UTILITY WORKER RECEIVES FATAL ELECTRIC SHOCK
Type of Incident: Fatality
Date of Incident: August 30, 2011
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>SECTION</th>
<th>TITLE</th>
<th>PAGE NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>DATE AND TIME OF INCIDENT</td>
<td>3</td>
</tr>
<tr>
<td>2.0</td>
<td>NAME &amp; ADDRESS OF PRINCIPAL PARTIES</td>
<td>3</td>
</tr>
<tr>
<td>2.1</td>
<td>Owner</td>
<td>3</td>
</tr>
<tr>
<td>2.2</td>
<td>Prime Contractor</td>
<td>3</td>
</tr>
<tr>
<td>2.3</td>
<td>Employer(s)</td>
<td>3</td>
</tr>
<tr>
<td>2.4</td>
<td>Contractor(s)</td>
<td>3</td>
</tr>
<tr>
<td>2.5</td>
<td>Supplier(s)</td>
<td>3</td>
</tr>
<tr>
<td>2.6</td>
<td>Workers(s)</td>
<td>3</td>
</tr>
<tr>
<td>2.7</td>
<td>Others</td>
<td>3</td>
</tr>
<tr>
<td>3.0</td>
<td>DESCRIPTION OF PRINCIPAL PARTIES</td>
<td>4</td>
</tr>
<tr>
<td>3.1</td>
<td>Employer</td>
<td>4</td>
</tr>
<tr>
<td>3.2</td>
<td>Worker</td>
<td>4</td>
</tr>
<tr>
<td>4.0</td>
<td>LOCATION OF INCIDENT</td>
<td>4</td>
</tr>
<tr>
<td>5.0</td>
<td>EQUIPMENT, MATERIAL AND OBSERVATIONS</td>
<td>4</td>
</tr>
<tr>
<td>5.1</td>
<td>Equipment and Material</td>
<td>4</td>
</tr>
<tr>
<td>5.2</td>
<td>Observations</td>
<td>5</td>
</tr>
<tr>
<td>6.0</td>
<td>NARRATIVE DESCRIPTION OF INCIDENT</td>
<td>5</td>
</tr>
<tr>
<td>7.0</td>
<td>ANALYSIS</td>
<td>7</td>
</tr>
<tr>
<td>7.1</td>
<td>Direct Cause</td>
<td>7</td>
</tr>
<tr>
<td>7.2</td>
<td>Contributing Factors</td>
<td>7</td>
</tr>
<tr>
<td>8.0</td>
<td>FOLLOW-UP/ ACTION TAKEN</td>
<td>8</td>
</tr>
<tr>
<td>8.1</td>
<td>Human Services, Occupational Health and Safety</td>
<td>8</td>
</tr>
<tr>
<td>8.2</td>
<td>Industry</td>
<td>8</td>
</tr>
<tr>
<td>8.3</td>
<td>Additional Measures</td>
<td>8</td>
</tr>
<tr>
<td>9.0</td>
<td>SIGNATURES</td>
<td>9</td>
</tr>
<tr>
<td>10.0</td>
<td>ATTACHMENTS</td>
<td>9</td>
</tr>
</tbody>
</table>
SECTION 1.0 DATE AND TIME OF INCIDENT
1.1 August 30, 2011 at approximately 1:00 p.m.

SECTION 2.0 NAME AND ADDRESS OF PRINCIPAL PARTIES

2.1 Owner(s)
2.1.1 ENMAX Power Corporation
141 – 50 Avenue SE
Calgary, Alberta
T2G 4S7

2.2 Prime Contractor
2.2.1 Not applicable.

2.3 Employer(s)
2.3.1 ENMAX Power Corporation
141 – 50 Avenue SE
Calgary, Alberta
T2G 4S7

2.4 Contractor(s)
2.4.1 Not applicable.

2.5 Supplier(s)
2.5.1 Not applicable.

2.6 Worker(s)
2.6.1 Apprentice 1 (************)
   (Names and personal details were removed before distribution of this report.)

2.7 Others
2.7.1 Calgary Police Service
SECTION 3.0 DESCRIPTION OF PRINCIPAL PARTIES

3.1 ENMAX Power Corporation was the employer of the deceased worker. ENMAX Power Corporation owns, operates and maintains the electricity distribution and transmission network in and around Calgary. The parent company, ENMAX Corporation, is a wholly owned subsidiary of The City of Calgary.

3.2 The deceased worker (**************) was a first year apprentice power line technician. He had successfully completed a 4-year program of electrical studies at the Southern Alberta Institute of Technology and had 14 months experience as a Journeyman Electrician. He had begun his Powerline Technician Apprenticeship on May 31, 2011. The apprenticeship training included a 5 week period of classroom and practical training on de-energized and energized systems at the Enmax Training Facility before beginning actual field work.

SECTION 4.0 LOCATION OF INCIDENT

4.1 The incident occurred on a utility pole, identified as 12W-184, which was located in the alley behind 3039 - 37th Street SW, in Calgary, Alberta (Refer to Attachment A – Map and Attachment B – Photograph 1).

