2012 HIGH RISE & TALL Engineering Structures

First International FIG Workshop - Hong Kong

Joel van Cranenbroeck
Chair of Commission 6 WG 6.2 International Federation of Surveyors (FIG)
Belgium, Europa

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FIRST INTERNATIONAL GPS BRIDGE MONITORING WORKSHOP

HONG KONG – JUNE 2005

Burj Khalifa برج خليفة
Lessons learnt …

- Nobody really believed that this worldwide first super tall building will be constructed … and realized what means 828 meters !
- Nobody figured out that there will be more high rises, super towers and tall buildings over the coming decade …
- Burj Khalifa project challenged architects, engineers, contractors, formwork providers and surveyors … pushing them to give their own best by working together toward a common goal : beating standards !
- Disregarding the “economics” behind the scene and the motivations (iconic, leaving marks, …) we acknowledge that such extreme engineering project induced a new dynamic in our profession …

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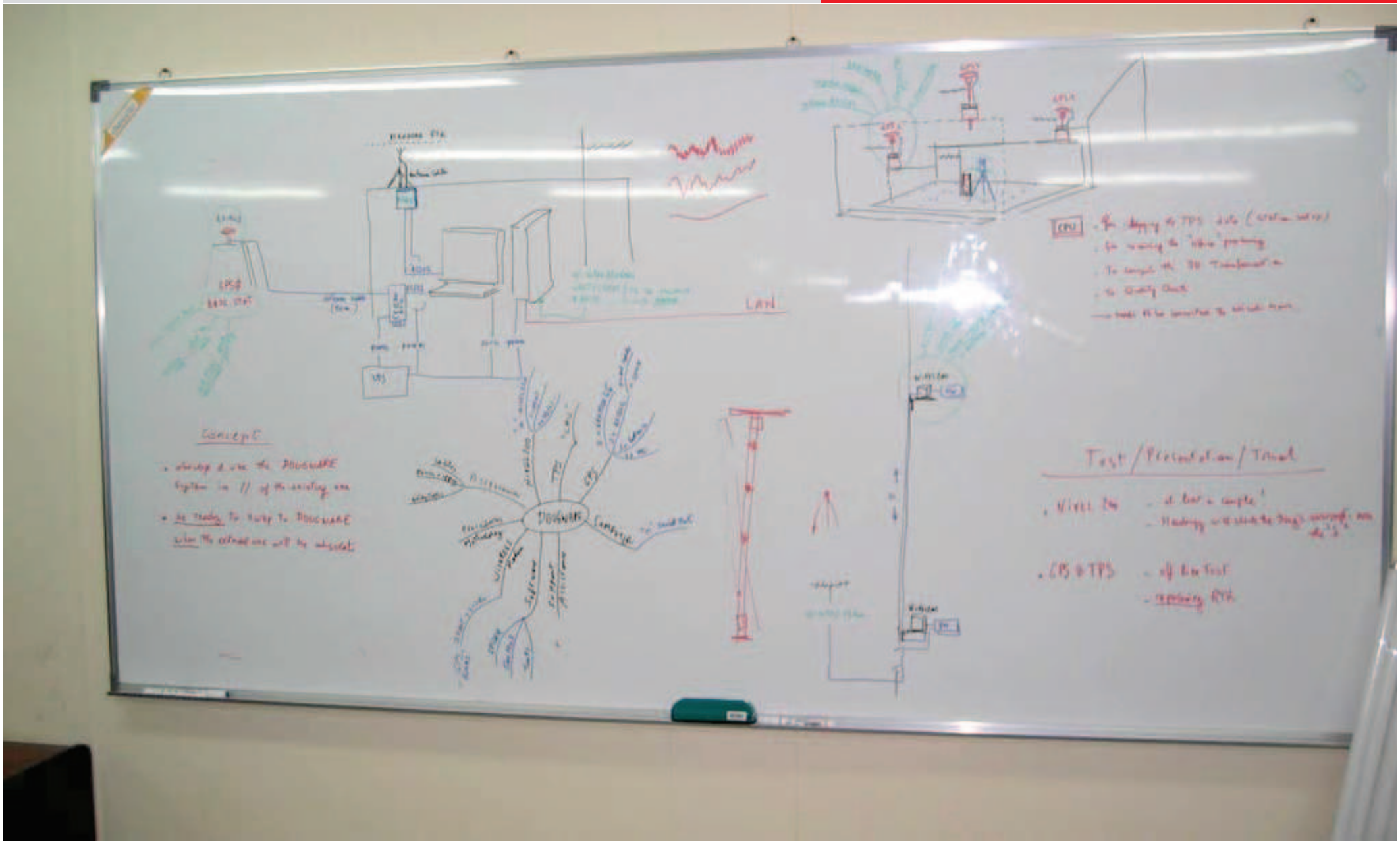
The concept that you propose (ie use of GPS to control the position of a TPS in a high rise construction environment) is unproven in this application.

