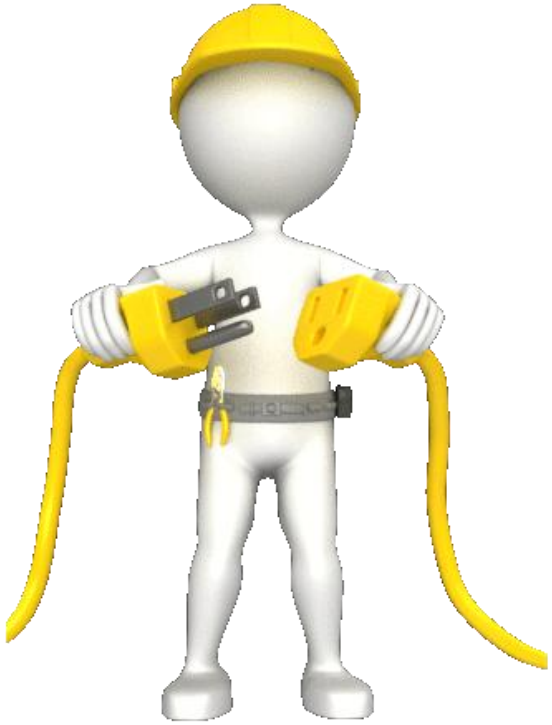
Alberta Health Services

Electrical Safety Program



Electrical Safety Steering Committee Members

- Chair – Steven Keevill Executive Director, Capital Management, Central Zone
- Consultant Terry Becker COE, Senior Management Consultant for Electrical Safety Program Solution Inc.

- Electricians – 13
- Directors/Managers – 5
- WH&S – 1
- Project Management – 2
- Property Management – 2
- FM&E Operations – 5
- Covenant Health – 2
- Major Capital Projects - 1

Objectives

- Electrical Safety Program Overview
- Pilot Project
- Gap Analysis
- Training
- Next Steps

Electrical Safety Program (ESP)

Overview

ESP Sections

1 Purpose, Principles and Scope
2 Management of the ESP
3 Rolls and Responsibilities
4 Relevant Act, Codes, Regulations and Standards
5 Safe electrical installation
6 Electrical Hazards Identification Assessment and Control
7 Electrical Safe Work Practices

ESP Overview Sections (cont.)

8 Electrical Specific PPE, Tool and Equipment

9 Electrical Safety and Technical training

10 Electrical Incident Reporting, Investigation and Management

11 Emergency Response for Electrical Incidents

12 Audit and Corrective Actions

13 Contract Management

14 Management of Change

15 Management of Documentation

1 Purposes, Principles and Scope

Purposes

- The Electrical Safety Program provides direction and policies for electrical safety.
- Consistent Provincial standard

1 Purposes, Principles and Scope (cont.)

Principles

- Electrical work shall only be performed on de-energized electrical conductors and circuit parts unless infeasible due to equipment design, operational limitations, or maintenance requirements.
- Electrical equipment must be CSA or equivalent approved.
- Prior to energized electrical work a documented electrical hazard analysis shall be completed.
- Energized Electrical work permit will be required for high risk and non-routine work tasks.

1 Purposes, Principals and Scope (Cont.)

Principles cont.

- An Electrical work zone will be established
- All electrical components will be considered energized until proven otherwise (TEST-BEFORE-TOUCH)
- Workers shall be Qualified and Competent
- Energized Work shall be planned and documented
  - Pre-job briefing and planning will include:
    - identification and analysis of hazards
    - mitigation measures to reduce risk

1 Purposes, Principals and Scope (cont.)

Principles cont.

- Electrical equipment will be maintained and tested as per manufactures specifications and Code Requirements
- Personnel shall receive appropriate training dependent on their Roles and Responsibilities
- Appropriate PPE tools and equipment shall be selected
- PPE must be inspected prior to use and maintained and cared for as per manufacturers specifications

1 Purposes, Principals and Scope (cont.)

Principles cont.

