



# Electrical Forensics Engineering

An Online Continuing Education Course for Engineers

**Course Number: E-4074**

**Credit: 4 Hours / 4 PDH / 4 CPD**

# Electrical Forensics Engineering

## Table of Contents

Section	Pages
1. Introduction	4
2. Some History	4-5
3. Electrical Circuits	5-11
4. Electrical Power	12
5. Electrical Energy	12-13
6. Temperature	13-14
7. Temperature Effects of Current Flowing Through Conductors	14-17
8. Temperature Effects on the Human Body	17
9. Electric Arcs	17-25
10. Ohmic High Resistance Connections	25-27
11. Electric Heaters, Another Source of Ohmic Heating	27-29
12. Grounding	29-31
13. Arc Fault Circuit Interrupters	31
14. Industrial and Commercial Accidents	31-33
15. Lightning	33
16. Process of Investigation	33-35
17. Conclusions	35
18. References	36-37

## List of Tables and Charts

Title	Page
1. Chart 3.1 Effect of Current Flow on a Human Body	8
2. Chart 5.1 Relationship Between Joules and Other Energy Measurement Systems	13
3. Table 7.1 Temperature Coefficient of Resistance of Some Common Conductors	16
4. Chart 8.1 Temperature Effects on the Human Body	17
5. Table 9.1 Melting and Boiling Points of Some Common Elements	19
6. Chart 10.1 Auto Ignition Temperatures of Some Common Materials	27

## List of Drawings

<b>Number</b>	<b>Title</b>	<b>Page</b>
3.1	Commonly Used Symbol for a DC Voltage Source	5
3.2	Graph of DC Volts Versus Time	6
3.3	A Common Symbol for AC Voltages	6
3.4	One Cycle of a 120 VAC Waveform	7
3.5	A Resistive Load Placed Across a DC Voltage Source	7
3.6	Drawing Showing 1 Circular Mill	9
3.7	Graph of Arc Voltage Versus Arc Current for an Arc Welder	10
3.8	2000 Amp Arc with a 44 Volt Battery	10
3.9	Ohm's Law Example	11
3.10	Example Showing Power Dissipation By a Resistor Across AC And DC Sources	12
7.1	Drawing Showing Area of 1 Circular Mill	14
7.2	Drawing Showing How Resistivity Is Used	15
7.3	Graph Showing the Relationship Between Resistance and Temperature for Copper	16
9.1	Sketch of Pin and Socket Electrical Connection	18
9.2	Sketch of a Melted Bead on the End of a Piece of Wire	19
9.3	Picture of an Arc Flash Test	21
9.4	Two Ways for an Arc to Form In a Three Phase System	22
9.5	Sketch of Power System Without Buss Bar Protection	23
9.6	Sketch of Incident Where Arc Occurred Inside EMT Conduit	24
10.1	Circuit Showing Switched Light Bulb	25
10.2	Circuit Showing a Switch with a High Resistance	26
11.1	Circuit Showing Protection Devices for a Resistive Heating Load	27

<b>12.1</b>	<b>Schematic of a Standard 120/240 Volt Service Entry</b>	<b>29</b>
<b>12.2</b>	<b>Schematic Showing Ground Connection from Voltage Source To Appliance</b>	<b>30</b>
<b>12.3</b>	<b>Diagram That Shows How a GFI Protects Against Electrical Shock</b>	<b>30</b>
<b>13.1</b>	<b>Diagram of How a AFCI Works</b>	<b>31</b>
<b>14.1</b>	<b>Test Set Up for Explosion Proof Devices</b>	<b>32</b>

## 1. Introduction

The original meaning of Forensics is from the Latin word **forensis**, which means "of or before the Forum." In Roman times, a suspected criminal would be tried before a group of people in a public debate. Both the suspected criminal and his accuser would give their side of the story in front of the group of people, who would then render a verdict based on what the two orators said. It is quite possible, in this kind of trial, that the party who was judged right was only the party who could speak the best. Justice was not necessarily served. There are two modern meanings of the word Forensics. They are 'a category of public presentation' and 'a form of legal evidence.' In this course, we are using forensics as the application of science to answer questions of interest to the legal system. Specifically, we will be concerned with Forensics investigations in the Electrical Engineering field.

We have come a long way from the original meaning. We are now interested in studying the cause of failures by a scientific investigation of the evidence left behind after a failure. This can be difficult because the evidence is often destroyed or damaged by the failure or the results of the failure. However, today's investigators are often able to determine, with a fair degree of confidence, the probable, possible, and sometimes definite cause of failures. They employ modern scientific methods which use microscopes, including scanning electron microscopes, x-rays, laser devices, chemical analysis, and close studies of the evidence left behind after a failure. These investigators are employed by insurance companies, law enforcement authorities, and the courts. Electrical engineers in the Forensics field are limited to making testimony only in their field of expertise. We cannot testify as a Certified Investigator, only as a Professional Electrical Engineer. In the case of fires, we can only say that an electrical event could have or could not have been a competent ignition source. And then, we use the terms 'possible' or 'probable' or rarely 'definitely.' Our opinions will be questioned and disputed by opposing interests. Therefore, we must have a real understanding of the basics of electrical theory. We must also have a practical understanding of the effects of electrical energy on materials, equipment, and the human body. And there is often a "sixth sense" that doesn't tell what happened in an event but instead points our noses in the direction to look when investigating a case.

## 2. Some History

One of the early documented cases of Forensic science was by Archimedes, who lived from 282 to 212 BC. By using the displacement of water by a crown, he could determine that it was not made of pure gold as was claimed. In this case, it was not possible to melt down the crown and determine by volume whether the crown was pure gold or not. Archimedes determined the volume of the metal in the crown by how much water it displaced and then determined by its weight that it was not pure gold.

In the seventh century, fingerprints were used by an Arab merchant, Soleiman, to identify a stolen item. The fingerprints were then be given to the lender. The fingerprints were used to identify the thief.

The first written forensic case is attributed to the Chinese physician Song Ci in the Song Dynasty China. He was a physician with a sickle who was called to the death to bring the body to the court. He gathered on a single piece of wood on how to distinguish between cartilage), along with the body by murder, suicide, and

In sixteenth-century Italy, physicians in army and university settings began to gather information on the cause and manner of death. Ambroise Paré, a French army surgeon, systematically studied the effects of violent death on internal organs. Two Italian surgeons, Fortunato Fidelis and Paolo Zacchia laid the foundation of modern pathology by studying changes that occurred in the structure of the body as a result of the disease. In the late 1700s, writings on these topics began to appear. These included: "*A Treatise on Forensic Medicine and Public Health*" by the French physician Fodéré and "*The Complete System of Police Medicine*" by the German medical expert Johann Peter Franck.

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