We need a proof of concept, testing, user feedback etc.

And all of this in a very niche market where we do not really understand the customers needs and have very little practical experience.

Leica Geosystems BU Geomatics - February 2005



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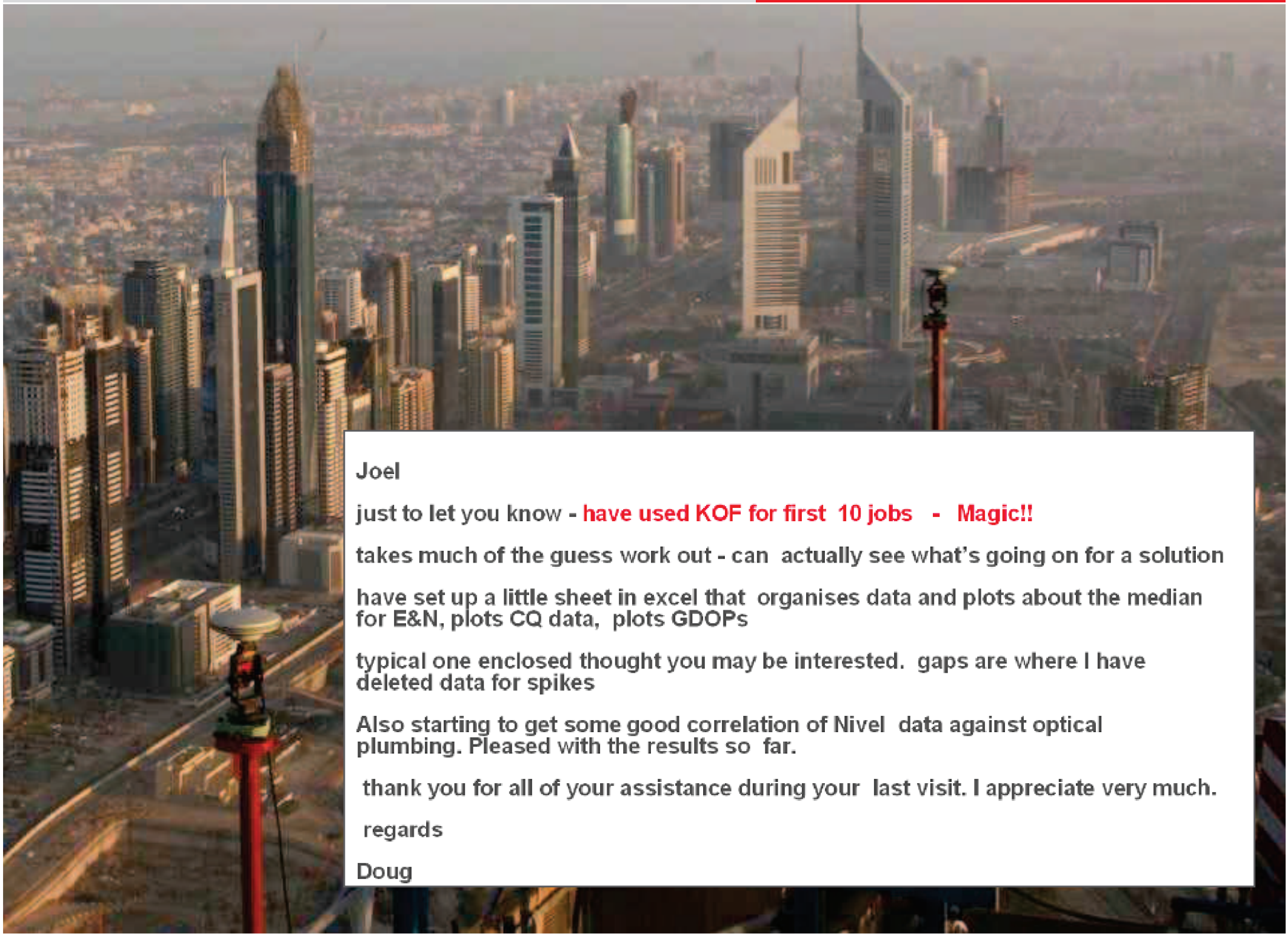

