

**APPRENTICE HEAVY DUTY MECHANIC
ELECTROCUTED ON A
PORTABLE LIGHT TOWER
Date of Incident: May 3, 2004
Type of Incident: Fatality**

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Section 1.0 DATE AND TIME OF INCIDENT

1.1 May 3, 2004 between 4:30 p.m. and 7:20 p.m.

Section 2.0 NAME & ADDRESS OF PRINCIPAL STAKEHOLDER(S)

2.1 Owner(s)

2.1.1 Driftpile First Nation
Box 30
Driftpile, Alberta
T0G 0V0

2.2 Prime Contractor

2.2.1 Sonex Construction Ltd.
21110 – 108 Avenue, Box 73057
Edmonton, Alberta
T5S 2C7

2.3 Employer

2.3.1 Teare Creek Contractors Ltd.
5052C Hartway Drive
Prince George, British Columbia
V2K 2K5

2.4 Other Employer

2.3.2 Quinney Construction Ltd.
Box 620
Grimshaw, Alberta
T0H 1W0

2.5 Supplier

2.5.1 Demco Electric Ltd.
5203 Airport Drive
Fort Nelson, British Columbia
V0C 1R0

Section 3.0 DESCRIPTION OF PRINCIPAL STAKEHOLDER(S)

3.1 Driftpile First Nation

Driftpile First Nation is a first nations community located in North Western Alberta and owner of the sewage lagoon.

3.2 Sonex Construction Ltd.

Sonex Construction Ltd. in a written contract with Driftpile First Nation agreed to be the prime contractor to construct the sewage lagoon expansion project. As the general contractor for the construction project, Sonex Construction Ltd. contracted the services of Teare Creek Contractors Ltd. to provide heavy earth moving equipment to move earth. Quinney Construction Ltd. and Driftpile First Nation provided the heavy equipment operators and labourers to Teare Creek Contractors Ltd. for the construction project.

3.3 Teare Creek Contractors Ltd.

Teare Creek Contractors Ltd. is a road construction and lease development contractor that also rents out heavy equipment. Teare Creek Contractors Ltd. was contracted by Sonex Construction Ltd. to move earth and provide heavy earth moving equipment for the sewage expansion project.

3.4 QCL (Quinney Construction Ltd.)

Quinney Construction Ltd. specializes in road building, lease preparation and pipeline work. Quinney Construction Ltd. provided some of the heavy earthmoving equipment. The Quinney Construction Ltd. owner was the Day Shift Foreman for the sewage expansion project. Sonex Construction Ltd. contracted Quinney Construction Ltd. to provide some heavy earth moving equipment and to supervise the earth moving operations.

3.5 Demco Electric Ltd.

Demco Electric Ltd. of Fort Nelson, British Columbia is an industrial, commercial and residential electrical equipment supplier. They also provide electricians for electrical maintenance and construction. Teare Creek Contractors Ltd. contracted Demco Electrical Ltd. to supply the electricians and electrical equipment to rewire the portable skid light tower. (see Section 7.9)

Section 4.0 LOCATION OF INCIDENT

4.1 Driftpile First Nation, sewage lagoon expansion project, Driftpile, Alberta.

Section 5.0 EQUIPMENT AND MATERIAL INVOLVED

5.1 Portable Skid Light Tower.

5.1.1 The portable skid light tower was fitted with a Mobile Lighting Company, Onan 4.0 GenSet, serial # D900311789, model # 4DKCEJ 1B, 120/240 volt, single phase, 4 KVA generator. The generator powered a step-up Widelite 1000 watt, Fm 120 ballast to 425 volts that powered two 1000 watt metallic halide lights mounted on the skid unit. (Attachment A, Photograph #2, #3)

5.1.2 The portable skid light tower equipped with two 1000 watt metallic halide lights, owned by Teare Creek Contractors Ltd. was one of two portable light towers used to provide lighting for the night shift sewage construction area. The other portable light tower was owned by Quinney Construction Ltd.