SECTION 5.0 EQUIPMENT, MATERIAL AND OBSERVATIONS

5.1 Equipment and Material

5.1.1 Mounted on the utility pole were three primary wires, a switch-fuse cutout, a pole mounted transformer, four secondary wires and two low voltage communication lines (Refer to Attachment B – Photograph 1).

5.1.2 The three primary wires were mounted horizontally at the top of the pole on a fiberglass crossarm. The primary wires carried a current of 8 kilovolts (Refer to Attachment B – Photograph 1).

5.1.3 The secondary wires were mounted vertically on the pole approximately 2.6 metres below the primary wires. The secondary wires included two hot wires carrying a voltage of 120 volts, a new system neutral wire and an old system neutral wire. The work being performed at the time of the incident was to change over the connections from the old to the new system neutral then to remove and salvage the old system neutral wire (Refer to Attachment B – Photographs 1 & 2).
5.1.4 The pole mounted transformer manufactured by Pioneer Electric Limited, was identified by serial number A38939 and ENMAX Power Corporation identification number 11929. The transformer was a single phase transformer with two primary bushings (H1 and H2). The power to the transformer passed from an 8 kilovolt primary wire through the switch-fuse cutout to the H1 primary bushing. Prior to the incident the H2 primary bushing was connected to the old system neutral and grounded. The transformer outlets X1 and X3 were connected to the hot secondary wires to power the distribution circuit. At the time of the incident the transformer outlet X2 was connected to the new system neutral wire (Refer to Attachment B – Photograph 3).

5.1.5 A work wire, consisting of a short length of wire with a clamp on each end, was intended to be used to maintain electrical continuity between the wire connected to the transformer primary H2 bushing and the system neutral while the wire’s connection was transferred from the old system neutral to the new system neutral (Refer to Attachment B – Photographs 4).

5.1.6 Leather linemen gauntlet gloves; Style #673 manufactured by Raber Glove Manufacturing Co. Ltd were being worn by Apprentice 1 (**********) at the time of the incident.

5.2 Observations

5.2.1 At the time of the incident it was overcast with a temperature of approximately 15°C.

5.2.2 The work wire that Apprentice 1 (**********) had been using while transferring the neutral connections on pole 12W-184 was observed to be attached to the old system neutral wire and was not connected at the other end (Refer to Attachment B – Photograph 4).

5.2.3 The H2 wire leading from the transformer was not connected to either system neutral wire (Refer to Attachment B – Photograph 4).

SECTION 6.0 NARRATIVE DESCRIPTION OF THE INCIDENT

6.1 On August 30, 2011, an ENMAX Power Corporation work crew was assigned to transfer various electrical connections from an old system neutral wire to a new system neutral wire. The same crew had installed the new system neutral wire the previous day. The work site included the 19 spans located in the alley west of 37 Street SW between 28 Avenue and 33 Avenue SW. The work was taking place while the electrical system was energized.
6.2 The work crew consisted of six first year Apprentice Power Line Technicians being supervised by two experienced Journeymen Power Line Technicians. The work crew had trained and worked together since May 30, 2011.

6.3 Apprentice 1 (************) and Apprentice 2 (************) arrived at the worksite between 9:00 a.m. and 9:30 a.m., approximately 40 minutes after the other members of the work crew.

6.4 Upon arriving at the work site, Apprentice 1 (************) and Apprentice 2 (************) reviewed the tailboard form with Journeymen 1 (************); the regular tailboard meeting had been conducted earlier with the other members of the work crew.

6.5 Shortly before 1:00 p.m., Apprentice 1 (************) climbed the pole identified as 12W-184 to transfer the electrical connections from the old system neutral wire to the new system neutral wire. Apprentice 2 (************) was in the truck mounted aerial bucket approximately 15 meters south of the pole where Apprentice 1 (************) was working.

6.6 Journeymen 1 (************) was standing at a truck parked near the base of pole 12W-184 when he heard a “splash”; a sound he associated with an electrical arc. Journeymen 1 (************) thought that Apprentice 1 (************) had made contact with a open hot secondary wire and instructed Apprentice 1 (************) to ensure that all hot secondary wires were properly taped. Apprentice 1 (************) responded by stating that he had just cut the wire connected to the transformer primary H2 bushing without having his work wire installed to maintain continuity. Apprentice 1 (************) asked if he should reconnect the wire.

6.7 Journeymen 1 (************) looked up to confirm which wire had been cut and observed Apprentice 1 (************) leaning away from the wires with his hand at his sides, a position referred to as “standing clear” that was taught during training as a safety measure in potentially hazardous situations. Journeymen 1 (************) instructed Apprentice 1 (************) to wait.

6.8 Apprentice 2 (************) was not aware of the situation and had turned to ask Journeymen 1 (************) a question when he noticed that Journeymen 1 (************) was providing direction to Apprentice 1 (************).
6.9 After instructing Apprentice 1 (************) to wait, Journeymen 1 (************) moved to get a hotstick from the truck so he could disconnect the transformer from the 8 kilovolt primary service when he heard a second “splash”. Journeymen 1 (************) looked up and noted that Apprentice 1’s (************) hand had come in contact with the open wire connected to the transformer primary H2 bushing and that Apprentice 1 (************) was being shocked.

