

# **FIG Commission 6 – Engineering Surveys**

## **Work Plan 2007–2010**

### **1 Title**

Engineering Surveys.

### **2 Terms of reference**

- Acquisition, processing and management of topometric data and all related information throughout the life cycle of a project (at construction site);
- Quality control and validation for civil engineering constructions and manufacturing of large objects;
- Modern concepts for setting-out and machine guidance;
- Deformation monitoring, analysis and interpretation, measurement of dynamic loaded structures (general);
- Prediction of deformation and movements in engineering projects, mines and areas of geological hazard;
- Automatic measuring systems, construction and industry and multi-sensor measuring systems;
- Terrestrial laser systems, their usage in architecture, civil engineering and industry;
- Quality control at the construction site;
- Standards related to construction and deformation measurement.

### **3 Mission statement**

- Promote the knowledge, skills and abilities of surveyors in civil and industrial works within the various professional fields of engineering;
- Support all development and multidisciplinary expertise leading to integrated survey methods, using various instruments and sensors and combining geometry with all other data relevant to each engineering problem;
- Provide a forum for exchange of knowledge related to engineering analysis of survey data for the study of structures;
- In addition to the links with related Working Groups of the International Association of Geodesy (IAG), the International Society for Mine Surveying (ISM) and the International Society for Photogrammetry and Remote Sensing (ISPRS), look for possible co-operation within these organisations and support the co-operation of civil, structural and mechanical engineers with our profession;

### **4 General**

In addition to the specific activities in the Mission Statement, the Commission will support and contribute to FIG Task Forces and the Standards Network. The Commission will also respond to the FIG Council to address new issues as they emerge.

### **5 Working Groups**

This Working Plan covers a wide scale of survey disciplines related to installations, plants and constructions of any kind.

## **Working Group 6.1 – Deformation Measurement and Analysis**

### Policy issues

- Automation of monitoring surveys
- Enhancement of geometrical modelling of deformations from integrated deformation surveys
- Physical interpretation of deformations including numerical modelling and prediction of deformations and back analysis.

### Chair

- Stathis Stiros (Greece), e-mail: stiros@upatras.gr
- Vice-Chair: Cecilia Whitaker (USA), e-mail: cwhitaker@mwdh2o.com

### Specific project(s)

- Regular symposia and exchanges between researchers and concerned professionals.

### Workshop(s)

- 13<sup>th</sup> International Symposium on Deformation Measurements, Lisbon, Portugal, 12–15 May 2008
- 14<sup>th</sup> International Symposium on Deformation Measurements, Australia, 2009
- Contributions to various joint meetings and FIG Working Weeks

### Publication(s)

- Proceedings of the meetings (by the host).

### Beneficiaries

- Geodetic engineers dealing with comparative measurements of deformed or unstable objects, geologists, geophysicists, and civil and structural engineers concerned with this issue.

## **Working Group 6.2 – Engineering Surveys for Industry and Research**

### Policy issues

Engineering surveys in industry and research demand ultimate quality to be realised in ever-shorter time slots and under spatially most limited conditions. WG2's main goal is to provide the specialists involved in that kind of missions with the latest state of the art concerning:

- The use of adapted survey techniques in industry & engineering;
- Multidisciplinary collaboration between survey engineers, civil engineers, structural & mechanical engineers, R&D scientists – for a better approach of complex engineering survey problems;
- Specific algorithms, instrumentation, equipment and techniques in engineering surveys;
- High precision measurements and special techniques for the large scale metrology of big equipment or structures;
- Integration of survey & alignment sensors with actuators and/or tools for on-line monitoring and control of a given process (dynamic systems);
- Relevant modules for the 'Optical 3D Measurement Techniques' series.

### Chair:

- Thomas Wunderlich (Germany), e-mail: Th.Wunderlich@bv.tu-muenchen.de
- Vice-Chair: Peter Kyrinovic (Slovakia), e-mail: peter.kyrinovic@stuba.sk

### Specific project(s)

- Engineering surveying procedures for power plants;
- Engineering surveying procedures for linear and circular accelerators;
- Engineering surveying procedures for nuclear research facilities;
- New techniques for as-built documentation and facility inventory;
- Industrial metrology in production, assembling and finishing processes;
- In-situ calibration of industrial robots.

### Workshop(s)

- Tutorials as part of the “International Course for Engineering Surveying”, Graz (Austria), 2007
- INGEO 4<sup>th</sup> International Conference on Engineering Surveying, Slovakia 2008
- Contributions to the FIG Working Weeks and to FIG Congress
- Specific seminars or workshops on dedicated topics.

