Problems in Locating Electrical Leaks

Bulletins 002, 003, 004 have described three methods of locating electrical leaks in electro- mechanical cable. There are four problems which when encountered increase the difficulty in locating the leaks.

1. Wet Leaks: An electrical leak occurs when there is a rupture in the plastic insulation surrounding the copper conductor. Sometimes there is direct contact between the copper and the armor wires, (dead short), other times there is burnt plastic from the break down process that leaves a carbon trail between the copper and armor, and in other cases there is moisture in the cable between the copper and armor forming a "wet leak".

   The armor wires are covered with a Zinc coating. Zinc is above and Copper is below Hydrogen in the electromotive series of metals, so when they are in a conductive medium, such as salt water, there will be a voltage generated between them. In the case of Zinc and Copper the voltage is about 0.83 volts. If you would like to run a little physics experiment, simply clip a short piece of armor wire to the negative lead of a digital voltmeter and the positive lead to a piece of copper wire and place them in a glass of salt water. The meter will indicate a voltage in the range of 0.83 volts. This voltage in a leak can significantly distort the location of the leak.

   To determine if you have a wet leak, first measure the resistance of the leak and then reverse the leads of the ohmmeter. If you have a wet leak there will be a significant difference between the 2 resistance measurements. The wet leak can be dried out by repeated application of voltage from a Hi-pot or a " burn out box".

   If you are not equipped to burn out the leak, then using the resistance method, (Technical Bulletin 002), calculate the distance to the leak, Lw, and then reverse the polarity of the Ohmmeter and again calculate the distance to the leak Lw'. Take the average of these two values, (Lw +Lw')/2 and this will be the correct location.

   Some leak locator bridges have a polarity switch built in to obtain the values of Lw and Lw'. Again the correct location will be the average of the two readings. If a reversing switch is not included, then swap the TRUCK and WHIP connections to get the value of Lw'. Again the correct location will be the average of the two values.
2. Very High Resistance Leaks: are leaks of greater than 10 Meg Ohms and require the repeated application of Hi-pot voltages of several thousand volts. Once the leak is less than one Meg Ohm, the burn out box can be used to reduce the leak to several hundred or less Ohms. As mentioned in previous Bulletins, the " burn out box" is a DC power supply with an adjustable output up to 600 or 800 volts with a current capacity of 1 to 3 amps. This type of power supply is LETHAL, so must be used very cautiously!!!
3. Multiple Leaks: There is no straight forward way of locating multiple leaks. Generally when multiple leaks occur they are all fairly close together. The best approach is to use any of the described leak locating methods and cut the cable and check both pieces of cable using the same locating methods and cut again. After all the cutting, be sure to Hi-pot both lengths of cable, to ensure they are clear of leaks before they are spliced back together.
4. Intermittent Leaks: are leaks that are not always present. These type of leaks typically are noticed during a job, and later when the cable is brought to the cable shop, the cable tests clear. If the leak does not appear when the cable is tested at 1,000 VDC, then to get the leak to reappear the cable is spooled back and forth in a number of ways while watching the ohmmeter to see when the leak occurs. Some shops pass the cable around a capstan, through a post former or around several sheave wheels. Spooling is done at very low and then at very high tensions. Once the leak reappears the spooling is stopped and the leak is located using one of the standard methods.