- Arc flash and shock mitigations shall be considered for new facilities and upgrades. (Safety by Design)
- Emergency Response and methods of release training shall be provided
- Electrical incidents shall be reported and fully investigated
- Audit these principles and program

1 Purposes, Principals and Scope (cont.)

Scope

- All employees and contractors shall comply with the minimum requirements outlined in the Electrical Safety Program (ESP)

2 Management of ESP

POLICY

- ALBERTA HEALTH SERVICES Management is committed to ensuring the Health and Safety of all personnel with respect to electrical safety. This Program has been identified as **"Exceptional"** under the ALBERTA HEALTH SERVICES corporate Workplace Health & Safety Management System, and **Very High** rating on the Hazard Identification, Assessment and Control Process therefore requires a comprehensive management approach that must include:

2 Management of ESP (cont.)

- Written Electrical Safety Program,
- Written procedures,
- Appropriate Training,
- Monitoring of performance,
- Incident reporting and management to closure,
- Emergency response training,

2 Management of ESP (cont.)

- Non-compliance enforcement
- Management of Change to regulatory, process and operation changes affecting the ESP.
- Annual Program review by the Electrical Safety Steering Committee (ESSC).
- All Changes to the program will be reviewed by the ESSC.

3 Roles and Responsibilities

All Roles and responsibilities have been clearly identified and defined including but not limited to:

- Qualified Electrical Worker (QEW)
- Task Qualified Worker (TQW)
- Luminaire Service Worker (LSW)
- Qualified Instrumentation Worker (QIW)
- Associate Electrical Worker (AEW)
- Qualified Operations Worker (QOW)
- Non-Electrical Maintenance Worker (NEMW)
- Non-Electrical Worker (NEW)
- Electrical Standby Person/Safety Watch

4 Relevant Acts, Codes Regulations & Standards

- Alberta Occupational Health and Safety Act, Code and Regulations
- CAN/CSA-C22.1 Canadian Electrical Code (CEC) Part 1
- CSA Z462 Workplace electrical safety Standard
- CAN/CSA-Z460, Control of hazardous energy – Lockout and other methods
- CAN/CSA-Z1000, Occupational health and safety management
- CAN/CSA-Z195, Protective Footwear
- CAN/CSA-Z94.3-07, Hearing Protection Devices
- CAN/CSA-Z94.1-05, Industrial Protective Headwear
- CAN/CSA-Z11, Portable Ladders
- AHS WH&S Management System Standard

6 Electrical Hazards Identification, Assessment and Control

OH&S regulations require that employers protect employees from electrical hazards.

