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Objective and Measurable

A white paper exploring mandates and techniques to determine worker qualification and compliance to established work practices

Law mandates establishing and monitoring safe work practices. In the United States, the ‘law’ is OSHA, Occupational Safety and Health Organization. To comply with this directive, a company must acknowledge hazards that may exist in their facility and operation and agree upon the safe work practices employees will employ when working on or near them. Training then follows to ensure employee knowledge and monitoring processes established to ensure compliance. Variations of this model exist worldwide.

The mandate, problem, and solution techniques described herein are focused on electrical safe work practices. It should be recognized that this model could be easily adapted for any aspect of an employer’s workforce.

It is widely agreed that, “Employees are a company’s most valuable asset.” [1] Believing this to be true, a natural follow up would be to prepare, preserve and protect the human asset with the same vigor as is afforded the mechanical equipment those humans work with on a daily basis. Both the human and hardware must be correctly selected for an intended outcome and maintained for optimal performance. Where humans are involved, optimal performance begins and ends with safety.

The basis for “monitoring safe work compliance” is rooted in OSHA, with techniques described in NFPA 70E. These two documents become the operating manuals for the human asset, the employee, in which every supervisor must be well versed. They provide both the requirements and compliance processes for safe and efficient operation and outcome. Workers must first be

“qualified” for the task, then monitored to ensure their daily work habits reflect the training elements used to determine their qualification status, while following company provided work procedures.

The benchmark of effective training and workforce development must consider three interconnected components.

1. Targeted to the topic (equipment and work practice)
2. Measured for understanding
3. Monitored for compliance

In recent years, training models have evolved by adapting to client’s scheduling and budgeting restraints with a diligent eye on its affects on the company’s overall financial health. Training providers, whether in-house or out-sourced, continue to develop new delivery models that ensure training effectiveness and the best return for the investment.

The employment process determines a worker’s ability to perform employer directed tasks or the need for initial training, so that the worker may achieve the necessary level of documented independent work performance. Technical competence is a foundational aspect to consider when determining the qualification of any worker.

In a past position in my career, I was tasked with staffing outages, often called ‘turn-a-rounds’, in an electrical generating plant. These are very work intense and time constrained projects that many large industrial type facilities endure, requiring great planning and

preparation to achieve a safe, successful and reliable result. These annual projects typically occur in low electrical load times of the year, spring and fall, throughout the industry. After a particularly negative result the prior year, I decided to give a basic level electrical test to all applicants, even though they may have had extensive experience performing this work in the past. To my chagrin, or maybe not, it was discovered that only 22% of the temporary workers could pass this basic test. To ensure some level of fairness, I also gave the test to the full-time company employees, half of which had less than 5 years experience. Only one of these 23 tested possessed an electrical license or had experience in taking similar type testing. Licensing of electrical workers within a company maintenance environment is not a mandate in many states, as was the case with the state in which this occurred. All of the company employees passed the test.

What was revealed was actually a factor of basic human behavior and performance. People work to their areas of strength, but when confronted with areas of weakness, often will remain silent for fear of reprisal. My father had a favorite quote he attributed to Abraham Lincoln "Better to be thought a fool than to speak up and remove all doubt" [2]. To revise that phrase in the context of this paper, "Better for my employer to think I know what I am doing than to ask for training and risk looking less valuable than I hope I am." The temporary workers I had previously hired were specialists. They were very good at certain aspects of their work, but extremely weak in others. As an employer, it is understood that the responsibility of determining the readiness of the workforce to perform any requested task and the preparation for that task rested firmly on my shoulders. What became painfully clear is that a safe, efficient and valuable workforce is not hired; it is developed.

A company must use all diligence to hire qualified 'candidates' for their electrical workforce, but, with full awareness, must consider these new hires, or those in their existing workforce, that have neither been tested nor measured for understanding are just that, qualified candidates. Qualification requires a process answering key questions to determine baseline factors upon which to act.

1. What is the existing level of expertise and understanding of the worker for the task they are expected to perform?
2. Where deficiencies are noted, how can these best be addressed to ensure effectiveness of any required training?
3. How will I be alerted when additional training is required to best spend the training dollars available and, more importantly, ensure the

safety of the worker while doing the tasks expected?

Let's attack these questions one at a time by first establishing what it really means to be a "qualified worker".

The definition of "Qualified electrical worker" (OSHA) [3] and the recommendations of 2012 NFPA 70E [4] (below, highlighted emphasis by author) both reference the mandate that a qualified worker have understanding of construction, operation and maintenance of the electrical equipment to which that worker intends to interact.