Joel

just to let you know - have used KOF for first 10 jobs - Magic!!

takes much of the guess work out - can actually see what's going on for a solution

have set up a little sheet in excel that organises data and plots about the median for E&N, plots CQ data, plots GDOPs

typical one enclosed thought you may be interested. gaps are where I have deleted data for spikes

Also starting to get some good correlation of Nivel data against optical plumbing. Pleased with the results so far.

thank you for all of your assistance during your last visit. I appreciate very much.

regards

Doug

November 2007 - Burj Dubai reached 585.7 meters

You may be interested to know that we have now reached top of concrete for the Burj tower at Level 156, at level 585.7m.

We have used our Leica GPS/ Nivel system all the way - the system has proven to be fantastic. Vertical walls are straight, lift shafts are too - standard deviations of concrete core walls are generally around 7mm.

At the very top I have computed the mean displacement of all core walls: dE 0mm, dN 5mm from design plans.

Doug Hayes, Chief Surveyor Burj Dubai - November 2007

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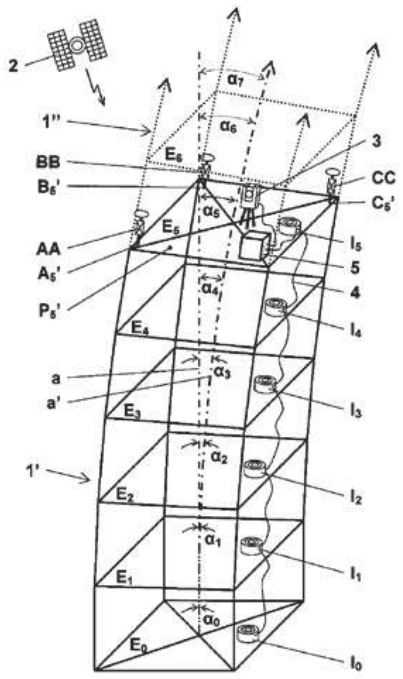
Publish
— *wi*

