

Fire/Explosion

Date of Incident: August 3, 1999

Type of Incident: Fatal

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Section 1.0 FILE NUMBER

1.1 375144

Section 2.0 DATE AND TIME OF INCIDENT

2.1 August 3, 1999, at 6:00 p.m.

Section 3.0 DATE AND TIME OF INVESTIGATION

3.1 August 3, 1999, at 7:00 p.m.

Section 4.0 NAME OF INVESTIGATOR(S) (INTERNAL)

4.1 MILLER, Chris
Occupational Health and Safety Officer

4.2 WOLD, Larry
Occupational Health and Safety Officer

Section 5.0 INCIDENT REPORTED BY

5.1 Safety Coordinator
Cardusty Trucking

Section 6.0 DATE AND TIME INCIDENT WAS REPORTED

6.1 August 3, 1999, at 6:39 p.m.

Section 7.0 NAME AND ADDRESS OF PRINCIPAL STAKEHOLDER(S)

7.1 **Owner(s)**

7.1.1 Cardusty Trucking Inc.
Box 1827
High Level, AB T0H 1Z0

7.2 **Prime Contractor**

7.2.1 Not applicable.

7.3 **Employer**

7.3.1 Cardusty Trucking Inc.
Box 1827
High Level, AB T0H 1Z0

Section 8.0 DESCRIPTION OF PRINCIPAL OWNER(S) OR EMPLOYER(S)

8.1 Cardusty Trucking Inc. is a trucking firm that contracts the hauling of fluids and provides petroleum-based services to energy companies in Alberta, mainly in the High Level, Rainbow Lake and Zama regions.

Section 9.0 LOCATION OF INCIDENT

9.1 The Cardusty Trucking Inc. shop is located at 959 Pine Street, Zama, AB -- Lots 16 & 17, Block 8, Plan 882-1687.

Section 10.0 EQUIPMENT AND MATERIAL INVOLVED

10.1 A mobile hot oiler unit consisting of one 1994 Western Star truck (tandem) Serial No. 2WLPCXHSRK933453, and four-compartment tank, pumps, valves, piping, and piping manifold of the hot oiler unit.

10.2 A hot oiler is a truck mounted pressure unit equipped with a diesel fuel fired tube boiler and a rear tank that is divided into four compartments. The two larger rear compartments of the tank are used for blending product specific to the type of work being completed. One of two front compartments contains fuel to fire the boiler and the remaining compartment is designated for methanol. The methanol is used for the purpose of protecting the pump, boiler, and piping system from freezing during cold temperatures. This is accomplished by circulating the methanol through the boiler and piping system while travelling to a job in below freezing temperatures. The hot oiler is used primarily for cleaning wax accumulation from down hole tubing, pipelines, and oil storage tanks. Hot oilers are also used on occasion to pump acid down oil well bores for purposes of enhancing production.

- 10.3 The workers had drained the two rear compartments of the hot oiler tank that contained production fluid. Witnesses indicated that the methanol and diesel fuel were not considered as production fluid by some employees because it was only for internal use within the hot oiler's own piping system. The methanol was circulated within the hot oiler's piping system to prevent freeze-up. The diesel fuel was piped directly to fire the burner on the unit.
- 10.4 The building in which the truck was being worked on was 12.2 m x 18.3 m in size (see Photograph #1).
- 10.5 The pressure truck was parked outside the bay that housed the hot oiler unit. Workers were going to move it to allow access to the hot oiler area to allow for ease of suctioning the spilled liquid (see Sketch).
- 10.6 The temperature at the time of the incident was 30° C+ which would cause rapid vapourizing of flammable fluids.

Section 11.0 NAMES OF OTHER INVESTIGATORS (EXTERNAL)

- 11.1 Royal Canadian Mounted Police (RCMP)
- 11.2 Fire Investigator, Town of High Level
- 11.3 Safety Coordinator, Cardusty Trucking Inc.

Section 12.0 NARRATIVE DESCRIPTION OF INCIDENT

- 12.1 A leak in the piping system of the hot oiler unit was identified on August 1, 1999. The operator and his swamper attempted to repair the leak, but were unsuccessful.
- 12.2 Arrangements were made to have the hot oiler unit repaired in Zama at Cardusty's maintenance shop.
- 12.3 At approximately 12:00 p.m. on August 3, 1999, the operator and his swamper arrived at the Zama shop with the hot oiler.
- 12.4 The mechanic, operator and swamper determined the exact location of the leak on the hot oiler's piping system. They determined that the piping manifold on the downstream side of the valves would have to be removed. The operator left the shop to get some sleep.