Section 6.0 NARRATIVE DESCRIPTION OF INCIDENT

6.1 The incident occurred on May 3, 2004 between 4:30 p.m. and 7:20 p.m.

6.2 At approximately 4:30 p.m., the Day Shift Foreman instructed the Worker, an apprentice heavy duty mechanic, to repair the portable skid light tower as only one of the two lights was working. (Attachment A, Photograph #2)

6.3 The Worker drove the Quinney Construction Ltd. mechanic's truck to the portable skid light tower located at the sewage lagoon construction site. (Attachment A, Photograph #1)

6.4 The Worker started up the portable light tower diesel engine that powered the electrical generator. The electrical components were all in the energized position to energize the two metallic halide lights mounted on the skid unit, however, only one of the lights was working. The Worker had the light tower in the energized operating mode because he needed the power on to try and get the other light working. (Attachment A, Photograph #4)

6.5 The Worker positioned himself onto the diesel motor frame and attempted to hook up the exposed electrical wires to get the other light working. (Attachment A, Photograph #5)

- 6.6 The Worker grounded his body by lying across the generator and then touched the hot conductor on the secondary side of the ballast, where it hung out of the junction box. (Attachment A, Photograph #6) (Attachment B, Safety Codes Officer's Report)
- 6.7 During the shift change, between 6:00 p.m. and 7:00 p.m., the night shift workers who were checking the heavy equipment fluid levels, topping them up and refuelling the equipment saw the Worker inside the portable skid light tower and thought he was doing some repairs or maintenance work. (Attachment A, Photograph #1)
- 6.8 At approximately 7:15 p.m. the Owner of the Teare Creek Contractors Ltd.'s heavy equipment needed to put some hydraulic fluid into one of the scrapers and went to borrow a knife from the mechanic's truck to open a container of hydraulic fluid. As the Owner approached the mechanic's truck he asked the Worker if he could borrow a knife and got no response. The light tower and other heavy equipment were running in the area creating noise, so the Owner called louder at the Worker but got no verbal or physical response. The Owner ran to the area where other workers were fuelling a piece of heavy equipment and got some of the night shift workers to assist in checking the Worker inside the portable skid light tower.
- 6.9 The Owner of the Teare Creek Contractors Ltd. portable skid light tower reached in and shut off the light tower diesel engine by turning off the ignition key. The co-workers checked for a response from the Worker and attempted to find a pulse. There was no response from the Worker and they did not find a pulse.
- 6.10 The Night Shift Foreman used his cell phone to call for an ambulance and the RCMP.
- 6.11 The High Prairie EMS responded to the call. They assisted the Lesser Slave Lake Regional Police Service and co-workers to extricate the Worker from within the portable skid light tower.
- 6.12 The High Prairie EMS transported the Worker to the High Prairie hospital.
- 6.13 The Worker was pronounced dead on arrival.
- 6.14 **INVESTIGATION OBSERVATIONS AND INFORMATION**
- 6.14.1 Workplace Health and Safety were informed of the incident at 9:12 p.m. on May 3, 2004. Sonex Construction Ltd., at the request of Workplace Health and Safety secured the portable skid light tower site with a snow fence erected around the light tower and a Driftpile First Nation security guard was placed at the entrance to the sewage lagoon project.

- 6.14.2 Workplace Health and Safety investigators met with the Lesser Slave Lake Regional Police Service, Driftpile, Alberta at 11:00 a.m. on May 4, 2004 prior to going to the incident site.
- 6.14.3 Workplace Health and Safety investigators arrived at the Driftpile First Nation sewage lagoon project incident site on May 4, 2004 at 12:30 p.m.
- 6.14.4 The work at the construction site had ceased due to weather conditions such as intermittent rain and snow as well as the fatal incident.
- 6.14.5 Workplace Health and Safety issued a Stop Work Order to Sonex Construction Ltd. for the portable skid light tower owned by Teare Creek Contractors Ltd.
- 6.14.6 On May 5, 2005 an Alberta Municipal Affairs Electrical Safety Codes Officer from Grande Prairie, Alberta carried out an electrical inspection of the portable skid light tower.
- 6.14.7 The Electrical Safety Codes Officer concluded that the portable light tower was not wired properly and did not meet the Canadian Electrical Code requirements. (Attachment B, Safety Codes Officer's Report)
- 6.14.8 The Electrical Safety Codes Officer concluded the Worker contacted the live exposed electrical wire inside the portable light tower. (Attachment A, Photograph #5, #6) (Attachment B, Safety Codes Officer's Report)
- 6.14.9 The Director of Medical Services's medical report concluded the Worker was electrocuted.

