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Editorial

Making Green Jobs Safe

Can a job be "Green" if it is not safe? Unfortunately, the current answer is yes. The United Nations Environment Program defines a green job as work in agricultural, manufacturing, research and development, administrative, and service activities that contribute substantially to *preserving or restoring environmental quality*[1]. The US Bureau of Labor Statistics proposes to define green *jobs as jobs involved in producing green products and services* that increase the use of energy from renewable sources, increase energy efficiency, or protect, restore, or mitigate damage to the environment[2]. From these definitions it is apparent that, although a green job must preserve environmental quality and/or produce green products and services, green jobs have no requirement that they be safe for those individuals performing the jobs (or for that matter, the consumers using green products and services).

When you think of the word "green" today in relationship to green products or services, one usually thinks of environmentally friendly, increased energy efficiency, reduced waste; but the word also conveys feelings that the products and services are safe or safer than the products or services they replace. However, the following examples illustrate that this is not always the case. Efforts to reduce the use of the ozone-depleting, chlorofluorocarbons, like perchloroethylene, have led to the promotion of substitute degreasing and dry cleaning solvents. Once such substitute, 1-bromopropane (1-BP), is an effective degreaser and reduces ozone depletion, but it is not without risks. The National Toxicology Program has concluded that exposure to 1-BP is toxic to the developmental and reproductive health of animals[3]. Animal toxicity studies with 1-BP and human case reports of occupational exposures to 1-BP have raised concerns that exposure to 1-BP might cause reproductive and neurologic effects[4–8]. A recent *Morbidity and Mortality Weekly Report* article highlighted two cases of workers diagnosed with clinical manifestations of neurotoxicity after use of 1-bromopropane in degreasing and dry cleaning operations[9].

In the construction of the recently completed Las Vegas City Center, six construction workers were killed, yet the City Center complex received six Leadership in Energy and Environmental Design (LEED®) gold certifications from the United States Green Building Council (USGBC)[10]. Should a building be considered green if multiple injuries, or for that matter, a fatality occurs during its construction, maintenance, or use and it can be demonstrated that the injury or fatality was influenced by the absence of recognized safe design and construction methods? Exploratory studies of LEED® versus non-LEED® buildings have shown that LEED® buildings appear to have more complex design elements that can be more hazardous to construct than traditional designs[11]. Identifying the hazards associated with these green design elements, assessing the risks to worker health and safety, and either eliminating the hazards or minimizing the risks are essential to the design, construction, operation, maintenance and occupancy of green, sustainable buildings. When environmental concerns predominate, there is the possibility that risk can be transferred to workers. For example, a practice in construction is to seal (wrap) buildings to keep out dust and allergens that may affect the indoor environmental quality of the future occupants. However workers installing interior materials and finishes often receive higher exposure to volatiles and construction dust due to lack of ventilation because the building is sealed. This practice impacts all of the workers on the project, not just those doing the green jobs as defined by the UN Environment Program and the US Bureau of Labor Statistics. Clearly, these and other examples illustrate that green does not equate to safe for workers.

The term "green jobs" does not refer exclusively to high "tech" jobs such as in the solar or wind energy industries. Rather, green jobs represent a continuum of jobs from those in traditional industries to new high technology settings. Traditional jobs, such as retrofitting buildings for energy conservation, have a green purpose but generally involve known tasks and recognized hazards that can be addressed through established control measures. In some cases, however, jobs such as making automobile panels lighter involve traditional manufacturing processes but may include new hazards such as composites containing carbon nanotubes. In this case, additional precautions may be warranted. Further down the continuum are jobs that involve innovative technologies such as development of solar or wind farms. In these cases, the hazards are generally known but they may appear in new scenarios such as working at heights on wind turbines or the need to control electrical discharges on solar arrays. Spanning across the continuum of green jobs are the hazards and risks to the collectors and processors of recycled waste, includ-

ing e-waste. Finally, as new technologies are developed, they may include unrecognized hazards. This is a perennial conundrum in the field of occupational safety and health, and will require methods that allow foresight and pay attention to sentinel events and anticipating possible hazards. In all of the green jobs along the continuum, the most effective means of risk reduction and hazard control is to design out the hazards. This is consistent with the hierarchy of prevention, and in the long run is the most cost effective means of reducing risk. In the U.S., designing out occupational safety and health hazards in green jobs, or any jobs for that matter, is referred to as Prevention through Design and is the focus of a seven year national initiative in the United States[12]. One project in this initiative is the Green Jobs, Safe Jobs campaign to ensure that worker safety is an important consideration in all green jobs. In December of 2009, a workshop was held, titled *Making Green Jobs Safe*, where approximately 170 stakeholders and partners deliberated and identified 48 compelling issues for ensuring green jobs are safe. These issues can be grouped in four categories; research, education, practice, and policy. In the research area, recommendations include identifying hazards in new green technologies and investigating design alternatives; identifying sentinel health events for surveillance; and designing out hazards at the molecular level through "green chemistry". In terms of education, the most critical issue identified is to affect a change in the culture of designers, architects, engineers, and businesses by incorporating consideration of occupational safety and health in professional curricula, textbooks, accreditation, and certification examinations. The highest priority issue for practice involves the widespread sharing of good practices and approaches. Finally, policy recommendations include the development of consensus standards with consideration of occupational safety and health such as the proposed American National Standards Institute (ANSI) standard on Prevention through Design and the need to include specifications pertaining to occupational safety and health in federal or other procurements for buildings, equipment, and materials with green requirements (http://www.asse.org/newsroom/standardsinfo.php). A summary of the outcomes from the plenary session speakers and the participants' discussions from the *Making Green Jobs Safe* workshop is expected to be published, by NIOSH, in 2010 http://www.cdc.gov/niosh/topics/PtD/greenjobs.html.

Ultimately, any approach to ensuring that green jobs are also safe jobs will require commitment and partnerships among health and safety professionals, designers, business owners, labor, environmentalists, insurance companies, and government. Sustainability is a necessary and worthy goal that is now being embraced both nationally and globally. Critical to achieving sustainability is the conservation of planetary resources. Human resources, or the human capital from working men and women, must be considered equally as important as the natural resources of our planet. Just as the sustainability of a society depends on its environment, the strength of our economy depends on a safe and healthy workforce.

Disclaimer

The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the National Institute for Occupational Safety and Health.

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