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- 12.5 The truck was put into the shop without draining, purging or sealing the 4-compartment tank (procedures as stated in the employer's safety manual).
- 12.6 Access to the piping manifold on the hot oiler required the removal of a portion of the working deck floor between the cab and 4-compartment tank. The mechanic and swamper started the removal at approximately 5:15 p.m.
- 12.7 The workers completed the removal of the metal floor plate and exposed the piping manifold.
- 12.8 The metal plate was leaned against the operator's control panel of the hot oiler unit. The mechanic positioned himself in a sitting position on the edge of the open part of the deck with his legs dangling into the open hole of the deck.
- 12.9 The swamper joined the mechanic on the truck's working deck to offer assistance.
- 12.10 The victaulic clamp on the downstream side of the methanol tank was removed. Fluid was not released at this time. There was no fluid in the lines of the manifold.
- 12.11 The mechanic then opened the valve on the piping system coming from the methanol tank. The valve was located on the upstream side of the manifold. Witnesses indicated about 1½ barrels of the fluid was released onto the floor before the valve was completely re-sealed.
- 12.12 The mechanic instructed a worker from the shop to get the vacuum truck to suck up the fluid.
- 12.13 Several other workers were present in the shop at the time the fluid was released. They were forced to leave the building because of the odourous vapours.
- 12.14 At 5:58 p.m. the mechanic instructed the swamper to move the pressure truck to allow access for the vacuum truck. The pressure truck was parked outside directly behind the bay where the hot oiler was.
- 12.15 The swamper left the working deck of the hot oiler via the stairs and walked around to the front of the unit. He observed the fluid on the floor as he walked past the working deck of the truck to the rear of the hot oiler unit. The pressure truck had to be moved so the vacuum truck could access the area.

- 12.16 At 6:00 p.m. the swamper entered the space between the back end of the hot oiler and the front of the pressure truck, which had not been started or moved (no vehicles were running at the time of the incident). He heard a WHOOSH sound followed by flames rolling out between the axle of the hot oiler. A flame also shot from the vent line connected to the tank, igniting the swamper's coveralls briefly. Witnesses indicated the point of ignition was in the same area the mechanic was situated.
- 12.17 The flames on the swamper's coveralls were quickly extinguished and he moved away from the fire unharmed.
- 12.18 The pressure truck was started and moved away from the burning building by another employee.
- 12.19 Shortly after, the mechanic appeared, totally engulfed in flames. He walked from the bay containing the hot oiler to the convenience store located at the far end of the shop. A customer extinguished the flames with water.
- 12.20 At 6:03 p.m. an emergency call was completed.
- 12.21 The injured mechanic was assisted to the nearby fire and ambulance facility.
- 12.22 At 6:05 p.m. a medivac helicopter was dispatched and RCMP were notified.
- 12.23 The injured mechanic was transported via ground ambulance to meet the helicopter.
- 12.24 At 7:45 p.m. the ambulance and the helicopter met and the injured mechanic was airlifted to the nearest local hospital.
- 12.25 At 9:30 p.m. the injured mechanic was flown to a hospital in Edmonton.

Section 13.0 CONCLUSIONS

- 13.1 The incident was caused by the escape of flammable liquid from the methanol compartment of the hot oiler tank. The expansion of the flammable liquid vapours created an explosive atmosphere within the maintenance shop. Neither the fire investigator nor the investigating occupational health and safety officers could determine the actual ignition source. Witnesses informed investigators that the ignition occurred directly under the truck, where the mechanic was situated.

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13.2 With the above facts in mind, the following ignition sources may have contributed to the explosion and subsequent fire:

- static electricity from the mechanic's clothing, or
- a spark from a metal object (such as a dropped tool) striking the metal deck of the hot oiler unit, or
- Ignition of fluid vapours by boiler. The bay did have a trough on the south end of the shop that led into the boiler room. The trough was covered with metal plating and was located approximately 1.5 metres from the centre of the truck. This trough was not connected to the sump located beneath the truck. The floor sloped away from the trough towards the sump.