(54) Title: SURVEYING PROCEDURE AND SYSTEM FOR A HIGH-



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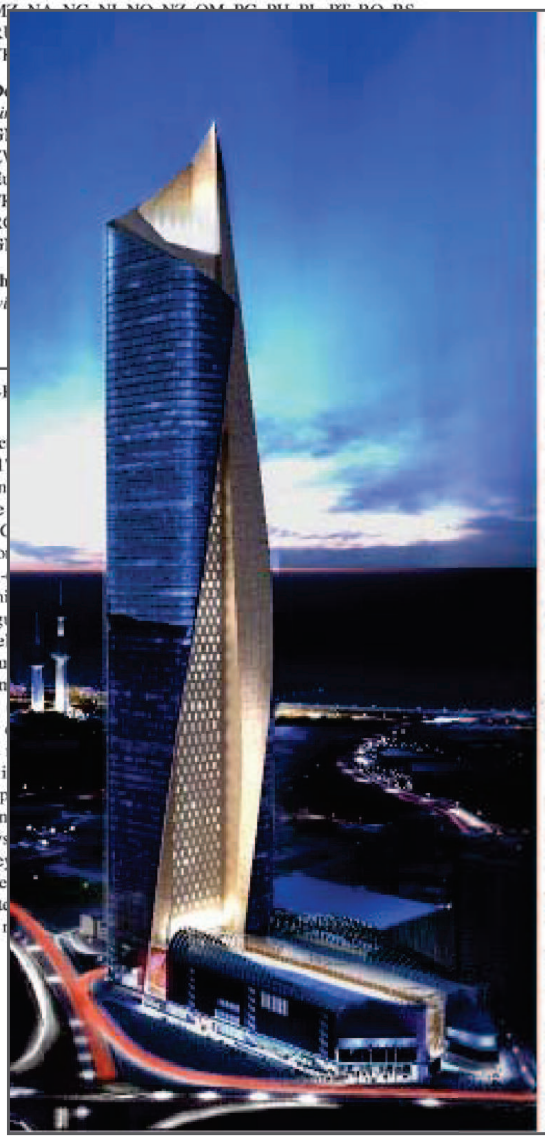

Attn : Mr. Joel Van Cranenbroeck

We are one of the largest construction company in Kuwait presently executing 413m high tower. We are interested to install the GPS System for survey and monitoring similar to one installed by you on Burj Dubai.

We have downloaded the paper published by you along with MCL Hayes and Ian R Sparks.

We would request you to provide your complete priced proposal for all the instruments needed noting that we would need to engage one qualified surveyor who is to be recommended by you to work with us for this survey monitoring work.

We will await your urgent response noting that we would like to have the installation completed by end of February 2007.

Best Regards,

Hani Abu Haidar

Project Director

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WO 2007/080092 A1

BURJ KHALIFA DUBAI
AL HAMRA TOWER KUWAIT
LANDMARK ABU DHABI
CAPITAL MARKET RIYAD
LAMAR TOWERS JEDDAH
SHARD OF GLASS LONDON
FREEDOM TOWER NEW YORK
LOTTE TOWER SEOUL
SKYTREE TOWER TOKYO…
INDIA, CHINA, RUSSIA, EUROPA,
MIDDLE EAST, USA, CANADA, …

Where are we Today ? What are the neXt steps ?
The Reasons we are “Work-Shopping” in HK …

- GNSS for high rise … Troposphere corrections … Deflection of the vertical (Geoid undulations) …
- Not only geodetic but also geotechnical monitoring and combined …
- Not only survey control the core walls but the complete structure …
- Not only the lift cages but also the lifts …
- Each new project means a new structure where the FEM must be updated and refined along the work progress with much measurements …
- From regular checks toward a real time dynamic model …
- From CAD toward dynamic GIS …
- After construction, long term monitoring is due …
- And there are more to come …