OSHA 29 CFR 1910.399

*Qualified person. One who has received training in and has **demonstrated skills and knowledge** in the construction and operation of electric equipment and installations and the hazards involved.*

OSHA 29 CFR 1910.333 A

*"General." **Safety-related work practices shall be employed** to prevent electric shock or other injuries resulting from either direct or indirect electrical contacts, when work is performed near or on equipment or circuits which are or may be energized. The specific safety-related work practices shall be consistent with the nature and extent of the associated electrical hazards.*

***Note 1 to the definition of "qualified person:"** Whether an employee is considered to be a "qualified person" will depend upon various circumstances in the workplace. For example, it is possible and, in fact, likely for an individual to be considered "qualified" with regard to certain equipment in the workplace, but "unqualified" as to other equipment. (See OSHA 29 CFR 1910.332(b)(3) for training requirements that specifically apply to qualified persons.)*

***Note 2 to the definition of "qualified person:"** An employee who is undergoing on-the-job training and who, in the course of such training, has **demonstrated an ability to perform duties safely** at his or her level of training and who is under the direct supervision of a qualified person is considered to be a qualified person for the performance of those duties.*

NFPA 70E, 2012 edition, [4], provides "how to" guidance on compliance to the OSHA regulation. In Chapter 1, Article 110 recommended minimum compliance techniques are clearly provided.

- ✓ Employer provided expectations (aka Electrical Safe Work Practices or ESWP)
- ✓ Pre-requisite training to their ESWP

- ✓ Demonstration of skills proficiency after training has occurred (aka Effective Training)
- ✓ Regular supervision or annual inspections to observe compliance
- ✓ Retraining on tasks not done at least annually
- ✓ Retraining when supervision or annual inspections uncover non-compliance

With this definition and process clearly established, it then becomes evident the employer must audit their workforce to first determine the level of qualification and compliance that exists. After this determination is made, processes must then be put in place to raise any level that falls short of the ESWP. For the level of work practices to remain at this high level of expectation, further processes are required to monitor compliance and immediately unleash a pre-determined action plan to regain the ground that has been lost.

The new O&M:

O&M in plant and facility language refers to delineation between operations and maintenance activities. Often, managers examine work tasks to properly place them in one or the other category. They must further audit performance to ensure this separation remains.

An audit is a systematic process of objectively obtaining information and evaluating, or measuring, the data against a known foundation. Two very keywords emerge that are often missing in most cursory examinations.

1. Objective and
2. Measurable

Often, these assessments become subjective in nature, accompanied by statements such as, “I think he knows” or, in exasperation, “With all the training they’ve received, *surely* they understand”. To be considered objective, the results should conclude:

- “I heard him say the proper thing”,
- “I see the correct answer was marked”, or
- “I observed the worker doing it correctly”

For an objective conclusion to be made, it must be measured against an accepted standard. The standards for their qualification are determined by regulations, industry best practices and, most importantly, by applicability to the requested task. These expectations must first be given in the form of training and then followed up with a means to measure understanding. With a goal of 100% demonstrated proficiency, this then becomes a baseline upon which to measure the need for refresher training as time goes by.

Employees work under a mindset of consent. “My employer consents to my employment because I am a recognized valuable asset to the company.” Often, consent is assumed in the absence of guidance. Companies often view the bottom line of the financial statements as the measurable outcome in determining success. Internal processes ensure honesty, integrity and fairness to have confidence in the result. In the same way, workers view the successful completion of a task as their goal and measure. Too often, the emphasis and acknowledgement is on their end goal and little time, effort or thought is given on how it was achieved. The worker is rewarded for exceeding expectations when, in fact, they may have cheated. Harsh words, but honest to the culture. Cheated, in the sense that safe work practices were ignored or guidelines altered, to complete what they ‘thought’ was the goal of work performance and success. To them, success is keeping the plant running or getting the power back on as quickly as possible, which in their minds justifies the work practices used. Success cannot be measured by decreased loss time incidents or accident reports alone. True success can only be achieved by comparing the results with the practices that achieved those results.

Even with this essential determination of qualification, the employer cannot assume a worker will interact with electrical equipment ‘safely,’ unless they are given the company expectations of how to work with energized and de-energized equipment, show proficiency in demonstrating skills and techniques necessary to safely perform the work task, and be periodically monitored for compliance and understanding. Objective tools must then be utilized to measure this level of “qualification”. There can be no hint of subjectivity in the process as employee understanding and compliance is being measured against this minimal safe standard.

Additionally, the employer must audit their electrical safety program to ensure compliance with current standards, industry best practices and any shortfall in providing a safe work environment. Processes must be in place to track these benchmarks and, immediately, formulate a plan to regain compliance.

