

*A 2-Day Technical Seminar on*

# Rating of HV Underground Power Cables

*- Calculations & Practical Considerations*

by  
**Earle C. (Rusty) Bacom, III**

## What you will learn?

- Understand the basic ampacity calculation procedures and perform a hand calculation
- Appreciate the importance of understanding the thermal environment and soils
- Evaluate the implications of load shape, charging current & impedance on ampacity

## Overview

As with any transmission and distribution equipment, calculating the power-transfer-capability (**cable ampacity or rating**) of a cable system is ultimately the most critical part of designing or specifying the cable construction and trench configuration and for continued operation. Analytical methods from the early 1900s were first formalized in the 1957 paper by J.H. Neher and M.H. McGrath and have seen ongoing refinement through the International Electrotechnical Commission's subsequent development of IEC 60287 and related ampacity standards.

This seminar serves power cable users by providing an in-depth evaluation of the basic technical concepts related to cable ampacity including cable and trench constructions as well as background on soil and backfill characteristics and thermal testing. This background is the basis for a presentation on the analytical methods for performing ampacity calculations including worked examples that will be discussed and presented in this seminar. Computer spread sheets may be distributed to attendees to help illustrate example calculations, and demonstrations and videos will augment the classroom presentations.

By attending this seminar, attendees will gain an understanding of the important considerations for calculating the ampacity (or rating) of underground cable systems and a general understanding of specialized circumstances that should be considered when evaluating ampacity such as the impact of load shape, pre-load conditions for emergency ratings, mutual heating from parallel and crossing cables, and specialized installation methods that can affect ampacity (directional drilling, submarine, etc.).

This 12-14 hour seminar will be presented over two days in a classroom setting using lectures, in-class discussions and example calculations.

Attendees may wish to bring a notebook computer or hand calculator to the class, but this is not absolutely required.

## About the Seminar Leader

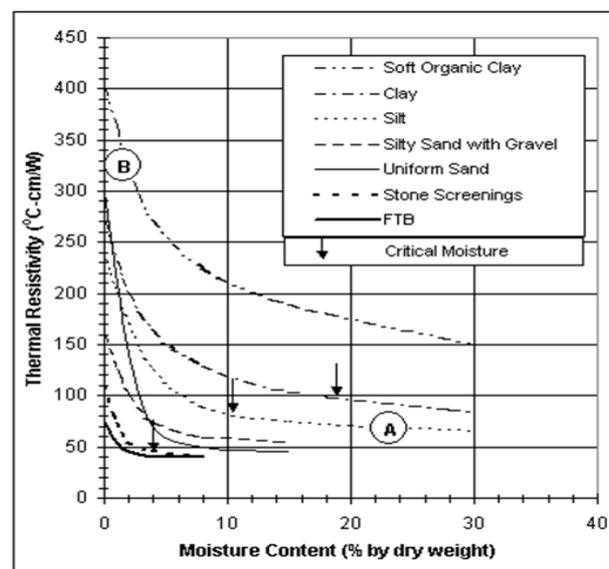
### Earle C. (Rusty) Bascom, III

This course will be presented by **Earle C. (Rusty) Bascom, III**, Principal Engineer with Electrical Consulting Engineers, P.C. Mr. Bascom has over 20 years of experience focusing on the analysis, design, research and education on underground transmission and distribution cable systems.



Mr. Bascom has performed numerous ampacity and uprating studies, has developed numerical methods for cable ratings, was the principal developer of the ampacity module in the Electric Power Research Institute's Underground Transmission Workstation, and is a member of the CIGRE Working Group B1.35 that is focused on ampacity topics. He authored Chapter 11 on ampacity of the 2006 edition of EPRI's *Underground Transmission Systems Reference Book*. He is active in the IEEE, Power & Energy Society, Standards Association, and contributes to several working groups and discussion groups of the Insulated Conductors Committee.

Mr. Bascom holds an A.S. degree in Engineering Science from Hudson Valley Community College in Troy, New York, a B.S. and M.E. degrees in Electric Power Engineering from Rensselaer Polytechnic Institute in Troy, New York, and an M.B.A. degree from the State University of New York in Albany. Mr. Bascom is a licensed professional engineer in the states of New York, Florida and Texas and has authored 40 technical papers or publications and holds one patent.



### CPD Recognition

This training program is especially designed to meet the Continuing Professional Development (CPD) needs of participants. A Certificate of Attendance will be awarded at the end of the program. This serves as evidence of your personal and professional commitment to your career.

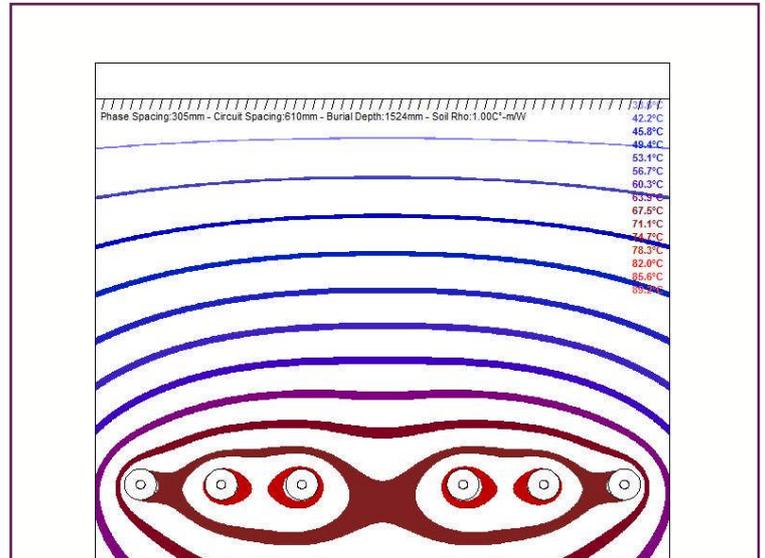
# Seminar Outline

## DAY 1

1. **Introductions, Summary of Course Goals**
2. **Overview of Cable System Types**
  - Extruded
  - Self-Contained
  - Transmission & Distribution
3. **Ampacity History and Principles**
4. **Methods for Determining Ampacity**
  - Tables
  - Calculation Methods (Neher/McGrath IEC)
  - Normal & Emergency ratings
  - Summary of calculation equations
5. **Implications of System Constraints on Ratings**
  - Loading patterns
  - Charging current and critical length
6. **Effect of Design & Installation Variables on Ampacity**
  - Temperature
  - Soil Characteristics
  - Special Backfill Materials

## DAY 2

7. **Soil Characteristics and Evaluation**
  - Route thermal surveys
  - Soil dry-out considerations
8. **Worked Examples**
9. **Special Environmental Considerations**
  - Cables in Air, Multiple Cable Circuits
10. **Crossing Cable Considerations**
11. **Ampacity for Deep Installations**
12. **Upgrading Methods and Dynamic Ratings**



## Who Should Attend?

This course is for the engineer and technical personnel who are interested in a focused discussion on **underground cable ratings** with an emphasis on calculation procedures and parameters affecting ampacity such as cable material, special backfill and native soil characteristics.

No prerequisites are necessary, but a background in electrical, mechanical or civil engineering will help in understanding some concepts.



## Customised In-House Course Available

This program can be customised to suit specific needs of your organisation at significant savings. Please contact us on (02) 8448 2078 or email [enquiry@cpdint.com.au](mailto:enquiry@cpdint.com.au) for more details.