

# 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**

Dec. 1<sup>st</sup> to 5, 2003

### **2 Location**

Montreal, Canada

### **3 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 over 80 countries. For more details regarding these software, please visit our Web site [www.powline.com](http://www.powline.com).

### **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 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.

## **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 for about one hour at the end of each day to repeat parts of the course that were less understood by French speaking trainees.

## **7 Detailed daily training 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 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 me 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](mailto:elias@ghannoum.com)

## **10 Cost**

The registration fees for this seminar are 2000 US\$ (3000 \$ Can) for the first person and 1800 US\$ (2700 \$ Can) for any additional person from the same company.

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

This fee also includes applicable taxes for Canadian attendees.

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 4-5 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., 19<sup>th</sup> 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.

