

# COMPREHENSIVE STAKING AND LINE DESIGN TRAINING AND CERTIFICATION

## Overview Of The Twelve Modules For Certification

The training program is designed to educate and equip the staking technician to design electrical distribution facilities to adequately serve the customers of the utility. It will train the novice as well as improve the skills of the experienced employee. The course of study leads to certification as a qualified staking technician. The certification will be awarded after the student accomplishes well-defined tasks and demonstrates a working knowledge of the subject material through observation and completion of comprehensive written tests.

### COURSE OF STUDY

The course of study will be comprised of twelve modules. The student will perform the following activities to successfully complete each module.

1. Attend a seminar and answer workbook questions
2. Perform the course of action in the field to the supervisor's satisfaction
3. Pass a written examination based on the seminar curriculum plus outside reading

Upon satisfactory completion of study and practice in all twelve modules, the student will receive certification.

The twelve modules for certification are listed below.

**(1) Basic Surveying**

**(2) The National Electrical Safety Code & Utility Specifications**

**(3) Pole-line Structure Design and Layout**

**(4) Underground Design and Subdivision Layout**

**(5) Unique Structures**

**(6) Easement Acquisition**

**(7) Obtaining Permits**

**(8) Construction Contract Administration**

**(9) Joint Use Staking and Make-ready Surveys**

**(10) Sizing Transformers and Conductors**

**(11) Basic Sectionalizing Design**

**(12) Line Inspection**

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## Overview Of The Twelve Modules For Certification

### **MODULE 1 - BASIC SURVEYING**

This course will teach the student the basic and advanced methods of line route surveying. He or she will learn how to make accurate distance measurements, turn and bisect line angles, and measure changes in elevation. The student will be taught how to conduct a complete point survey using a total station. A basic overview of GPS and its application to line design and staking is included in the module. To complete the study, the student will learn how to transfer both paper and electronic field data to hand drawings or computer aided drafting programs.

### **MODULE 2 - THE NATIONAL ELECTRICAL SAFETY CODE & UTILITY SPECIFICATIONS**

The NESC establishes the rules used in the design and maintenance of power systems. This course provides the staking technician with a working knowledge of the NESC and how to apply the applicable rules. The focus of this course will be on those rules that specifically apply to distribution line design such as grounding, overhead line clearances, overload factors, strength reduction factors, ice loadings, and underground line construction. This course is a pre-requisite to pole-line structure design.

### **MODULE 3 - POLE-LINE STRUCTURE DESIGN AND LAYOUT**

In this module the student learns how to design overhead electrical distribution structures. The course is organized into a set of building blocks, each one building upon the other. The building blocks are conductors, poles, pole-top assemblies, and guys/anchors. Tables and graphs are provided for the student to lookup design values for immediate application in the field. He or she will also learn to make basic calculations to determine strength and maximum allowable spans for wind and ice loading, plus total guy load due to tension and wind.

### **MODULE 4 - UNDERGROUND DESIGN AND SUBDIVISION LAYOUT**

In addition to designing overhead lines, the staking technician must also design underground facilities. This course will explain the components of underground distribution systems along with their application and limitations. The student will learn how to layout subdivisions, specify pad-mounted equipment, and design sectionalizing systems. This course will also cover conduit systems and the correct methods for calculating pulling tensions relative to conduit bends and cable runs.

### **MODULE 5 - UNIQUE STRUCTURES**

The student will learn to design special structures that require additional strength due to extreme wind load, long spans, and multiple circuits. This section also includes designing steel pole and unguyed wood pole structures.

### **MODULE 6 - EASEMENT ACQUISITION**

Experienced line designers say that obtaining the right-of-way easement is the toughest part of staking. A well-designed power line is of little use if cannot be built on the land. In this section the student will learn about easement law, land ownership rights, titles, easement descriptions, and recording easements. He or she will also learn valuable negotiating skills to aid in the procurement of an easement. These are people skills that enable the staking technician to obtain an easement and establish a high level of trust with the customer.

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### **MODULE 7 - OBTAINING PERMITS**

Today, property owners are more reluctant to give right-of-way easements for overhead or underground power lines. Consequently, more use is being made of existing public rights-of-ways. To do this, permits must be obtained from the governing agency. They are usually detailed and onerous. This module teaches the student what information is required in a permit, how to setup an efficient permitting process, how to establish good personnel contacts to ease the process, and how to prepare permit documents and drawings.

