THE ART OF CALCULATION TRAINING

CLASSROOM INSTRUCTORS

Michael Shlyamberg, P.E.
has over 40 years of engineering and management experience in the design, analysis, startup, maintenance, operation and inspection of nuclear (BWR, PWR, CANDU, RBMK) and fossil power plants, industrial facilities, and DOE installations. Since 1993 he's been providing independent consulting services to the NRC, Utilities and the DOE. He developed this training in collaboration with Messrs. Harold Epstein and Mark Bowman (see p.2 for highlights of their qualifications) based on their hands-on engineering design experience and participation in over two hundred (200) of NRC engineering inspections and utilities' self-assessments. Their combined calculation related experience includes either development or a detailed review of most types of system & component level mechanical and electrical calculations.

CONTACT INFORMATION

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INTENDED AUDIENCE

Design & Systems Engineering personnel with 1 to 8 years of experience, their first-line supervisors and Shift Technical Advisors

TYPE

Classroom

DURATION

2 days.
Options to "buy" classroom sessions or to acquire a license for use of material after a "train-the-trainer" session.

TERMINAL LEARNING OBJECTIVES

This training applies to all engineering disciplines. The goals are:

- Learn what differentiates calculation from a computation.
- Apply knowledge of concepts gained from this training to maintain compliance with plant's license and to assure the integrity of its design in activities related to review, revision and preparation of calculations, irrespective of the type of software.

DAY 1

Prerequisite: Review before class Case Studies 1 through 4 and perform Exercises 1 & 2 from Case Studies 3 and 4 (Total of 4 Exercises)

1. Define **What** is included in this training is and **What** is not.
   - This training addresses:
     - Calculation Elements
     - Process of calculation review, revision and preparation
     - Provides details on how this work is performed
   - Implementation of plant specific calculation procedures is NOT a subject of this training.

2. Define **Why** calculations are performed differently than computations.

3. Define Elements of Calculation **(How)**
   - Adequacy of Calculation as a Stand-Alone Document
     - Problem Statement (Purpose/Scope/Objective) and Limits of Applicability
     - Methodology/Approach
     - Acceptance Criteria
     - Assumptions
     - Design Inputs
     - Computational Technique
     - Results & Conclusions
     - Overall Assessment

- Effect of Calculations on Plant Design Basis and Current Licensing Basis

4. Define Calculation Review Process, Case Studies. All Case Studies utilize INPO training techniques of dynamic learning activities.
   - Case Study 1—Mechanical Design: Intake Structure Cooling
   - Case Study 2—Electrical Design: Station Battery Short Circuit Evaluation
   - Case Study 3—Mechanical Design: EFW Pump Analysis – includes 3 Exercises
   - Case Study 4—Electrical Design: Degraded Voltage Analysis – includes 2 Exercises

DAY 2

Prerequisite: Review before class Case Study 5

5. Define Guidelines for the Interdisciplinary Review.
6. Define Calculation Revision Process.
   - Determine Scope of Revision:
     - Physical and Functional Boundaries
     - "You Touch It, You Own It" Rule
     - 50.59
     - Case Study 5—Mechanical Design: Intake Structure Cooling, Calculation Revision

7. Acquire First Hands Knowledge of Calculation Preparation Process.
   - Two (2) Case Studies:
     - Case Study 6—Mechanical Design: NPSHA Calculation
     - Case Study 7—Electrical Design: EDG High Resistance Neutral Grounding System

KEY INDUSTRY DOCUMENTS

1. 10 CFR 50, Appendix B
2. ASME BPVC, Section XI, Rules for Inservice Inspection of Nuclear Power Plant Components
3. ANSI N45.2.11-1974; NQA-1 1994 Edition
4. IEEE & NFPA Standards

OTHER RELATED INFORMATION

- In addition to a hard copy of a training material (~ 250 slides), each trainee will receive a Desktop Guide – The Art of Calculation Review, Revision and Preparation of Safety Related Calculations that addresses all engineering disciplines (~ 200 pages).
- A certificate of completion will be issued to each attendee.
- Each attendee is eligible to receive up to 2 CEUs upon a successful completion of the course.
- Contributors:
  - Mr. Epstein, an electrical engineer with over forty-five years of experience with participation in various IEEE committees
  - Mr. Bowman, an electrical engineer with over 30 years of experience. He is active in IEEE: chair, officer, member. He also is the Chair of the ETAP Nuclear Utility Users Group.