13.3 The investigators concluded:

- The hot oiler's two front tank compartments were not drained, purged or sealed before maintenance work procedures were started as required by the employer's safety manual when dealing with all tank trucks.
- The work being performed on the hot oiler unit did not require the opening of the valve on the methanol compartment piping system. The manifold had already been disconnected and there was no fluid escaping.
- The employer did have a generic procedure for working on trucks during hot work maintenance and general maintenance. Maintenance work that the mechanic was performing to the hot oiler did not require hot work procedures to be initiated. One of the safe procedures for general maintenance of tank trucks was to keep the tank sealed, as per the employer's policy.

13.4 The mechanic worked on other tank trucks for the employer and had been oriented to the safe practices manual for performing work on tank trucks that had hauled flammable liquids. According to witnesses, he was also a hot oiler operator and knew the procedures for operating the hot oiler.

Section 14.0 FOLLOW-UP/ACTION TAKEN

14.1 Industry

14.1.1 The employer developed an Industry Alert highlighting procedures and special cautions when dealing with tank truck repairs of any kind which was circulated to industry.

14.1.2 The employer has revised their policies and procedures manual addressing appropriate safe procedures for working on or repairing tank trucks, hot oilers, pressure trucks and other units.

14.1.3 The employer has developed a valving system on the hot oiler units that will enable a lockout of the methanol tank.

14.2 **Alberta Human Resources & Employment**

14.2.1 Investigating officers issued a compliance order under Alberta General Safety Regulation 448/83 Section 15 to ensure the employer would reinforce safe procedures for working on tank trucks with all their employees.

Section 15.0 INJURY SEVERITY

15.1 Fatal

Section 16.0 SIGNATURES

[original signed]

Section 17.0 ATTACHMENTS

Attachment A	Photographs
Attachment B	Sketch



Photograph #1

This photograph shows the Cardusty Trucking building on the morning of August 4, 1999. The solid green arrow indicates the area where the mechanic was at the time of the incident.

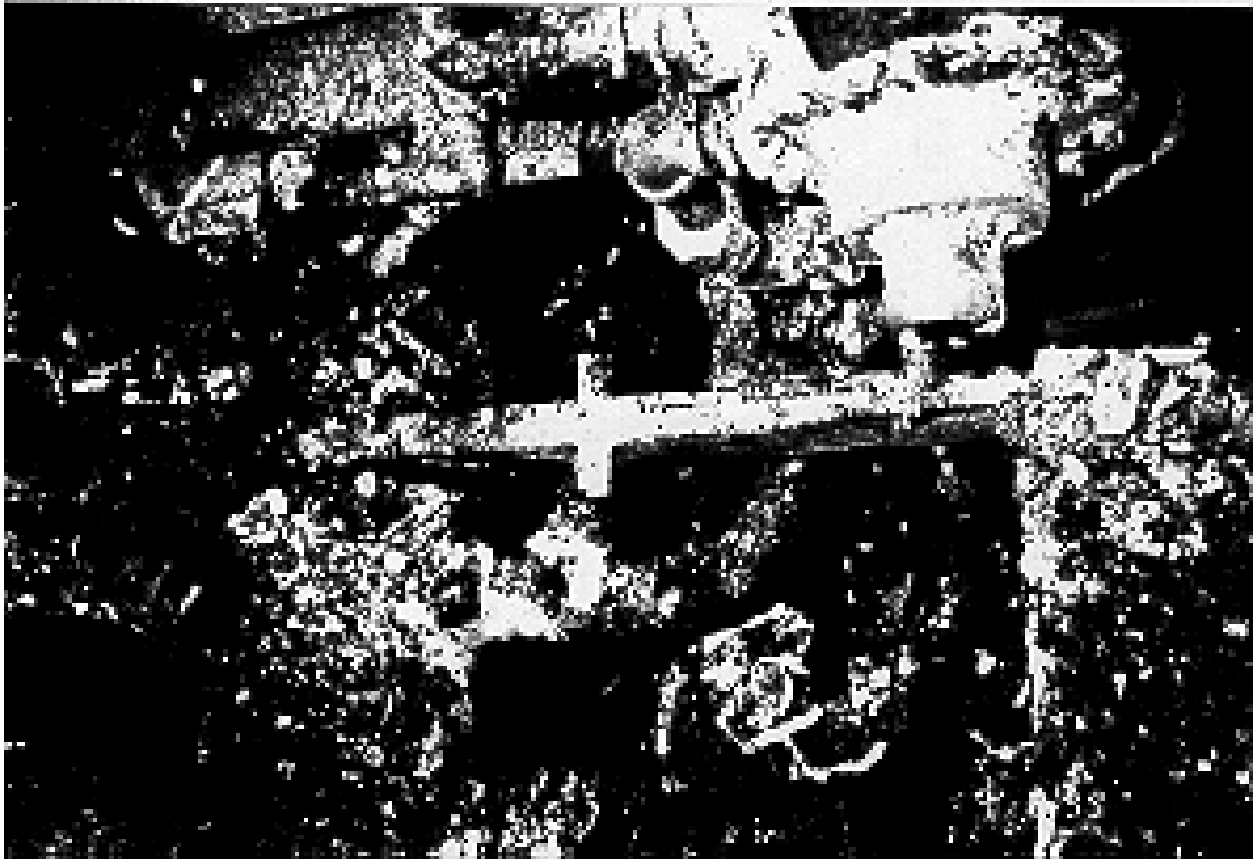
Taken by OHSO Chris Miller.