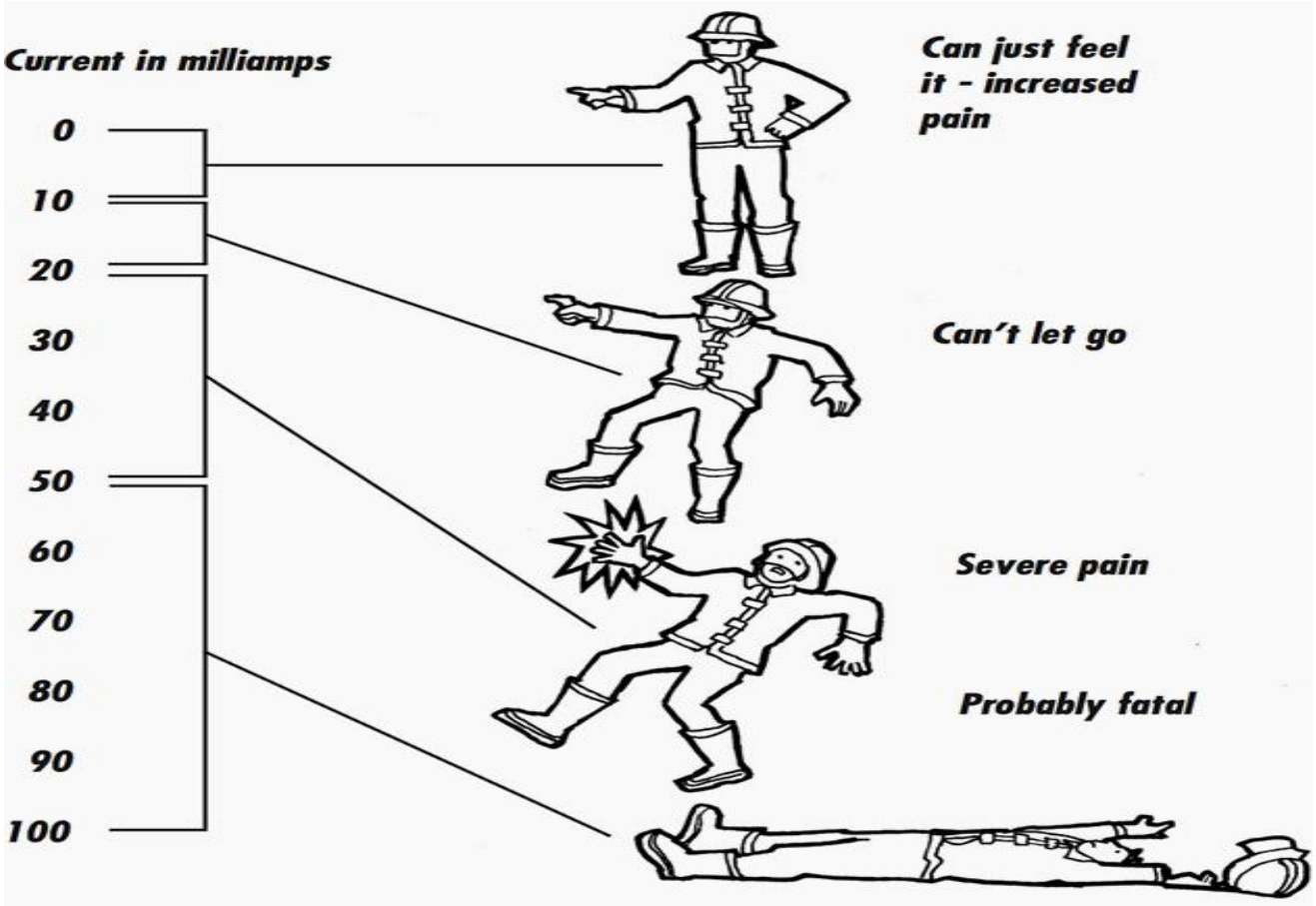
- Shock
- Arc Flash (with associated Arc Blast).

Shock - Electric shock is direct contact (or being in close proximity) with exposed energized electrical that causes the flow of electrical current through the body.

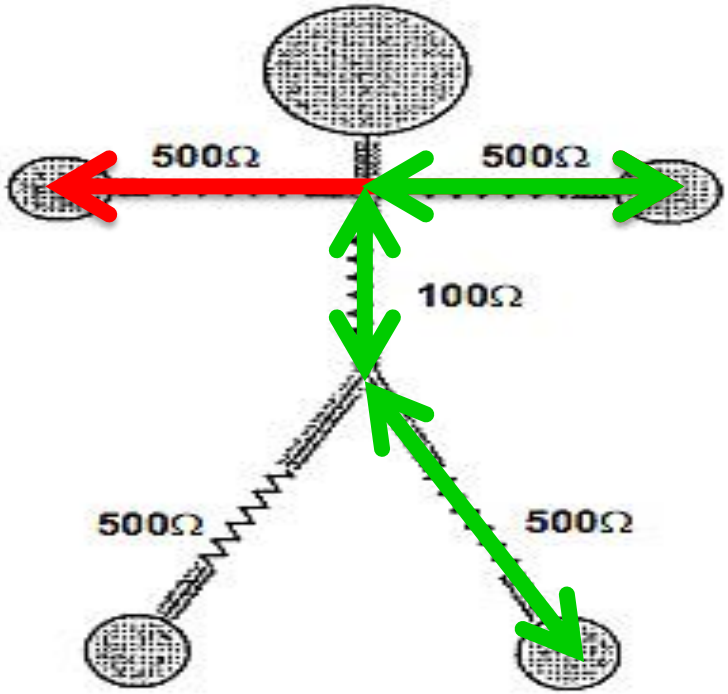
Arc Flash - Electrical equipment that faults due to an **abnormal condition** and creates an arcing fault and arc flash, can expose a worker to extreme heat causing severe burns.

