

Commission 6 – Engineering Surveys

Work Plan 2011-2014

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 (method statements)
- 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 such as land slides, subsidence etc
- Automatic measuring systems, construction and industry and multi-sensor measuring systems
- Terrestrial laser systems, their usage in architecture, civil engineering and industry including automated periodic measurements in order to measure track movements
- Industry measuring system metrology, testing and quality control
- Standards related to the construction, deformation measurement and measuring system metrology

3. Mission Statement

The mission of Commission 6 is to:

- 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 (geodetic, geotechnic, fast motion) 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 WGs of IAG, ISM and ISPRS, look for possible co-operation within these organisations and support the co-operation of civil, structural and mechanical engineers with our profession
- participation with ICOLD (International Committee on Large Dams) national committees
- participation on the FIG Standards Network on standardisation policy, support the standardisation activities at the international, local and national level, and development of standards and method statements
- participation on regional FIG events, and events organised in co-operation with sister organisations.

4. General

This Working Plan covers a wide scale of survey disciplines related to plants, installations and constructions of any kind. Commission 6 wants to promote:

- development of international standards and qualifications,
- development of best practice guides in Engineering Surveys,

Commission 6 will consist of three Working Groups and one joint working group with Commission 5. Commission 6 has study groups on specific issues and these could also be used for the FIG contribution to respond to global warming and disaster management.

The Council has requested Commission 6 to consider establishing a Memorandum of Understanding with the Institution of Civil Engineers (ICE).

5. Working Groups

Working Group 6.1 – Deformation Measurements and Analysis

Policy Issues

Deformation studies in Engineering Surveying are based on a broad knowledge of suitable sensors and their potential, modern data storage and communication solutions and advanced processing and analysis methods. Additionally a thorough understanding of the behaviour of monitoring objects (large scale structure or landslide effected area), is essential to set-up and operate an optimum monitoring system. Nowadays deformation tasks are more and more oriented towards real-time systems, which require automation of data capture and new concepts in data processing, analysis and interpretation.

WG6.1's main goals will be to support specialists in deformation studies with state-of-the art solutions and provide latest developments and future oriented concepts:

- Promoting studies on the potential of existing and new sensors to determine geometric deformation quantities from surveying and adjacent fields such as geotechnics;
- Promoting the development of concepts for automated data storage, data transfer and data pre-processing;
- Promoting the adaptation of numerical algorithms to derive relevant deformation quantities in real-time, including concepts from time series analysis;
- Promoting a multidisciplinary collaboration between surveying, structural and geotechnical engineers to understand the behaviour of structures and geotechnical objects;
- Study of most modern concepts for data analysis like artificial neural networks, fuzzy logics and generic algorithms;
- Initiate investigations to extend the range of deformation studies to higher frequencies, which are important in Structural Health Monitoring, i.e. to be able to study oscillations and vibrations and their effects on critical structures;

Chair

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Secretary:

Dr.-Ing. Björn Riedel (Germany), e-mail: b.riedel@tu-bs.de

Specific Projects

- Prepare reports on State-of-the-Art for typical deformation tasks (e.g. dams, bridges, high buildings, landslides, rock-fall, ...);
- Comparison of most modern instrumentation for automated deformation measurements;
- Comparison of concepts from artificial intelligence for deformation analysis;
- Case studies: For a typical data set of continuous observations, which has to be defined, different analysis concepts and tools have to be applied.

Workshops/Symposia

- 14th International Symposium on Deformation Measurements, Hong Kong, Nov. 2011
 - 15th International Symposium on Deformation Measurements, Europe (Hamburg ?), 2014
- These symposia will continuously be organised as joint symposia with IAG/ WG 4.2,

Publications

- Proceedings of the meetings (it is intended to have peer reviewed proceedings)

Beneficiaries

- Surveying professionals dealing with all aspects of deformation studies
- Surveyors interested in most modern, automated instrumentation
- Geologists, structural and geotechnical engineers concerned with deformation tasks

Study Groups:

For each of the specific projects, given above, a study group could be initiated.

Working Group 6.2 – 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 use of adapted survey techniques in the rail and railway building and operating sector;
- Promoting the understanding of fibre optic sensors, e.g. interferometric sensors, Brillouin and Raman scattering and Bragg gratings;
- 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
- Promoting the use of Terrestrial based RF positioning system in engineering surveying;
- Creating an awareness of surveyors through a task force “Geotechnical sensors” as the trend today is going for an integration of those sensors in the geodetic deformation analysis.
- Creating an awareness of surveyors through a task force “Railways Trolley monitoring system.

Chair

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Vice Chair

Prof. Esmond C.M. Mok, Department of Land Surveying & Geo-Informatics
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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. (Terrestrial laser scanners etc.)
- Dynamic Monitoring of Buildings and Structures during and after construction;
- Offshore construction surveys;
- Integration of sensors for engineering surveys;
- Rail track setting out and monitoring;
- Railway infrastructure (trolley system).

