

Green Building Risks: Limits on Environmental and Health Quality Metrics for Contractors

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Abstract : The United States (U.S.) population spends the majority of their time indoors in spaces where building codes and voluntary sustainability standards provide clear Indoor Environmental Quality (IEQ) metrics. The existing sustainable building standards and codes are aimed towards improving IEQ, health of occupants, and reducing the negative impacts of buildings on the environment. While they address the post-occupancy stage of buildings, there are fewer standards on the pre-occupancy stage thereby placing a large labor population in environments much less regulated. Construction personnel are often exposed to a variety of uncomfortable and unhealthy elements while on construction sites, primarily thermal, visual, acoustic, and air quality related. Construction site power generators, equipment, and machinery generate on average 9 decibels (dBA) above the U.S. OSHA regulations, creating uncomfortable noise levels. Research has shown that frequent exposure to high noise levels leads to chronic physiological issues and increases noise induced stress, yet beyond OSHA no other metric focuses directly on the impacts of noise on contractors' well-being. Research has also associated natural light with higher productivity and attention span, and lower cases of fatigue in construction workers. However, daylight is not always available as construction workers often perform tasks in cramped spaces, dark areas, or at nighttime. In these instances, the use of artificial light is necessary, yet lighting standards for use during lengthy tasks and arduous activities is not specified. Additionally, ambient air, contaminants, and material off-gassing expelled at construction sites are one of the causes of serious health effects in construction workers. Coupled with extreme hot and cold temperatures for different climate zones, health and productivity can be seriously compromised. This research evaluates the impact of existing green building metrics on construction and risk management, by analyzing two codes and nine standards including LEED, WELL, and BREEM. These metrics were chosen based on the relevance to the U.S. construction industry. This research determined that less than 20% of the sustainability context within the standards and codes (texts) are related to the pre-occupancy building sector. The research also investigated the impact of construction personnel's health and well-being on construction management through two surveys of project managers and on-site contractors' perception of their work environment on productivity. To fully understand the risks of limited Environmental and Health Quality metrics for contractors (EHQ) this research evaluated the connection between EQH factors such as inefficient lighting, on construction workers and investigated the correlation between various site coping strategies for comfort and productivity. Outcomes from this research are three-pronged. The first includes fostering a discussion about the existing conditions of EQH elements, i.e. thermal, lighting, ergonomic, acoustic, and air quality on the construction labor force. The second identifies gaps in sustainability standards and codes during the pre-occupancy stage of building construction from ground-breaking to substantial completion. The third identifies opportunities for improvements and mitigation strategies to improve EQH such as increased monitoring of effects on productivity and health of contractors and increased inclusion of the pre-occupancy stage in green building standards.

Keywords : construction contractors, health and well-being, environmental quality, risk management

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