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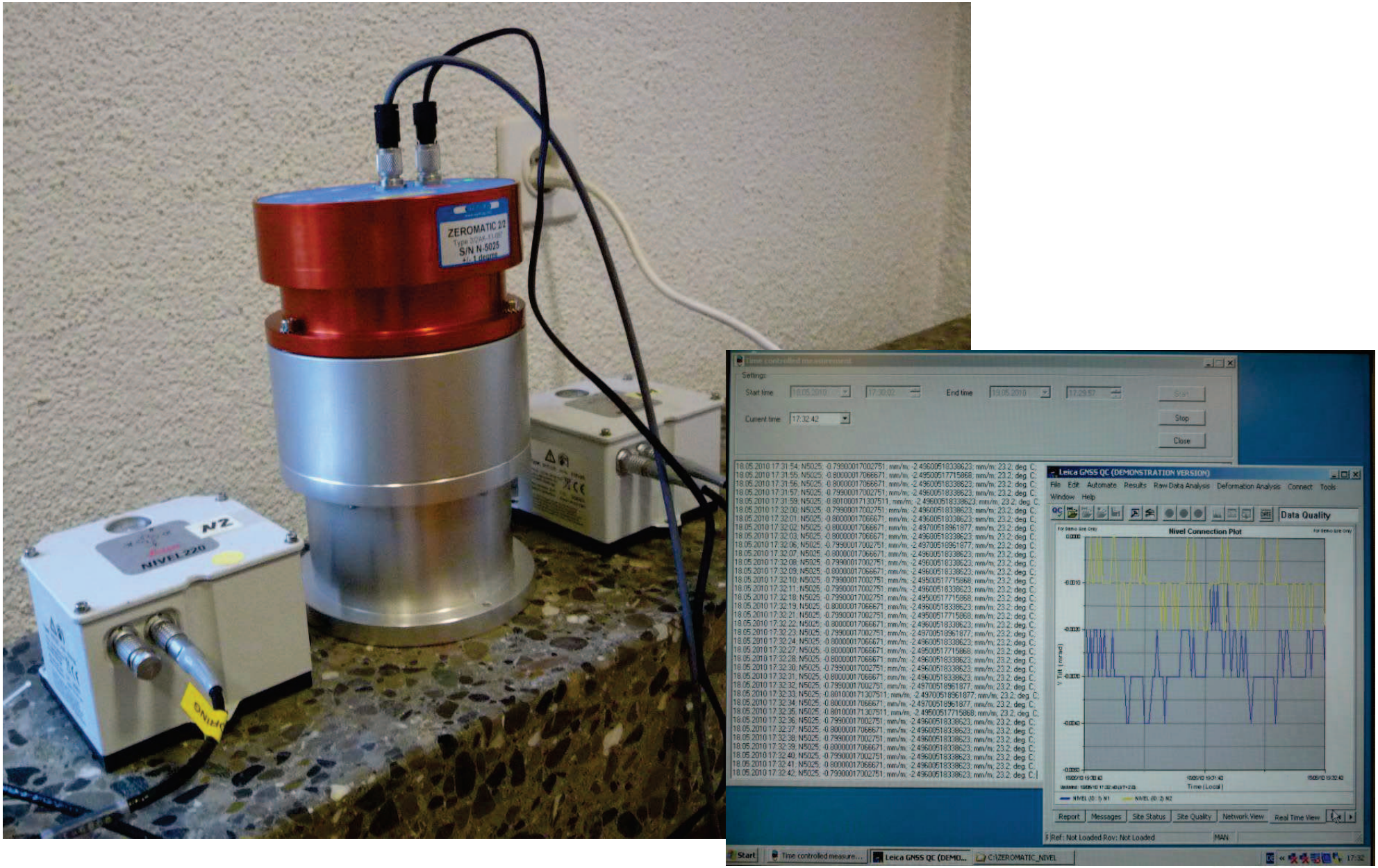
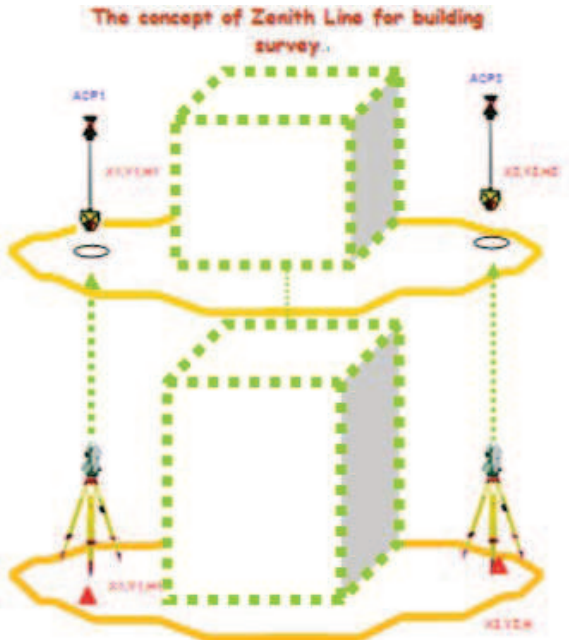
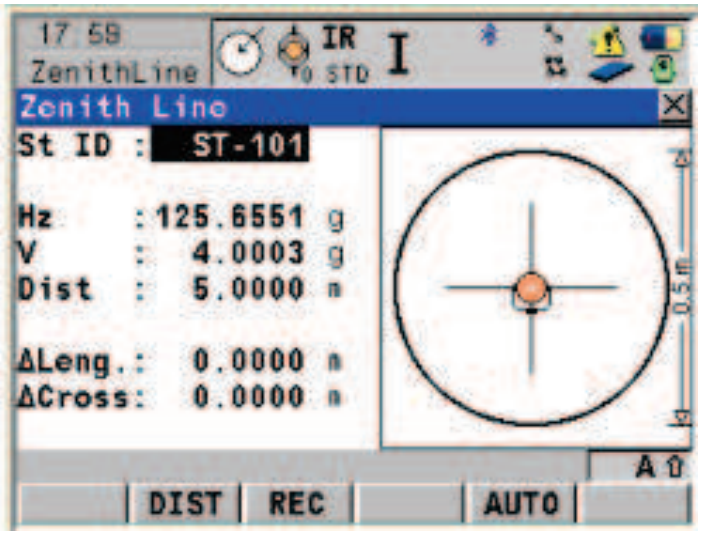
Automatic Motorised Dual Axis Inclinometer …

