

	Document: WHITE PAPER		Subject: Do we have “The Right Stuff” in our Electrical Safety Program?	
	Issued by: TWB	Approved by: TWB	Rev. #: 3.0	Rev. Date: Dec 18, 2007

Do we have “The Right Stuff” in our Electrical Safety Program?

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Do we have the “Right Stuff” in our Electrical Safety Program? Have we learned anything since we started this project? What might we have done differently, if anything? What do we do now that we have the Electrical Safety Program in place? What did we learn, what were the barriers to just getting to the launch pad? Did we have any problems during the count down? Was the launch without any incidents? Did we get a man to “zero gravity” and back safely to earth? Are we finished?

You know in the 1960’s NASA was tasked to get a man into space in the Gemini Program and they were successful. There was a goal, there was a plan, there was some action, there was a lot of checking, there was a lot of learning, there was perseverance, there were mistakes, but man did make it into space safely!

Of course developing and deploying an Electrical Safety Program isn’t like trying to get a man into space, or is it? Isn’t the process the same? It involved a lot of people, it involved changing people’s attitudes that it could be done.

Isn’t the process the same in developing an Electrical Safety Program? Are there similar barriers, barriers that you have to find a way around, in order to succeed? In the case of electrical safety, the success is making the worker do it safer every time!

Ultimately, the work required to make the necessary changes involves both the owner of the electrical equipment and the electrical workers, whether staff or contractor.

This paper will present two perspectives of implementing revised energized electrical safe work practices. How each company’s approach (an owner and a contractor) was different, but in the end both forms of Electrical Safety Programs created, complement each other. Documented Electrical Safety Programs for the Owner and Contractor provide a manageable, practical and appropriate process for ensuring electrical workers are more safe than they were in the past, and provide evidence of due diligence with respect to Regulations.

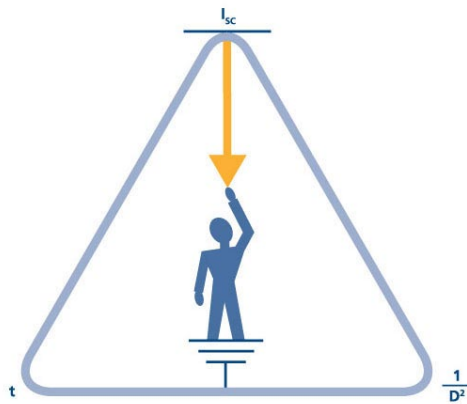
A review of the challenges and successes will be presented, as well as the need to cooperate and work together to get revised work practices implemented.

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The Owner:

Things change, and you have to adapt. As an owner of electrical distribution equipment that has both staff and contractors working on it, you have Regulations, Acts, and other Laws that you must comply with to ensure an appropriate level of safety to personnel. These change, and you must monitor them and be able to proactively react appropriately to ensure you comply. You have to be able to demonstrate appropriate due diligence.

Do you really understand the electrical hazards present when working on energized electrical equipment?



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Figure 1 – “The Arc Flash Triangle”

An electrical arc flash is a violent, toxic hazard that is not only comprised of heat, but noise, shrapnel, toxic vapours, a blast wave and UV light. It only takes a small amount of electrical current to cause an electric shock to a human being, and the human body will quickly react resulting in pain, internal damage, a potential heart attack, that could lead to death (i.e. electrocution).

Acts, Regulations & Laws:

Since 2004 in Canada the emerging application of new electrical safe work standards (i.e. NFPA 70E and the pending CSA Z462 Workplace Electrical Safety Standard), and changes to Canadian Regulations (i.e. OH&S, and CEC Part 1), have challenged us to consider if we having been doing enough to protect the electrical worker from the electrical hazards of working on energized electrical equipment.

In 2004 the Provincial Government in Alberta, changed their OH&S Regulation adding in specific language with respect to an employer protecting workers from “electrical equipment flashover.”

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Then in 2006, the CEC Part 1, added in a new Rule, Rule 2-306 that requires Arc Flash & Warning Labeling and in January of 2006, CSA decided to adopt/adapt NFPA 70E for Canada.