### Publication(s)

- Proceedings of the meetings (by the host).

### Beneficiaries

- Dialogue with manufacturers to realise competent consumer wishes;
- Advising optimal instrument for each special application of a mission catalogue;
- Development of suitable planning tools for extensive scanning tasks;
- Software improvements to increase variety of best-fitting objects;
- Monitoring of CAD-SW behaviour under heavy scanning data load;
- Expansion of application fields.
- The surveyors, designers and manufacturers are waiting to acquire more expertise in these special applications.
- The group of professional which have the benefit of the results consist of engineers dealing with quality control of large objects or structures, scientific laboratories dealing with particle accelerators and detectors, fusion rings, gravitational antennas, power lasers, etc., scientists and engineers dealing with large scale metrology and accurate positioning in R&D sectors or in industry, finally universities and manufacturers involved in the development of special instruments.

## **Working Group 6.3 – Engineering Survey Data Bases and Facility Management**

### Policy issues

- Focus on the role of the surveying engineer as the responsible manager of spatially referenced information;
- Support for the co-ordination of the activities of other disciplines.

### Chair

- Lothar Gründig (Germany), e-mail: gruendig@inge3.bv.tu-berlin.de
- Vice-Chair: Vladimir Sereдович (Russian Federation), e-mail: sva@ssga.ru

### Specific project(s)

- Concepts of data models for the Mapping of relevant 4D or 5D project data, covering 3D geometry, time, and descriptive attributes;
- Exchange, provision and presentation of facility management data in computer networks;
- Data integration for this subject, taking into accounts the presence of redundant data and different sources of information;
- The automation and combination of feasible data acquisition techniques.

### Workshop(s)

- Workshop on Engineering Survey Data Bases and Facility Management, DDMM 200x, Berlin, Germany
- FIG Working Weeks
- Sessions and contributions to joint seminars, workshops and symposia.

### Publication(s)

- Proceedings of the meetings (by the host).

### Beneficiaries

- Surveying engineers, engineers and managers involved in facility management tasks.

## **Working Group 6.4 – Engineering Surveys for Construction Works and Structural Engineering**

### Policy Issues

- Promoting the use of adapted survey techniques in industry & engineering;
- Promoting a multidisciplinary collaboration between survey engineers, civil engineers, structural & mechanical engineers;
- Promoting the understanding of fibre optic sensors, e.g. interferometric sensors;
- Study the use of embedded sensor arrays and the role of advanced surveying techniques for structural monitoring;
- Creating an awareness of surveyors through a task force 'Fibre optic sensors' of the rapidly emerging technology of fibre optic sensors as "non-geodetic" sensors to measure deformations (strain) and temperatures in civil engineering structures

### Chair

- Gethin Wyn Roberts (United Kingdom): gethin.roberts@nottingham.ac.uk
- Vice-Chair: Joël Van Cranenbroeck (Switzerland), e-mail: joel.vancranenbroeck@leica-geosystems.com

### Specific Projects

- Precise methods and equipment for staking out during construction and structural works;
- QC and documentation for as build compared to as designed;
- Precise methods and equipment for engineering surveys for visualisation and photo match;

- Precise methods and equipment for remote surveys;
- Dynamic Monitoring of Buildings and Structures;
- Offshore construction surveys.

#### Workshops

- Regular symposia and exchanges between researchers and concerned professionals
- Tutorials as part of the “*International Course for Engineering Surveying*”, Graz (Austria), 2007
- Workshop on Automatic and multi-sensor Measuring Systems, 2009
- Contributions to various joint meetings and FIG events.

#### Publications

- Proceedings of the meetings (by the host)
- Web page

#### Beneficiaries

- Surveying profession becoming involved in this developing technology which will partly replace current geodetic techniques;
- Surveyors wanting to acquire information about fibre optic sensors as used in “smart civil engineering structures”;
- Engineers who has to decide about the best techniques to monitor civil Engineering structures;
- Universities teaching advanced sensor technology.
- Engineering surveyors and engineers involved with construction and setting out will benefit, as well as structural engineers, current buildings and future building designs.

