

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

## **Date**

October 19-23, 2003

## **Location**

Dubai/Sharjah, United Arab Emirates

The course will take place in the Grand Hotel in Sharjah (UAE). A block of rooms is being reserved for the group attending the course. In order to increase efficiency of the training session, all trainees are required to stay in the same hotel.

## **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. These software are currently the state-of-the-art and are used by more than 800 utilities and companies in more than 80 countries. For more details regarding these software, please visit our Web site [www.powline.com](http://www.powline.com).

## **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 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.

## **Instructor**

This course will be delivered by Mr. Elias Ghannoum, an internationally renowned expert having 32 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  $\pm 500$  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 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.

Chairman of Working Group 4 of IEC/TC7 "Aluminum and Aluminum alloy stranded Conductors"

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.

## **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 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 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](mailto: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  
        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 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 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 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**

---

Prepared by

Elias Ghannoum, Consultant

Power Line Software representative for the Middle-East, India and North Africa

**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**

October 19-23, 2003

**Location**

Sharjah (UAE). The training session will take place in the Grand Hotel in Sharjah

**Cost**

The registration fees for this seminar are 2500 USD for the first person and 2250 USD for any additional person from the same company. Prepayment of the training course should be transferred to the following account:

BANK OF MONTREAL (MBANX)  
55 BLOOR ST. W., 19TH FLOOR BMTT  
TORONTO, ONTARIO, CANADA, M4W3N5  
TRANSIT: 0-20002  
Checking account number: 4503-526,  
Client: Elias Ghannoum

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

The above Bank has a US corresponding bank: "Harris Bank". This Bank uses a routing number "122 105 249". With all the above information, your financial institution should be able to make the necessary transfer to the above specified account.

You can also issue a Bank Draft or Money order for the required amount and forward it to us by DHL.

**Hotel details**

Hotel expenses and meals are the responsibility of the attendees. Please confirm your hotel reservations directly with the hotel. The coordinates of the hotel are the following:

Grand Hotel Sharjah  
Tel. 971-6-528 5557, fax: 971-6-528 2861  
email: sales@sharjahgrand.com  
Contact person: Mrs. Suzy or Mr. Ghassan El-Hindi  
Please refer to Ghannoum's Seminar.

The negotiated rate with hotel for this seminar is the following: Single Room (city view) + Buffet Breakfast + Buffet Lunch or Dinner + Coffee and cakes during coffee breaks= Dhs 355.00 net per person/per day (about 90 US\$). Please note that attendees should stay in the hotel during the seminar period (except those living in Dubai/Sharjah).

### **Additional information**

Please note that the number of attendees is limited (usually not exceeding 10-12) persons in order to increase efficiency of the technology transfer. Thus registration is on a first come basis. Once this number is reached we will not be able to accept any new registration. 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. 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 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 me at the following phone number: 1-514-344 4127.

Sincerely yours,

***Elias Ghannoum, Consultant***  
***PLS Agent for North-Africa, Middle-East and India***  
*Tel: 1-514-344 4127, Fax: 1-514-344 4724,*  
*email:elias@ghannoum.com*