



FINAL REPORTS

Publishable Final Activity Report

Contract N° : **FP6-003766**

Acronym : **I-SAMCO**

Title : **International Structural Assessment Monitoring and Control**

Project Co-ordinator:

VCE Holding GmbH

A

VCE

Deliverable prepared by:

Participant	Country	Acronym
VCE Holding GmbH	A	VCE
Joint Research Centre of the European Commission	I	JRC
Commissariat a l'Energie Atomique	F	CEA
Federal Institute for Materials Research and Testing	D	BAM
Swiss Federal Laboratories for Materials Testing and Research	CH	EMPA
Academy of Science of the Czech Republic	CZ	ITAM
Central Laboratory for Seismic Mechanic and Earthquake Engineering of the Bulgarian Academy of Sciences	BG	CLSMEE

Reporting Period: **October 1st 2004 - May 31st 2007**

Project Start Date: **October 1st 2004**

Duration: **2,5 Years + 2 Months Extension**

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1. EXECUTIVE SUMMARY

The achievements of the I-SAMCO project resulting out of its activities can be summarized as follows:

- 1.) International collaboration has been achieved and fertilized through collaboration agreements with the United States, Canada, Japan and China.
- 2.) The dissemination of European knowledge has been done by dissemination events and the appointment of European representatives in the most important global activities.
- 3.) The access to knowledge from overseas has been achieved through the collaboration agreements and the participation to overseas projects.
- 4.) Standardization has been supported by drafting respective recommendations and participation in global standardization activities particular on data formats and meta data protocols.
- 5.) Training and education has been given through the numerous events described in this report.

Details are to be taken from respective chapters.

The project activities have been characterized by the following facts:

- All activities have been completed as per contract
- 25% more man hours have been spent on the activities
- The number of events have been doubled
- The schedule has been implemented as planned
- More new partners and items for collaboration have been found than anticipated

Therefore the project is considered to be successful and the activities will live on beyond the end of the project through emerging activities.

Recommendations

It has been found that I-SAMCO performed most necessary activities. Nevertheless the level on which such activities are performed in America or Asia has been found to be one order of magnitude higher than in Europe. In order to avoid a fallback of Europe in this field considerable higher efforts on European level are recommended. This can actively be studied in the field of earthquake engineering, where despite a higher demand in Europe, the funding lacks behind dramatically.

2. PROJECT EXECUTION

2.1 General Project Information

Instrument and Duration:

The Specific Support Action I-SAMCO (International Structural Assessment Monitoring and Control, FP6 003766) was launched in October 2004 and terminated in May 2007.

Project Logo:



Project Website: <http://www.samco.org/isamco>

Contractors, Coordinator and Partners:

I-SAMCO Contractors			
No.	Participant name	Short Name	Country
1	VCE Holding GmbH	VCE	AT
2	Joint Research Centre of the European Commission	JRC	I
3	Commissariat a l'Energie Atomique	CEA	F
4	Federal Institute for Materials Research and Testing	BAM	D
5	Swiss Federal Laboratories for Materials Testing and Research	EMPA	CH
6	Academy of Science of the Czech Republic	ITAM	CZ
7	Central Laboratory for Seismic Mechanic and Earthquake Engineering of the Bulgarian Academy of Sciences	CLSMEE	BG

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I-SAMCO International Partners*		
Name	Short Name	Country
Network of Earthquake Engineering Simulation, NSF	NEES	USA
National Institute for Earth Observation and Disaster Prevention	NIED	Japan
National Centre for Research in Earthquake Engineering	NCREE	Taiwan
Intelligent Sensing for Innovative Structures, Canada Research Network	ISIS	Canada
Asian Institute of Technology	AIT	Thailand
Commonwealth Scientific & Industrial Research Organization	CSIRO	Australia
University of Tokyo, Department of Civil Engineering	UniTokyo	Japan
University of Bristol, Department of Civil Engineering	UniBristol	UK
University of Carleton, The Ottawa-Carleton Institute for Civil Engineering	UNICalt	Canada

* Collaboration with International Partners has been established in Collaboration Agreements with I-SAMCO.

2.2 Project Objectives

The Specific Support Action I-SAMCO (International Structural Assessment Monitoring and Control, FP6 003766) was launched in October 2004. The support action had its origin in the Thematic Network SAMCO (Structural Assessment Monitoring and Control, GTC2-2000-33069) that was launched successfully in 2001. The standardization initiative embedded in SAMCO network quickly identified the international demand for standardization initiatives. The drive came from the United States (Stanford and Drexel Universities) with a strong participation of Japan (The University of Tokyo), with interest from the U.S. NSF and the Taiwanese N.C.R.E.E. A group has been formed including all these institutions to work on international regulations and standards. SAMCO has been invited to join and therefore the I-SAMCO support action was funded by the European Commission. It helped to close this gap between European and Overseas interest groups that are acting along the same lines and enabled the most successful work done in SAMCO to become international. The demand for international collaboration existing in the engineering community worldwide has been identified as key drivers for the project.

I-SAMCO's overall objective was to contribute to enhancing international collaboration between key institutions, academia and industry to share knowledge, methodologies, tools and results of past and future research. International collaboration was installed through networking, joint participation to international projects, exchange of researchers and contribution to national projects of common interest.

This involves the following project objectives:

- (1) International Collaboration: The objective is the setting up of a global I-SAMCO network based on the existing bilateral relations of the I-SAMCO contractors, including key players of Europe, Asia, America and Australia. By setting up an industry-led, international R&D community, I-SAMCO shall support the further development of the research networking infrastructure. Through Collaboration in I-SAMCO, costs, burdens and risks related to R&D can be reduced and shared combining end-users with advanced technology producers and research institutions all over the world.

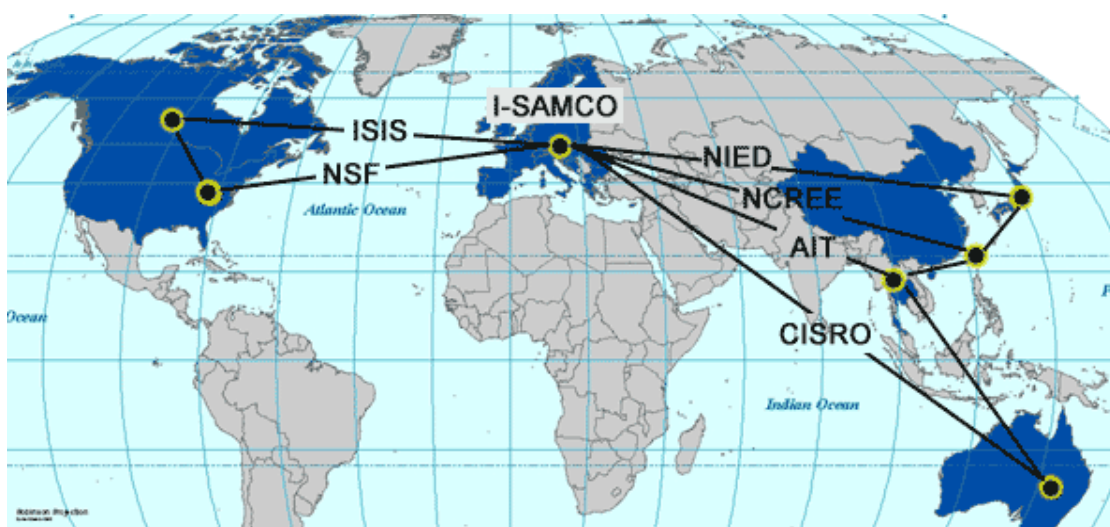


Fig.1: International Collaboration in I-SAMCO

- (2) **Dissemination of European Knowledge:** The objective is to contribute actively to the exchange of knowledge and dissemination of the results of the SAMCO network, to third country organizations. I-SAMCO shall enable the spread of European knowledge over the usual diffusion of EU projects. That way new markets shall be created and the way to international business and future collaborative RTD (Research and Technological Development) activities shall be opened. It is aimed to identify possible lacks and deficiencies in European R&D, to define future focal points for the European R&D and to set strategies for the research activities in Europe.
- (3) **Access to Knowledge from Overseas:** Looking at recent activities and programmes of the research community overseas, especially in the US, a great leap forward in their development is to be expected. In order to keep the European advantage in the field, it is necessary to open the ERA to the novel developments made outside of Europe. The major aim is to help European researcher, business and research organizations in the European Union to have access to knowledge and expertise outside of the EU borders. This shall be enabled by the exchange of researchers between the continents and the participation of European researchers in promising overseas projects like the NSF-FHWA project.
- (4) **Standardization:** A number of organizations have identified the requirement for standardization going beyond Europe of the way in which measurement data and other information are stored. The lack of such standardization is hindering the European market in respect of the application of new and innovative technologies. Also countries overseas have developed strategies to overcome the problem of interoperability. In I-SAMCO the experiences and achievements of the third countries in this subject shall be used to bring forward the European standardization initiatives and to develop a road map for international standardization. By identifying the barriers for incorporation of technologies in the area and setting up proposals how to overcome that obstacles, the existing equipment and methodologies will come closer. The aim is that monitoring application and services can be applied across networks, different platforms and products.
- (5) **Training and Education:** The science is faced with the new areas of technological development. The classical modes of science disciplines will be replaced with the new ones in which interdisciplinary character of research will be dominant. The scientists will be faced with the needs of having much wider knowledge of different disciplines from one point of view and from another they will be faced with the needs of having deeper knowledge in a specific field of science. The market-driven character of I-SAMCO R&D (Research and Development) means that academics and researchers are part of an effort to transfer valuable technologies through education and training to future generations. Participation in I-SAMCO also ensures that state-of-the-art information is broadly available for curriculum development. The mobility of researchers will be promoted, particularly with a view to the successful creation of the ERA.

