ELECTRICAL SAFETY CODES

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The cable television industry has improved our television viewing for many millions of people. Our industry has contributed to the high technology of the world we live in. We now deliver TV signals of many varied program sources, and we also transport digital signals in our cable systems in both directions. We now use computers in our everyday working on our systems; i.e. doing our billing, system design, and addressing converters. We spend many hours maintaining our systems so that our subscribers have 24 hour service. The various jobs which we perform all have a basic underlying motive-to operate a profitable business and do it safely.

We have built most of our cable systems using the finest equipment available. We phase lock our head inns, provide interactive two-way transmission, and even turn on and off the TV signals at the subscribers TV from the office with a computer. We have accomplished this under an ordinance called a franchise, which the city fathers grant us. We all have read our franchises and in them we find that we must abide by various codes; i.e. National Electrical Safety Code, National Electrical Code, and others. Most system engineers have copies of these code books, most not current, but why should we have current ones when the ones we have don't make any sense? When we try to read them we wonder if a lawyer who didn't know who Volt was, or which end of a piece of copper wire was positive or negative, wrote these code books in his spare time!!!!!

When you ask someone about the code, they usually give you a strange look and either change the subject or bluff their way through the answer. Everyone seems to have some idea what the code is, but are just not quite sure as to what the code actually says!!! I will try to clear some of the mystery concerning the safety codes and hope that cable operators will begin to pay more attention to this most important subject.

This paper will concern itself with only two of the many codes which we might operate under. The first is the "National Electrical Safety Code" which concerns itself with our physical outside distribution plant. The second is the "National Electrical Code" which concerns itself with the installation of our cable drops into buildings and homes.

Both codes have one main primary objective--electrical safety to our personnel who work on the cable television plant and electrical safety to the subscribers who we have hooked up to our cable television plant. "Safety" is the key word and if we use this as our main goal in providing cable television service to our subscribers, we will accomplish the following:

1. Make our cable television systems safe from electrical shock hazzards to our company personnel.
2. Make our cable television systems safe from electrical shock hazzards to our subscribers.
3. Reduce our liability to the general public and to ourselves.
4. Ensure that our cable television plant is at the same "ground potential" as the telephone plant and the power system.
5. Reduce our system down-time because of better grounding paths for electrical disturbances with no difference of potential between our system and the phone or power systems.
6. Reduce converter/descrambler failures because of better ground paths and equipotential systems in homes and buildings.

It is now becoming clear how important it really is to pay much attention to the mysterious code books and begin to use them as a good source and foundation to build an effective and grounded cable television plant. The small costs of bonding strands together, bonding to existing verticles and even driving ground rods is insignificant compared to the potential costs of system down-time. Subscriber grounding and bonding is also small in cost compared to the replacement and repair of converters costing $80-150.

The utilities have had much experience in the field of being liable for damages caused directly or indirectly by their plants to the property of others. The cable television industry has had little experience in this field, and as we begin to provide services to subscribers in areas of protection of both life and property, we will be forced into situations where we are going to be held accountable for our actions. Sound engineering practices based on existing codes will benefit our cable television plant and reduce our liability.

The code books have order to them in the way they are written and once that is understood then making some sense of the code becomes clearer. The codes are written ambiguously and are subject to interpretation and that is what makes them hard to understand. The best hint for understanding the code books is that they are written like a novel one would buy at the book store. You have to start at page one and build and progress on previous sections until you arrive at the section or topic which interests you. Unlike an encyclopedia, in which one can pick a particular subject, turn to that page and read and understand with no reference to prededing chapters and sections. One example of this in the code is the definition of "Electrode" which one possibly considers a simple ground rod. This is not the case and one must search for the exact definition and also be aware that there are heirarchies of "Electrodes". A 3, 4, or 6 foot ground rod does not constitute a grounding electrode anywhere!!!!!! A manufacturer produces these lengths of ground rods because someone wants to buy them. Nothing less than an 8 foot rod will meet code, of specific material and diameter, and shall maintain at least 25 ohms to ground at all times. In other words, if in the winter time the frost level is deep enough to increase the ground resistance to more than 25 ohms to ground, then a longer rod is required or you do not meet code. The same applies in sandy soil. But, of more importance, if you do not maintain low resistance paths to ground, where do you think that surges go if your electrode resistances are too high...they propagate down the cable into your amplifiers and then you have an outage.

Another example is the grounding of our strand. The NESC says that no less than 4 connections per mile, which translates to about every 1st, 10th, and last pole in our plant, are necessary. This is not good enough in this day and time. We should bond and ground everywhere we can at every pole we can, as this reduces the differences of potential between us and the other utilities. It is the difference of potential that causes failures in 99 per cent of the outages, and not defective transistors. Remember that every time we double the number of ground paths we cut the resistance to ground in half. An effective ground has to be less than 2(two) ohms to ground. A 25 ohm ground is ineffective in shunting lightning to ground...again one must be concerned with bonding conductor size, bonding materials, and proper methods of bonding and grounding. Old wives tales which have been passed down through the ages from grunt to grunt, lineman to lineman, and technician to technician have no place in todays cable television plant.

A word of caution--if the power company uses a delta distribution system in changing from primary AC to 120/240 AC you should not bond the cable TV strand to the power company vertical grounding wire...install your own grounding system on the poles and protect the last 8 feet of your grounding vertical with a mechanically strong insulated guard securely fastened to the pole. The ground rod must be equal or below ground level and must provide at least 25 ohms of resistance (or less) to ground in its most adverse condition.

The National Electrical Code prescribes the method in which a home or building should be grounded. A device such as a grounding block is needed to ground the outside shield of our coaxial cable. A green wire, not smaller than #18 is now used to connect the ground block or device to the grounding electrode system of the home or building. In order to sustain the least liability, the attachment point is where the power company attaches their neutral to the grounding electrode system of the building or home. This point can be more difficult to locate than you think, but if you find the grounding conductor out of the fuse panel, then you can connect anywhere along this grounding conductor. Using the same grounding point the phone company uses does not constitute an effective ground according to code...the phone installer may have used the wrong point of con ection...and two wrongs do not make a right! If this is not readily available then your own grounding electrode can be installed (not less than 8 ft. in length made of the required material) and must maintain less than 25 ohms to ground in worse condition.

I hope that this paper sparks interest in this most difficult subject and that we will begin to follow code. It not only reduces our liability to the general public, it even helps prolong longetivity of our cable systems.

Code books have committies and the people on the committies have names and phone numbers and should be called when one has a question about the code. The power company and phone company are also very good and informative sources as to questions, but be weary of "wives tales". Undertaking the task of understanding the codes is not an easy project, and it will take many hours even before daylight is seen at the end of the tunnel...but it is worth the time and effort.

The latest edition of the "National Electrical Safety Code" can be obtained from the Institute of Electrical and Electronics Engineers, Inc. 345 East 47th St., New York, NY 10017.

Latest editions of the "National Electrical Code" can be obtained from your electrical wholesaler in your community.

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