Workshops

- Regular symposia and exchanges between researchers and concerned professionals

Publications

- Proceedings of the meetings (by the host).

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";
- Surveyors wanting to acquire information about geotechnical sensors as used in engineering structures such as dams;
- 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.

Study group 6.2.1 Fibre Optic Sensors

Chair

Dr. Helmut Woschitz (Austria), email: helmut.woschitz@tugraz.at

Activities

- technical meeting in Graz

- 2-day conference or workshop in Germany
- Publication on Marketing of fibre optic sensors, possible.

Study Group 6.2.2 Laser Scanners (Joint with Commission 5)

Chair

Dr Ivo Milev, Germany, email: ivo.milev@technet-rail.de

Activities

- Innovative Technologies for an efficient geospatial management of earth resources 5-7 September, 2011 Ulaanbaatar, Mongolia
- Innovative technologies (2012 Uzbekistan)

With main topic: laser scanning for geospatial management of earth resources

Study Group 6.2.3 Ground Based Synthetic Aperture Radar

Chair

Prof Alessandro Capra, Italy, email: alessandro.capra@unimore.it

Activities

- Installation and replacement of the instrument for landslides and structures monitoring:
 - Time series analysis of periodic campaigns putted together (temporal decorrelation investigation);
 - Installation site and monuments: control of stability, refraction of glass/plexiglass.
- Integrated monitoring systems:
 - Geo-referencing, overlapping with high resolution DTM, GIS application;
 - Data comparison and validation with other sensors (Total station, GPS, ...);
 - Integration with others long range techniques and comparison of the respective accuracies;
 - Real time or near real time processing for early warning monitoring systems, possibility and future developments.

The issues will be developed in Technical Meeting and/or Congress that will be held in Italy.

Study Group 6.2.4 Geotechnical Sensors

Chair

Dr. Marco di Mauro, Switzerland, email: marco.dimauro@lgs-geo.it

Activities

- technical meeting in Italy
- 2 day congress in Germany
- PR for this technique, whenever possible.

Study group 6.2.5 Railway Surveying Techniques

Chair

Mr. Carlo Bonanno, Leica Geosystems, Italy, email: carlo.bonanno@leica-geosystems.it

Activities

- technical meeting in Italy and Switzerland
- 2 day congress in Italy
- PR for this technique, whenever possible

Working Group 6.3 – Machine Control and Guidance (MCG)

Policy Issues

The importance of real-time 3D-position sensors for navigation of machinery on construction sites of roads, tunnels, railways, and airports has increased over the last years and the market is still growing. Also in the field of agriculture GPS-based applications such as crop mapping and automatic steering are well introduced. The new FIG Working Group 6.5 will intensively deal with following topics:

- Kinematic Measurement and Sensor Technology (focus on L1 RTK Cost systems, adjustments of total station MCG requirements, additional Sensor like Slope Sensors, INS, Orientations Sensors, etc.),
- 3D-Applications (Agriculture, Construction, Special Applications e.g. UAVs),
- Multi-Sensor Systems and -platforms
- MCG Data Processing and Data Flow
- Control Process and Control Algorithm
- Standardization of Major Construction Projects

The main goal of Working Group 6.3 is the interaction of research and industry activities.

Chair

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Vice Chair

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Specific project(s)

- Regular symposia and exchanges between researchers and concerned professionals
- Expert Meetings during the exhibitions “Intergeo”, “World of Concrete”, “World of Asphalt”, “Agritechnica” and “Bauma”

Workshop(s)

- 3rd MCG Conference 2012 in Stuttgart
- 4th MCG Conference 2014 in Berlin
- *DVW Symposium “Interdisziplinäre Messaufgaben im Bauwesen”* – Weimar, Germany 2011
- *DVW Symposium - Kinematische Messmethoden "Vermessung in Bewegung"* Berlin, Germany, 2012
- Chartered Institution of Civil Engineering Surveyors' XCES annual conference

- Interaction with ION projects
- Contributions to FIG conferences and various joint meetings

Publication(s)

- Proceedings of the meetings (by the host)

Beneficiaries

- Due to new geodetic sensors (GNSS) and low cost sensors new application fields will emerge. In this respect close collaboration and regularly exchange between research departments of companies, users and academia is essential
- Standardization
- Technology transfer and networking
- Advising hard and software components
- Introduction of machine control and guidance into academic curricula

Study Groups

For each of the specific projects, given above, a study group could be initiated.

6. Co-operation with Other Commissions and organizations

Joint Working Groups

Working Group 5.5 – Ubiquitous Positioning Systems (Commission 5 has lead and work plan is described in Commission 5 work plan)

Study Group 6.2.2 Laser Scanners (Joint with Commission 5, Commission 6 has lead)

7. Co-operation with United Nation Organisations, Sister Associations and other Partners

The Council has asked Commission 6 to take responsibility on the implementation of the MoU with the International Association of Mine Surveying (ISM).

8. Meetings

Meetings have been listed under each Working Group and Study Group.

Commission 6 is considering organising a meeting or workshop in China.

9. Commission Officers

Chair

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