- **Arc Blast** - An arc blast is the release of pressure as a result of arcing fault current. Hazards are high air pressures, sound and shrapnel.

6 Electrical Hazards Identification, Assessment and Control



6 Electrical Hazards Identification, Assessment and Control



Human Body Resistance Model

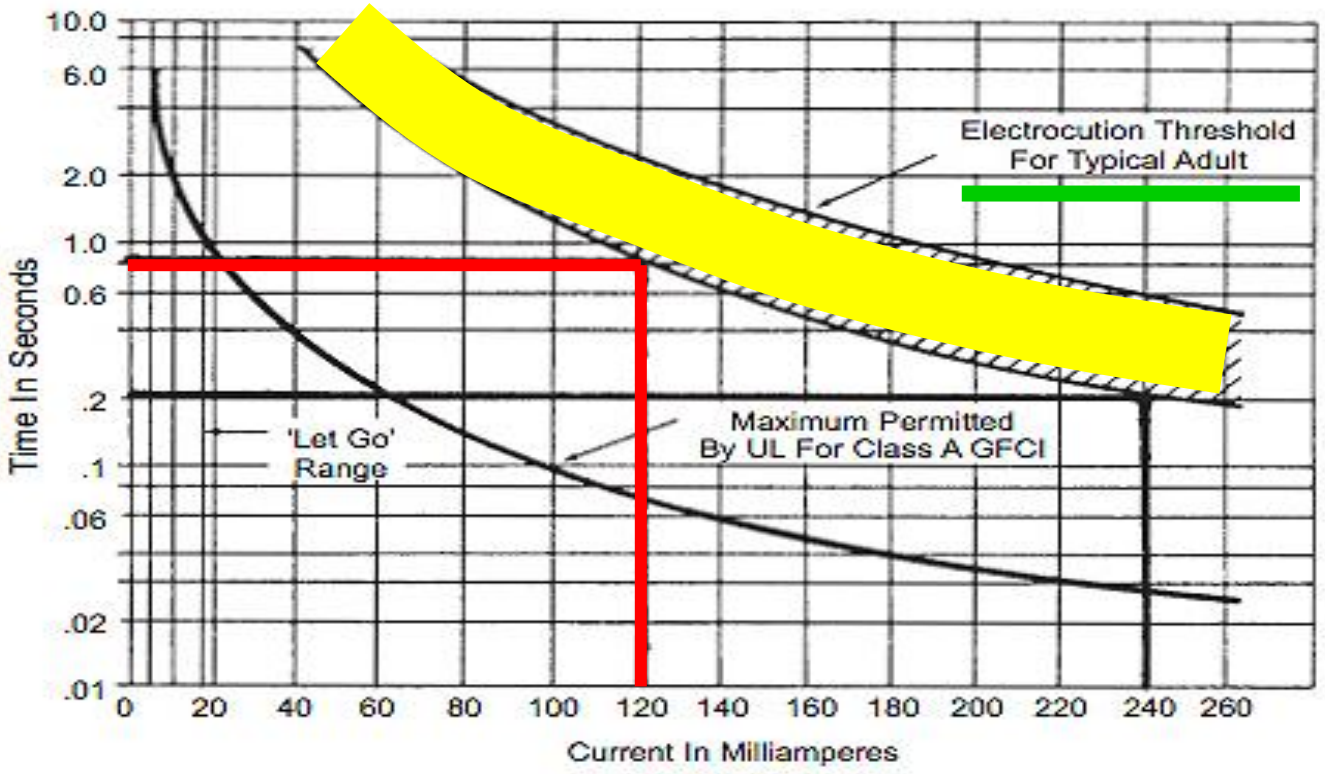
6 Electrical Hazards Identification, Assessment and Control

