Design and Optimization of Overhead Transmission Lines using PLS-CADD and PLS-Tower Software
Theoretical and Practical PLS-CADD training Course

Who should attend

Engineers and technicians using or planning to use computer software PLS-CADD and PLS-TOWER for design, optimization, assessment, upgrade and construction of Overhead Transmission Lines. This software is currently the state-of-the-art in the industry and used by more than 800 utilities and companies in more than 80 countries. For more details regarding the software, please visit our Web site www.powline.com.

Many new features have been added lately to PLS-CADD, thus increasing substantially its capabilities. All these improvements will be reviewed during this course for the benefit of previous and new users of PLS-CADD such as:

- Conductor and tower loading calculations according to a large number of international and national standards
- Multiple alignments capabilities, either separate alignments or linked alignments (tap-off from an existing tower)
- Numerous improvements to Finite Element analysis of lines and sag tensions
- Numerous options for graphical sagging and fitting conductors to LiDAR data or other survey data
- Added the capability of automatically downloading free USGS DOQ and DRG imagery from TerraServer and extracting terrain data from attachments
- Modified imagery routines, etc.

Course outline

The course will last 5 days, during which the following aspects will be covered in details
• Terrain modeling, survey data, and plan-profile
• Conductor design, modeling and sag-tension calculations
• Structure modeling, geometry, strength and spans,
• Interactive line design and optimization
• Construction drawings and documents
• Assessment of existing lines and options for upgrade
This course will cover in details the use and application of PLS-CADD and partly PLS-TOWER. This course also includes the theoretical basis of the engineering concepts upon which the above software is based and that are widely used in transmission line design.

The above points will be covered using practical examples and will involve active participation of trainees in order to increase the benefits of this session.

Instructor

This course will be delivered by Mr. Elias Ghannoum, an internationally renowned expert having 36 years of experience in overhead transmission line design. He worked during 27 years with Hydro-Quebec one of the most important transmission lines utilities in the world. He was involved in design and construction of lines with voltage levels from 49 kV to 800 kV as well as HVDC lines up to ± 800 kV.

Mr. Ghannoum is Fellow of the Institute of Electrical and Electronics Engineers (IEEE), and has received Awards from CIGRE and IEEE for outstanding contributions to technical work on transmission lines and best technical paper. He had also received the Order of Merit Award from the Canadian Standards Association for his contributions to international and national standards in lines and conductors.

He holds many titles and positions in International standard writing bodies and technical organizations such as:

- Chairman of the International Electrotechnical Commission (IEC), Technical Committee 7 "Overhead Conductors"
- Past Chairman of Working Group 8 of IEC/TC11 "Loading and Strength of Overhead Transmission Lines", the Technical Group responsible for writing IEC 60826 and current chairman of Working Group MT1 responsible for maintenance of TC11 documents
- Past Chairman of Working Group 4 of IEC/TC7 "Aluminum and Aluminum alloy stranded Conductors"
- Chair of the Canadian Standards Subcommittee C22.3 responsible for OHL standards based on reliability principles.

Mr. Ghannoum was chief transmission Engineer for Hydro-Quebec during 20 years before starting his own consultancy practice in 1997. He provided expertise to many international clients such as The World Bank, Electricité de France, ESKOM, Power Grid Corporation of India, etc. He also lectured during 15 years a graduate course on transmission line design at the University of Montreal, Canada.

Acquisition of the software

Engineers can attend this course even if they have not yet acquired the subject software. The course can help them acquiring engineering knowledge in the field and understanding the capabilities provided by computer aided software PLS-CADD. For those who have not yet acquired the software, a
special training version of PLS-CADD, TOWER and PLS-POLE will be made available to them during the training period only, including the required hardware key. Purchase of the software can be arranged any time by contacting Mr. Ghannoum at the address below.

Registration

If you are interested in this course and would like to register, or would like more information on the subject, you will find all the necessary details at the end of this document. You can also contact Mr. Ghannoum at the address below if you need more information about this course. Please note that the number of attendees is limited to about 12 participants in order to maximize the transfer of knowledge.

Elias Ghannoum, Consultant  
76 Ave. Claude Champagne  
Outremont, Québec, Canada, H2V 2X1  
Tel: 1-514-344 4127, Fax: 1-514-344 4724  
email: elias@ghannoum.com
Design and Optimization of Overhead Transmission Lines using PLS-CADD and PLS-Tower Software

5-day Training course on Theoretical and Practical aspects of PLS-CADD
(including an overview of PLS-POLE and TOWER)

**Detailed Daily program**

**DAY 1**

Introduction of the Instructor Elias Ghannoum
Introduction of the attendees

**Overview Of PLS software and evolution**

Need to integrate and computerize all aspects of line design
PLS-CADD system overview
PLS Transmission Structure Programs overview
Presentation of completed projects

**Terrain Data and Modeling in PLS-CADD**

- How to organize project files
- View commands - opening of windows - viewing of phases and sags
- Needed terrain data and surveying techniques
- Prepare a terrain model
  - Generate and edit feature codes data
  - Generate, edit or import XYZ terrain models
    - Create alignments, profiles and side profiles
    - Multiple alignment options
  - Create TIN terrain models
  - Break lines
  - XYZ vs. user-defined data
  - Filtering XYZ data
  - Attach DXF and Bitmaps to plan, profile or sheet
- Generate, edit or import PFL terrain models
- Scan and digitize existing drawings