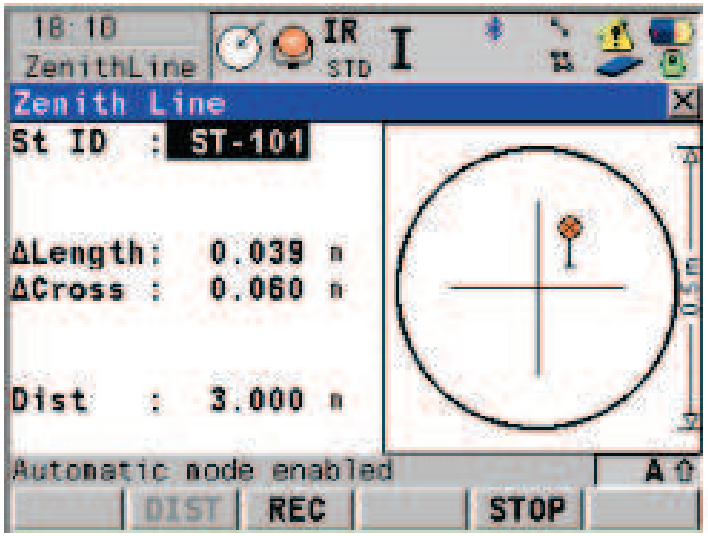


When GNSS Signals are not available …

There are (should be) much alternatives ?







