and the project did not assemble random samples of individuals to interview from all the possible staff in either the manager or the safety supervisor groups. Additionally, this project did not include the perspectives of front-line workers which would provide another valuable perspective regarding the safety culture of the Omni hotel project.

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