### **Working Group 6.5 – Terrestrial Laser Scanners (Joint with Commission 5)**

#### Policy Issues

- Promote the use of laser scanning for geometric documentation in a variety of environments, particularly high risk and environments which benefit of remote measurements (eg structures, slopes, underground surveys, structural deformations of cultural heritage monuments);
- Investigate existing and developing terrestrial laser scanner instrumentation for engineering applications;
- Evaluate and compare algorithms for processing terrestrial laser scanner data (e.g. registration, surface modelling etc);
- Investigate and document metrological and quality control issues for laser scanning measurements;
- Investigate the integration of laser scanning measurements with other measuring techniques, such as conventional geodetic systems and photogrammetric techniques;

#### Chair

- Maria Tsakiri (Greece) e-mail: mtsakiri@central.ntua.gr
- Vice-Chair: Rudolf Staiger (Germany), e-mail: rudolf.staiger@fh-bochum.de

### Specific Projects

- Methods and equipment of terrestrial laser scanning for engineering surveying procedures;
- Create standardised terrestrial laser data sets to allow comparison between different software and processing methods;
- Calibration aspects for indoor and outdoor testing of terrestrial laser scanner instrumentation;
- Methods for combining terrestrial laser scanners with other sensors, eg CCD cameras, and integrating their data.

### Workshops

- Regular symposia and exchanges between researchers and concerned professionals
- Tutorials as part of the “International Course for Engineering Surveying”, Graz (Austria), 2007
- Workshop on Laser Scanning, November 2007
- Contributions to various joint meetings and FIG events
- Contribution to the ‘Optical 3D Measurement Techniques’ conference series
- Contribution to meetings of the ISPRS Working Group V/3 “Terrestrial Laser Scanning”.

### Publications

- Proceedings of the meetings (by the host)
- Web page

### Beneficiaries

- Surveying profession becoming involved in this developing technology;
- Engineers and other professionals involved in the cultural heritage sector wishing to record and monitor structures of engineering and cultural heritage importance;
- Manufacturers involved in the development of terrestrial laser scanners to consider needs of users;
- Users requiring calibration aspects of terrestrial laser scanners.

## **6 Study Groups**

### Study Group 1 – Continuum Mechanics as a Support for Deformation Monitoring, Analysis and Interpretation

Chair: Anna Szostak -Chrzanowski (Canada); Co-chair: W. Prószyński (Poland)

### Study Group 2 – Optimal Use of Interferometric Synthetic Aperture Radar (InSAR)

Chair: Chris Rizos (Australia); Co-chair: tba

### Study Group 3 – Crustal Deformation

Chair: Stathis Stiros (Greece); Co-chair: tba

### Study Group 4 – Monitoring and Analysis of Cyclic Deformations and Structural Vibrations

Chair: Gethin Wyn Roberts (UK); Co-chair: Philip Collier (Australia)

### Study Group 5 – Fibre Optic Sensors

Chair: Helmut Woschitz (Austria); Co-chair: tba

## Study Group 6 – Terrestrial-Based RF Positioning Technologies

Chair: Joel Barns (Australia); Co-chair: Xiaolin Meng (UK)

### **7 Co-operation with Sister Associations**

Commission 6 intends to continue co-operation with sister associations, especially The International Association of Geodesy (IAG). Further more The International Society for Mine Surveying (ISM) and the International Society for Photogrammetry and Remote Sensing (ISPRS) are of interest.

### **8 Communications**

Commission 6 will use general the commission web page with linkages to other relevant web pages to keep commission delegates, other FIG members and the public informed.

Commission 6 will provide an annual newsletter with input from the working groups. This will be distributed by e-mail.

### **9 New partnerships**

Commission 6 will try to support the developed partnership with ISM and the IAG Special Commission 4. New partnership could be developed with ISPRS according the increasing input of laser scanning (terrestrial and airborne) to the engineering survey projects.

### **10 Calendar of events**

2007

- Tutorials as part of the “*International Course for Engineering Surveying*”, Graz, Austria
- INGEO 4<sup>th</sup> International Conference on Engineering Surveying, Bratislava, Slovakia
- FIG Working Week, Hong Kong SAR, China, 13–17 May 2007
- Optical 3D Measurement Techniques, Zurich, Switzerland.

2008

- 13<sup>th</sup> International Symposium on Deformation Measurements, Lisbon, Portugal, 12–15 May 2008
- FIG Working Week, Stockholm, Sweden, 14–19 June 2008

2009

- 14<sup>th</sup> International Symposium on Deformation Measurements, 2009, Australia
- FIG Working Week, Eilat, Israel, 3–8 May 2009
- Workshop of the Working Group 6.4
- Workshop on Engineering Survey Data Bases and Facility Management

2010

- FIG Congress, Sydney, Australia, 9–16 April 2010

## 11 Commission officers

Commission Chair

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#### *Study Group Chairs*

*Study Group 1 – Continuum Mechanics as a Support for Deformation Monitoring, Analysis and Interpretation*

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