Calculations using ohms law

Amps = Volts/Resistance * 1000 (A to mA)

Volts	Calculations	Hand to Hand	Hand to Foot
120	120/(Resistance) * 1000	120 mA	109 mA
240	240/(Resistance) * 1000	240mA	218 mA
600	600/(Resistance) * 1000	600 mA	545 mA
4160	4160/(Resistance) * 1000	4160 mA	3781 mA

6 Electrical Hazards Identification, Assessment and Control



Electrical Current (AC) Versus the Time It Flows Through the Body

Westex Arc Flash Testing Overview

6 Electrical Hazards Identification, Assessment and Control (cont.)

Risk Assessment Process Includes

- Low Risk Work Tasks – Table
- High Risk Work Tasks - Table
- Work Task Flow process Flow Chart
- Electrical Pre-job Briefing & Planning Checklist
- Arc Flash & Shock Hazard Analysis Form
- Arc Flash & Shock Hazard Analysis Flow Chart – Table Method

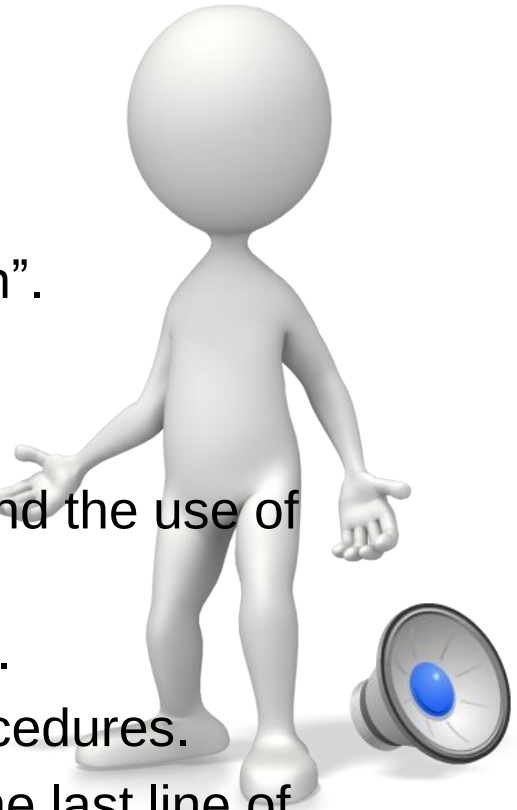
6 Electrical Hazards Identification, Assessment and Control (cont.)

- Energized Electrical Work Permit (EEWP)
- Energized Electrical Job Hazard Analysis (EEJHA) Form
- Electrical Hazard Analysis Process
- Shock Hazards Analysis Process with Boundaries
  - Limited Approach Boundary
  - Restricted Approach Boundary
  - Prohibited Approach Boundary

6 Electrical Hazards Identification, Assessment and Control (cont.)

Mitigation of Hazard Control

- De-energize is always the first choice.
- Substitution of Equipment
- Engineer the hazard risk down, “Safety by Design”.
- Equipment “Safety by Design”.
- Maintain critical electrical equipment.
- Increase awareness by the application of signs and the use of barriers.
- Administrative controls, Electrical Safety Training.
- Administrative controls, Electrical Safe Work Procedures.
- Electrical Specific PPE, Tools & Equipment, as the last line of defence, and ensure it is appropriately used and maintained.



6 Electrical Hazards Identification, Assessment and Control (cont.)

Maximum Allowed Working Incident Energy

- no energized electrical work task will be performed when the incident energy is greater than 65 cal/cm^2.