In January 2006, CSA announced that they had signed an MOU to work jointly with NFPA on harmonizing Standards for North America. One of the first Standards chosen to Canadianize was NFPA 70E "Standard for Electrical Safety in the Workplace," which will now be a voluntary National Standard of Canada, CSA Z462 Workplace Electrical Safety Standard (planned to be in print late 2008).

Most recently, on October 9, 2007 the Saskatchewan Provincial Government issued their amendments to the SK OH&S Act and associated Regulations, and added precedence setting language with respect to electrical arc flash:

PART VII Personal Protective Equipment:

Skin protection

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(1) Where there is a risk of injury to the skin of a worker from sparks, molten metal or radiation, an employer or contractor shall provide, and require the worker to use, approved protective clothing or covers or any other safeguard that provides equivalent protection for the worker.

(2) Where there is a risk of injury to the skin of a worker from fire or explosion, an employer or contractor shall provide the worker with, and require the worker to use, outer flame resistant clothing that:

- (a) meets an approved industry standard; and
- (b) is appropriate to the risk.

(3) Where there is a risk of injury to the skin of an electrical worker from arc flash, an employer or contractor shall provide the electrical worker with, and require the electrical worker to use, arc flash protection that meets an approved standard.

What should I do?

As an Owner of the equipment that can expose both the Owner's workers and Contractors employed by the Owner to electrical hazards, the Owner must ensure they provide direction. The Owner in most cases is also the Prime Contractor (depending on the Province or Territory), and has overall responsibility for all workers on the Owner's property.

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In the past electrical hazards may not have been given enough respect. There was and is limited knowledge in industry with respect to the arc flash/blast hazard and generally there is complacency to the shock hazard as well. There may not be adequate specific electrical hazard content in existing safety documents or nothing in place at all.

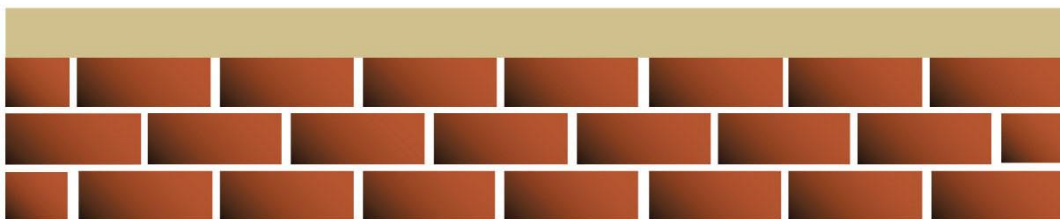
Where the Owner uses a Safe Work Permit system, they may not have recognized the electrical hazards appropriately, and responsible operations staff didn't respect the hazards or felt the electrician would "take care of it." We all seem to know that an O/H powerline isn't safe to approach or make contact with, but may not know why. Government Regulations tell us to stay away from powerlines, but again do not emphasize the reasons why by telling us what the electrical hazards are, that they are unique and require special care (i.e. qualified and competent worker) and specific electrical PPE when exposed to them within certain approach limits.

Owners may have assumed that the electrical worker had it under control, and had the required competencies to deal with the electrical hazards. We may have wrongly assumed that the electrical worker was qualified and had the right tools for the job.

Given this status quo, and all of the Regulatory and Standards of practice change that is occurring are existing electrical safe work practices adequate, are we are doing a good job right now or are we not? We use PPE (but, is it the right electrical specific PPE)? We have a Safe Work Permit process (but, does it adequately address the electrical hazards with an appropriate assessment)? Do we write up procedures every time we do a job (and if written are the procedures consistent, what content do they cover off, are they retained in formal documents, and imbedded as the tools in a structured Electrical Safety Program)?

What needs to happen is a comprehensive review of all of the "Stuff" you have, in order to make sure it is "Right." What really is "The Right Stuff?"