Photograph #2

The solid blue arrow indicates the metal deck the mechanic was sitting on, his feet and legs in the open area indicated by the solid red arrow. The solid green arrow shows the location of the valve containing the flammable fluid.

Taken by OHSO Chris Miller.



Photograph #3

The red arrow indicates the valve containing the flammable product.

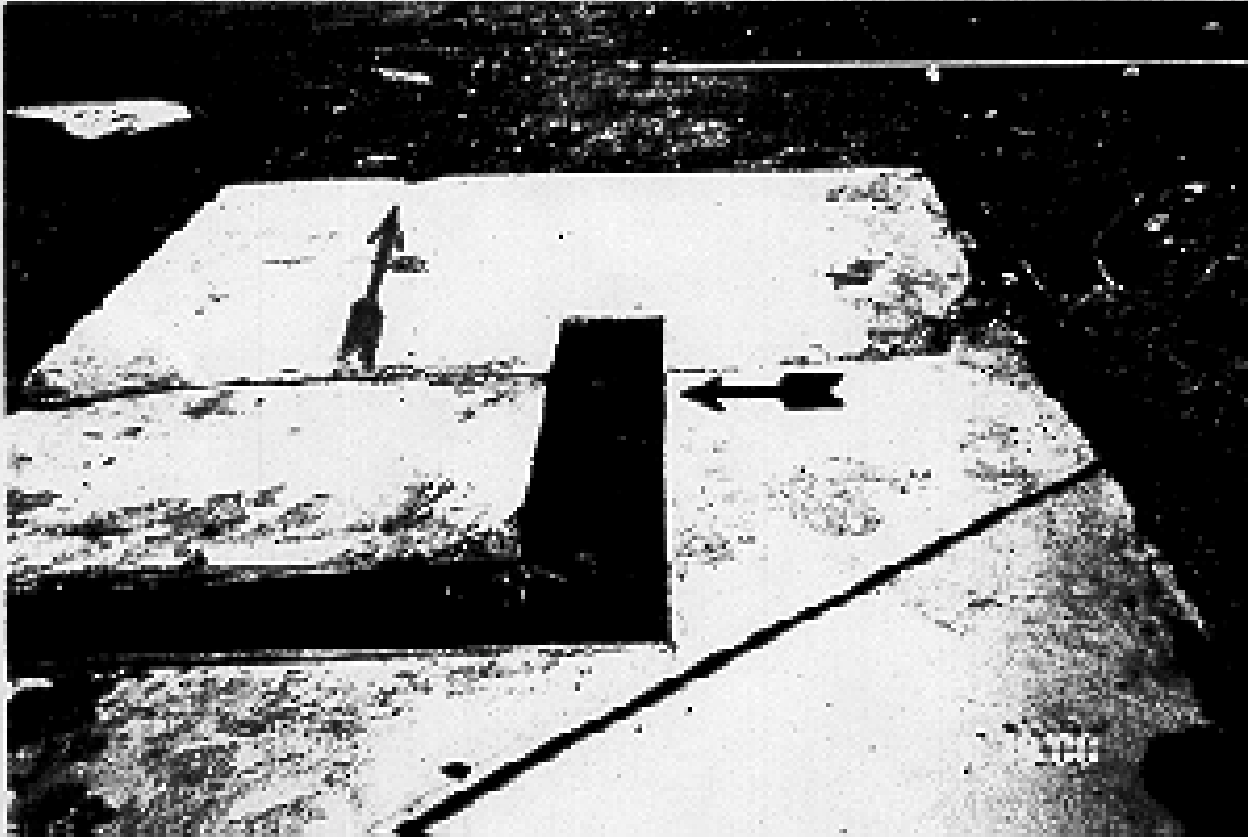
Taken by OHSO Chris Miller.



