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

Theoretical and Practical PLS-CADD training Course
General information and registration form

1 Date of course

Nov. 29 to Dec. 3, 2004

2 Location

Montreal, Canada

3 Who should attend

Engineers and technicians already using or planning to use computer software PLS-CADD and PLS-TOWER for design, optimization, assessment, upgrade and construction of Overhead Transmission Lines.

These software are currently the state-of-the-art and are used by more than 800 utilities and companies in over 80 countries. For more details regarding these software, please visit our Web site www.powline.com.

Many new features have been added to PLS-CADD in 2003-2004 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:

- Multiple alignments capabilities, either separate alignments or linked alignments (tap-of from an exiting tower)
- Numerous improvements to Finite Element analysis of lines and sag tensions
- Numerous options for graphical sagging and fitting conductors to LiDAR 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.

4 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 TOWER and PLS-POLE. This course also includes the theoretical basis of the engineering concepts upon which the above software is based 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.

Details regarding the daily schedule are given hereafter.

5   Instructor

This course will be delivered by Mr. Elias Ghannoum, an internationally renowned expert having 33 years of experience in overhead transmission line design. He worked during 27 years with Hydro-Quebec, one of the most important transmission lines utility 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 ± 500 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"
⇨ Chairman of Working Group 8 of IEC/TC11 "Loading and Strength of Overhead Transmission Lines", the Technical Group responsible for writing IEC 60826.

Mr. Ghannoum was chief transmission Engineer for HQ 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, 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.

Mr. Ghannoum is also an associate of Power Line Systems and has provided many training seminars throughout the world on PLS software.

6 Language

This course is delivered in English (except if all attendees agree to French), but attendees can ask questions in French. The Instructor will be available during lunch time to repeat parts of the course that were less understood by French speaking trainees.

7 Detailed daily training program

<u>**DAY 1**</u>

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
          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

<u>**DAY 2**</u>

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 limits of use
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 in TOWER, PLS-POLE or 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 attachment 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

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

Create and edit wood poles and frames
Create and edit steel poles and frames
Create and edit concrete poles and frames
Determining allowable spans of existing structure designs

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

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

8   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 will be made available to them during the training period only.

Purchase of the software can be arranged any time, you need only to contact Elias Ghannoum for a quotation. .

9   Registration

If you are interested in this course and would like to register, or would like more information on the subject, please contact Mr. Ghannoum at the address below and/or complete the registration form in this document.

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

10 Cost

The registration fees for this seminar are 3000 $ Can for the first person and 2700 $ Can for any additional person from the same company. Fees can also be paid in US $ based on the ongoing exchange rate.

This fee includes the morning continental breakfasts, coffee breaks, and lunches. It does not include the cost of a hotel room.

This fee also includes all applicable Canadian taxes.

Instructions for prepayment of the training fees are provided in this document.

11 Hotel details

Hotel expenses and meals other than those listed above are the responsibility of the attendees. A block of rooms is being reserved for this seminar and details will be provided during the registration process

12 Additional information

Please note that the number of attendees is very limited, and usually does not exceed the range of 10-12 persons 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. The course will usually take place if there are at least 5 confirmed registrants.

If you have not yet arranged to purchase the PLS software, we will gladly take care of the same. Thus payment for the course and software can be combined.

Usually, attendees bring their own computer and the latest version of the software will be installed on these computers, to be used only during the training week (each user requires a hardware key that will be made available during the training).

Note that Trainees can also follow the course on the screen. An LCD projector is used to image all the operations performed by the instructor, 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 me at the following phone number: 1-514-344 4127.

13 Payment

Payments of the required amount in US $ are to be made by transfer of funds to the following account:
> Swift code: HATRUS33 (for transfers from outside North-America)
> Routing number 02-600-7760 (for transfers from within North-America)
>
> For further credit to account:
> BANK OF MONTREAL (MBANX)
> 55 Bloor St. W., 19th Floor BMTT
> TORONTO, ONTARIO, CANADA, M4W3N5
> Transit: 20002
> Institution number: 001
> Checking account number: 4503-526
> Client: Elias Ghannoum

For payments in Canadian funds, a bank draft or a certified check is accepted. Payment in US funds can also be made through a Bank Draft or Money order for the required amount forwarded to us by mail or courier services.

Please let us know when such transfer is made in order to follow it up from our side.

Registration sheet

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**Theoretical and Practical PLS-CADD training Course
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Name: _____

Company: _____

Complete Address:

_____

_____

_____

_____

Phone and fax numbers: _____

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 <u>elias@Ghannoum.com</u> or by fax to 1-514-344 4724)