As the Owner you have to start by ensuring you have a "safe installation," a solid foundation. In Canada it is the law in the Provinces and Territories to purchase CSA or equivalently approved equipment, and install it to the minimum requirements of the Canadian Electrical Code (CEC), Part 1.



Safe Installations Solid Foundation • Canadian Electrical Code (CEC) Part 1 Compliance

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Figure 2 – Solid Foundation, Safe Installations First

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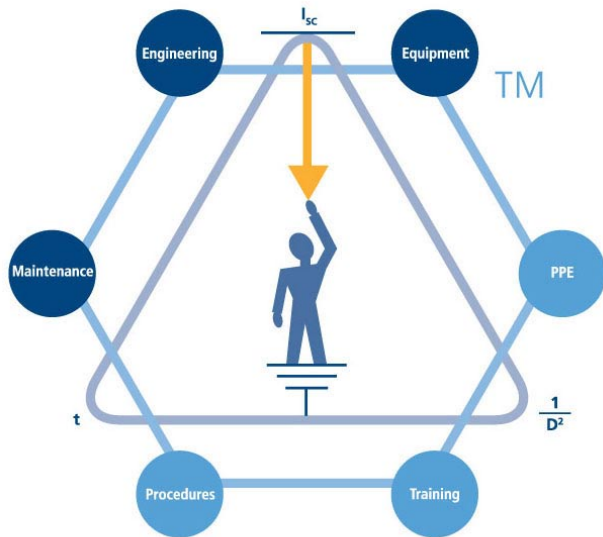
Do you comply with Provincial or Territorial electrical permitting and inspection requirements? Do you know when your last electrical code compliance inspection was, do you have an Annual Permit for your electrical installation in place? Do you keep records of electrical maintenance work completed?

What processes and documentation should I consider?

NFPA 70E and the pending CSA Z462 help you define what the right stuff is? You probably need a formal Electrical Safety Program (ESP) to start, and within it you put the tools you need to reduce the risk to the worker.

What are the tools I need? Are they “The Right Stuff?” You need to review what tools make sense for your company, considering the age of your facilities, what your current maintenance practices are, capital growth plans, culture, and the electrical workers you employ. You need to document what you decide to do.

As the Owner of the electrical distribution equipment, you probably should consider putting in your Electrical Safety Program some engineering tools, equipment tools, electrical equipment maintenance tools, electrical specific PPE tools, electrical safety training tools, and electrical safe work procedure tools.



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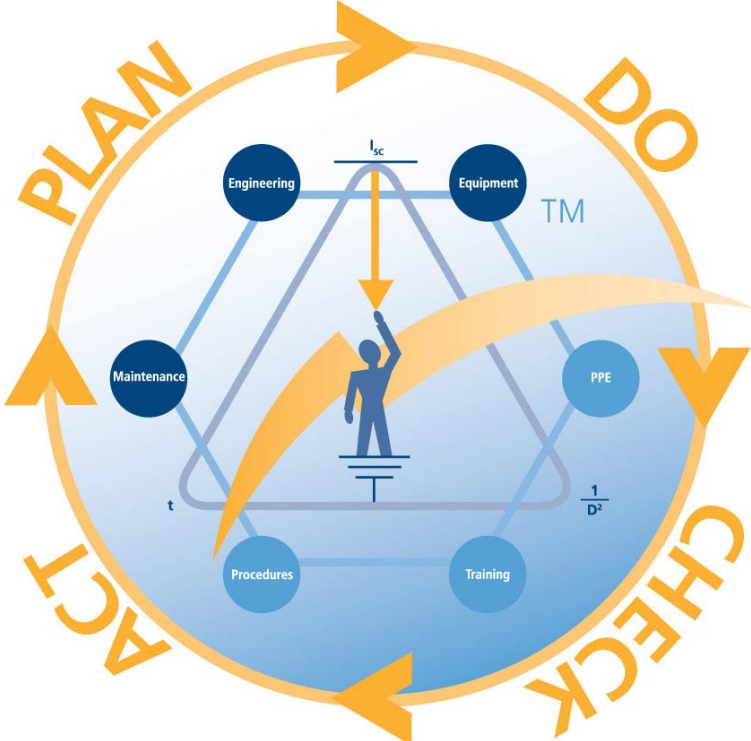
Figure 3 – 6 Toolboxes in an Electrical Safety Program

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By structuring a formal Electrical Safety Program, you provide the worker with the tools he/she needs to properly assess the electrical hazards and take appropriate control measures to eliminate or reduce the risk. They have a resource to help them decide when they need the tools. The tools help get the job done safer, this is the goal of the Electrical Safety Program.

