

## IEEE Standards Interpretation for IEEE Std 80™-2000 IEEE Guide for Safety in AC Substation Grounding

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29 July 2002

### Interpretation Request #1

The latest IEEE Std 80 standard (IEEE Std 80-2000) has published Biegelmeier Z curve for the body current (Figure 5) but the standard does not comment much on the curve. Since the Biegelmeier curve forms the basis of IEC 479-1 specification, which seems to be used in Europe, can the working group for IEEE Std 80 provide some comments on the accuracy of the Biegelmeier curves compared to the Dalziel curves that are currently used in IEEE Std. 80? Has IEEE considered harmonizing the standards IEEE Std. 80 and IEC 479-1, when it comes to safe human body currents?

### Interpretation Response

The design equations in IEEE 80 from the 1961 edition to the 2000 edition were based on the work done by Charles Dalziel. Working Group D7 was very aware of the work Biegelmeier had done and that it is the basis for IEC-479-1. It was necessary for the Working Group to consider Biegelmeier's work and make the comparison between Biegelmeier and Dalziel since Dalziel's equations are such an integral part of the safety aspect of IEEE-80 and the Working Group needed to justify its continued use. The reason Figure 5 was presented in the 2000 edition of IEEE 80 was to give the reader a visual comparison between Biegelmeier Z curve and Dalziel's equations. The comparison shows the Dalziel equation with  $k = 0.116$  is more conservative than the Z curve for times between 0.06 and 0.7 seconds. Typical substation fault clearing times fall within this timeframe. The Working Group concluded this was enough information to justify the continued use of Dalziel's equation and no deeper explanation was needed.

The goal of the Working Group is to continually improve IEEE-80, not necessarily to harmonize with IEC-479-1. As the science of human response to electric shock increases, the equations in IEEE-80 may need to be modified as well as those presented in IEC-

479-1. The Working Group will continue to investigate and review new information as it become available and how it pertains to substation grounding system design.