Photograph #4

This photograph shows the valves and piping leading to the tank compartments on the rear of the truck.

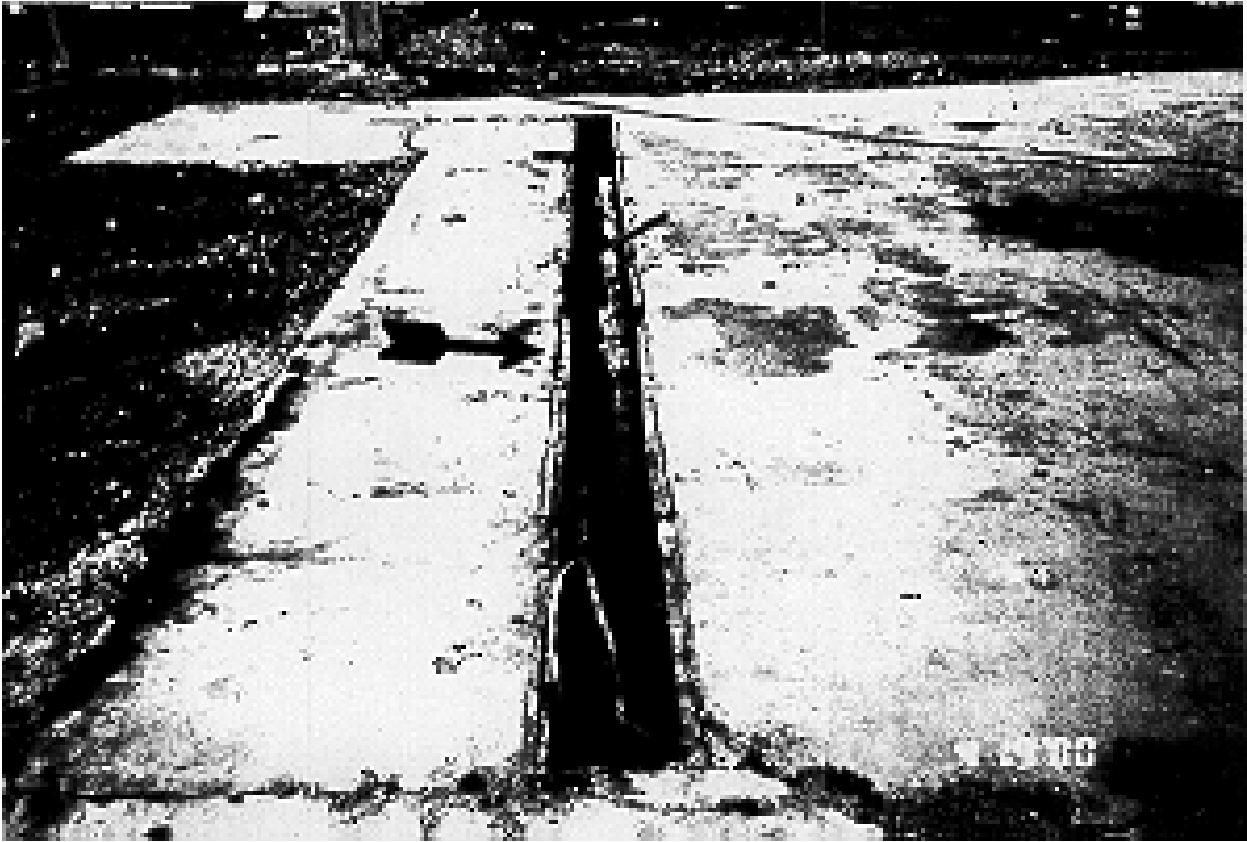
Taken by OHSO Chris Miller.



Photograph #5

A view of the trough that housed the in-floor heating system. The blue arrow indicates the approximate location of the wall between the shop and boiler room. The red arrow shows the boiler room.