An electrical specific Occupational Health & Safety Management System:

A formal, structured, documented, utilized, and audited Electrical Safety Program becomes your discipline specific Occupational Health & Safety Management System (OHSMS). It compliments or becomes an important part of your overall OHSMS. You layer the documented ESP over the electrical hazards to reduce and manage them appropriately.



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Figure 4 – Plan, Do, Check Act for Electrical Safety

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If you follow the simple process of Plan, Do, Check, Act as outlined in CSA Z1000, Occupational Health & Safety Management, as an Owner you can ensure you effectively manage the electrical hazards, comply with Regulations, and minimize the risk to workers.

If you have some of "The Right Stuff" in your documented Electrical Safety Program you will increase safety to the worker when working on energized electrical equipment, yes you can "get a man into space, and safety back to Earth again!!"

Optimizing Electrical Hazard Risk Management with an Electrical Safety Program:

So as an Owner what can or should I really do:

Plan: Do you know what is happening in electrical safety, if not find out, get educated about the Regulations and new Standards of Practice. Do a business risk assessment of your status quo procedures for energized electrical work. What are the implications of change? If required get third party help. Consider development of an Electrical Risk Management Policy or Strategy for both safe installations and safe work practices.

Do I need to schedule some electrical safety training?

Consider where the most impact can be made? Do you have electrical specific PPE for your workers?

Do you have electrical safe work procedures in place?

What else can I or should I consider to do to take control of managing electrical hazards, can I engineer down the risk, can I specify safer electrical equipment, are my short and long term maintenance practices adequate?

When is the right time to have an Arc Flash Hazard Analysis completed? Maybe I should get some electrical specific PPE for my electrical workers first as a priority, get some training done too.

Do: Do a detailed review of what you have in place right now, do you have any electrical safety documents at all, if you have some are they adequate? Are they used, and audited for improvement? If you don't have an Electrical Safety Program, create one or start to develop written documentation. Are your workers trained and competent?

Get training for you and your staff.

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Get electrical specific PPE and get your electrical workers to start wearing it for energized electrical work.

Start working on electrical specific safe work procedures.

Research and/or get a third party consultant to assist in assessing what engineering "safety by design" changes can be considered.

Research and/or get a third party consultant to assist in assessing what "safety by design" elements can be specified for electrical equipment.

Plan a comprehensive review of electrical equipment maintenance practices, as an Owner are you doing enough maintenance or the right maintenance?

Check:

Audit what you have done and document your findings, and improvements implemented. Keep abreast of Regulatory and Standards of Practice changes.

Act: Take action, ensure you implement new processes or improvements, and practice what you have in place. Implement a continual process of review, and manage change effectively.

The Contractor:

As with many companies 2 or 3 years ago we had not been seriously affected by an arc flash incident or so we thought. We had limited knowledge of this hazard and did not perceive it as an important risk.

The culture of the day was to do whatever the customer requested, but try and do it safely. If the task was determined to be high risk and getting the job meant putting safety in the background, a lot of contractors would do just that to keep the work, which was the culture for contracting companies.

The company I work for has an employee who experienced and survived a serious arc flash. For our company, this was a wakeup call that launched us on a journey that would change the safety culture within our organization, but did we have "The Right Stuff" to get there?

Arc Flash Awareness in Western Canada three years ago was almost non-existent. Competent and qualified electricians had either experienced or knew someone who had been involved in a flash but never put the two together to acknowledge the high risk that they had been exposed to. After this incident, it was all too apparent to us.