2.3 Work Performed and Results (Project Level)

(1) International Mapping

Work performed:

The field of structural assessment, monitoring and control is very fragmented. Therefore a common platform and reference point was established by SAMCO. With I-SAMCO the initiative should get international and the standardization activities should be brought forward.

In this work package the key organizations, enterprises, researchers, institutions and other players, as well as their current RTD activities on global scale were mapped. The identification of key players (mapping) was carried out and an international "RTD watch" database was created which provide a holistic overview of the research landscape worldwide and to identify interested parties for future research activities. The state-of-the-art has advanced in the last four years, in which SAMCO was active; therefore the information in the database required an update too, also to fit the demand of I-SAMCO for internationality.

Results:

The aim to offer a searchable, extendable, online database in the frame of the existing SAMCO database was fulfilled by extending the SAMCO database by I-SAMCO events and new contacts in the new member states. In the last years the number of organizations active in the area of structural assessment, monitoring and control, also from the new EU member states, has increased constantly. Those key players in 9 nations (Czech Republic, Hungary, Slovakia, Slovenia, Estonia, Latvia, Lithuania, Malta and Cyprus) were captured in the SAMCO database. A search engine was established for an easy and quick search. At this the existing SAMCO database was used as backbone to minimize the effort in implementing. Organisations involved in the area of structural assessment, monitoring and control can be queried here:

http://samco.jrc.it/page.gx? app.page=/search/search_organization.htm

(2) Collaboration Agreements

Work performed:

With the development and establishment of memoranda of understanding between the contractors and the international partners the legal basis for the International Collaboration was set up. As first step excellent parties for that International Collaboration had to be selected. The aim was to enable usage and access to outstanding laboratories and testing facilities and to enable participation in important research projects outside the ERA in order to bring the European research achievements forward and to participate in international standardization initiatives.

Results:

A Memorandum of Understanding that constitutes the Collaboration Agreements and elaborates the strategy of I-SAMCO, principles of the Collaboration, the mutual interest of the parties that are signing the agreement, the responsibilities of the parties and the prohibitions was defined. Based on this Memorandum of understanding two kinds of Collaboration Agreements (Collaboration Agreement on the exchange of researchers and Collaboration Agreement on the participation in research projects) were established depending on the purpose of the exchange.

The Collaboration Agreements define scope, means and control mechanisms for the international activities.

International Collaboration was achieved with the following organisations:

- Network of Earthquake Engineering Simulation (NEES) by NSF (National Science Foundation) situated in Columbia / USA is the biggest project in the field of Earthquake Engineering worldwide.
- NIED (National Institute for Earth Observation and Disaster Prevention) situated in Japan constructed the world's largest shaking table (E-DEFENSE) that is 20 by 20 meters with 6 degrees of freedom and a vertical payload of 1200t.
- ISIS (Intelligent Sensing for Innovative Structures, Canada Research Network) is a research network with the aim to advance civil engineering to a world leadership position with the priority to train highly qualified personnel.
- NCREE (National Centre of Research in Earthquake Engineering) is the largest testing facility in Taiwan with excellent researchers and facilities heavily involved in earthquake engineering, and disaster mitigation.
- CSIRO- Commonwealth Scientific and Industrial Research Organization is involved in similar activities in Australia and a leading institution in the field.
- AIT (Asian Institute of Technology) situated in Thailand represents the south east Asian area with a focus on structural health management.
- University of Tokyo, Department of Civil Engineering
- University of Bristol, Department of Civil Engineering
- The Ottawa-Carleton Institute for Civil Engineering
- Drexel University

(3) International Workshops/ Summer Academies

Work performed:

- SAMCO Summer Academy 2005: 80 persons from 27 nations from all over the world participated in the SAMCO Summer Academy, which took place from September 5th to September 9th 2005 in the province of Salzburg in Austria.
- NEES and NEESgrid Seminar: was held in Ispra / Italy from May 23rd to May 24th 2005. The seminar taking place on the premises of JRC Ispra 2005 was organized by NEESit (international Partner NSF) and JRC (project participant). It was attended by 31 participants from EU, Taiwan and USA, representing national research centres and laboratories in the field of structural mechanics and earthquake engineering.
- 2nd NEES World Forum: I-SAMCO organized in collaboration with the Joint Research Centre (JRC) of the European Commission the 2nd World Forum on Collaborative Research in Earthquake Engineering (2WFCREE), which was held at JRC-Ispra (VA, Italy) on March 26-27, 2007. It follows the 1st WFCREE organized by NEESinc at San Francisco on March 16-18, 2006.
- Workshops in Ljubljana/Slovenia, Prague/Czech Republic and Sofia/Bulgaria: Dissemination and knowledge transfer into newly associated states is a must for a European action. Therefore I-SAMCO organized three dissemination events on structural assessment, monitoring and control. Hosting organizations were the ZAG (Slovenian National Building and Civil Engineering Institute), ITAM (Academy of Science of the Czech Republic) and CLSMEE (Bulgarian Academy of Science and the Institute of Theoretical and Applied Mechanics) in Sofia.

Results:

The I-SAMCO Summer Academy 2005 helped to involve people in the field who are not part of I-SAMCO or SAMCO. Scientifically excellent lectures worldwide were gained and young researchers and PHD students were trained.

In the NEES seminar the US NEESgrid initiative was presented to the European earthquake community. Potential collaborations were discussed which resulted in a common resolution of the seminar. (NEES = Network for Earthquake Engineering Simulation, a huge research effort of the NSF (US National Science Foundation) on earthquake engineering simulation). The NEES cyber infrastructure and software was introduced. As a consequence of the seminar a “European NEES data centre” – besides of those planned in the US, Japan and Korea was established at JRC.

In the 2nd World Forum objectives and interdependencies between major international research programs could be identified and policies and/or agreements were facilitated and discussed in order to foster international collaborative research. It has further engaged a representative international group of researchers and research administrators to discuss and promote opportunities for collaboration in earthquake engineering, laboratory testing and training of young researchers.

Summarising all the international events brought together the international partners with the I-SAMCO contractors and also SAMCO network members. That way the SAMCO network was integrated and supported. Specific research subjects were treated and new collaborations were established. The international events help in the course of the I-SAMCO project brought the following achievements:

- Identification of the current practice and state of the art
- Meeting of an International forum
- Integration of SAMCO partners
- Coordination and harmonization of ongoing RTD activities
- Education and Training

(4) International Harmonisation

Work performed:

A group of experts has been formed that defined the basis for new codes. A European delegation created from VCE, BAM and EMPA was supported to act as a European lobbying body. Frequent meetings on international level were necessary. Meetings:

- ISO Meeting in Munich at April 2006
- Creation of national Steering Committee for "Monitoring and assessment"
- ISO Meeting in Berlin, April 2007

The main purpose was to identify barriers that hinder the incorporation of technologies in the area of structural health monitoring and to make proposals how to overcome that hurdles.

A harmonization workshop was carried out. The Workshop was held at JRC-Ispra on September 27th to 28th 2004, was attended by 31 participants from EU, Taiwan and USA, representing national research centers and laboratories in the field of structural mechanics and earthquake engineering.

Results:

A compilation of the results of past EU-initiatives working on pre-standardization has been carried out. This concerns mainly the projects SAMCO (Structural Assessment, Monitoring and Control, CTG2 – 2000 – 33069) and EU-MEDIN (Euro-Mediterranean Disaster Information Network). A connection to the EU-MEDIN was established so that a link to the harmonization of methods to improve pre-disaster planning as well as hazard, vulnerability and risk assessments could be made.

The monitoring of several structures (bridges, towers, masts) has taken place as benchmark projects in Czech republic in the years 2005-2006 on the basis of internal ministry grants as well as on the industrial projects. ITAM as the leading coordinator of long time measurement has several proposals to include in standards and codes as it has been done on the national level.

A Guideline for Structural Control was worked out by EMPA. The goal of this guideline is to give a state of the art or overview, respectively, of structural control. This guideline presents and summarizes the usual approaches and methods in the field of structural control. From this point of view, this guideline may be a helpful document and a source for ideas and references as well for engineers and scientists. Standards of Germany, Japan, the United Kingdom, the United States as well as reports of international researcher organisations (e.g. federation du beton – fib; ISIS Canada) have been scrutinized. Structural control principles and their applications, different aspects of their testing, the derivation of equation systems etc. are described in many research publications, laboratory reports and books. The material was collected and systematized in a way that the information could be used for the guideline. Actual research results of EMPA Laboratory as well as those of SAMCO partners were considered.

A Guideline for Monitoring and Control was worked out by BAM. To remove the major obstacle in the application of the already existing methods, guidelines were drafted to form a basis for a public order of such services. This is the demand which the EU Commission has placed at the SAMCO network with the expectation that the guidelines will be the base for an international code to be worked out. There isn't a comprehensive international standard yet which describes the use of methods and procedures of SHM (Structural health Monitoring) according to comparable results. A concept and the contents of that guideline for monitoring and assessment of engineering structures was developed at BAM and was brought into the international standardization process (CEN or ISO) for the processing until March 2006.

