

Chapter 7

Time Overcurrent (51) Element Testing

1. Application

The 51-element is the most common protective element applied in electrical systems. It uses an inverse curved characteristic and operates faster as the fault magnitude increases. There are many different styles of curves in use and each style mimics a different damage characteristic of equipment or systems. The most common curve characteristics used in North America are usually described as ANSI or U.S. Curves. Some relays allow you to select European curves usually described as IEC curves. All of these curves are mathematic models of electro-mechanical relays to allow coordination between different relay generations. General Electric used special curves for their IAC electromechanical relay line and some relays also have these curves available. Some relays also allow the user to enter custom curves to create specific protection curves unique to a specific piece of equipment (like motors) but this feature is seldom used. See examples of the different styles of curves with identical settings in the following TCC drawings. Notice that the x-axis values have changed to represent a multiple of the element's pickup setting. This is typical for 51-element curves so that all curves can be compared without site specific values. Most manufacturers display their curves in multiples of pickup or its equivalents, "percent of pickup" or " I/I_{pk} "

Testing Digital Relays – A Practical Guide from the Field

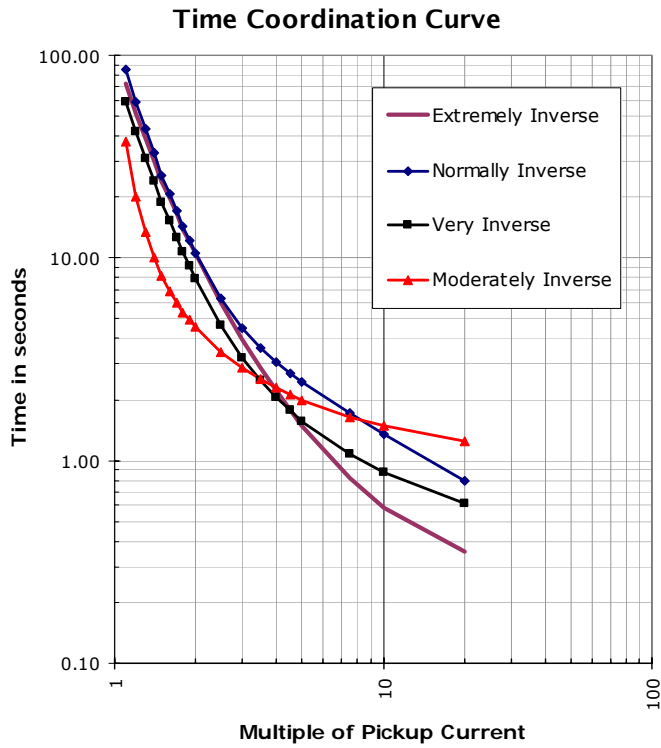


Figure 7- 1: 51-Element North American Curves

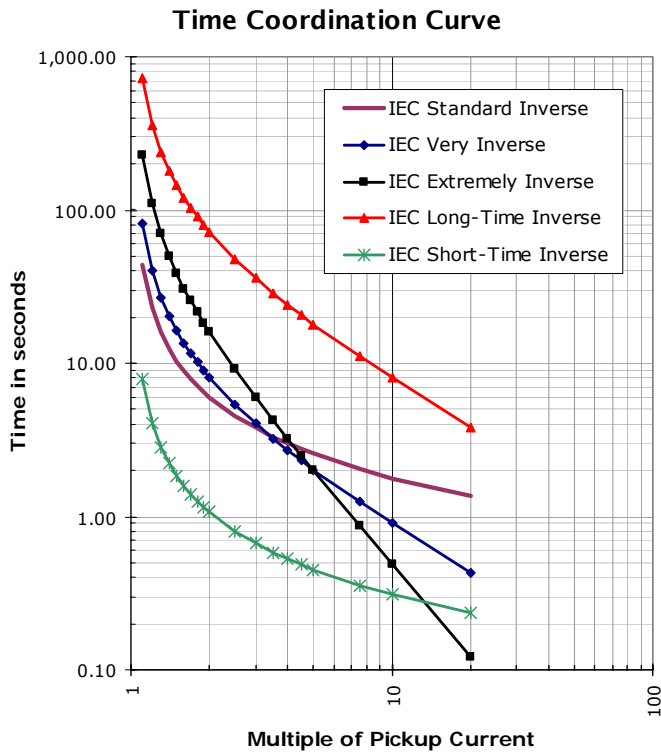


Figure 7- 2: 51-Element IEC European Curves