These ongoing processes involved procedures that are both equipment and system specific. The electrical safe work practices are incorporated into the task specific procedures and utilized as the work practice norm. Each task is thoroughly examined and written, as the road map a worker will follow in performance of the task. Milestones are identified along the road with points assigned for successful achievement. After the task is completed, a total score is determined by adding up the milestones achieved and compared against the pre-determined score goal. Action plans are put in place to

immediately remediate the milestones missed. The result is a document, whereby observable compliance is not only measured, but reasonable employer response be ensured.

These new processes are a definite change from what has been the established norm. Employers seek to hire the most technically competent workers. Assumptions are made that technically competent and qualified are synonymous, when, in fact, they are two entirely different processes an employer must undertake. The employer must ensure technically competent workers understand the hazards encountered in the performance of their work and how to remain safe while doing it. This has been one of the most radical shifts in employer duties in the last decade.

To embrace change from the C-suite down to the plant floor, a progression of steps must be followed.

1. Acknowledge the need
 - a. Own the culture
 - b. Establish the guidelines
2. Acquire the knowledge
 - a. Train for the expectations
 - b. Provide positive mentoring
3. Apply the solution
 - a. Monitor the process
 - b. Document the effectiveness

Change cannot be driven from the top down, nor is it driven from the bottom up. Real, lasting change is driven from the inside out. Workers need a mirror in which to examine their work practices against expected behaviors and be rewarded more for the process than the end result. The days of electrical 'heroes' that are rewarded for work efficiency regardless of the means utilized must come to an end. This culture must be confronted head-on with established guidelines and expectations, which are then monitored for understanding and compliance.

The workforce is any company's greatest asset and, like other assets, must be well constructed and appropriately maintained. Equipment maintenance requires gathering baseline and operational data to make prudent decisions on any necessary action. So also, the workforce, when it is regarded as the most critical of company assets, requires being given the guidelines around which electrical work is to be performed and measurable tools put in place to monitor operational effectiveness.

I've been privileged in the past several years to assist clients around the globe in achieving a more technically developed workforce and safer work environments. What is very evident is that no matter the nation or

locale, workers strive for the same thing, to stay employed. The assumption that a higher level of education or experience somehow relates to a safer worker is completely false. In the absence of clear guidelines, workers are left to their own devices.

Below are a few frequently asked questions, as these global clients have considered their diverse needs and response.

FAQ

1. I hire qualified electricians, why do I need to monitor their every move?
 - a. You likely were diligent to hire technically competent electrical workers. Qualification (paraphrased) ensures they can "recognize and avoid injury from electrical hazards". It is the employer's responsibility to train their workers on specific facility hazards, ensure understanding and monitor compliance after training has been given. These 3 steps must be effective, timely and documented to keep workers safe and for you to comply with regulations and standards.
 - b. You will not be monitoring their every move all the time. NFPA 70E establishes this "periodic" monitoring as at least once a year. That may not be enough to satisfactorily know they will work according to your electrical safety program. The employer's electrical safety program must "direct electrical activity" where the electrical hazard exists. Do your work procedures include steps on working safely and pre-work checks on all protective equipment?
 - c. What documentation do you have to show this process and worker proficiency?
2. I provided my workers with the PPE, what more do I need to do?
 - a. How do you know these workers can inspect the PPE on a daily basis to determine its condition?
 - b. Do you have a process in place to track any required re-testing or re-certification of PPE?
 - c. Who is responsible and accountable for this?
3. Who can do this monitoring of electrical work practices?
 - a. First things first. Do you have written work procedures that your workers will follow to perform work on or near energized electrical conductors or parts? If so, then anyone who

has been trained on how to “watch for certain actions” and how to “conduct an objective interview” in a non-threatening way should be able to monitor and audit.

- b. It is best to have specific persons, not always electrical persons but employees trained to do this monitoring so that it may occur on a more timely or consistent basis.
 - c. Along with the in-house observers, an independent outside party, such as NTT, is useful in monitoring not only specific work tasks but in auditing the entire process in an unbiased objective format. In this way a company is assured of compliance, unbiased reporting and monitoring of the overall electrical safety program, all conditions prescribed by NFPA 70E.
4. Is this monitoring only for electrical work practices?
- a. Yes and no. We suggest beginning with the electrical practices, since this is a mandate of both OSHA and NFPA 70E, but the same format and procedure can be applied to all work, especially work considered a hazard risk to employees.
5. Where do I begin? With the monitoring or writing the electrical safety program? They both seem important, but isn't the monitoring based upon the electrical safety program?
- a. You are correct. The electrical safety program determines work procedures and policies. This is usually a long process to get agreement within a company, especially one with many work sites and local plant management, on what will be the conditions of working while the electrical system is energized. NTT safety consultants can do a gap-analysis and advise your plant management where there are gaps or discrepancies with applicable regulations and recommended practices. This process can take months to work through all the parties within your company to attain a document that all agree to enforce.
 - b. In the meantime, your workers may be using work practices, which are more about being comfortable than in compliance to electrical safe work practices. We recommend an initial “over-view” audit of both your electrical safety program and your work force. In this way, an electrical safety program, training and development needs can better be determined and a plan put in place to manage and budget the results.