Arc Flash & Shock Labeling

- Manufactures Label
- AHS Label as outlined in the ESP

7 Electrical Safe Work Practices

- All electrical equipment should be considered energized until it is proven de-energized
  - "TEST-BEFORE-TOUCH"
  - *No person shall begin work on de-energized parts until this verification has been completed.*

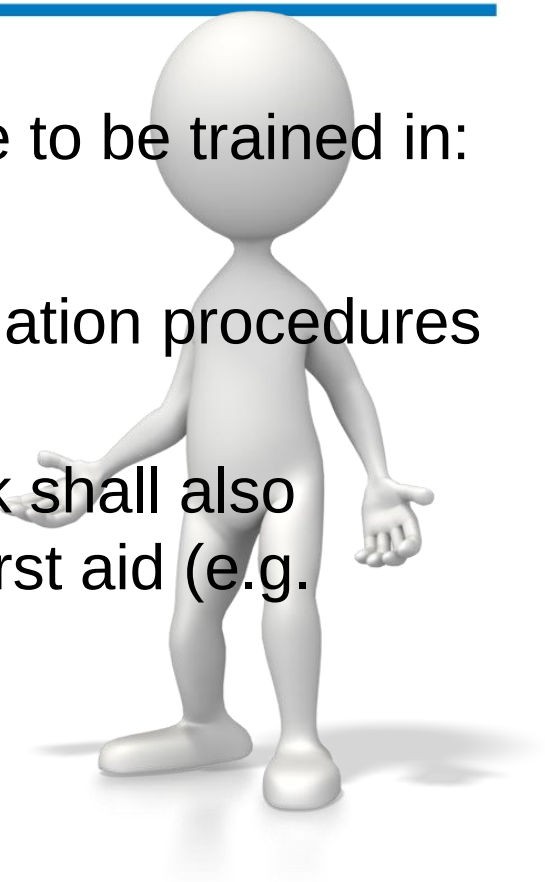
8 Electrical Specific PPE, Tools & Equipment

- This ESP covers the requirements for PPE Including:
  - Clothing
  - Tools and equipment
  - Electrical Specific PPE, Tools & Equipment

10 Electrical Incident Reporting, Investigation & Management

Any incident suspected to be of electrical origin where a person or equipment is damaged must be reported to the Manager/Supervisor and WH&S.

11 Emergency Response to Electrical Incidents



Workers exposed to electrical hazards are to be trained in:

- methods of release of victims
  - This should include emergency isolation procedures and the use of Rescue Hot Sticks
- Workers required to perform such task shall also receive regular training in methods of first aid (e.g. including CPR and the use of AED

13 Contract Management

Contractors shall be qualified and competent to undertake the work tasks for which they are contracted.

15 Management of Documentation

The Safety program management is a dynamic and constantly evolving process

Record must be kept for reference of program activities and results

Records provide information necessary to assess the ESP

Pilot Project

- Red Deer Regional Hospital Centre (RDRHC)
- South Health Campus

Pilot Project

Reason For Success

- Manager has electrical background and member of the ESP Committee
- Frontline User had ESPS 2 day training
- RDRHC implemented FLRA giving frontline worker background information on task hazard analysis

Pilot Project

Reason For Success

- Management Support for Safety Related processes
- ESP Documentation questions straight forward and Identified where to find the proper information.

Pilot Project

Areas of improvement

- Repetitive documentation and information
- Too many documents to be completed and reviewed
- Less complicated flow chart would be an asset
- Too many priorities to be able to allow sufficient time

Gap Analysis

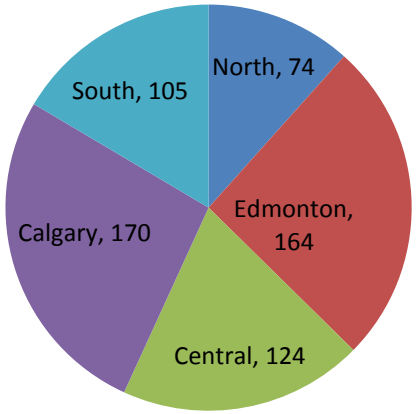
Demographics

Zone	# of responses	E-mail Sent	% By Zone	% of Total
North	74	170	44%	12%
Edmonton	164	300	55%	26%
Central	124	186	67%	19%
Calgary	170	243	70%	27%
South	105	140		16%
Grand Total	**637**	**1039**	**61%**	**100%**