Section 7.0 ANALYSIS

- 7.1 On May 3, 2004, the Worker was fatally electrocuted as he attempted to hook up some of the exposed, energized electrical wires in the portable skid light tower as he tried to get one of the two metallic halide lights working.
- 7.2 The Driftpile sewage lagoon project did not have neither a journeyman heavy duty mechanic nor a journeyman electrician available to maintain their equipment.
- 7.3 The Day Shift Foreman, is the owner of Quinney Construction Ltd. based out of Grimshaw, Alberta.
- 7.4 On May 1, 2004, the Day Shift Foreman hired the Worker as the construction site heavy duty mechanic to work for Teare Creek Contractors Ltd. with the knowledge the Worker was not competent to perform heavy duty mechanical work.

- 7.5 On May 3, 2004, the Day Shift Foreman directed the Worker to repair the portable skid light tower as only one of the two lights was working.
- 7.6 The Worker was not competent to perform the electrical task he was working on at the time of the incident. He was not technically qualified, formally trained and did not have sufficient experience to perform this electrical task.
- 7.7 The Worker, who was not competent to work on live electrical equipment, should have been required to lock out the equipment to do the electrical task.
- 7.8 Teare Creek Contractors Ltd. did not have a lock out policy.
- 7.9 Alberta Apprenticeship and Industry Training verified they had no records to indicate the Worker had training or qualifications to perform electrical work.
- 7.10 The Worker was provided with the Quinney Construction Ltd.'s mechanic's truck to service the heavy equipment. The Worker used the Quinney Construction Ltd.'s mechanic's truck to transport his mechanic's tool cabinet.
- 7.11 There was no hiring documentation and no documentation for orientation or site specific safety training.
- 7.12 On February 6, 2002, Teare Creek Contractors Ltd. had the portable skid light tower rewired by Demco Electric Ltd., at Fort Nelson, British Columbia. There was no electrical permit issued for the light tower rewiring work. The portable light tower was not recertified by either the manufacturer or an electrical P. Eng. after the rewiring was completed.

Section 8.0 APPLICABLE LEGISLATION

8.1 Sonex Construction Ltd.

8.1.1 Occupational Health and Safety Act, Section 3(3) Prime contractor obligations

- 8.1.1.1 Sonex Construction Ltd., as the prime contractor, did not ensure as far as it was reasonably practicable that contractors complied with the Act, Regulation and Code at their work site.

8.2 Teare Creek Contractors Ltd.

8.2.1 Occupational Health and Safety Act, Section 2(1)(a)(i) Obligations of employers

8.2.1.1 Teare Creek Contractors Ltd. did not ensure as far as it was reasonably practicable the health and safety of workers engaged in the work of the employer while repairing the portable light tower.

**8.3 Occupational Health and Safety Regulation, Section 7(1)(b)
Availability of specifications**

8.3.1 Teare Creek Contractors Ltd. did not have the manufacturer's specifications or specifications certified by a professional engineer for the portable light tower readily available to workers.

**8.4 Occupational Health and Safety Regulation, Section 7(3)
Availability of specifications**

8.4.1 Teare Creek Contractors Ltd. did not have the original of the document setting out manufacturer's or employer's specifications or specifications certified by a professional engineer for the portable light tower available for inspection by an officer.

**8.5 Occupational Health and Safety Regulation, Section 13(1)(a)(b)
Direction and instruction of workers**

8.5.1 The Day Shift Foreman did not ensure a journeyman electrician repaired the electrical lights on the portable light tower. The Day Shift Foreman directed the apprentice heavy duty mechanic to do electrical repairs on the portable light tower when a journeyman electrician was required to do the electrical repairs.