**DAY 2**

**Conductor Design and Modeling**

- Various conductor types
- Permanent deformation from overloading
- Permanent deformation from creep
- Effects of high temperature on creep and strength reduction
- Effect of high temperature on aluminum in ACSR conductors
- Conductor models in PLS-CADD
Stress-strain charts
Where to get conductor data
Aeolian vibrations - design criteria to limit them
Temperature vs. ampacity – PLS-CADD implementation of IEEE 738
Line thermal rating
Live line rating – link to PLS-CADD

Design criteria

Weather data
Wind and ice loads - gust response factors, etc.
Conductor tension limits
Conductor and tower automatic loading based on international standards such as IEC 60826, CENELEC EN50341
Conditions for automatic sagging
Structure loads and safety factors (loads generated using the ruling span concept)
Structure load, particularly non-uniform loads using the flexibility of attachment points of conductors
Conditions for checking clearances

PLS-CADD/ LITE - simplified PLS-CADD module

Quick sag/ tension calculations
Illustration of various sagging methods
Create load files for structures modeled with TOWER, PLS-POLE and PLS-CADD
Clearance between lines
Loads on towers with many cables attached in various directions

Structures Modeling by Allowable Spans (Method 1)

Available structure models
Allowable spans method (Methods 1 or 2) - best for standardized designs
Full analysis method (Methods 3 or 4) - best for assessment and upgrade
Material lists, create and edit parts lists
Create and edit Allowable Span (Method 1) Structures

DAY 3

Interactive Line Design

Spot structures interactively
String and sag conductors - Demonstrate four sagging methods
Check clearances - vertical, between phases, galloping, etc.
Check overall design efficiency
Modeling of lines crossing
Snap structures to surveyed points
Generate Construction Documents

- Plan & Profile sheets, staking lists, stringing charts, offset clipping, etc.
- Automatic generation of material lists
- Export project data to other commercial databases

Files, backup and support

- Project window
- Backup / Restore backup
- PLS site, news, forum, tech. support

Day 4

Modeling Existing Lines, Assessment and Refurbishing

- Modeling existing lines and structures
- Assessment, reconductoring, refurbishing, etc.
- Links to SAPS
  - Limits of validity of ruling span concept
  - Unbalanced ice, RSL after broken conductor, marker balls, structure deflection, etc.

Automatic minimum cost spotting with PLS-CADD

Highlight about PLS-POLE - Structure Modeling of Poles and Frames (Method 4)

DAY 5

TOWER - Steel Latticed Tower Analysis and Design

- Modeling concepts
  - Joints, members, connections, tower wind load, conductor loads, etc.
  - Handling of planar joints, mechanisms, tension-only members, etc.
  - Checking and modifying older designs
  - Automatic member design
  - Joint transmission/ communication use of towers

Special topics
Design and Optimization of Overhead Transmission Lines using PLS-CADD and PLS-Tower Software
Theoretical and Practical PLS-CADD training Course

Registration to the training course

Date
March 5 to 9th, 2007

Location
Rome, Italy at the training center of TERNA (Italian Electrical utility)

Cost
The registration fees for this seminar are 2500 USD per person. Prepayment of the training course is required. The details for money transfer will be provided after the registration.

Trainees are required to check if visas are required for them to enter Italy and to make the required applications. Please note that no refunds will be made if the trainee cannot attend the course for personal reasons or for visa problems. Visas are the responsibilities of the trainees and those attending the course should consult with the Italian consulates for conditions.

Hotel details
Hotel expenses and meals are the responsibility of the attendees.

Upon registration, the trainee will receive a list of hotels near the training center in order to make their own reservations and arrangements.

Additional information
Please note that the number of attendees is limited in order to increase efficiency of the technology transfer. Thus registration is on a first come basis. Should the course be cancelled for reasons due to our side, full refund shall be made to all registrants.

If you have not yet arranged to purchase the software, we will gladly take care of the same, being the PLS agent in the area. Purchased software can be delivered to the purchaser during the training session and installed on the purchaser computer. Thus payment for the course and software can be combined.

Attendees should bring their own laptop computer and the latest version of the software will be installed on these computers, to be used only during the
training week (each user will given a hardware key for use during the training session).

Note that Trainees who do not have access to a Laptop, can follow the course on the screen (I will be using an LCD projector that will image all the operations on my own laptop), as well as a board and flip charts.

Please advise us at the earliest about your registration. Should you need any other information, please do not hesitate to contact us at the following phone number: 1-514-344 4127.

Sincerely yours,

Elias Ghannoum, Consultant
PLS Agent
Tel: 1-514-344 4127, Fax: 1-514-344 4724,
email: elias@ghannoum.com
Registration sheet

Design and Optimization of Overhead Transmission Lines using PLS-CADD and PLS-Tower Software

Theoretical and Practical PLS-CADD training Course
   Rome-Italy, March 5th to 9th, 2007

Name: __________________________________________________________

Company: ______________________________________________________

Complete Address:

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

Phone and fax numbers: Phone:                                      Fax:               

Email address ____________________________________________________

PLS software: Please indicate if you have already purchased PLS Software, and the version of all software you have in hand.

   PLS-CADD    yes __ no ___   version _____
   TOWER       yes __ no ___   version _____
   PLS-POLE    yes __ no ___   version _____

Method of payment:        Bank transfer ____ Date______ amount ________
   Check or money draft ___Date_____Amount____
   Certified check____, Date______, Amount________

Date: ____________________________
Signature ____________________________

(Please return this registration form either by email to elias@Ghannoum.com 
or by fax to 1-514-344 4724)