(5) Participation in the Overseas Project

Work performed:

Projects outside the EU have been attended in the course of WP 5 which is devoted to the participation in overseas projects. The WP was created because of international partners that had expressed their willingness to let European researchers participate in their projects without restriction (e.g. the project NSF-FHWA). Nevertheless the costs have to be carried by Europe.

The vision was to finally create the base for virtual institutes and collaboration facilities that do not require long travel and related costs. It was aimed to create the base for the data and information sharing, in particular the participation in major, expensive laboratory tests or benchmark test on real structures that are unique and not repeated worldwide.

The beginning of the international participation needs the establishment of human relations and mutual exchanges of researchers, whose base are the Collaboration agreements (WP2). These agreements allowed partners from I-SAMCO or SAMCO to participate in huge research projects outside of the EU. The following collaborations on projects have been carried out:

- Collaboration on the Brooklyn Bridge in New York with the Drexel University of Philadelphia
- Collaboration on the Confederation Bridge in Canada with the Carlton University of Ottawa
- Collaboration with the University of Harbin, China on several bridges across the Yangtze
- Collaboration with AIT in Thailand – conduction of a joint conference in Bangkok
- Collaboration with the University of Tokyo on several sub themes of monitoring

Results:

European researchers and engineers have participated in unique projects in Asia and the US. The participation to huge and well-known overseas research projects has been enabled

by several contacts and the exchange of researchers on bilateral and multilateral way.

There is a draft concept for joint data format and data protocol.

On the other hand the international partners of the I-SAMCO Project (NEES / USA, NIED / Japan, NCREC / Taiwan, ISIS / Canada, AIT / Thailand, CSIRO / Australia, University of Tokyo / Japan, University of Bristol / Great Britain, University of Carleton / USA) were invited to demonstrate or apply their approaches on European facilities (e.g. in the ELSA laboratory of the JRC).

(6) Integration into the SAMCO Platform

Work performed:

This WP6 is devoted to the integration into the SAMCO platform. The aim was to use the existing human resources and technical infrastructure of the SAMCO network and to support the SAMCO network by including them into the international Collaboration.

The existing infrastructure (database, newsletter, etc.) of SAMCO was enlarged to suit the requirements of international participation. The SAMCO database was extended for I-SAMCO. Information on current and finished international projects as well as documents and data with relation to international structural assessment, monitoring and control were added for scientific exchange. Also a search engine on international key players was established in the framework of the existing SAMCO database.

The SAMCO network was supported by enabling international exchange and collaboration. This was achieved by international events participated by the SAMCO partners and members as well as the international partners of I-SAMCO and other reputed international key players from all over the world. Information dissemination events were held in the newly associated states Romania and Bulgaria, bringing the SAMCO initiative and partners to these states. That means that the work achieved in SAMCO was demonstrated on benchmark projects and the knowledge of SAMCO was disseminated in I-SAMCO (e.g the work on harmonization and SHM technologies).

Results:

There was an increase of data of 20% since I-SAMCO has been integrated into the SAMCO database. The platform contains by now more than 150 project related documents. There are 88 Projects entered with 1167 data files and 243 registered users.

The platform is accessible by <http://samdoc.jrc.it>. The database is an innovative feature of the network, because the data supply is free of charge and accessible for everyone. In particular the database has the following aims:

- *Support for Research and Development:* The database support the research community through the provision of the raw information for their work. Everybody is able to use the raw data for further examinations.
- *Linking Developers and End Users:* The database bridges the gap between developers and end users of technologies. The awareness among the end users about research and development results and available technologies has increased, by the provision of information. Thus, end users can find the information and service and developers can present their technologies.
- *Support for Practicing Engineers:* With reference projects and demonstration cases, the database supports engineers to strengthen a certain technology or methodology.
- *Demonstration of the activities within the European research area:* This is important for the collaboration with Japan and the United States.
- *Providing contact points:* Finally the database is a contact point for industry, research, consultants and organizations.

The database collects all available data in the field of structural assessment, monitoring and control. It contains information about methodologies, projects, tests and research work. In particular includes:

- *Benchmark tests:* A number of reference tests are included, which aim to allow a comparison of different approaches and methods.
- *Laboratory tests:* These tests shall increase the recognition of the experimental capabilities and methods within the engineering community. Interested parties are allowed to use the data for further research work or to check new technology approaches.
- *Raw data:* The data gained through the tests can be obtained in order to allow further examinations.
- *Research Projects:* Documentations and results of research projects and activities within the field.
- *Organizations:* The organizations being active in the field are listed.
- *Methods:* Different approaches, methodologies and technologies developed in the field.
- *State-of-the-art reports and literature hints:* Specialized publications and technical guidelines as well as specialized literature hints.

The standardization initiative embedded in SAMCO was involved into the international standardization activities of I-SAMCO. Active links to between the standardization and certification group, were established with the US NEES project. The SAMCO related activities have been integrated in the signed CA with NCREE and in the draft CA agreed with NEESinc. This allows the integration, mainly through the JRC, of the SAMCO Partners in the international context in order to obtain information and knowledge about the most meaningful advances in new materials and structures, testing and assessment methods, design guidelines and standards.

(7) Exchange of Researchers**Work performed:**

This WP7 is linked to WP5, the Participation to Overseas Projects. Nevertheless the purpose of WP 7 was to use existing programmes and to provide the necessary information and support for international implementation. A targeted strategy should be developed and maintained throughout the project.

Several Research Exchanges have been carried out between the I-SAMCO contractors and the international partners on specific research topics.

Results:

Exchanges :

- *NCREE Taiwan (host) – VCE Austria:* VCE sent a civil engineer to NCREE. The two institutions analysed their requirements on a common data model for data management and data transfer. Although the parties work on the same field many differences have been identified and surmounted in a complex but very generic data model design based on the well proven BRIMOS[®] Data Model. A data model was established at the NCREE for the laboratory tests.
- *B&T China (host) – VCE Austria:* VCE sent two expert in SHM to carry out a knowledge transfer event “BRIMOS Seminar and Press Conference” organized by B&T China.
- *HIT China (host) – VCE Austria:* VCE sent two SHM experts to hold lectures at the HIT Institute (Harbin Institute of Technology of the Shenzhen Graduate School) and to carry out BRIMOS demonstration measurements at the “Songhua River Highway Cable Stayed Bridge“ and “Binzhou Yellow River Cable Stayed Bridge“ organized by HIT.
- *JRC – Italy (host) – NCREE Taiwan:* NCREE sent four experts. The main purpose was the collaboration and exchange of competences in the field of the application of optical methods for measurements during laboratory testing. The focus was on data management (including Data Model) in JRC-ELSA (European Laboratory for Structural Assessment) and NCREE, development of hybrid testing techniques in ELSA and NCREE, including possible networked simulations and full scale fatigue tests on cable-to-box girder connection adopted in cable stayed bridges.
- *NCREE Taiwan (host) – JRC Italy:* JRC sent an expert on optical measurement methods at the JRC-ELSA to NCREE. The purpose was the collaboration and exchange of competences in the field of the application of optical methods for structural measurements. The ongoing collaboration included also exchange of software packages and common work in order to converge on possible common software for optical measurements during laboratory tests performed on structure
- *BAM – Germany –* Since April 2005 Pablo Cuellar from the Polytechnical University of Madrid (UPM) has been working for the department VII.2 (Buildings and structures) at BAM. He is taking part in a project aiming to study the properties and long-term behaviour of ballasted railroad tracks, and has already developed a Finite Element program that estimates the vertical dynamics of an ideal track composed of rail, rail-pad, sleeper, ballast and subgrade. Parallel to that, Pablo is also investigating the suitability and possibilities of performing Discrete Element Analysis (DEM) for the simulation of ballast local effects at BAM. In order to assess the state of the art of DEM in its application to ballast

simulation he is currently in contact with two other research groups in the field (Stuttgart and Montpellier).

- Exchanges with the University of California San Diego on the joint data model and metadata protocol

(8) Information Dissemination

Work performed:

WP 8 represents the international dissemination of information and implementation of results. This WP is considered to be important because it makes the visibility of the European side stronger. Overlap with WP3 (international events) and WP6 (integration into the SAMCO platform) is given.

The following dissemination tools were used/established:

- Integration of I-SAMCO into the existing SAMCO web site (with access to the databases) by VCE
- Establishment of a user community based I-SAMCO document exchange platform (this is a web based system with an authorization model to restrict access to I-SAMCO members) by VCE and JRC
- Dissemination of an electronic SAMCO Newsletter, which contains contributions and company profiles of I-SAMCO participants as well as announcements issued by VCE
- Integration of I-SAMCO data into the existing platform with public access (web based database, public domain) by VCE and JRC (please refer to WP6)
- The NEES Central Platform was made available for all I-SAMCO participants. This was reached in the NEESgrid Workshop (please refer to WP3). This web portal is available to all NEES participants and I-SAMCO participants and is designed to provide a simple way for researchers to share and archive their project data.
- Dissemination workshops in Bulgaria and Romania (please refer to WP3) and meeting of the international forum for the dissemination of the results.