### **MODULE 8 - CONSTRUCTION CONTRACT ADMINISTRATION**

A well-written construction contract and properly drawn set of plans and specifications will go a long way toward getting the lowest bid prices and ease of administration. Accurate accounting of the materials, and close monitoring of the contractor's progress are essential to completing a project on time and on budget. The student will learn how the construction contract affects every aspect of the project, and how to administer the contract terms and conditions for a successful outcome.

### **MODULE 9 - JOINT USE STAKING AND MAKE-READY SURVEYS**

The communications industry is forever scrambling for pole rental space on distribution structures to attach, telephone, CATV, and fiber optic cables. With right-of-way becoming harder to obtain, electrical utilities, both distribution and transmission, are combining circuits on one pole line to maximize efficiency and reduce costs. This course will teach the student how to handle joint use attachments. He or she will learn how to perform make ready surveys, measure clearances, determine strength requirements, prepare construction estimates, make final inspections, and understand the requirements of joint use contracts.

### **MODULE 10 - SIZING TRANSFORMERS AND CONDUCTORS**

This course will focus on basic electric theory and the methodology to correctly size transformers and service conductors for standard residential and small commercial loads. The student will learn how to perform basic calculations for current, voltage, power, and voltage drop. He or she will also study basic circuit theory and its application in an electric distribution system. The course will discuss transformer connections and their application to specific electrical loads.

### **MODULE 11 - BASIC SECTIONALIZING DESIGN**

The student will learn how distribution lines and the end customers are protected from damage due to over-current and over-voltage. The student will learn about fault currents and the basic application of devices to interrupt the maximum available fault current produced by short circuits. The student will also learn about voltage surges caused by lightning, and the use of lightning arresters to shunt the over-voltage to ground. In addition, the student will learn the basic theory of voltage regulators and capacitors. This course is designed to give the student a basic understanding of the devices, and focus on correct placement and application of the devices on the circuit when a line is being staked.

### **MODULE 12 - LINE INSPECTION**

The National Electrical Safety Code requires that a utility inspect its facilities periodically to ensure that they are safe and adequate to distribute electricity. In this module, the student will learn the principles of making an inspection. The course will discuss the importance of a systematic method, the elements that should be checked, and different ways to perform the actual inspection.

## NWPPA Comprehensive Staking Technician Program

### Core Schedule - Richland and Spokane, WA

Day		Time		2009-10			2010-11			2011-12		
				Nov 2-6, '09 Spokane	Feb 2010 Richland	June 2010 (Tentative)	Nov 2010 Richland	Feb 2011 (Tentative)	June 2011 (Tentative)	Nov 2011 (Tentative)	Feb 2012 (Tentative)	Jun 2012 (Tentative)
				Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 1	Week 2	Week 3
Mon	8:00 AM to 12:00 PM	Underground		NESC	Surveying	Contracts	Underground	Surveying	NESC	Overhead		
	1:00PM to 5:00PM	Underground	Protection	NESC	Surveying	Contracts	Underground	Surveying	NESC	Overhead		
Tue	8:00 AM to 12:00 PM	Underground	Protection	NESC	Surveying	Joint Use	Underground	Surveying	NESC	Overhead		
	1:00PM to 5:00PM	Underground	Inspection	NESC	Surveying	Joint Use	Underground	Surveying	NESC	Overhead		
Wed	8:00 AM to 12:00 PM	Underground	Inspection	NESC	Surveying	Overhead	Underground	Surveying	NESC	Overhead		
	1:00PM to 5:00PM	Joint Use	Transformers	NESC	Surveying	Overhead	Protection	Surveying	NESC	Transformers		
Thr	8:00 AM to 12:00 PM	Joint Use	Transformers	Permits	Easements	Overhead	Protection	Easements	Permits	Transformers		
	1:00PM to 5:00PM	Contracts	Unique Structures	Permits	Easements	Overhead	Inspection	Easements	Permits	Unique Structures		
Fri	8:00 AM to 12:00 PM	Contracts	Unique Structures	Permits	Easements	Overhead	Inspection	Easements	Permits	Unique Structures		
	1:00PM to 5:00PM	Contracts										

This program is designed to cover a three year period, with three weeks of seminars per year.

Each module will be offered twice during the three year period.

Bonus classes are scheduled by request or when possible to meet high demand for classes

A student must attend and complete all twelve modules, passing a test after each, to receive certification.

Special testing may be offered under a case by case consideration for students who have attended past seminars and wish to receive credit.

Transformers module should be completed before taking the Underground module

Overhead module should be completed before taking the Unique Structures module