How many employees does it take to change a light bulb?

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How many employees does it take to change a light bulb? That is the question many employers should ask themselves before having an employee or contractor change a light bulb in their facility. More specifically, employers should ask:

1. How can we provide a safe working environment for our employee to change the light bulb?
2. What relevant training does the employee need in order to change the light bulb?
3. What codes and standards apply to the light fixture?
4. Does the structure's electrical wiring comply with current regulations?

For such a simple task, it would take an entire team of employees to account for the issues arising from this list of questions. Changing a light bulb never seemed so difficult. On the other hand, an accident with the possibility of electrical shock or a fall hazard would be an unacceptable event. With the potential wage loss, staffing issues, and downtime, as well as possible insurance involvement, legal representation, and/or worker compensation concerns, the cost of a light bulb accident can be substantial. The Bureau of Labor and Statistics indicates there was a total of 419 fatalities due to electricity exposure in 2011. The 2010 data from the Electrical Safety Foundation International indicates that in private industry, there were 163 fatalities due to contact with electrical current and a total of 1,890 non-fatal electric shock injuries resulting in numerous days away from work.

The Occupational Safety and Health Administration (OSHA) requires an employer to provide a workplace free from known dangers, and the employee must follow established regulations (General Duty Clause). Yet electrical accidents, both fatal and

non-fatal, still occur. Changing a light bulb can result in a workplace accident and an OSHA investigation.

Effects of electrical contact can result in pain, burns, neurological damage, and/or death. Typically, one would expect increased voltage to be the determining factor in the degree of damage sustained by an individual, when actually it is the ***current*** that causes the effects. For example, a 0.03 Amp (30mA) current could cause a person to stop breathing resulting in respiratory failure. A 30mA current would only power less than a 4-watt light bulb, equivalent to the wattage of a hallway night light. The heart can go into fibrillation at 75mA, which is the same current for a 9-watt light bulb. For comparison, a single 4-ft. T8 fluorescent light bulb is rated at 32-watt. A person's body tissue can start burning at 5 amps, which is enough current to operate a mini-refrigerator. The possibility of internal organ damage begins at 20 amps, the same current rating observed in a typical home kitchen circuit.

In order to limit hazards in the workplace, there is a hierarchy of control that includes five steps. The steps range from most effective to least effective: elimination, substitution, engineering controls, administrative controls, and personal protective equipment (PPE). The most effective, **elimination** of the hazard, is essentially the removal of the hazard from the work place. **Substitution** of the hazard, for example, is using fiberglass insulation instead of asbestos. Applying **engineering controls** involves designing a hazard out of the workplace, i.e., adding two buttons to be pushed simultaneously when operating a machine, therefore eliminating the possibility of a pinch hazard for an operator. **Administrative controls** are the codes, requirements, and recommendations produced by the associated community (i.e., OSHA, National Fire Protection Association) to limit potential hazards. **PPE**, the final and least effective step involves insulating the worker from a hazard, such as wearing a dust mask or electrical insulated gloves.

De-energizing an electrical system is the premier method used in preventing electrical workplace injuries. This methodology is generally referred to as "Lockout-Tagout" or

“LOTO.” LOTO is a six-step process as defined by the National Fire Protection Association. A summation of the steps is as follows:

1. Determine all sources of electricity.
2. Open the disconnecting devices.
3. Visually verify (if possible) that disconnect blades are open.
4. Apply lockout devices and tags.
5. Test with rated voltage detector.
6. Ground the de-energized phase conductors in case of possible induced voltages.

Unfortunately, there are exceptions to using LOTO in the field; however, these exceptions do not apply to changing a light bulb. The exceptions are used when a life-safety issue arises from de-energizing the electricity, typically observed in an industrial environment. There are strict requirements for PPE when working on energized equipment.

Overall, changing a light bulb, a simple task at the outset, never looked so difficult and hazardous. Providing a safe working environment through the use of codes/standards is the key to prevention. Electrical shock and many other injuries may be avoidable when proper training, installation, and workplace standards are followed. Therefore, the next time you find an employee up on a ladder changing a light bulb, think twice about what is really happening and if you know the proper steps to changing a light bulb.

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