In the following dissemination events I-SAMCO partners took part:

- ECTP (European Construction Technology Platform) workshop (October 2005) took place in Paris, which was used to do valuable coordination work.
- The EVACES Congress in Bordeaux (October 2005) brought together the international community in relation to I-SAMCO a major number of important contacts in relation to the contract have been made.
- A congress on monitoring of bridges (November 2005) has been visited in Hong Kong by several participants of the network. An I-SAMCO presentation has been successfully given.
- International collaboration has been enforced at an international workshop at NCREE in Taiwan, where the relevant researchers in our field have been gathered to discuss the international situation.
- The 2nd ISHMII Conference has been held in Shenzhen China (November 2005) with a large participation globally. This is the most relevant international organization on this subject. Several keynote lectures in relation to I-SAMCO have been provided.

- A visit to the SPIE Conference in San Diego (March 2006) has been used to deepen the ISHMII collaboration and to meet the global community. Main subject has been exchange of researchers and the international standardization.
- The 1st World Forum on earthquake engineering has been held in San Francisco (March 2006). It brought together the relevant research community on earthquake engineering globally. A leading role could be obtained for I-SAMCO, which will be the host of the 2nd World Forum.
- A number of dissemination events have been visited where I-SAMCO presentations have been given. There are particular the IABSE Congress in Copenhagen Denmark in May 2006 and the IABSE Symposium in Budapest in September 2006. Relevant papers are available.
- A keynote lecture has been provided at the International Conference on earthquake engineering and the cultural heritage in Prague in June 2006, where high level talks with representatives of DG Research were conducted.
- A visit has been paid to the IABMAS Conference in Portugal in July 2006 with meetings of a number of I-SAMCO members.
- The EASEC 10 Conference in Bangkok brought together 800 participants from South East Asia countries. A keynote lecture on I-SAMCO issues has been invited.

Results:

- *International Forum:* The organized events brought together all the key organizations. The results of the exchange of researchers, like laboratory or on site test, and the results from the participation in research projects in other continents were presented. These results were made available for the whole international forum, according to requirements that have been defined in the Collaboration Agreements.
- *SAMCO platform:* These results were made available for the SAMCO network, according to requirements that have been defined in the Collaboration Agreements. The existing communication infrastructure of SAMCO has been used for the dissemination of results and data. Future RTD activities on the basis of the identified lacks and needs have been discussed.
- *NEES IT International Collaboration Infrastructure:* There is an international mailing list "It-intl" which has been extended to the I-SAMCO partners. In this mailing list topics about data exchange by NEESit and harmonization are treated.
- *Access to NEEScentral:* Access to the central server of NEES in San Diego was given to all I-SAMCO partners. This web portal is available to all NEES participants and I-SAMCO partners and is designed to provide a simple way for researchers to share and archive their project data.
- *Stakeholders:* Contacts to stakeholders like the IAEA and IABSE have been used for implementation of the results.
- *General PR work* was carried out by the workpackage leaders and of course the project management. All kinds of tools such as an electronic newsletter and activities on the publication level were managed here.

(9) Management

Work performed:

WP 9 comprised the management of this collaboration.

The respective activities carried out have been:

- Coordination
- Project steering
- Organization of events
- Organization of publications
- Collaboration with other projects
- Education and training
- Financial management
- Management of the time schedule

Results:

The results achieved can be roughly characterized by:

- The coordination has been found frictionless and a good relation with the responsible Scientific Officer, Mr. George Katalagianakis, has been established
- Project steering has been performed during the numerous meetings of the Consortium and anonymous decisions have been taken throughout the project
- A major number of events has been organized according to a detailed list which all have received highest attention and participation
- Dissemination has been ensured by various publications and presentations in the most relevant international conferences, workshops and seminars
- Collaboration agreements have been drafted and implemented with particular success in the field of earthquake engineering
- Education and training has been achieved by various exchange activities of researchers and by training workshops supported during the project
- The financial management within the project has been frictionless
- The schedule has been kept throughout the project with the exception of a 2 month extension, which became necessary due to the final event ending on the last day of the original project period

No problems or deviations have been experienced.

3. ACTIVITY REPORTS PER PARTNER

Each partner has been asked to submit an activity report which has been directly introduced into this report without any modification by the Coordinator.

3.1 VCE – VCE Holding GmbH

As an overview the following can be stated:

Ad WP1 - International Mapping

VCE was planning, preparing and conducting all the events of the end users forum of the network. In the first reporting period main events have been registered which were the strategy workshop in April in Berlin, the harmonization workshop in May in Ispra and the summer academy in September in Zell am See. Within this work package mainly the organisational staff has been involved but also those preparing the proceedings and the technical programme. The following persons have been involved: Mr. Wenzel, Mrs. Neuhäuser, Mrs. Krims-Steiner, Mrs. Winter, Mrs. Halbkram, Mrs. Wallisch, Mr. Furtner, Mr. Stöger.

The international mapping process has been continued within the network in the second and third years, in which centres of competence and authorities in the field have been identified on international level. In the last year the number of organizations also from the new EU member states has increased constantly.

The aim to offer a searchable, extendable, online database in the frame of the existing SAMCO database was fulfilled by simply extending the SAMCO database by I-SAMCO events and new contacts in the new member states. The mapped organizations are available in the SAMCO database, where a search engine was established for an easy and quick search. At this the existing SAMCO database was used as backbone to minimize the effort in implementing that part of the WP1.

Ad WP2 – Collaboration Agreements:

With the development and establishment of memoranda of understanding between the contractors and the international partners the legal basis for the International Collaboration was set up. As first step excellent parties for that International Collaboration had to be selected. The aim was to enable usage and access to outstanding laboratories and testing facilities and to enable participation in important research projects outside the ERA in order to bring the European research achievements forward and to participate in international standardization initiatives.

Ad WP3 - International Workshops/Summer Academies:

1. Organization of Kick-off Meeting (12 July, 2004) in Vienna
2. NEES and NEESgrid Seminar (23-24 May 2005) in Ispra / Italy
3. Organization of Summer Academy in Zell am See /Austria (5-9 September 2005)
4. Organization of the Samco (NAS) Workshop in Ljubljana, Slovenia (10 – 11 Oct. 2005) together with ZAG.

5. Organization of the SAMCO Workshop in Prague, Czech Republic (June 2006)
6. Mr Wenzel together with a representative of the JRC attended the 1st World Forum on Collaborative Research in Earthquake Engineering (1WFCREE) held in San Francisco on March 16-18, 2006 and organized by NEESinc. The JRC representative and the I-SAMCO Coordinator took the engagement to organize in Europe the 2nd World Forum on Collaborative Research in Earthquake Engineering (2WFCREE).
7. Mr. Wenzel attended the EASEC Conference in Bangkok, Thailand (3 – 5 Aug. 2006).
8. Organization of the Workshop in Prague, Czech Republic (18 – 19 Sept. 2006) together with ITAM.
9. International Workshop on Reforming Civil and Environmental Engineering Education given the Societal Challenges Related to Infrastructure, Istanbul /Turkey (4-7 Oct. 2006) sponsored by I-Samco
10. Workshop in Sofia /Bulgaria (19-20 Oct. 2006)
11. 2nd World Forum on Collaborative Research in Earthquake Engineering (2WFCREE) in Ispra /Italy (26-27 March)

Within this work package mainly the organisational staff has been involved but also those preparing the proceedings and the technical programme. The following persons have been involved: Mr. Wenzel, Mrs. Neuhäuser, Mrs. Krims-Steiner, Mrs. Winter, Mrs. Halbkram, Mrs. Wallisch, Mr. Furtner, Mr. Stöger.

Ad WP4 – International Standardization:

The work started in the first year has been continued. A compilation of the results of past EU-initiatives working on pre-standardization has been carried out. This concerns mainly the projects SAMCO (Structural Assessment, Monitoring and Control, CTG2 – 2000 – 33069) and EU-MEDIN (Euro-Mediterranean Disaster Information Network).

A connection to the EU-MEDIN promotes the sharing of disaster-related information and data, research, results, knowledge and expertise. The Initiative aims at harmonising methods to improve pre-disaster planning as well as hazard, vulnerability and risk assessments and bring added value to I-SAMCO.

The network is interested in the harmonization of data and methods and is willing to cooperate with European partners.

Ad WP5 – Participation in Overseas Projects:

The international partners of the I-SAMCO Project (NEES / USA, NIED / Japan, NCREE / Taiwan, ISIS / Canada, AIT / Thailand, CSIRO / Australia, University of Tokyo / Japan, University of Bristol / Great Britain, University of Carleton / USA) are all equipped with major research and test facilities.

International partners were invited to demonstrate or apply their approaches on European facilities (e.g. in the ELSA laboratory of the JRC),

Ad WP6 – Integration to the SAMCO Platform:

The SAMCO database was extended for I-SAMCO. International projects and organisations were added to the search engine. Also the results from the mapping process carried out in I-SAMCO were integrated into the SAMCO database. I-SAMCO data were integrated into the SAMCO database by using the software tool (GIST, Generic Information Server Technology) which has been developed at the JRC in former EU activities. Since the project start of I-SAMCO documents with relation to international structural assessment, monitoring and control and from the mapping (please refer to D1) were integrated into this database. There was an increase of data by 20% since I-SAMCO has been integrated; the platform contains by now more than 144 documents for the internal management of the project.

The platform is accessible by <http://samdoc.jrc.it>

Ad WP7 – Exchange of Researchers:

During a “researcher exchange” between NCREE and VCE (Ernst Forstner – VCE and Yuan-Sen YANG and Wen-Hsiang TU, NCREE Taiwan), enabled by the I-SAMCO network, the two institutions analysed their requirements on a common data model for data management and data transfer. Although the parties work on the same field many differences have been identified and surmounted in a complex but very generic data model design based on the well proven BRIMOS® Data Model.

