Construction personnel are exposed to a variety of uncomfortable and unhealthy elements on construction sites. These elements are primarily thermal, lighting, acoustics, air quality and ergonomics related. Uncomfortable noise levels on construction sites result from power generators, equipment, and heavy machinery which averages 95 decibels (dB(A)). 9 dB above OSHA regulations.

- More than 420,000 US construction workers are potentially exposed to hazardous noise levels.
- The construction industry has the highest reported occupational fatalities in the US by the Bureau of Labor Statistics (2018).

**Background on Environmental and Health Impacts from Construction Sites: Findings from Literature Review**

- Power generators, equipment, machinery use, transportation, temporary lighting, and heating and cooling consume large amounts of energy.
- Site energy consumption generates environmental emissions.
- Health complications abound from site environmental emissions.
- Inefficient site management impacts energy use.
- Decentralized energy reporting mechanism leads to inefficient energy use monitoring.
- 2/3rd of countries lack mandatory building energy codes. Even less have construction energy codes.

**Methodology**

A systematic review of research studies consisting of peer reviewed literature, white papers, and reports between the years 2002 and 2018 provides further substantive support of the gap in guidelines towards contractor health and safety and the impacts on productivity, and construction budgets.

**Discussion**

- Results show that regulations that impact the health of construction personnel is limited in tests.
- Temporary lighting is a key term in tests, but in the post-occupation context.
- Not addressed in pre-occupation use.
- Results from the pilot survey indicates three common trends of concern on site: hot temperatures, lighting, and acoustics.
- Literature supports the importance of lighting and noise on contractors’ health and productivity.
- Literature substantiates claim on lack of metrics for pre-occupation phase.
- Health sections were primarily concerned with IEQ and ergonomics, leaving a large gap in energy use, environmental impacts, and contractor well being.
- Envison is the only test to explicitly focus on contractor safety and well-being: guidelines go beyond OSHA; however, Envison focuses only on infrastructure.
- Individual site energy consumption could not be determined due to limited research studies.
- ENR emission standards which regulates engine hp size for nonroad diesel fuel for generators is a solution for reduced gas emissions on sites.

**Conclusion**

- Modifications in codes will have great impact — large numbers of projects in the US employ LEED, WELL, Living Building Challenge, and ASHRAE Standards.
- Preliminary results indicate that more data is needed to ascertain individual construction activities and site energy use, in order to determine management plan.
- Two key terms, temporary lighting and Energy STAR portfolio show a way for improvement.
- Energy STAR portfolio is required by majority of standards for calculating GHG emissions consistently across the building sector. Changes towards construction inclusion may rely upon changes in the tools such as ENERGY STAR, as much as the standards and codes themselves.
- Temporary lighting is relevant for the frequency of night construction, working in spaces void of fenestration, or requiring task specific lighting. Reduced nighttime work was at the forefront of reduced carbon footprints of construction sites in Malaysia (7).

**References**