**8.6 Occupational Health and Safety Code, Section 7(1)
Hazard assessment**

8.6.1 Teare Creek Contractors Ltd. did not assess the worksite and identify hazards for the electrical repairs on the portable light tower.

**8.7 Occupational Health and Safety Code, Section 12(c)
Specifications and certifications**

8.7.1 Teare Creek Contractors Ltd. did not ensure the electrical rewiring by Demco Electric Ltd. on the portable skid light tower was performed in accordance with the manufacturer's specifications or specifications certified by a professional engineer.

**8.8 Occupational Health and Safety Code, Section 12(d)
Specifications and certifications**

8.8.1 Teare Creek Contractors Ltd. did not ensure the portable skid light tower was serviced, tested, adjusted, calibrated, repaired and maintained in accordance with the manufacturer's specifications or specifications certified by a professional engineer.

**8.9 Occupational Health and Safety Code, Section 212(1)(a)
Locking out**

8.9.1 Teare Creek Contractors Ltd. did not ensure the worker locked out the equipment and removed and rendered safe any hazardous conditions to perform electrical repairs on the portable light tower.

**8.10 Occupational Health and Safety Code, Section 212(1)(b)
Locking out**

8.10.1 Teare Creek Contractors Ltd. did not ensure the worker rendered the portable skid light tower inoperative in a manner that prevented its accidental reactivation and provided equal or greater protection than the lock out of the equipment to perform electrical repairs on the portable skid light tower.

**8.11 Occupational Health and Safety Code, Section 394(1)(2)
Working alone**

8.11.1 Teare Creek Contractors Ltd. did not have a system or policy for workers to check in for emergency assistance while working on isolated equipment such as the portable light tower.

Section 9.0 FOLLOW-UP / ACTION TAKEN

9.1 Alberta Human Resources and Employment

9.1.1 On May 4, 2004 Workplace Health and Safety issued a Stop Work Order to Sonex Construction Ltd. for the portable skid light tower.

9.1.2 On May 4, 2004 Workplace Health and Safety issued orders to Sonex Construction Ltd. to develop written hazard assessments, lock out procedures and working alone procedures for workers repairing the portable light towers.

9.2 Industry

9.2.1 Sonex Construction Ltd. developed and implemented a management system to ensure contractors complied with the Act, Regulation and Code.

9.2.2 Sonex Construction Ltd. completed written hazard assessments, lock out procedures and working alone policy for repairing the portable light towers. Workers were trained

trained in the hazard assessment, lock out procedures and working alone procedures to be followed at the sewage lagoon expansion project.