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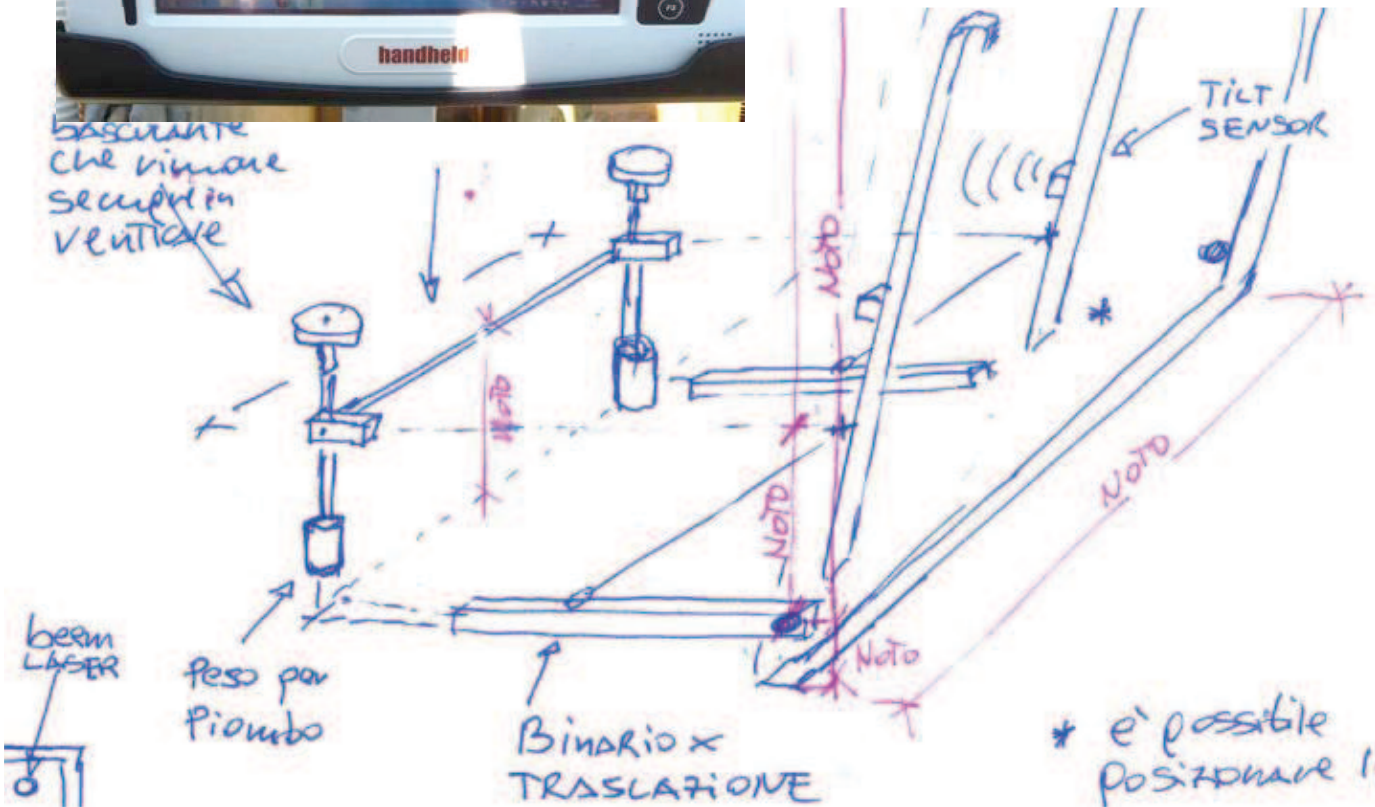
Toward more Automatic Guidance …

Just increasing the complexity to make it simpler !



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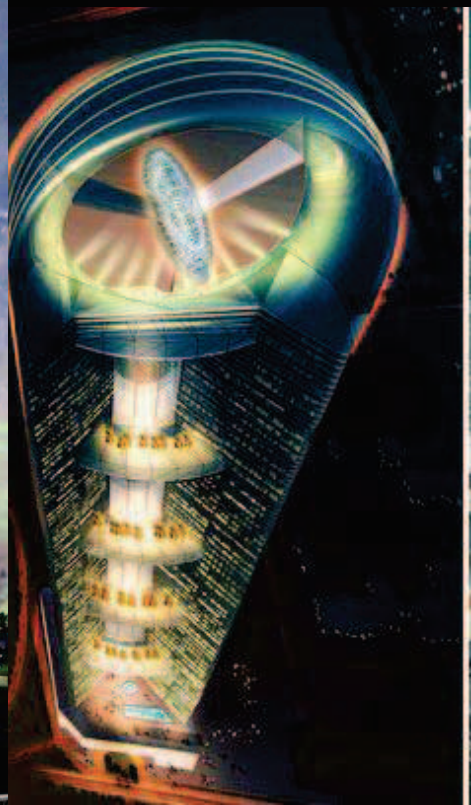


High Rise Structures … Not only buildings !

Towers, Pylons, Wind Turbines …

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Opening Session

Let’s {net}work together to rock ourselves !