The BRIMOS® technology was developed by the Vienna Consulting Engineers (VCE Holding GmbH) for commercial application of Ambient Vibration Monitoring. Customer’s approval and long-lasting successful application of BRIMOS® made professional data handling necessary. In the first place the integration of the BRIMOS® technology to facility management including GIS requires well defined interfaces as well as organized archival storage. Secondly the VCE Technology Management is aware about the risk of a slowdown of the evolution on BRIMOS® expertise without a proper data and knowledge base. The experience gained in during the development of the BRIMOS® data management is shared within the I-SAMCO initiative for the SAMCO data model design.

The steps in the SAMCO Data Model design are:

- Definition of similarities in Data Management in BRIMOS® application (VCE) and laboratory tests (NCREE) (February 2006)
- Draft of the common SAMCO Data Model (February 2006)
- Testing of the SAMCO Data Model for data integrity in both institutions
- Establishment of a table on requirements for the software (internal use of database – MS Access; data sharing with database – Web Browser)
- Fusion of resources for software development
- Tests for application on data transfer between NCREE and VCE
- Tests for application on data transfer from third parties (ELSA)
- Providing the data model and download/upload software to other institutions

Furthermore there was an exchange of researchers with China - Mr. Peter Furtner and Mr. Lutz (VCE) :

1. BRIMOS Seminar and Press Conference, 12-15 November 2005 (Furtner), Hongkong

2. ISHMII Conference in Shenzhen with Lecture by Mr. Wenzel and Mr. Furtner and BRIMOS-Recorder exhibition at the conference
BRIMOS demonstration measurement at the Louxi Bridge in Gouangzhou
Shenzhen + Gouangzou, 15 -23 November 2005 (Mr. Furtner + Mr. Wenzel)

3. BRIMOS demonstration measurement at the “Songhua River Highway Cable Stayed Bridge“ (3 days);
Lecture at the Harbin Institute of Technology in Harbin;
BRIMOS demonstration measurement at the “Binzou Yellow River Cable Stayed Bridge“ (4 days);
Visit at B&T China Instruments in Peking
Harbin + Binzhou + Peking, 21 May to 06 June 2006 (Mr. Furtner + Mr. Lutz)

Ad WP8 – Information Dissemination:

The following activities related to information dissemination were carried out within the last working period:

- Integration of I-SAMCO into the existing SAMCO web site (with access to the databases) by VCE
- Establishment of a user community based I-SAMCO document exchange platform (this is a web based system with an authorization model to restrict access to I-SAMCO members) by VCE and JRC
- Integration of I-SAMCO data into the existing platform with public access (web based database, public domain) by VCE and JRC
- Dissemination of an electronic SAMCO Newsletter, which contains contributions and company profiles of I-SAMCO participants as well as announcements issued by VCE

Ad WP9 – Management:

The network management has been performed by the team as usual. This included all necessary steps for the enlargement of the Consortium taken care of by Mrs. Krims-Steiner and Mrs. Winter, the activities of administration and cost control by Mr. Wenzel and his accounting team and the day to day business.

It shall be mentioned that not all activities performed under the network by VCE personnel are reported in the cost statement.

3.2 JRC - Joint Research Centre

Activities in the 3 reporting periods

OBJECTIVES RELATED TO THE PROJECT

The JRC contributed, with different level of involvement, to various objectives of the project described in the Workpackages, led by the Partners following their specific competences.

The objectives in which JRC has been involved are summarized in the following.

- *Create the conditions for international collaborations for the comparison of the European knowledge, standards, technologies and testing techniques with non-European countries;*
- *Organize international Workshops and Academies taking advantage from the wide contacts of JRC all over the world;*
- *Dissemination of European Knowledge by contributing actively to the exchange of competences and dissemination of results accumulated through the SAMCO network to overseas country organizations;*
- *Contribute to Education, Outreach and Training (EOT) at international level through exchange of researchers;*
- *Contribute to the definition of a Strategic Agenda for the International Collaborative Research in Earthquake Engineering (ICREE).*

Main objectives of the JRC in the project

The main objectives of the JRC in the project are essentially those defined in the WP-1 "International Mapping" and WP-7 "Exchange of Researchers" for which JRC had the leadership and defined below.

WP-1: International Mapping

The main objectives specific to the WP were the following:

- ✓ To identify research institutions, enterprises and key organisations as well as their current RTD activities on global scale;
- ✓ To establish an international "RTD watch" database, which provide a holistic overview of the research landscape worldwide;
- ✓ To identify interested parties for future research activities.

WP-7: Exchange of Researchers

The main objectives specific to the WP were the following:

- ✓ To identify existing programs and provide the necessary information and support for international implementation;
- ✓ Make effective the exchange of researchers between the JRC and other Partners with leading research organization in the world.

JRC contributed also to other WPs led by other Partners and in particular a major contribution has been given to the dissemination of the European Knowledge in earthquake engineering and in creating the conditions for setting-up international collaboration within Europe and with Countries overseas by taking advantage from its huge number of contacts with research organization of relevance at international level.

Methodology of work and background

As Member of the I-SAMCO-SC, JRC contributed in the most relevant decisions related to the organization of the network and its initiatives and activities.

The methodology of work was intrinsically defined by the nature of the JRC contribution, which was essentially focused on the mapping of the leading research organization in the world and in the organization of workshops mainly aiming at creating the conditions for international collaborations.

Close collaboration has been established also with the I-SAMCO coordinator (Vienna Consulting Engineers, VCE) in order to try advantage from complementarily knowledge and competences and comply with the general objectives of the action.

A very close collaboration as been established in particular for the organization of the 2nd World Forum on Collaborative Research in Earthquake Engineering on March 26-27 2007 at the JRC-Ispra (2WFCREE, which was also the final I-SAMCO workshop), the redaction of the relevant Summary and Resolution and the preparation of the draft Strategic Agenda for the International Collaborative Research in Earthquake Engineering (ICREE).

EUROPEAN DIMENSION AND ROLE OF JRC

The Specific Support Action I-SAMCO has been conceived mainly for the internationalization of the SAMCO related activities, i.e. the valorization of European projects and the diffusion of knowledge coming out from the European research executed under the EC framework Programmes and at National level.

Specific attention has been put to knowledge transfer from research organizations to end-users through activities related to codes and standards as well as to certification of designs and procedures. The focus given to research networking is the contribution of SAMCO to the realization of the European Research Area (ERA) and the attention given in supporting end-users is the contribution of SAMCO to the realization of the unique market in Europe.

I-SAMCO is intended to provide the instruments necessary to compare and harmonize the European knowledge and competences with the most advanced countries around the world. In this context, the focal role relevant to the knowledge transfer has been given to the JRC recognizing its European role and independence from national and private interests.

JRC contribution to the internationalization of I-SAMCO

Since the beginning of the activities of I-SAMCO, JRC has been recognized as the Partner best placed not only for enhancing the European dimension of the network, but also to create the basis for international collaborations taking advantage from the wide range of contacts of the JRC all over the world.

This internationalization effort has been recognized of relevance for assessment of the European state of the knowledge, technologies and research in Europe in comparison with other countries in the world having a prominent position in the field of interest for I-SAMCO and in particular in earthquake engineering for which JRC has high level reputation in the world's scientific community.

MAIN RESULTS OBTAINED BY THE JRC

JRC was Member of the I-SAMCO Steering Committee and contributed to the decision taken on the activities of the Network and to most of the Workpackages, Workshops and Summer Academies organized along the timeline of the execution of the project.

The most relevant in house activities and the related deliverables are presented in the following.

The International Mapping

The main JRC achievements related to the WP-1 "International Mapping" consisted in the identification of key research organisations, enterprises, scientists, institutions and other players, as well as their current RTD activities on global scale. This allowed establishing an

international “RTD watch” database, which provided a holistic overview of the research landscape worldwide and the identification of interested parties for future research activities.

This identification of key players has been done in collaboration with all the I-SAMCO Partners in each country of the participants and also in third countries using the existing bilateral relations to 3rd countries. The contribution of the JRC took advantage from the large number of international contacts established by the ELSA laboratory in many years of internationally recognized activities in earthquake and structural activities.

JRC took advantage also from their connections to organisations with international organizations like the IAEA (International Atomic Energy Agency) and the OECD (Organization for the Economic Cooperation and Development).

The Exchange of Researchers

JRC has been active in this topic and contributed as follows.

Visit of NCREE representatives at JRC

In the framework of I-SAMCO and with the management support of the I-SAMCO Coordinator, JRC received four scientists from NCREE (200, SECT 3, Hsinhai Road, Taipei 10617, Taiwan) for a short visit of one week on May (15-19) 2006.

The NCREE representatives received at JRC-Ispra have been:

Prof. Ken-Chyuan Tsai, NCREE Director

Dr. Yuan-Sen Yang, responsible for data model and networked hybrid simulation software

Dr. Ker-Chun Lin, responsible for cable stayed bridge connection test technology

Dr. Wen-Hsun Tu, responsible for large scale structural and fatigue tests

The one week short visit and working meetings have been focused on the following topics:

Data Management (including Data Model) in ELSA and NCREE;

Development of hybrid testing techniques in ELSA and NCREE, including possible networked simulations;

Full scale fatigue tests on cable-to-box girder connection adopted in cable stayed bridges.

