C28 Safety Code Violations, Corrections, and Replacements

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The goals of this research project are to illustrate electrical code violations, to demonstrate that code violations do not cause immediate damage and to discuss repair or replacement of violating equipment.

This presentation will impact the forensic science community and/or humanity by educating them about electrical hazards, safety, damage and repair.

A video presentation of an electrical fire scene will be utilized to illustrate electrical safety code violations. The damage caused by the violations will be shown and the repair of the electrical system will be discussed.

One evening the resident of a very fine home in a very exclusive neighborhood returned home. The electric gate at the entrance to the property worked okay. The driveway and property was lit as usual in the evening. However, the resident noticed an unusual glow in the front windows of the house's piano room. Upon entering the house, smoke was discovered but there was no alarm, since the house did not have smoke detectors. The fire department was called to extinguish the fire. Upon arrival the fire department found the fire emanating from electrical wiring within the walls of the building. Normally, the fire department turns off electrical power to a burning building before attacking the fire because it presents a shock and electrocution hazard for the firemen. The contaminants in water are good conductors of electricity and fire hydrants are good ground conductors. This can result in serious injury to firemen. However, the firemen had difficulty turning off the electrical power in this burning building. After turning off the building's main circuit breaker, their thermal imaging equipment indicated that wiring in the walls and beneath the building was still overheating and energized. Subsequently, the fire department turned off the electric power at the building's remote electric meter box and extinguished the fire. The fire department informed the residents of the fire building that the entire electrical system of their home would probably have to be replaced.

The remote electric meter box was surrounded by poison oak. It was corroded with vegetation and insects were found inside. Its cover was not closed and its neutral was not grounded as required by the National Electrical Code. Conductors were found attached to the two pole 200 ampere circuit breaker in the distribution section of the meter box, which fed into the meter box. These conductors were rated at 40 amperes and they would not be properly protected by a 200 ampere circuit breaker. In addition, utility companies do not permit customers to pull conductors through a meter box. The conductors went to a distribution box mounted on the left side of the meter box. However, the conductors could have been used to bypass the meter and steal electricity. These conductors should have been noticed by the utility meter reader and eliminated prior to the fire. Whoever installed the conductors violated the National Electrical Safety Code by working in close proximity to energized electrical conductors. The illegal box attached to the left side of the meter box was corroded with vegetation and had insects inside. It fed electrical power to a duplex receptacle mounted on the support for the meter box. The duplex receptacle previously supplied power to outside wiring. Evidence of burning was found on the conduit to the receptacle. Apparently, the outside wiring powered by the receptacle had overheated and caused a previous fire. Afterwards, the outside wiring was powered by splicing into the main service cable to the building in an underground splice box. The splice box was not sealed to keep the elements away from the splices or the conductors, which were not rated for outdoor or underground use. A number 12 AWG copper wire, which is rated at 20 amperes by the National Electrical Code, was found spliced directly to an aluminum cable rated at 200 amperes. The 200 ampere circuit breaker in the meter box would not prevent the 20 ampere wiring from overheating when current above 20 amperes passed through it. The 200 ampere circuit breaker in the meter box was the only overcurrent protection in the circuit. This explains why the house circuit breakers did not de-energize the outdoor wiring. In addition, it is a violation of the National Electrical Code to splice copper conductors directly to aluminum conductors. The dissimilar metals react and cause connection problems. The outdoor splices were made approximately four years before they failed and caused a problem. A neutral conductor from the house panelboard had been brought out to the splice hole. When the spliced conductors failed, they energized the neutral conductor into the house. The energized neutral conductor in the house eventually found a path to ground in a receptacle in the house. The amount of current in the conductor/wire was only limited by the resistance of the wire and its connections. Therefore, the current exceeded the rating of the wire. The overcurrent caused the wire to overheat and ignite combustible materials located near it. Heat damage was also found in the fire building's main panelboard where the overheated neutral conductor/wire was located. This panelboard contained many electrical code violations. It was not labeled, properly grounded or wired. A subpanel in the building was also defective. Wallcovering material had been sprayed into it while its cover was off. The material would affect the connections in the panelboard and the response of the circuit breakers to overcurrent. Bad connections will overheat and result in electrical breakdown and failure. Non-responsive circuit breakers will permit overloaded electrical circuits to overheat and cause fires.

The repairs to the electrical system involved eliminating the code violations. The wiring through the meter box was removed. The distribution section of the meter box was cleaned out and properly grounded.

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The outdoor splice box was replaced with a sealed box rated for outdoor use. Outdoor wiring was replaced with wiring rated for outdoor use. The main panelboard in the house was replaced, correctly wired and grounded. The subpanel in the house was replaced.

Code Violations, Electrical Damage, Electrical Repair

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