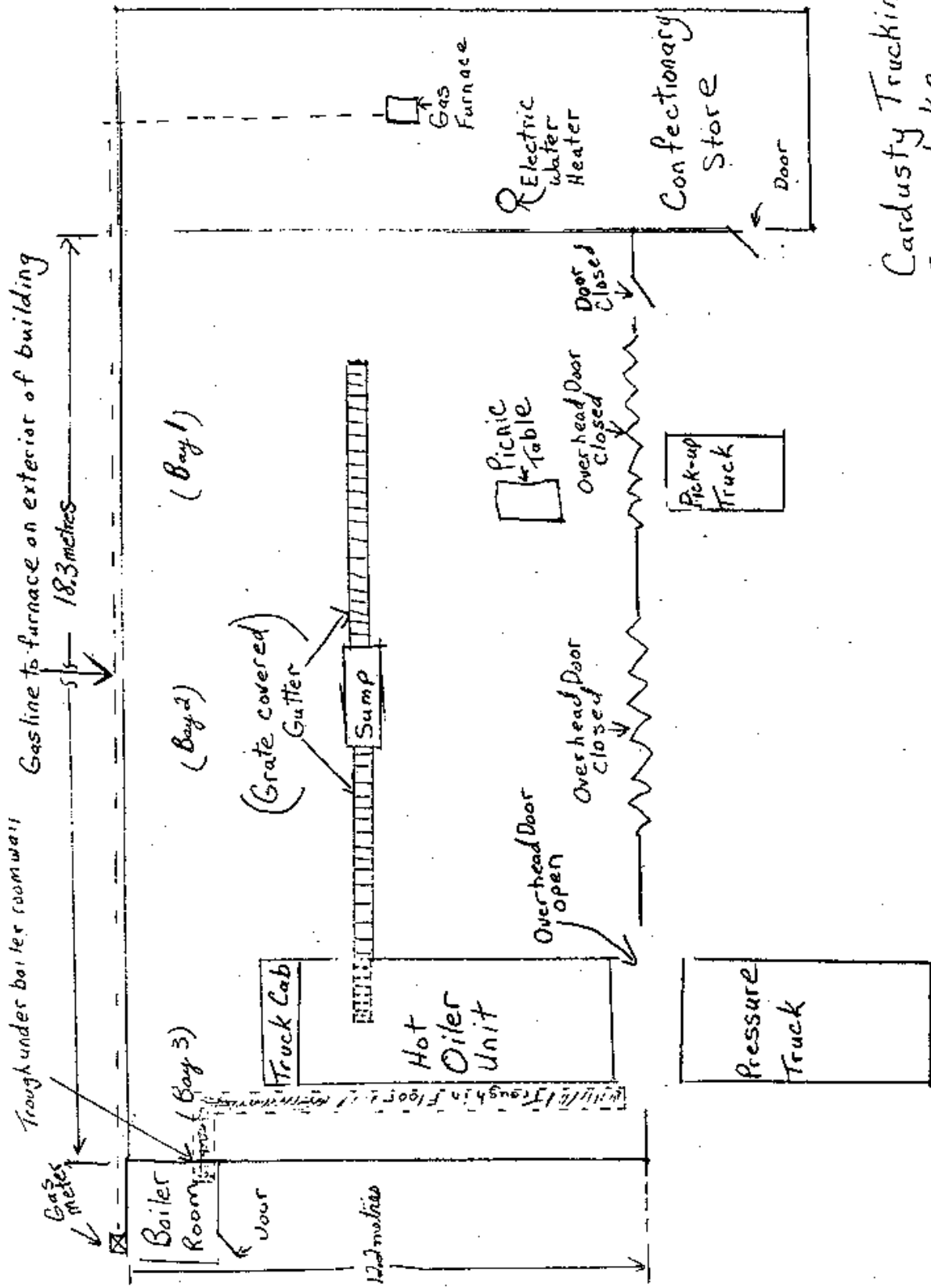
Taken by OHSO Chris Miller.



Photograph #6

Another view of the trough which housed the in-Moor heating system. The blue arrow indicates that the trough ran the length of the shop.

Taken by OHSO Chris Miller.



Cardusty Trucking Shop
 Zama Lake
 Drawing - not to scale
 Drawn by Chris Miller