The visit allowed also the finalization of the NCREE/JRC Collaboration Agreement (CA) that has been signed on October 3rd 2006 and will be active until October 2nd 2011.

Visit of JRC representatives at NCREE

After the signature of the JRC/NCREE Collaboration Agreement and in the framework of I-SAMCO a scientist of the JRC has been formally invited at the NCREE for a short visit of one week from November 27th to December 1st 2006.

The JRC representatives visiting NCREE has been:

Dr. Philippe Caperan, responsible of the optical measurement methods at the JRC-Ispra European Laboratory for Structural Assessment (ELSA).

NCREE showed major interest for these measurements methodologies, thus the main purpose the short visit of the JRC representative at NCREE was the collaboration and exchange of competences in the field of the application of optical methods for structural measurements. The ongoing collaboration will include also exchange of software packages and common work in order to converge on possible common software for optical measurements during laboratory tests performed on structures.

Main JRC contributions to the project valorisation

JRC contributed to the valorisation of the project and the dissemination of the information related to the I-SAMCO related activities and scientific background. This was provided by attending the Steering Committee meetings and contributing to the definition and setting-up of the valorisation and dissemination activities.

To this end, JRC contributed in organizing Workshops and Summer Academies lasted to deliver scientific and technical background and information to researchers, end users and young scientists.

JRC started from the fact that international collaboration among Research Centres of relevance having in charge large experimental laboratories is often made difficult by lack of common standards for the storage of experimental results. Communication of results to Partners thus becomes difficult and relevant experimental data of interest for the scientific community have low level of diffusion.

To discuss this item and brainstorming how to overcome this difficulty, JRC organized in the framework of the FP5 SAMCO Thematic Network the "Harmonization Workshop" held at the JRC-Ispra on September 27th to 28th 2004 to discuss:

- ✓ To enable international collaboration
- ✓ To harmonize communication
- ✓ To standardize data and protocols

The Workshop was attended by representatives of many research organizations around the world. It was proposed to explore the possibility to set-up an International Collaboration in Earthquake Engineering Simulation among large scale facilities from Europe and overseas. As regards the harmonization of communication and data repository, the US NEES (Network for Earthquake Engineering Simulation) and experienced the importance of the IT development for the communication among the NEES laboratories sited in different states of the US.

The first action decided at the Harmonization Workshop was the organization of a specialist NEES-IT Seminar at JRC-Ispra to inform the scientific community about the effort and the achievements of NEES in the field of Information Technology (IT).

The Recommendations of the Harmonization Workshop are reported in Appendix-A1.

The NEES-IT Seminar at JRC-Ispra

Under the framework of the FP6 Specific Support Action I-SAMCO, JRC organized the NEES-IT Seminar decided during the SAMCO Harmonization Workshop at JRC-Ispra on May 23rd to 24th 2005 aiming at presenting to the scientific community the ongoing work performed by the NEES-IT group at the San Diego Super Computer Centre (SDSC) in San Diego California.

The final recommendations of the Seminar refer essentially to Data and Tele-Presence and are summarized in the following:

With reference to DATA, the following recommendations have been given:

- ✓ The preservation and the exchange of data together with their context (full background documentation) are put forward as a key issue by all the participants of the seminar.
- ✓ There is a need for a worldwide initiative devoted to standardization to allow for data exchange and mining between the different research institutions in different countries and continents. NEES will launch a specific action devoted to standardization.
- ✓ The European participants expressed an interest in having a central database placed in Europe for the upload of EU data, preferentially to upload to the US central database only. This would provide better access to the database for EU users, and improve the robustness of a global system of central repositories located in various places in the

world. NEES-IT is opened to provide assistance in either solution. Obviously, a European central requires more efforts from the EU.

- ✓ JRC-ELSA should explore the possibility to host such a central European repository.
- ✓ As pilot step in the collaboration, JRC-ELSA will upload all the data of one of its project, stored on its local database into NEES-Central database in order to assess the compatibility between the two repositories. This could be also a first step for defining a common data model. A report about this activity will be circulated among the seminar participants.

With reference to TELE-PRESENCE the following recommendations have been given:

- ✓ There is a strong interest of the EU participants in the NEES tele-presence tools (Ring Buffer, Real Time Data Viewer and flexible Tele-presence System). The demonstrations of these tools, given during the seminar, were convincing in spite of the low bandwidth of Internet connection available.
- ✓ NEES-IT is willing to give support in the field of tele-presence and to receive feedback on its use.
- ✓ The JRC-ELSA is ready to use the tele-presence tools and to dedicate programming efforts in order to stream its data in a way suited for the Ring Buffer. Report on developments and achievements in this activity will be circulated among the seminar participants.

The Recommendations of the NEES-IT Seminar at JRC-Ispra are reported in Appendix-A2.

The 2WFCREE at JRC-Ispra

The final I-SAMCO Workshop consisted essentially in the organization at the JRC-Ispra of the "2nd World Forum on Collaborative Research in Earthquake Engineering" (2WFCREE) on March 26th to 27th 2007. The Forum accounted more than 90 attendees from 22 countries (10 of which from the European Union and 2 representatives from International Organizations).

The 2WFCREE engaged a representative international group of researchers and research administrators to discuss and promote opportunities for collaboration in earthquake engineering and laboratory testing, as well as the means necessary to facilitate this collaboration.

The Attendees selected three broad areas for which international collaboration provides important added value and proposed discussion on these three topics under the three following Working Groups:

WG-1: Hybrid testing and distributed simulation

WG-2: Data infrastructure and distributed data base

WG-3: Dissemination of knowledge, education and training in a distributed environment

The final Announcement of the Forum is in Annex-1, the final Agenda and the List of Attendees in Annex-2.

The 2WFCREE Summary and Resolution

The 2WFCREE Summary and Resolution provided recommendations oriented to:

- ✓ Organize the earthquake engineering research community in Europe
- ✓ Define with international Partners a Strategic Agenda for International Collaborative Research in Earthquake Engineering (ICREE)
- ✓ Set up a structure for making effective the international collaboration
- ✓ Prepare joint calls for international collaborative project proposals

It has been decided that the experiences of the 1st and 2nd World Forums should be continued and the Working Groups (opened to other scientists) should remain active and should verify the work advancement at the next WFCREE. The 3WFCREE will be held at the Tongji University in Shanghai, China, in April/May 2008.

The Summary and Resolution of the 2WFCREE is reported in Appendix-A3

Collaboration with International Organization

JRC is Partner in a formal collaboration with the International Atomic Energy Agency (IAEA) through a Memorandum of Understanding (MoU) for the joint management of a Coordinated research Project (CRP) based on an international benchmark including 20 Teams from all over the world.

To manage the results of the benchmark provided by the Teams, it was necessary to have a common repository accessible via Internet and common standards for the results to be uploaded in the repository.

The JRC formally offered the I-SAMCO Document Exchange Platform (DEP) for this end. For reason of confidentiality and specific policies, it has been decided to use the same technology to provide the IAEA with a DEP (<http://cc.irc.it>), which is essentially similar to the one of I-SAMCO a part for the policy relevant to the management of the authorizations.

The Summary and Resolution of the 2WFCREE at JRC-Ispra are reported in Appendix-A3, the recommendations of the WG-1 in Appendix-A3.1, the recommendations of the WG-2 in Appendix-A3.2 and the recommendations of the WG-3 in Appendix-A3.3 and the list of Attendees in Appendix-3.4 of the report.

CONCLUSION

The Joint Research Centre (JRC, General Directorate of the European Commission) was involved as Partner in the FP6 Specific Support Action I-SAMCO (International Structural Assessment, Monitoring and Control) through the "European Laboratory for Structural Assessment" (ELSA) having the mission of performing research in areas of structural mechanics where structural safety is the key.

The present document is the contribution of the JRC to the Final Report of I-SAMCO and describes the activities performed and the main achievements delivered in the framework of the project. Since the duration of the project was extended for six additional months compared to the original four years, this report covers the period from October 1st 2004 to March 31st 2007.

Since the beginning I-SAMCO has been conceived for the internationalization of the SAMCO related activities, mainly dealing with the valorisation of European projects and the diffusion of knowledge provided by the European research as well as the transfer of knowledge from research organizations to end-users.

The main JRC objectives of relevance for I-SAMCO were focused on the mapping of leading research organization in the world, the realization on the conditions for setting up international collaborations and the making effective the exchange of researchers among research organizations in Europe and in the world.

JRC contributed also to the valorisation of the project and the dissemination of the knowledge related to the activities of interest for I-SAMCO through the organization of Workshops and the contribution to Summer Academies lasted to deliver scientific and technical background and information to researchers, end users and young scientists.

In the framework of the FP5 Thematic Network SAMCO, a major contribution was the organization of the Harmonization Workshop, held at the JRC-Ispra on September 27th to 28th 2004, which was an important step towards the proposal for harmonization of the structure of the experimental results to be included in the Databases.

In the framework of the FP6 Specific Support Action I-SAMCO and as follow-up of decision taken at the Harmonization Workshop, JRC organized at Ispra also the US NEES-IT Seminar (Network for Earthquake Engineering Simulation) on May 23rd to 24th 2005 aiming at presenting to the IT specialists of the scientific community the ongoing work performed by the NEES-IT group at the San Diego Super Computer Centre (SDSC) in San Diego California.