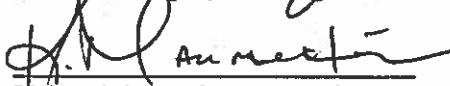
9.3 Additional Measures

9.3.1 No additional measures are required.

Section 10.0 SIGNATURES


Davis Bourque, Investigator

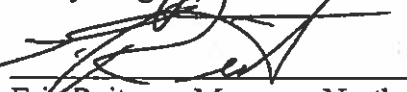
Sept 22, 2005
Date


Kristy Mauracher, Investigator

Oct. 3, 2005
Date


Gerry Wagner, Team Reviewer

Oct 3, 2005
Date


Eric Reitsma, Manager, North

Oct. 3, 2005
Date

Section 11.0 ATTACHMENTS

Attachment "A" Photographs
Attachment "B" Electrical Inspection Report



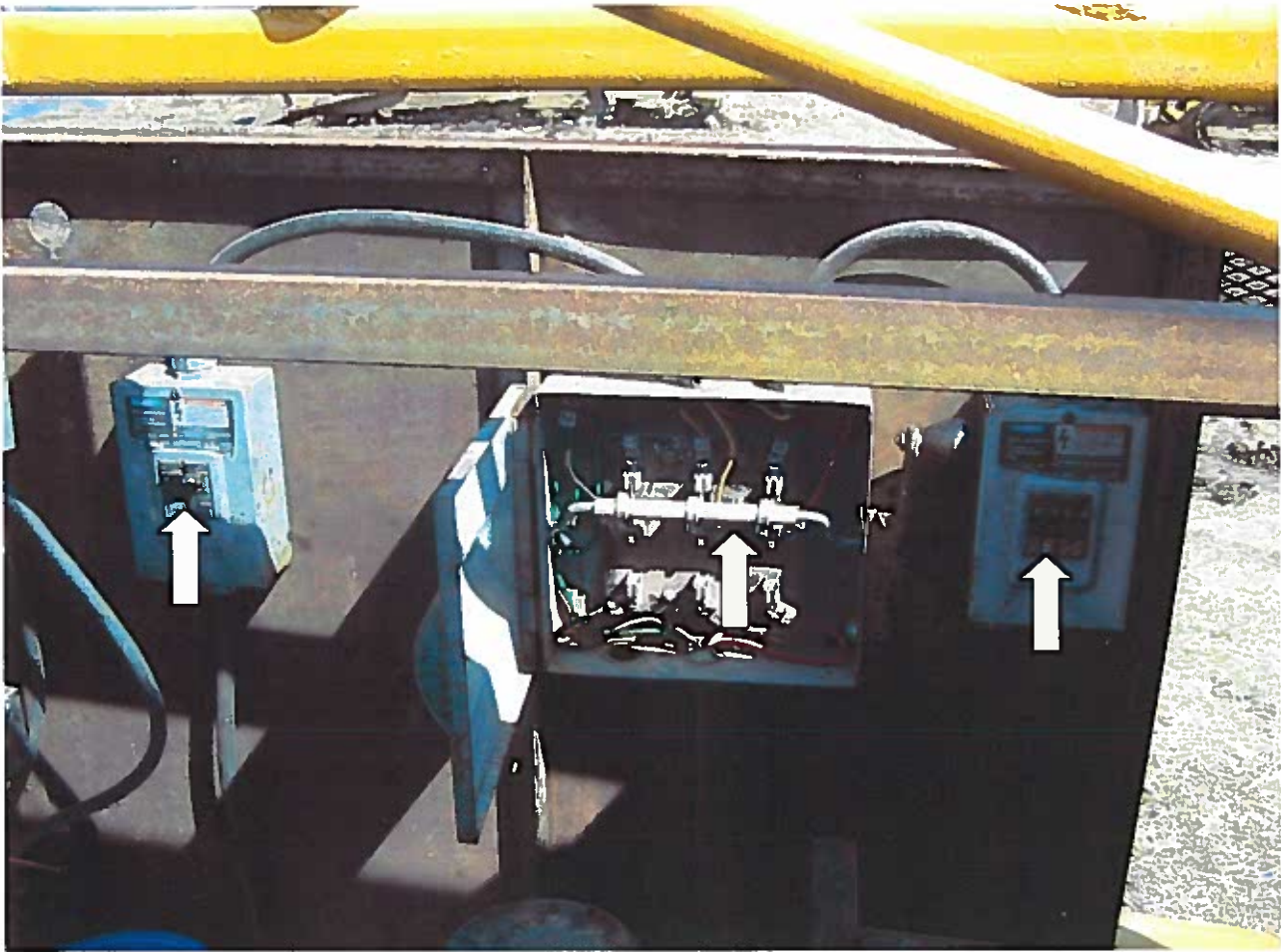
Photograph #1 Shows the location of the heavy equipment and portable skid light tower at the Driftpile lagoon construction site. Arrow #1 shows the Teare Creek Contractors Ltd. portable skid light tower. Arrow #2 shows the mechanic's truck parked near the portable skid light tower. Arrow #3 shows the fuel truck and the location of some of the night shift co-workers



Photograph #2 Close up picture of the Teare Creek Contractors Ltd. portable light tower at the Driftpile lagoon construction site. Arrow #1 shows the two 1000 watt metallic halide lights. Arrow #2 shows the access into the light tower.



