



INSULATED CONDUCTORS COMMITTEE

Established 1947

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Transnational Lunch



www.plumettaz.com

New Techniques to Install High Voltage Cables into Ducts

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VISION & PERFORMANCE



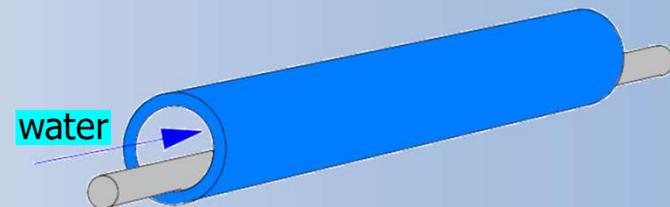
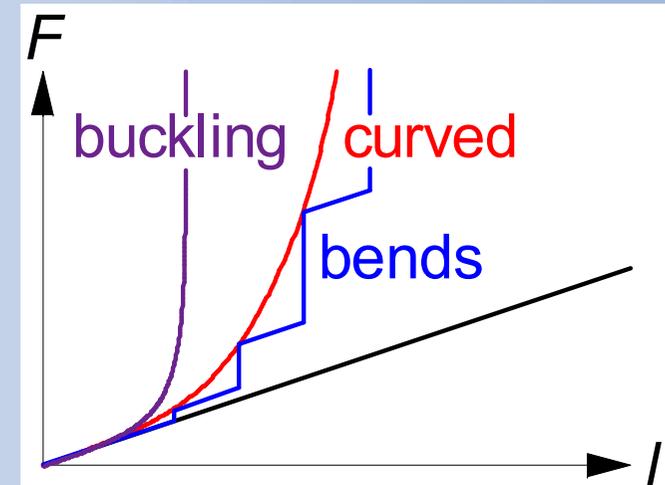
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Introduction

Cable in Duct Force Build-Up

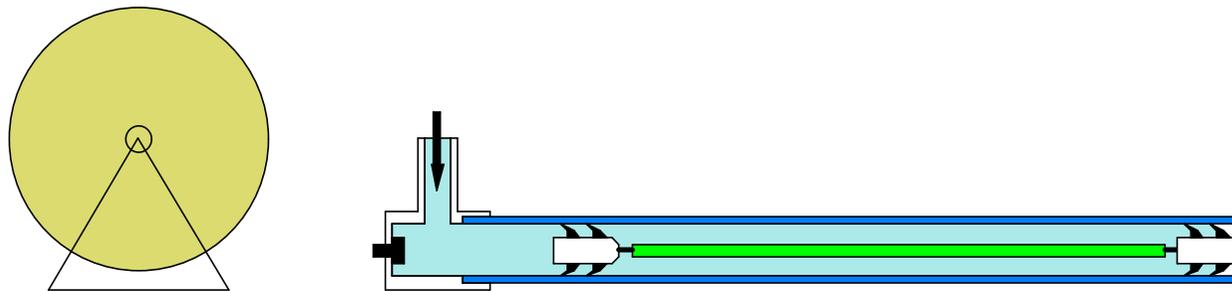
- **Build up installation force**
 1. Gravity (linear)
 2. Cable pullforce (exponential)
 3. Cable pushforce (asymptotic)
 4. Cable stiffness in bends
- **Clever installation methods**
 - Jetting (limits 2. and 3.)
 - Floating (also limits 1.)
- **Note: effect 4. still left**



Introduction

Cable in Duct Installation Method

- **Techniques to install cables into ducts:**
 - Winch pulling
 - Pushing (rodding)
 - Jetting (blowing)
 - Floating
 - Water Push-Pull
 - FreeFloating
- } the new techniques



Introduction, FreeFloating

It really works!



The New Techniques

- **No winch rope to install**
- **Labour + equipment one side of duct**
- **No synchronization problems**
- **Low forces, water cooling, less (no) wear**
- **Long lengths (extremely!)**
- **Option of FreeFloating (one launch location)**

Cable Configurations

- **Single-core cables**
- **Stranded triple-core sheath**
- **Stranded triple-core loose**
- **3 parallel loose cables**



Water Push-Pull Projects

- **France**
 - HV cables 3.3 km
 - Al core
- **Austria**
 - HV cables 1 km
 - Cu core, Pb sheath
 - High friction jacket
- **Other projects**
 - See presentation Sub C



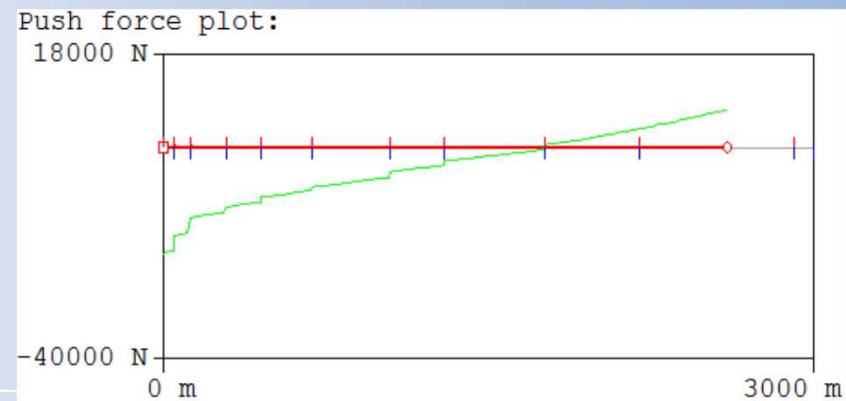
Pulling Force Calculation Software

- **Software calculates force build-up for all effects:**
 - Gravity, capstan, buckling, cable stiffness
- **For all installation methods:**
 - Pull, Push, Jet, Float, Water Push-Pull, FreeFloat

Winch pulling 1273 m



WaterPushPulling 2607 m!



Conclusions

- **Cable-in-duct installation techniques presented**
- **Water Push-Pull and (Free)Floating**
 - Less forces, less wear of cable
 - Long lengths possible (especially Al-core cable)
 - Operation from one side, less installation steps
 - More versatility (FreeFloating)
- **Several land projects and trials done**
- **Other land and offshore projects in preparation**
- **Software that takes all effects into account**