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Note:
Picture of 600V breaker where the arc flash event occurred, and pictures of the burns to the hands of the electrical worker that resulted. Burn to the face also occurred.

This left us with a lot of questions about where could we get the answers?

We went to one of our largest customers to find out where they were with respect to arc flash and shock protection. We both had a lot to learn, but we knew that NFPA 70E would be our best guide, until CSA Z462 is available.

How do we implement changes within our respective companies to protect the workers?

After a lot of research and consultations with our large customer, we put into place new practices, procedures and “electrical specific PPE” to eliminate or reduce the risk of anyone being involved in an arc flash, but procedures and practices alone won’t solve the problem. It all comes down to the electrician or apprentice in the field working around energized electrical equipment.

We knew that we had to get buy in from the workers, which meant that all employees in our company from senior management to the field had to support and be a part of electrical safety.

New practices had to be learned, the new “electrical specific PPE” was different, arc flash “PPE” was something no one had ever seen before, but after having the training and acknowledging the hazard, it is slowly becoming a normal practice. Some of the companies we work for, but not all, are starting to ask us about the additional “electrical specific PPE” we are wearing and what are the new practices?

As mentioned, not accepting a job based on the risks around safety is a relatively new concept in our industry. When we implemented the use of an “Energized Electrical Work Authorization” and

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associated "Safe Work Practices", "Procedures" and "PPE", employees in the field initially thought this would be the end of our customer base. What would happen when we required the customer to share responsibility for the risks involved in completing the task that they were hiring us to perform? Some customers were unaware of the hazards or required controls needed when working around energized electrical equipment. When we asked our customers to sign a document accepting responsibility, they started asking questions and refusing to sign the document. Instead of losing the work, we worked with the customer and came up with ways to de-energize the equipment safely, which was our main goal. Working with our customers on a daily basis helps us all fully understand the importance of having an Electrical Safety Program and when we work together, we can make the job site as safe as possible.

The Energized Electrical Work Authorization process was an important part of moving our program forward. An example of the form used is included below.

With the full support and active participation of our VP, we have built a best in class, leading Electrical Safety Program. This has given the employee in the field the confidence to present our requirements to the client and know that if we should lose the job due to our company safety requirements, there will be no consequences for him, but praise for having "the Right Stuff" and doing the right thing.

Now that our employees have been given the tools (i.e. SWP's, electrical specific PPE, confirmation of properly certified and rated DMM, and insulated hand tools) to protect them from arc flash and shock, we feel that we can eliminate or reduce injuries resulting from arc flash.

Operating companies and Contractors must have the same goal and by working together, electrical workers with all companies can be equipped with "The Right Stuff" to protect themselves from electrical hazards and know that they will go home at the end of the day to their families safe and sound.

Yes we have the Right Stuff!!



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ENERGIZED ELECTRICAL WORK AUTHORIZATION

PJHA# _____

Syntech Branch Location	Client / Customer Name	Date
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Part I - To be completed by person requesting work

Description of circuit / equipment / job location:
Description of Work to be done:
Reason/justification why the circuit / equipment cannot be de-energized or the work deferred until the next scheduled outage:

Part II - To be completed by the Journeyman Electrician performing work

Detailed explanation of job procedures for above task:
Process used to determine arc flash / shock protection boundary (4 foot minimum for Arc Flash, refer to table 130.2 of NFPA 70E for shock protection).
Necessary Personal Protective Equipment required to safely perform the task. (Minimum PPE for Category 2 – Arc Flash Face Shield, Leather gloves, FR coveralls c/w 100% cotton undergarments and earplugs).
Means employed to restrict the access of unqualified personnel on worksite:
Review any additional hazards and controls that will be put in place:
Above work can be done safely? <input type="checkbox"/> YES <input type="checkbox"/> NO
<div style="display: flex; justify-content: space-between;"> _____ Journeyman Electrician (<i>Print Name</i>) _____ Signature _____ Date </div>

Part III - Approval to perform work while electrically energized

Client / Customer Name (<i>please print</i>)	Client / Customer Signature
Date Work Approved	



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