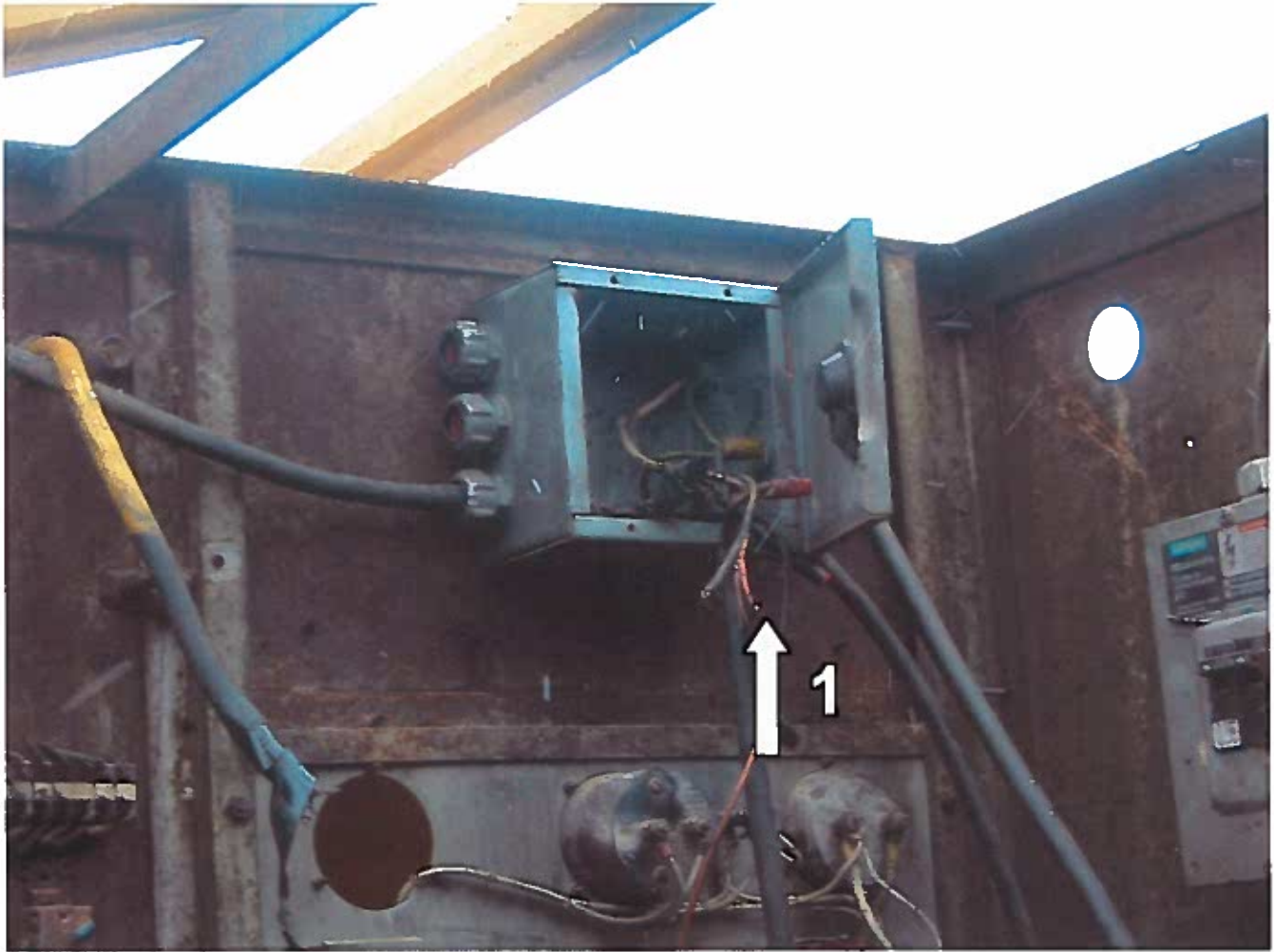
Photograph #3 Inside view of the portable light tower showing the Onan 4.0 GenSet generator. Arrow #1 shows the diesel motor radiator. Arrow #2 shows one of the two step up ballasts.