Finally the JRC contributed also by organizing the 2nd World Forum on Collaborative Research in Earthquake Engineering (2WFCREE) held at the JRC-Ispra on March 26th to 27th 2007, which was also the conclusive action of I-SAMCO. The 2WFCREE has been attended by more than 90 Scientists and Research Managers from 22 countries, 10 of which from the EU. International collaboration in specific fields as cyberenvironment and distributed laboratory, experimental databases, formation and training has been recognized as a must and it was decided to draft a Strategic Agenda for the International Collaborative Research in Earthquake Engineering (ICREE).

3.3 CEA

Activities in the 3 reporting periods

1. Activities in WP 3 - International Workshops:

- Participation in the Harmonization Workshop in Ispra (September 27th – 28th 2004) (JC. QUEVAL and A. LE MAOULT)
- Participation in Summer Academy in Zell am See (September 7th – 9th 2005) (JC. QUEVAL)
- Participation in the NEES and NEESgrid Seminar in Ispra (May 23rd – 24th 2005) (A. LE MAOULT)
- Participation in the i-SAMCO Workshop in Prague (18 – 19 Sept. 2006) : Alain Lemaout
- Participation in NEES World Forum (26-27 March 2007): Alain, LeMaout, Jean Claude Queval and Pierre Sollogoub

2. Activities in WP 4 - International Standardization:

CEA has a NEES account to the EU-NEESit project on NEEScentral website and uses it to estimate the usability and the file hierarchy structure.

3. Activities in WP7 – Exchange of researchers

CEA proposed researchers to come and see a test (Ecoleader) during February 2005. A documentation of this test has been written and put on VCE document exchange platform.

4. Activities in WP 8 - Information Dissemination:

Each meeting enables localizing and the exchange of information with the partners.

3.4 BAM

Activities in the 3 reporting periods

1. Activities in WP 3 - International Workshops:

Organizer of National (Baudynamiktagung, Kassel 2006) and Semi-organizer of international Conference (ISHMII Shenzhen 2005)

Organizer of IMO-Wind Workshop as part of the international DEWEK Conference

Organizer of National OGOWin Workshop

Organizer of National Conference on "Measurements in Structural Engineering"

2. Activities in WP4 - International Standardization:

- Member of ISO TC 108 / SC 2, WG 3. In this WG ISO 4866 "Vibrations of buildings- guidelines for the measurement of vibration and evaluation of their effects on building" is now revised. Last Meeting in August / September 2005 in Mississauga, Canada.
- Also Member of ISO TC 108 SC 2 WG 26. "Mechanical vibration and shock", Signal processing". Following parts of this ISO standard are currently available or coming into being.
- Part 1: general introduction (final draft May 2005)
- Part 2: Time domain windows for Fourier transform analysis (Final standard October 2004)
- Part 4: shock response spectrum analysis (draft February 2005)
- ISO 21289 "Mechanical vibration and shock — Measurement and analysis parameters to be specified for the acquisition and processing of vibration data" (Committee-draft February 2005)
- E DIN ISO 13373-2 "Zustandsüberwachung und -diagnostik von Maschinen — Schwingungs-Zustandsüberwachung — Teil 2: Verarbeitung, Darstellung und Auswertung von Schwingungsdaten (ISO/DIS 13373-2)", Final standard July 2005
- ISO Meeting in Munich in April 2006
- Creation of national Steering committee for "Monitoring and assessment"
- ISO TC 108 SC2 Meeting in Berlin and Prague, April 2007

3. Activities in WP7- Exchange of Researchers:

Since April 2005 Pablo Cuellar from the Polytechnical University of Madrid (UPM) has been working for the department VII.2 (Buildings and structures) at BAM. He is taking part in a project aiming to study the properties and long-term behaviour of ballasted railroad tracks, and has already developed a Finite Element program that estimates the vertical dynamics of an ideal track composed of rail, railpad, sleeper, ballast and subgrade. Parallel to that, Pablo is also investigating the suitability and possibilities of performing Discrete Element Analysis (DEM) for the simulation of ballast local effects at BAM. In order to assess the state of the art of DEM in its application to ballast simulation he is currently in contact with two other research groups in the field (Stuttgart and Montpellier).

Publications

1. Guideline for the assessment of existing structures

Tagungsband: 5th International Conference on Bridge Management, "Bridge Management 5, Inspection, maintenance, assessment and repair", April 11-13, 2005, Guildford, UK (Proceedings) (2005), 227-234; Thomas Telford Publishing; Hrsg.: G.A.R. Parke, P. Disney (University of Surrey, UK), ISBN 0-7277-3354-0

2. Complex monitoring system for long-term evaluation of prestressed bridges in the new Lehrter Bahnhof in Berlin

2nd International conference "Reliability, Safety and Diagnostics of Transport Structures and Means 2005", July 7-8, 2005, Pardubice, Czech Republic (Proceedings) (2005), 248-256; Hrsg.: J. Mencik, University of Pardubice, Czech Republic, ISBN 80-7194-769-5

3. IMO-WIND: An integrated monitoring system for offshore wind energy turbines

6th International Conference on Structural Dynamics, "Structural Dynamics EURODYN 2005", September 4-7, 2005, Paris, France (Proceedings) 1 (2005), 287-292; Millpress, Rotterdam, Netherlands; Hrsg.: C. Soize, G.I. Schueller

3. Richtlinien für die Dauerüberwachung und die Bewertung von Ingenieurbauwerken

TÜV Fachkolloquium "Erfahrungsberichte über die Überwachung von Ingenieurbauwerken im Straßen- und Schienennetz" Leipzig, 10.06.2005 SBN 90-5966-033-1

4. Monitoring and assessment of structures under changed loading conditions

SAMCO Summer Academy 2005 on Structural Assessment, Monitoring and control, September 5-9, 2005, Zell am See, Austria

5. Monitoring, Schadensfrüherkennung und Sensorik für Offshore-Windenergieanlagen

4. Symposium "Offshore - Windenergie - Bau- und umwelttechnische Aspekte", 27.9.2005, Hannover (Beitrag 5.) (2005), 12 pages; Hrsg.: Forschungsgruppe GIGAWIND, University of Hannover

6. Offshore wind energy plants- a challenge for integrated structural health monitoring systems

International Workshop on Lifetime Engineering of Civil Infrastructure, November 9-11, 2005, Ube Yamaguchi, Japan (Proceedings) (2005), 219-229; Yamaguchi University, Japan; Hrsg.: A. Miyamoto, A. Sarja, T. Rissanen, ISBN 4-9901161-8-6 C3055

7. Guidelines for Monitoring and Assessment - An SAMCO initiative as a basis for the international standardization

2nd International Conference on Structural Health Monitoring of Intelligent Infrastructure (SHMII-2'2005) ,Shenzhen, China, 16.11.2005 -18.11.2005

8. Monitoring, Schadensfrüherkennung und Sensorik für Offshore-WEA

4. Symposium Offshore-Windenergie,University of Hannover, 27.09.2005

9. Damage detection based on static measurements on bridge structures

24th International Modal Analysis Conference (IMAC), January 30 - February 2, 2006, St. Louis, Missouri, USA (Proceedings CD-ROM) (2006), 12 pages, ISBN 0-912053-94-1

10. Damage detection based on static measurements on bridge structures

15th SAMCO Workshop ,Zurich, Switzerland, 30.03.2006 to 31.03.2006

11. Guidelines for monitoring and assessment

15th SAMCO Workshop ,Zurich, Switzerland, 30.03.2006 to 31.03.2006

12. Rücker, W: Bautechnische Probleme und derzeitige Forschungsansätze bei Offshore Windkraftanlagen, OGOWin Workshop 22 February 2007, Berlin

13. Rohrman, R.G., Rücker, W., Said, S., Schmid, W. : Aufgaben der Dauerüberwachung am Beispiel von Betonbrücken und Windenergieanlagen,
Seminar „Messen im Bauwesen“, 16 March 2007, BAM, Berlin

14. Baeßler, M., Rücker, W.: Improved Acceptance Limits for Bridge Deck Vibrations in Light of Test Results, Railway Engineering Conference 2007

15. Rücker, W.: Methoden für zerstörungsarme Zustands- und Schadensanalysen

Seminar der Ingenieurakademie West e.V., Dortmund, 11 May 2007

16. Rücker, W.: Methoden zur kontinuierlichen Bauwerksüberwachung

Seminar der Ingenieurakademie West e.V., Dortmund, 11 May 2007

17. Rücker, W.: Zustandsüberwachung und –bewertung bestehender Bauwerke

ISD Kolloquium, Tragstrukturen der Zukunft, Hannover, 31 May 2007

Conferences, Seminars and Workshops

ECTP Conference, Paris,	25.10.2005
BRE Workshop, London,	26.10.2005
2. ISHMII Conference, Shenzhen, China,	14.- 18.11.2005

SAMCO Workshop, Zurich, Swiss	29.-31.3.2006
2. Baudynamiktagung, Kassel, Germany	16.-18.5.2005
IABSE-Conference, Porto, Portugal	17.-20.07.2006
I-SAMO Workshop, Prague, CZ	18.-19.09.2006
Hans Lorenz Symposium Berlin, Germany	12.10.2006
ECTP Kongress, Paris, France	21.-22.11.2006
DEWEK 2006, Bremen, Germany	22.-23.11.2006
SAMCO Workshop, Vienna, Austria	15.-16.01.2007
7 RP GTCP, Köln, Germany	07.02.2007
OGOWin, Statusseminar, Berlin, Germany	22.02.2007
Messen im Bauwesen, Berlin, Germany	16.03.2007
2nd ISPRA, Italy	26.-28.03.2007
GIGAWIND, Hannover, Germany	18.04.2007
Ingenieurakademie West e.V., Dortmund,	11. 05. 2007
ISD Kolloquium, Tragstrukturen der Zukunft, Hannover,	31. 05. 2007