- Surveyors have no other alternative to survive than to continuously adapt, invent, create, innovate … reverse all they learnt and they did to think most of the time “outside” the box(es) !
- The “press button” ready made instrumentation proposals are luring professionals (surveyors or others) that surveying is easy !
- There is no better way to promote our profession than to be involved in challenging projects and especially extreme engineering ones !
- Time to consider Meta Surveying !
- The surveyor of the 21st century will be an artist … or disappear …

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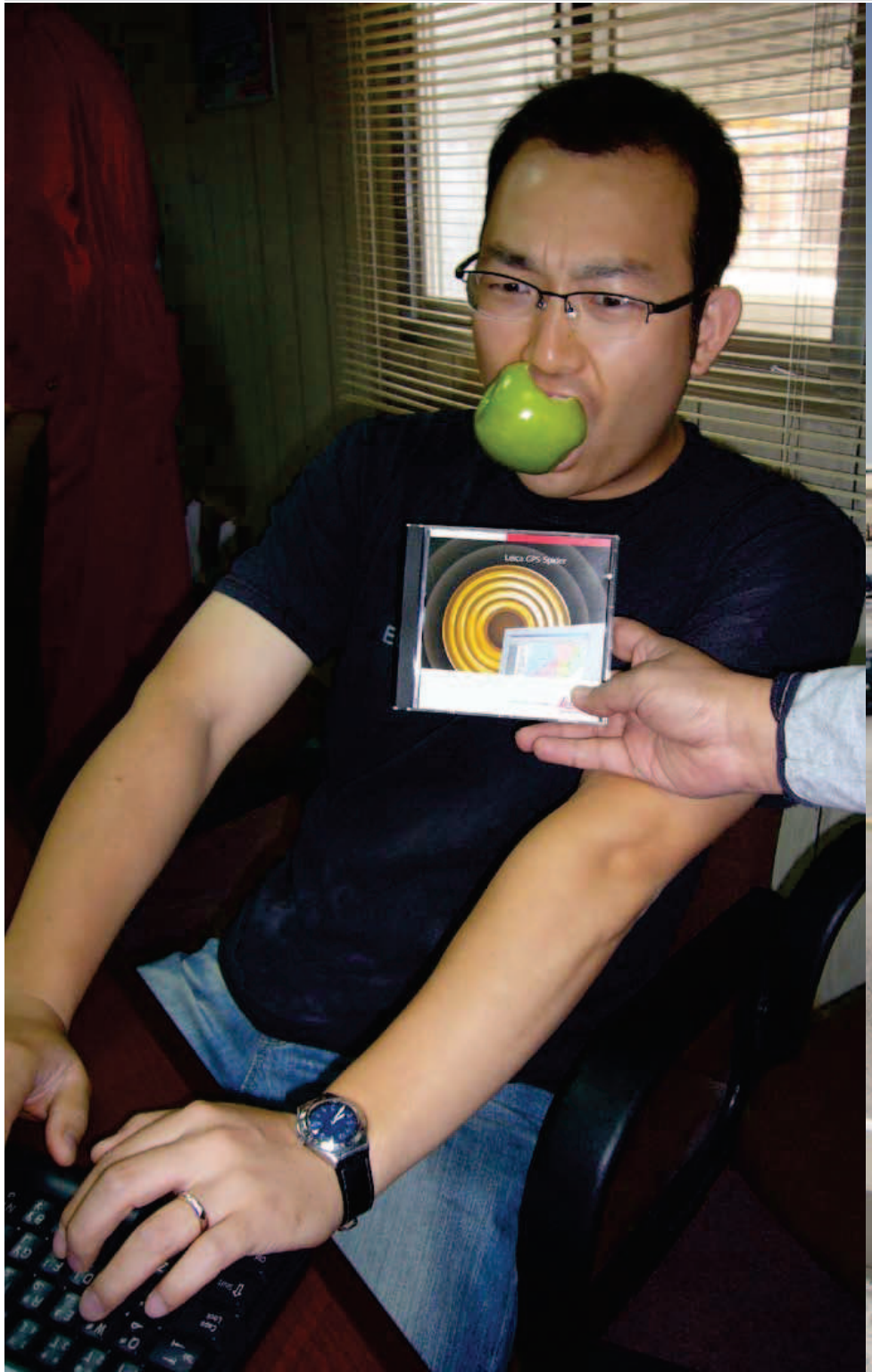
Leica GPS Spider


Leica