Photograph #4 Close up picture of the electrical panels inside the portable light tower enclosure. The picture shows the ballasts are in the energized position. Arrows show all panel switches are in the on position.



Photograph #5 Inside of the light tower looking from behind the Onan 4.0 GenSet generator diesel motor radiator to the electrical connections panel going from the step up ballasts to the metallic halide lights. Arrow #1 shows the live wire contacted by the Worker. Arrow #2 shows the neutral wire. Arrow #3 shows the ballast. Arrow #4 shows the metal radiator bracket the Worker layed on and grounded his self.



Photograph #6 Close up of the electrical connections panel going from the step up ballasts to the metallic halide lights. Arrow #1 shows the live wire contacted by the Worker.

16100-E01-SSR

At the request of Davis Bourque, Occupational Health and Safety Officer with Workplace Health and Safety, I conducted an electrical investigation on May 5, 2004 at the new sewage lagoon, just North of Drift Pile, Alberta.

General Observations:

A) The Skid Unit:

1. The skid unit consists of a welded/bolted metal frame mounted on 2 skid runners. The skid runners were constructed of about 4" steel pipe. The generator was mounted on top of one end of the frame and expanded metal formed a floor around it. An enclosed shed, about 5 foot by 9 foot with about a 4 foot high ceiling, was mounted on the skid. A metal frame and plate metal formed the walls and roof of the shed. It is basically a metal walled and roofed shed on a metal skid.

B) The Generator:

1. The generator was an Onan Model 40 KCEJ 1B, 120/240 volt, single phase, 4 KVA unit.
2. The junction box on the generator had 2 duplex receptacles, protected by mini breakers, mounted in the face of it.
3. The distances around the generator to the shed walls were approximately 1 foot on one side, 1.5 feet on the other side, 1 foot on the generator end and 3 feet on the diesel driver end. The clearance to the ceiling was about 18 inches.

C) The Service:

1. A 4 conductor #10 AWG SOW cable ran from the generator junction box to the main disconnect, a 2 pole single throw 40 amp Seimens breaker in an enclosure. The breaker was in the "on" position.
2. From the main breaker, a 4 conductor #10 AWG SOW cable ran to a 30 amp 250 volt Square D transfer switch.
3. Two 4 conductor #10 AWG SOW cables ran from the transfer switch. The first went to a 30 amp 4-pole 3 wire twist lock female cord end. The position of the transfer switch blades put this cord end in a "de-energized" state.
4. The second cable leaving the transfer switch ran to a 4-circuit 120/240 volt single phase Seimens load center. The position of the transfer switch blades put this load center in the "energized" state.
5. The load center contained four 15 amp single pole breakers, 2 per line. The breakers were all in the "on" position.

D) The Lighting:

1. At the driver end of the generator, mounted in a row on the floor, were 5 remote light fixture ballasts. 3 ballasts were disconnected from any power source or lamps. The remaining 2 ballasts (Ballast A and Ballast B for future reference) were each connected to the load center by individual 3 conductor SOW cables. The "hot" conductor, in the cable from each ballast, was connected to one of the 15 amp breakers in the load center. Both of these 15 amp breakers were on the same bus bar in the load center.
2. The nameplates of Ballast A and Ballast B indicated they were Widelite 120 volt 1000 watt Metal Halide ballasts. They were of the auto-transformer type, with a 9 amp rating and an open circuit secondary voltage of 425 volts.
3. A 3 conductor SOW cable ran from each of the ballasts to a single 6" by 6" junction box, mounted on the inside of the end wall of the shed. These cables were connected to the secondary sides of each of Ballast A and Ballast B.
4. The cable from Ballast B spliced to another cable, which ran out of the shed, up the light pole, and to a junction box at the top of the light pole. The cable then spliced (outside the junction box) onto two other cables, each feeding a 1000 watt metal halide fixture. The conductors were parallel connected (black to black to black, white to white to white, and green to green to green).
5. The junction box in the shed had a hinged cover. The cover was open and the cable conductors were spliced through the opening left by the open cover. The junction box at the top of the pole had the cover removed. The cable between the junction boxes was run with no cable connectors or "knocked-out" opening used at either junction box.
6. The cable from Ballast A terminated in the wall mounted junction box.
 - The green conductor was spliced to the green conductors in the other 2 cables at the junction box. (one from Ballast B and one going up the light pole to the junction box at the top of the light pole).
 - The white conductor was hanging out of the open box, with the end of the conductor being bare. The conductor's insulation was tore back about 3 inches and the 3 inches of the bare copper conductor was hanging through the tear. The white insulation was quite soiled except the portion exposed by the tear. The exposed stranded copper conductor itself was clean.
 - The black conductor was spliced, with a #33 Marrett splice cap and tape, to a orange conductor. The orange conductor was hanging out of the open box and had a bare crimp-on terminal end on it.