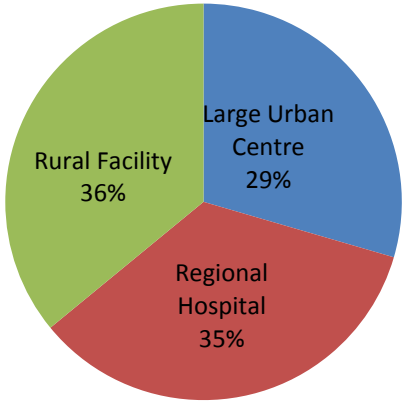
Gap Analysis

Demographics

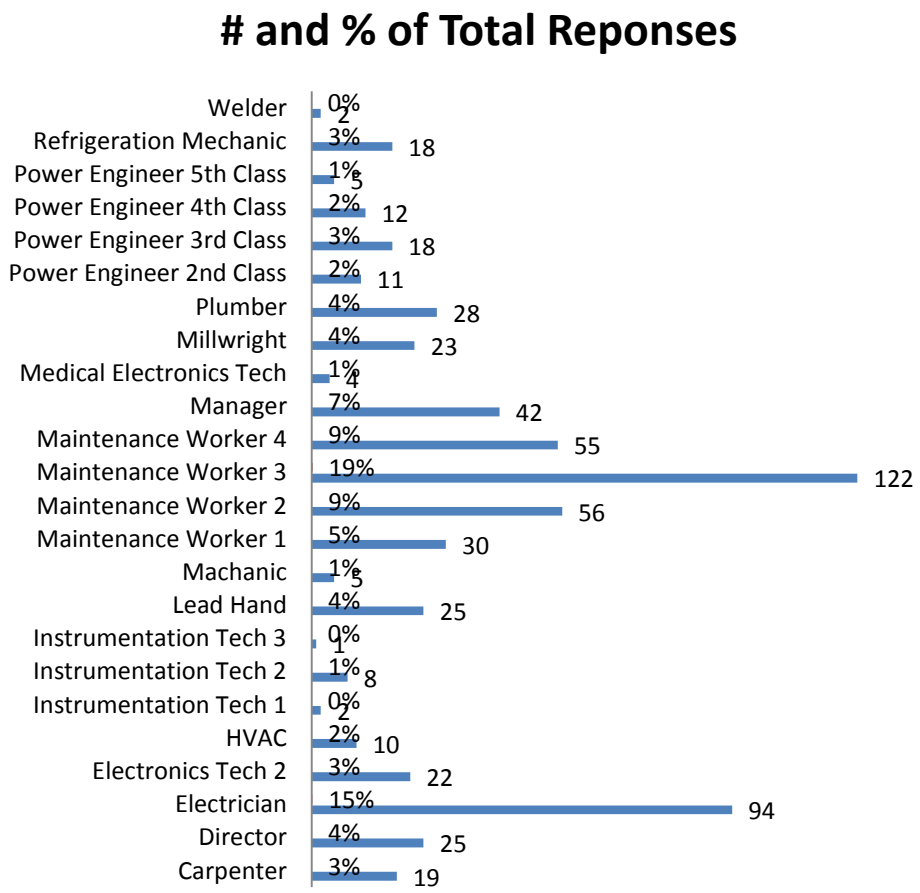
Responses By Zone



% Facility



Gap Analysis



Gap Analysis

The Good

At your facility is emphasis put on de-energized work first?

Answer	# Emphasis on De-Energized	%Emphasis on De-Energized
I'm Not sure	50	10%
No	27	6%
Yes	400	84%
Grand Total	**477**	**100%**

Gap Analysis

The Good

Do you first check for absence of voltage prior to any de-energized work?

Answer	# Absence of Voltage	% Absence of Voltage
No	[illegible]	10%
Yes	422	90%
Grand Total	**[illegible]**	**100%**

Gap Analysis

The Good

Do you use a Lock-Out/Tag-Out process?

Answer	# Lock-out/Tag-out	% Lock-out/Tag-out
No		4%
Yes	383	96%
Grand Total		**100%**

Gap Analysis

The Bad

Do you perform any energized electrical work?

