The Barn Raiser

Mid-South Engineering Company

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New NEC Code Targets Electrical Safety

There are many hazards that exist in electrical systems. When we think of these hazards we tend to think mainly of shocks and electrocutions caused by accidental contact with energized or "live" equipment. The National Electrical Code (NEC) has for years mandated certain minimum working space around electrical equipment meant mainly to provide enough space to perform examination, servicing and maintenance of the equipment. NFPA 70E (Standard for Electrical Safety Requirements for Employee Workplace) contains a table which defines "limited approach", "restricted approach" and "prohibited approach" boundaries to live parts for shock protection. However, a significant number of electricians are being seriously burned or killed from accidental *electrical arc flash burns* while working on energized equipment. The burns caused by an arc flash lasting only a second can be severe because the arc can reach temperatures of 35,000 degree F (approximately four times the temperature of the sun's surface). The arc flash can produce extensive first-degree burns, permanent blindness or death. The explosion associated with such a flash can cause shrapnel to pierce the worker's body. The 2002 NEC has added a new requirement mandating electrical equipment to be marked to provide warning of electric arc flash hazard. In this context the NEC makes a reference to NFPA 70E in a fine print note. While compliance with NFPA 70E is not made mandatory by the NEC, the NEC recognizes that the safety related work practices in NFPA 70E provide a safe work place.

NFPA 70E requires that live parts to which a employee may be exposed be placed in an "electrically safe" condition (de-energized in keeping with listed lockout/tagout procedures) before working on or near them. However, it does recognize that under special circumstances brought about by equipment design, operational limitations, performance of start-up and troubleshooting operation etc. it may be necessary for electrical equipment (electrical conductors or circuit parts) to be worked on "hot". In such cases it mandates that specific safety related work practices be followed to protect employees from arc flash or contact with live parts. One of the important requirements is the determination of a "flash protection boundary".

A flash protection boundary is one into which entry is prohibited without wearing Flame Retardant (FR) clothing and Personal Protective Equipment (PPE).

A flash hazard analysis is required before a person mat be allowed to approach any exposed electrical conductor or circuit part that has not been placed in an electrically safe work condition. This analysis is meant to determine the flash protection boundaries under specific circumstances. Depending upon various factors this analysis may require the calculation of the bolted fault current at the point involved and incident energy levels in calories per square centimeter. Once it is established that work will be performed *within these flash protection boundaries* these incident energy levels will be required to be documented by the employer. Flame Retardant (FR) clothing and Personal Protection Equipment (PPE) will be required based upon the calculated incident energy levels. Alternatively, tables contained in NFPA 70E listing hazard risk categories may also be used in lieu of a detailed flash hazard analysis.

Only "qualified persons" familiar with the proper use of special pre-cautionary techniques, personal protective equipment, insulating and shielding materials and established tools and test equipment are permitted to work within the defined boundaries. The protective clothing may consist of hard hats, face shields, flame retardant neck protection, ear protection, Nomex suits, insulated rubber gloves and footwear.

It is obvious that industry wide this issue needs to be addressed urgently. Several companies have already established task forces to deal with the Byzantine and often confusing requirements of NFPA 70E. At Mid-South we have developed the knowledge and expertise to address these issues and are currently working with some clients to help them establish the proper guidelines.

"The Barn" built in the 1930's to house Welsh ponies, serves as Mid-South's offices. →

A Guide to Project Success

What defines a project? Any project has three necessary and basic components: scope, budget, and schedule. The scope is the work to be accomplished in order to reach specific goals and objectives and it must give consideration to quantity as well as quality. The budget is the cost to perform this work measured both in dollars and in manhours. The schedule is the logical sequencing and timing of the tasks required to complete the work.

To have a successful project, the project manager cannot focus on only one component at the expense of the other two. Too often the focus is on budget without regard to either scope or schedule. Because scope is affected by budget and vice versa, all three components must be worked together, with constant focus to each.

Project management is the art and science of coordinating the work of people, equipment, materials, money, and time to complete a specific endeavor. **Things don't just happen. People make them happen.** But to do so, the components of the project must be well defined. The worst night-mare of a project manager is to be handed a job where the scope, schedule, and the budget are not tied together. Any individual will fail at project management when there is too much scope or too little time for the budget. The old sayings still ring true, "You can't get something for nothing", and "Good people make things look simple."

Once the three components of a project have been established, to continue to have a successful project the leaders must **communicate, communicate, communicate.** Not only does the project manager need to communicate with his superiors, he must be in communication with the people who will design the system, the people who will build the system and the people who will operate and maintain the system.

To be successful, the project manager above all else, must **control the changes in the scope of the project.** If a project has been properly planned, there will be very few changes to the scope and, therefore the budget will be a good tool with few surprises to the project owner when the system is completed as scheduled.

Maybe a New Air Compressor Isn't What You Need For Your Existing Plant

Compressed air is common in most industrial plants and used for a wide variety of tasks, such as refrigeration, pneumatic cylinders on machinery, seal rings, cleaning, and the like. Electrical motors are the most common way to power a compressor with over 17 million horsepower estimated in use in the United States today. Electrical cost to operate a compressed air system during a single year's time can exceed the initial cost of the system, and will certainly account for the largest percentage (roughly 69%) of the lifetime cost of a system. The initial system cost is estimated at only 8% of the lifetime expenses, and maintenance is estimated at 23%. These percentages allow you to quickly understand that maintaining your compressed air system can make a bad situation better, and would continue to benefit you during the good times.

Energy wasted can be quickly correlated to dollars "thrown up in the air". If your compressed air system operates at roughly 85 psi and we base our energy cost at $0.0447 per kilowatt hour, the the chart below shows you how much a small leak will cost you:

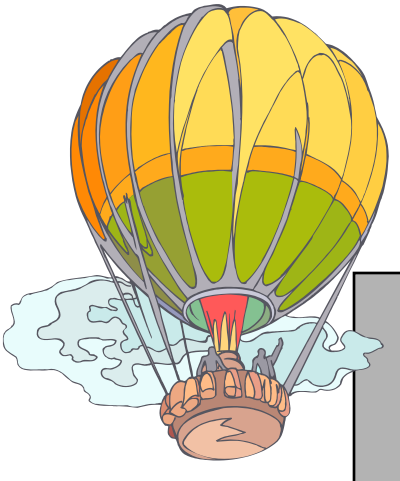
Hole Size	Air Leakage	Power Required	Cost $/Hour	Cost $/Year
3/64"	2 cfm	0.3 kwh	$ 0.01	$ 117.50
1/8"	21 cfm	3.1 kwh	$ 0.13	$ 1,213.87
3/16"	57 cfm	8.3 kwh	$ 0.37	$ 3,250.05
3/8"	220 cfm	33 kwh	$ 1.47	$12,921.88

While you may not have a single hole of the size shown in the chart above, it isn't hard to walk around your complex and find enough leaking valves, or hoses to quickly exceed the same area. We need to check the valves and valve stems, air filters, joint connections, and all our hoses for leaks. That hissing noise because of worn gaskets or from an air lance left leaking is truly a snake devouring profits right under our noses.

The bottom line for all of us using a compressed air system is to make maintenance a priority and to train our operators to stop wasting air by leaving leaking air valves off of our repair lists. You might even consider leaf blowers as a clean-up tool rather than an air lance.

Having this information allows us to evaluate if we need a new air compressor, or to say that the answer is in maintaining what we do have.

For more information you can refer to a paper submitted at the 1995 ASME International Mechanical Engineering Congress and Exposition in San Francisco.



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