E) Miscellaneous:

1. Another cable ran from inside the shed, originating beside the junction box. It ran out of the shed, ½ way up the light pole, and back down the pole. Neither end of the cable was terminated.
2. A #3 AWG ground cable was fastened to the skid frame with an electrical lug, but the other end was not terminated anywhere. Nor was any other lug visible in the immediate area.
3. A hydraulic pump (assumed to raise and lower the light pole) was located on the floor of the shed, against the end wall at the driver end of the generator. This was below but to the left of the junction box in the shed. The pump was electrically fed by a SOW cable, which was then tape spliced to a 2 conductor #16 appliance cord. The appliance cord had a 2 prong polarized male cord end on it, which was plugged into one of the duplex receptacles located in the generator junction box face plate. The appliance cord lay across the expanded metal flooring and had a section of its insulation damaged at about the middle of its length. The insulation of the hot conductor was torn and looked to have been crushed. The copper conductor was exposed and several of the strands of wire were broken. There were no signs of arcing found on the cable, the conductor nor the expanded metal floor at the point where the cable damage was located. The duplex receptacle, which the cord was plugged into, was protected by a mini-breaker mounted in the generator junction box faceplate, adjacent the receptacle. The mini-breaker did not appear to be in the tripped position.
4. The floor area, below the junction box on the shed wall, was very dirty but the dirt was quite compacted. Lying on the floor surface was a #33 Marrett splice cap and one strand of copper wire. Both items were quite a bit cleaner than the floor surface and were not embedded into oil/dirt mixture covering that portion of the floor.

F) Assessment of Observations:

1. The wiring, up to the junction box on the shed wall appeared to generally be in compliance with the Canadian Electrical Code Part 1 (CEC). The service portion of the system requires a main grounding conductor to a ground electrode.
2. The secondary conductor cable of Ballast B was not properly terminated at the junction boxes and the conductors themselves were spliced outside of the junction boxes. Ballast B was approved to be connected to one 1000 watt metal halide lamp, not two as was the case here. This could have caused faulty operation of those lights.
3. The secondary conductor cable of Ballast A terminated in the junction box in the shed. The conductors stopped there and were not connected to any lamp, as they should have been. At the time of the investigation, the conductors were hanging out of the junction box with their ends exposed.

4. Ballasts A and B were autotransformer ballasts. This means the potential difference between the grounded metals in the shed and the "hot" conductors on the secondary side of the ballasts, as per the ballast nameplate rating, was 425 volts.
5. Neither junction box had a cover nor was properly bonded.
6. The damage to the appliance cord feeding the hydraulic pump had the potential of causing a short circuit to ground. However, there was no sign of arcing, and the individual strands of the conductor are fine enough that any arcing should have been apparent, had it occurred.

G) Conclusion:

Based on my observations, I feel the fatality was a result of the deceased having grounded his body by lying across the generator and then having touched the hot conductor on the secondary side of Ballast A, where it hung out of the junction box.

* This report is intended to be a technical supplement to the investigation conducted by WHS. Digital pictures of the equipment were taken and a copy given to WHS. Attached to this report is an index of those pictures.

Brian McIntosh
Senior Electrical Field Inspector
Safety Services
Alberta Municipal Affairs