Today's innovative and valued training companies must offer a series of services designed to assist any employer in complying with electrical safe work practice standards and regulations. Some employers are well on their way to achieving this level of workplace safety. They may request industry experts to review their electrical safety programs, provide a gap analysis should any gaps exist and advise them on training and tools monitoring worker compliance. Others are just beginning to walk down this road and need a 'guide' to recommend which pathway will obtain their desired results expending the least amount of time, effort and training dollars. The vast majority of companies find they are somewhere in the middle and formulate a plan from a list of benchmarks meeting the unique circumstances and needs to which they find themselves today.

Developing a safe and efficient workforce to succeed in today's competitive marketplace requires more than yesterday's training models. The days of providing disconnected courses driven by an immediate need or worker request with hopes that somehow employees will “get some of what they need or find a resource from which to get it” are over. World-class employers know that, to provide the level of safely delivered expertise required to succeed in today's economy, nothing can be left to chance. Partnering with a firm that works closely with the company subject matter experts will result in providing an overview snapshot of needs, develop training curriculum and provide delivery methods to ensure a logical sequence in the learning process producing measurable results.

Benchmarks in developing a world-class electrical workforce:

Employers Providing Expectation, Training and Accountability

1. Electrical safety program

- Compliant with applicable regulations
- Following standards and recommended practices
- Considering industry best practices

2. Audit workforce

- Technical competence
- Safety awareness
- Workplace culture

3. Provide effective training

- Targeted to topic and task
- Sequential in worker development
- Measure understanding and proficiency
 - Pre-class baseline
 - During class using polling techniques to

enforce learning gains or immediately uncover lack of understanding

- Post-class as guide in determining qualification and benchmark for continued compliance

4. Monitor compliance against

- Standards for protection
- Company provided work procedures
- Industry best practices

References:

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[3] Quote attributed to Abraham Lincoln,

<http://quoteinvestigator.com/2010/05/17/remain-silent/>

[3] OSHA 29 CFR Part 1910, Occupational Safety and Health Standards, U.S. Government Printing Office, Washington, D.C.

[4] NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces, 2012 Edition, Quincy, MA.

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Robert S. LeRoy is Director of Electrical Programs at NTT Training, Inc. He has 41 years experience in the utility, industrial and commercial electrical systems and equipment. During his nearly 20 years with a utility generating facility, Mr. LeRoy was an active member and leader in the utility's voluntary emergency response team, as first response to chemical, fire and medical emergencies. Responding to countless emergency situations has given him a passion for safety and perspective on the role of human behavior in averting these events. Since joining NTT as an electrical training specialist in 2006, he has conducted over 350 classes in NEC, NFPA 70E, NFPA 70B/NETA, 1910.269, NESC, Grounding and Bonding and Hazardous Locations to thousands of students worldwide. In 2010, he became Director of Electrical Programs for NTT Training, responsible for developing programs for all electrical safety related topics and updating existing courses as standards evolve. Additionally, he assists clients in the utility, oil and gas, manufacturing and aviation industries

in gap analysis for compliance to electrical safety regulations and procedures, develop a well-trained electrical workforce and provide innovative monitoring tools to measure compliance and training effectiveness. He is a master electrician and a member of NFPA, IAEL, ASSE and IEEE. Beginning in 2008, he has worked with several international clients to adapt US based NFPA electrical standards (NEC, 70B electrical maintenance practices and 70E electrical safe work practices) and meld with local country regulations or international client requirements for acceptance and use in countries as diverse as Japan, Indonesia, Singapore, Saudi Arabia, Mexico, Central and South America, Africa (Nigeria and Burundi), Canada, and Kazakhstan. Mr. LeRoy has conducted accident reports and forensic installation and work practice studies to assist clients in identifying any deficiencies that led to their unfortunate event and develop processes and procedures to remediate any gaps to establishing a safer work environment. Guided by the following motto, he continues his endeavor to positively affect the worldwide electrical culture.

“Safety is always the goal. Effective training with measurable results is the path that changes the behaviors that keep it just out of reach.”