



ENGINEERING CASE STUDY MYSTERY CURRENT

**By Patrick J. Lynch P.Eng.
POWER LINE SYSTEMS ENGINEERING INC.**

Where is all that current coming from?

This is a really interesting case study. Definitely a phenomena you don't run across everyday.

We initially got the call from a very frustrated cable TV engineer. Apparently, the plastic cable TV splitter boxes were melting off the wall at many homes, however, only in one specific area of town. The outside house cable TV grounds would also generate a "spark" each time an attempt was made to connect it to the outside house electrical utility ground. (Refer to movie link attachment in email.) and/or http://powerlinesystems.ca/users/plynch/arcing_currents_10sec.mpg



FIGURE 1

New plastic cable splitter box installed on the homeowner's wall above the remnants of the other plastic melted cable splitter box.



Numerous groups had been involved over the last year in an attempt to solve this situation. Unfortunately, the problem still remained unresolved.

Generally, this ground current condition will occur when the electrical utility has a loose or high resistance street neutral connection. The house neutral / ground currents will then “seek” an alternate neutral return path. Note: Over the last 30 years of conducting electrical engineering field investigations, we have discovered high ground currents in many hospitals, data processing centres and high tech manufacturing plants. These high ground currents can cause serious operational and life safety issues.

Our engineering group was hired to provide the necessary technical expertise and co-ordination required with all the concerned stakeholders to resolve these issues. The stakeholders consisted of the homeowners, cable company, electrical safety group, distribution electrical utility and the transmission electrical utility.

Actual measurements between these 2 grounds (cable & utility) at this site revealed a 35 Volt difference and over 20 Amps of current flow between these 2 grounding systems.

The first logical step was to provide complete electrical isolation in an effort to determine this current source. The distribution utility powered down all the street transformers providing power to all these homes (approximately 100-150 homes involved). In addition, the cable company powered down their trunk amplifiers and physically disconnected all wiring for power and cable signal to this entire area (to rule out the possibility of any electrical backfeed into this community). NOTE: At one point during this investigation, there were over 8 bucket trucks and crew, as well as, 15 additional service trucks involved in this project.

With all this electrical isolation, the 20 Amp current problem still didn't go away. The burning question still remained. **Where was this current coming from?**



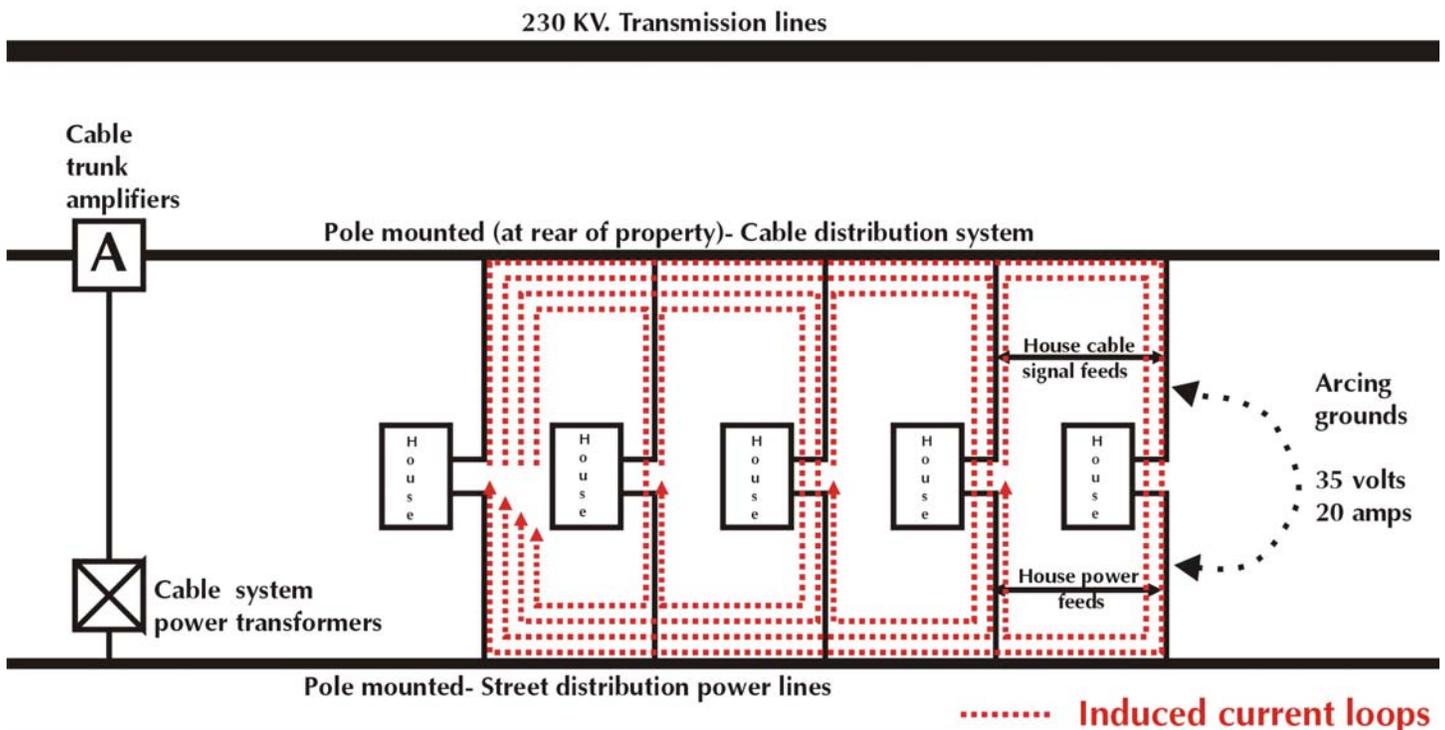
PHASE 2 – ADDITIONAL ENGINEERING INVESTIGATIONS

We then took a #4 gauge copper insulated wire and electrically connected both ends together to form a 5' foot diameter loop. We measured over 1 Amp of circulating current in this loop of wire at the front of these houses. Moving this same “sensing” loop of wire to the back of the house property line, produced over 2 Amps of circulating loop current.

Directly behind these houses, was a 230 KV. high voltage transmission line corridor. It would appear the 60 Hz. magnetic field generated by the current flow through these transmission lines was magnetically inducing current to flow into this 5' foot diameter loop of wire.

A much larger magnetic induction loop had been inadvertently created between the electrical distribution utility power ground system and this cable TV installation. This larger loop area, perpendicular to the 230 KV. transmission line magnetic fields, then allowed a correspondingly higher 20 Amps of circulating current to flow.

ELECTRICAL LAYOUT ARRANGEMENT -TOP VIEW





SOLUTION

As they say in real estate, “location, location, location” is the most important thing to consider in buying a house. At this particular site, cable location, also played a pivotal role in the proper operation of the electrical power / cable systems in this area.

To reduce this induced current loop area, would require the complete relocation of this cable system for this community. This would involve the teardown and rebuild of this entire cable system. We arranged for the distribution utility to immediately grant access for this new cable system to be installed on their street utility poles. Note: Normally this utility pole access permit approval process could take up to 2 months. All the on-site truck crews were then immediately transferred to the cable infrastructure rebuild process.

After the rebuild was complete, the circulating current between the grounds in these 2 systems has now been reduced to less than .5 Amps for this entire community.

Patrick J. Lynch, P.Eng
POWER LINE SYSTEMS ENGINEERING INC.
(905) 294-5468
plynch@powerlinesystems.ca

This engineering case study may not be reproduced in whole or in part without the expressed written permission of Power Line Systems Engineering Inc.