6.10 Apprentice 2 (************) also heard the “splash” and observed Apprentice 1 (************) being shocked.

6.11 Journeymen 1 (************) and Apprentice 2 (************) immediately responded to the emergency by alerting the other workers, de-energizing the transformer by opening the switch-fuse cutout, calling 911 and activating the ENMAX Power Corporation’s emergency plan through the ENMAX Control Centre.

6.12 Journeymen 2 (************), Apprentice 2 (************) and Journeymen 1 (************) worked together to perform a pole top rescue and lower Apprentice 1 (************) to the ground where CPR was started immediately.

6.13 Emergency Medical Services arrived and transported Apprentice 1 (************) to the Foothills Medical Centre where he passed away as a result of his injuries.

SECTION 7.0 ANALYSIS

7.1 Direct Cause

7.1.1 Apprentice 1 (************) received a fatal electric shock when he contacted the energized wire connected to the transformer primary H2 bushing that had been cut from the system neutral.

7.2 Contributing Factors

7.2.1 Apprentice 1 (************) did not install the work wire onto the wire connected to the transformer primary H2 bushing before cutting the wire from the old system neutral wire.

7.2.2 Apprentice 1 (************) contacted the open wire connected to the transformer primary H2 bushing before the transformer was safely disconnected from the 8 kilovolt primary wire.

7.2.3 The leather linemen gloves that Apprentice 1 (************) was wearing did not provide adequate protection from the potential 8 kilovolts of the primary wire.
SECTION 8.0  FOLLOW-UP/ ACTION TAKEN

8.1 Human Services, Occupational Health and Safety

8.1.1 On August 30, 2011, Occupational Health and Safety received an incident notification, responded to the scene and commenced an incident investigation.

8.1.2 On August 31, 2011, Occupational Health and Safety issued a Notice to Produce to ENMAX Corporation to provide a copy of their completed incident investigation report.

8.1.3 On September 2, 2011, Occupational Health and Safety issued a Notice to Produce to ENMAX Corporation for copies of documentation related to this incident.

8.1.4 On November 15, 2011, Occupational Health and Safety issued a Notice to Produce to ENMAX Corporation for a copy of their “Green Team” manual.

8.2 Industry

8.2.1 On August 30, 2011, ENMAX Power Corporation stopped work at the work site following the incident.

8.2.2 On September 13, 2011, ENMAX Power Corporation issued a Safety Bulletin to all staff requiring the use of appropriate voltage rated rubber gloves for any work involving neutral or ground connections.

8.2.3 ENMAX Corporation completed an investigation of the incident and provided a copy of the completed report to Occupational Health and Safety as requested.

8.2.4 ENMAX Corporation complied with the request from Occupational Health and Safety to provide miscellaneous documentation related to the incident.

8.3 Additional Measures

8.3.1 Not applicable.
SECTION 9.0 SIGNATURES

Original report signed  
(***********), Lead Investigator  

Date  

Original report signed  
(***********), Reviewer  

Date  

Original report signed  
(***********), Director Investigations & Mining  

Date  

SECTION 10.0 ATTACHMENTS:

Attachment A  
Attachment B
Blue arrow points to the work site location in the laneway behind 3039 - 37th Street SW, in Calgary, Alberta.
Photograph 1 – Shows the utility pole identified as 12W-184, located in the alley behind 3039 – 37th Street SW, in Calgary, Alberta.

Arrow #1 points to the three primary wires.
Arrow #2 points to the switch-fuse cutout that was opened after the incident.
Arrow #3 points to the pole mounted transformer.
Arrow #4 points to the secondary wires.
Arrow #5 points to a residential service line.
Arrow #6 points to the low voltage communication cables.
Photograph 2 – Shows the secondary wires on pole 12W-184.
Arrow #1 points to the old system neutral wire.
Arrow #2 points to the new system neutral wire.
Arrow #3 points to the two 120 volt “hot” secondary wires.
Photograph 3 – Shows the transformer mounted on pole 12W-184 and the system neutral wires.
Arrow #1 points to the transformer primary H1 bushing.
Arrow #2 points to the transformer primary H2 bushing.
Arrow #3 points to the transformer outlet X3 bushing.
Arrow #4 points to the transformer outlet X2 bushing.
Arrow #5 points to transformer outlet X1 bushing.
Arrow #6 points to the wire connected to the transformer primary H2 bushing.
Arrow #7 points to the old system neutral wire.
Arrow #8 points to the new system neutral wire.
Photograph 4 – Shows the secondary wires on pole 12W-184.
Arrow #1 points to the old system neutral wire.
Arrow #2 points to two connections that had been transferred to the new system neutral wire prior to the incident.
Arrow #3 points to the work wire connection on the old system neutral wire.
Arrow #4 points to the wire connected to the transformer primary H2 bushing.
Arrow #5 points to the open end of the wire connected to the transformer primary H2 bushing.
Arrow #6 points to where the wire connected to the transformer primary H2 bushing had been connected to the old system neutral wire.
Arrow #7 points to the end of the work wire that was not connected.