Answers	# Energized	% Energized
No	403	64%
Yes	224	36%
Grand Total	**627**	**100%**

Why do you perform energized electrical work?

Answers	Acceptable Reason	% Acceptable Reason
no	109	49%
yes	115	51%
Grand Total	**224**	**100%**

Gap Analysis

The Bad

How do you replace light bulbs/lamps/fluorescent tubes?

Answers	# Replace Lights	% Replace Lights
Both	235	60%
De-Energized	84	22%
Energized	71	18%
Grand Total	**390**	**100%**

What PPE do you wear when replacing light bulbs/lamps/fluorescent tubes?

Answers	# Acceptable level of PPE	% Acceptable level of PPE
NO	176	45%
YES	214	55%
Grand Total	**390**	**100%**

Gap Analysis

The Bad

What voltage is the electrical equipment you work on?

Answers	# Maximum Voltage	% Maximum Voltage
> 4160 VAC	28	13%
120 VAC	43	20%
208 VAC	9	4%
347 VAC	16	7%
4160 VAC	7	3%
600 VAC	108	50%
Less than 150 VDC	2	1%
Less than 50 VAC	3	1%
Grand Total	**216**	**100%**

Current Position	# Position	% Position
Electrician	94	100%
Grand Total	**94**	**100%**

Gap Analysis

The Ugly

Zone	# of Electricians
North	5
Edmonton	31
Central	20
Calgary	43
South	14

Gap Analysis

The Ugly

Answers	# Ballast	% Ballast
No	451	72%
Yes	173	28%
Grand Total	**624**	**100%**

Answers	# Luminaire	% Luminaire
No	121	121
Yes	52	52
Grand Total	**173**	**173**

Answers	# Supply Voltage for Ballast	% Supply Voltage for Ballast
120 VAC	63	36%
347 VAC	10	6%
All of the Above	96	55%
I don't know	4	2%
Grand Total	**173**	**100%**

Current Position	# Position	% Position
Electrician	94	100%
Grand Total	**94**	**100%**

Gap Analysis

The Ugly

Do you perform emergency stand by or safety watch duties for electrical work?

Answers	# Emergency Stand By	% Emergency Stand By
No	375	62%
Sometimes	107	18%
Yes	123	20%
Grand Total	**605**	**100%**

Have you been In-Serviced on your responsibilities as an emergency stand by…

Answers	# Emergency Stand By Training	% Emergency Stand By Training
No	166	72%
Yes	64	28%
Grand Total	**230**	**100%**

Gap Analysis

The Ugly

Answers	# Maximum Voltage	% Maximum Voltage
> 4160 VAC	28	100%
Grand Total	**28**	**100%**

Current Position	# Position	% Position
Electrician	16	57%
Electronics Tech 2	2	7%
Lead Hand	2	7%
Maintenance Worker 3	1	4%
Manager	1	4%
Plumber	1	4%
Power Engineer 2nd Class	1	4%
Power Engineer 3rd Class	3	11%
Refrigeration Mechanic	1	4%
Grand Total	**28**	**100%**

Training

- Certain groups would Require the 2 day external training.
- My Learning Link or Modular Process

Training

- Modular Training
  - Modular 1 Electrical Awareness
  - Modular 2 Breaker and Pump resets
  - Modular 3 Electrical Systems <250VAC
  - Modular 4 Electrical Systems <>750VAC
  - Modular 5 Director/Supervisor/Manager
  - Modular 6 Safety Watch

Next Steps

- Socializing the Program
  - Jan 2015 – June 2015
    - Start reading the ESP looking at the forms and understanding the program

Next Steps

- Modular Training
  - Jan 2015 – June 2015
  - One Module/month
- Implementation Phase
  - July 2015 – Dec 2015
- Evaluation Phase
  - Jan 2016

Review Objectives

- Electrical Safety Program Overview
- Pilot Project (Lesson Learned)
- Gap Analysis
- Training
- Next Steps