MEMORANDUM

PRODUCTION PROJECTS

TO: Project Alliance Safety Committee 920220

FROM: D.R.Marier

RE: Sigalarm Proximity Locator - Judy Creek Field Tests

The Sigalarm Proximity Locator was tested under field conditions throughout the Judy Creek 5-20 and 4-8 Groupline Projects completed in December of 1991, and the first two months of 1992.

The 5-20 line paralleled a 25 kv powerline for approximately 500 meters. As we were taking out an existing, abandoned line, the ditchline varied and in some areas wandered in close proximity to the powerline's zone of influence. As we were installing a 323.9 mm groupline, the size of ditch and subsequent spoil pile, when paralleling a high voltage line placed our backhoes and sidebooms in delicate positions, requiring the constant attention of all operators and manpower in the area. The Sigalarm unit fully met our expectations. The audio alarm was mounted just outside the cab of the backhoe, with the control module and visual alarm inside the cab in full view of the operator. Once the sensitivity was selected and set by the operator the alarms operated without fail, except under one scenario. That situation was when the backhoe was directly underneath the powerline with the twin antennae equi-distance from the twin lines. No indication of a powerline was forwarded. As soon as the boom angle changed the alarm was activated. It appears that under this specific and rare condition the energy transmitted from the powerlines cancel each other out, perhaps a single antennae would eliminate this condition, however the advantages of retaining a dual antennae exceed the risks under this rare occurrence. A minor flaw identified with the unit involved the sensitivity control, that being when the backhoe was engaged in strenuous activity in hard or frozen soil the sensitivity control knob had a tendency to wander, throwing off the set and desired minimum distance alarm. A quick fix was to install a rubber o-ring behind the knob to restrict movement. A more permanent solution would be to incorporate a keyed knob, such as a pull out control found on many gas detector calibration controls.
The 4-8 project involved a high risk 25 kv powerline crossing right at the main road to fieldgate. Single and three phase powerlines were also within 20

meters of our planned activities as well. The activities involved a lengthy road bore, and with it large excavations and spoil piles. Again the proximity locator met our expectations. At this stage of the project a high degree of confidence was placed on the device by operators and laborers alike.

Work under high voltage powerlines should only be planned as a last resort, with adequate control measures developed and enforced at every stage of the activity. It is recommended that on future high risk activities around powerlines provisions at the contracting stage be implemented to insist that the Contractor provide a device which would produce similar results as the proximity locator tested. With such an approach, in time, our prime major contractors would acquire the device as standard equipment, and perhaps an infiltration of a similar device would enter the Alberta Industry.

Dennis

Sigalarm High Voltage Proximity Detector - Field Test

Purpose:

-To get a feel for:
  -The ability of the device to perform
  -The sensitivity of the device
  -The adjustability of the device under power lines of varying voltages and conditions (current vs no current)

Conditions:

-Date 91 09 20
-Time 1000-1400
-Temp +12c - +16 c
-Humidity - High
-Wind - light
-Sky - overcast

Test Location

-Bonnie Glen Gas Plant near Mulhurst, Alberta

Equipment

-Sigalarm High Voltage Power line Proximity Warning System c/w 60' antenna and pigtail (18/2 extension cord) and alarm -12v dc power supplied from battery of 1991 Chev Caprice using alligator clips.

Tests and Results

1. The cable was laid on the ground below and perpendicular to a 25kv 3 phase power line. The power line was approximately 25' high. Proximity Warning System (PWS) operated from the front of the car with the engine shut off. Start up sequence operated normally as if power line was in the area (lights and alarm were activated - acted normally throughout all tests). Using the coarse and fine adjustments, the power line could be tuned in and out. With the power line tuned out (but as close to being tuned in as possible), the antenna on the ground was lifted approx 4-6' into the air at the point where it was directly below the power line. This caused the alarm to sound.

2. The antenna of the PWS was strung out approx 100 ft from and parallel to a 25kv 3 phase power line. No other power lines were in the area however a gas line paralleled the power line approx 60' from the power line on the same side as the test. The intent of this test was to see if the device would pick up the power line from that distance (as claimed by the operating manual) and to see how sensitive it was at that distance. Using the coarse and fine adjustments, the power line could be tuned in and out. The device did not alarm when the antenna was dragged along the ground closer to the power line (see test#5 for a possible resolution to this concern). The test was retried with the antenna at a distance of 50'. The same results occurred.

3. The PWS was set up with the antenna strung out in an area where there were no power lines within approx 300 '. This test was done to check the start up sequence in a no power situation. The unit acted normally that is it did not go to it's most sensitive setting and alarm. The unit alarmed once the test button was pushed however the green light (which indicates that the antenna is OK) did not come on. The test was tried several times with the same results. The antenna was then checked with an ohm meter for continuity. This test showed that the antenna was OK.

4. The antenna of the PWS was strung out approx 40 ft from and parallel to a 138kv? 3 phase power line. Using the coarse and fine adjustments, the power line could be tuned in and out. The power line was tuned out (but as close to being tuned in as possible). The antenna cable was lifted in 3 places (each end and middle). The unit alarmed by moving it 3' vertically. AGT cable in the vicinity, no apparent interference. The unit seemed to loose it's fine adjustment (I think this was because the antenna was set back down in a different place than it was picked up from).

5. The antenna of the PWS was strung out approx 30 ft from and parallel to a 25kv 3 phase power line which went to an operating pumpjack (about 500' away). This was a retry of test #2 to see if the results repeated themselves. Using the coarse and fine adjustments, the power line could be tuned in and out. The power line was tuned out (but as close to being tuned in as possible). The antenna cable was lifted in 3 places (each end and middle). The unit alarmed by moving it 3' vertically. While holding the antenna approx 6' above the ground, it was moved horizontally. The result was that the alarm sounded when the antenna got closer and quit when the antenna got farther away. This disproved the results of test #2 and suggests that the earth shielded the antenna in some way when it was moved closer to the power line in test#2.

6. The antenna of the PWS was strung out approx 30 ft from and parallel to a 25kv 3 phase power line which went to a pumpjack which was not operating(about 500' away). Using the coarse and fine adjustments, the power line could be tuned in and out. The power line was tuned out (but as close to being tuned in as possible). The antenna cable was lifted in 3 places (each end and middle). The unit alarmed by moving it 3' vertically. While holding the antenna approx 6' above the ground, it was moved horizontally. The result was that the alarm sounded when the antenna got closer and quit when the antenna got farther away.

Conclusions

-This device works well on the ground and the results seem repeatable.
-Further testing may not be required based on these results (ie. do we need to install it on a crane or similar boom device to prove it works in those conditions).