Cooperation with National and International Projects

- Cooperation with GIGA WIND in the area of monitoring of Wind energy plants
- National Cooperation with OGO-Win
- National Cooperation with 10 partners in Offshore testing area research

3.5 EMPA

Activities in the 3 reporting periods

1. Activities in WP 3 – International Workshops/Summer Academies

- Participation to the 2nd International Conference on Structural Health Monitoring and Intelligent Infrastructure, Shenzhen, China, November 16-18, 2005. Presentation of three papers:
 - *Composite materials, camping, monitoring: a comprehensive approach to the safety of civil engineering structures at Empa*, Bergamini, A., Motavalli, M., SHMII-2'2005 Conference in Shenzhen, China, November 16-18, 2005, pp. 1437-1443.
 - *Tendon Breakages effect on static versus modal parameters of a post-tensioned concrete girder*, Huth, O., Czaderski, C., Hejll, A., Feltrin, G., Motavalli, M., SHMII-2'2005 Conference in Shenzhen, China, November 16-18, 2005, pp. 847-853.
 - *SMA adaptive tuned vibration absorber*, Shafieezadah, A., Gsell, D., Motavalli, M., SHMII-2'2005 Conference in Shenzhen, China, November 16-18, 2005, pp 1529-1534.
- Lecture with the title “Damage Identification” given by Prof. Masoud Motavalli within the short course “Structural Health Monitoring for Civil Infrastructure Systems”, Shenzhen, China, November 15, 2005, organized by the “*International Society for Structural Health Monitoring of Intelligent Infrastructures*”.
- Participation to the “SPIE Annual International Symposium on Smart Structures and Materials 2005”, 26 February - 2 March 2006, San Diego, USA. Presentation of the paper: *Electrostatic tuning of the bending stiffness of simple, slender multilayer composite structures*, Bergamini, A., Christen, R., Motavalli, M., SPIE Annual International Symposium on Smart Structures and Materials 2005, San Diego, March 7, 2005, Vol. 5760, pp. 152-162.
- Participation to the 18th SAMCO-Workshop, September 18th-19th 2006, Prague, Czech Republic. Presentation: Structural Health Monitoring with Wireless Sensor Networks - Challenges and Opportunities: Feltrin, G..
- Preparation of the paper “Monitoring of Civil Infrastructures using Wireless Sensor Networks”, by Bischoff, R., Meyer, J., Feltrin, G., Saukh, O. and presentation at the “Asia-Pacific Workshop on Structural Health Monitoring” in Yokohama, Japan, December 4-6, 2006.
- Preparation of a mini proposal “Wireless Sensor Networks for Information Age Construction Sites” for the workshop and participation to the 21st SAMCO-Workshop, Samco Proposal Coordinating Workshop, January 15, 2007, in Vienna.
- Preparation of a presentation for the forum and participation at the 2nd World Forum on Collaborative Research in Earthquake Engineering, March 26-27, 2007, European Commission, Joint Research Centre, Ispra (VA), Italy.
- Organisation of the U.S.-Europe Workshop on Bridge Management Challenges in the United States and Europe, September 11-13, 2007, at Empa, Dübendorf, Switzerland.

2. Activities in WP5 – Participation in Overseas Projects

- Participation to the North American Euro-Pacific Workshop, Sensing Issues in Civil Structural Health Monitoring, Honolulu, Hawaii, November 10-13, 2004.
- Presentation of the paper: “Instrumentation of the Indoor Cable Stayed Bridge at Empa” at the North American Euro-Pacific Workshop, Sensing Issues in Civil Structural Health Monitoring, Honolulu, Hawaii, November 10-13, 2004.

- Maintenance of hard- and software of the official web site of the “*International Society for Structural Health Monitoring of Intelligent Infrastructure*”. Transfer of the official web site to a server at ISIS Canada.
- Cooperation in the advisory committee and within the working groups of the “*International Society for Structural Health Monitoring of Intelligent Infrastructures*”.

3. Activities in WP7 – Exchange of Researchers

- Setting up of contacts between Empa and the University of Berkeley, California, for promoting the collaboration in the field of “wireless sensor networks”.

4. Activities in WP8 – Information Dissemination

- Active cooperation in the advisory committee and within the working groups of the “*International Society for Structural Health Monitoring of Intelligent Infrastructures*”.
- Maintenance of hard- and software of the official web site of the “*International Society for Structural Health Monitoring of Intelligent Infrastructure*”.

3.6 ITAM

Activities in the 3 reporting periods

1. Activities in WP3 - International Workshops/Summer Academies:

- From ITAM two PhD students attended the SAMCO summer academy in Zell am See (September 2005) in the frames of I-SAMCO.
- Invitation of Prof Z. Zembaty from Technical University Opole (PL). He has held the lecture in Prague (May 2005) on „Monitoring of damage of buildings from rockburst induced from deep copper mining“
- Organization of International Workshop „Advances in monitoring of modern and historic structures“ in Prague. The workshop was held in September 2006. The number of attendees was about 30 persons including Ph.D. students. There were present local authorities from the Ministry of Transportation and some visitors from the industry.
- Active participation on international workshop „SAMCO Proposal Coordinating Workshop and 2nd World Forum on Collaborative Research in Earthquake Engineering on Collaborative Research.
- Organization of the seminar held by Prof. Zembaty, TU OPOLE: a) Non stationary random vibration of a shear beam under high non-stationary random vibrations of a shear beam under high frequency seismic effects , b) Rockburst induced ground motion-comparative study
- Participation of PhD student at the CISM course on „New approaches to analysis and testing of mechanical and structural systems“

2. Activities in WP4 - International Standardization:

The results of monitoring of several bridges from previous years has been transferred into the proposals for national standards and codes. The taken place in Czech republic in the years 2005-2006 on the basis of internal ministry grants as well as on the industrial projects. ITAM as the leading coordinator of long time measurement has several proposals to include in standards and codes as it has been done on the national level.

In order to assess the state of a damaged historic object, we need to know, if its defect or failure (mostly a crack) is stable or if it changes in response to acting forces and/or environmental influences. The stability is evaluated on the basis of geometrical measurements of the shape and position of an objects, structures or structural elements and mutual spatial relations of structural parts separated by the defect. In most cases of masonry structures, we monitor movements in the vicinity of cracks. Further, it is important to measure leaning of towers or walls, vertical movement (downward movement of uplift) and expansion or shrinkage of objects or structural elements. The movements mentioned above are always influenced by temperature changes which influence also measurement devices, therefore, the temperature of the monitored structure and its surrounding is another basic monitored parameter. Many building materials are very sensitive to moisture changes, e.g. wood, sandstones, paper,...),

which reflects in their volumetric changes or differential mechanical characteristics and a higher adherence to chemical or biological attacks. Moisture and humidity characteristics are also followed up as a rule. The exterior and interior relative humidity is measured together with moisture content in building materials. From the family of climatic effects, the wind velocity, direction and fluctuations are monitored on special buildings and structures, usually together with vibration effects. Air pollution is monitored in historic cities and in the vicinity of important historical monuments, together with measurements of corrosion damage on historical materials and with monitoring of soiling of monument surfaces. In special cases, also chemical or ion characteristics of historic materials has been checked. There are some places in the Czech Republic where the water pollution or rather aggressiveness is monitored, also the variations of water table in the vicinity of monuments in danger of additional settlement or wooden pile degradation are registered. A substantial part of structural monitoring involve records of building history and events which might change or influence the building behaviour, e.g. restoration interventions, building activities in the vicinity of the monitored object, namely digging, as well as of activities with a stronger impact on environmental conditions (transport, dust production, etc.).

The measurement include long term monitoring of the St. Vitus Cathedral in Prague, the 14th Century New Town Hall in Prague, the Romanesque church in Rovné, The St. Francisco Order Monastery in Kadaň, the World Heritage Town Telč and its Chateau, the Baroque Chateau Veltrusy. Short term measurements were carried out on the World Heritage St.Trinity Column in Olomouc, National Museum in Prague, bronze sculptures of the National Theatre in Prague, Pernstejn Castle, Karlstejn Castle – both listed as National Monuments and some other important cultural heritage objects.

3. Activities in WP 5 – Participation in Overseas Projects

The monitoring of several structures (bridges, towers, masts) has taken place in Czech republic in the years 2004-2005 on the basis of internal ministry grants as well as on the industrial projects. ITAM as the leading coordinator of long time measurement has several proposals to include in Standards and codes as it has been done on the national level.

4. Activities in WP8 – Information Dissemination:

- Presentation of activities of ITAM within I-SAMCO and overall SAMCO project in European Parliament (October 2005)
- Drdácý M., Structural and material health monitoring of historical objects. In: F. Ahsani (ed.) Sensing Issues in Civil Structural Health Monitoring, Springer 2005.
- The I-SAMCO project has been presented at the VIII national conference Reliability of Structures.:
- S. Pospíšil, The need of structural monitoring in structural reliability, Reliability of Structures, Prague, April 2007

- Cooperation with the Grant of Ministry of transportation, Czech republic. 1F45D-013-120 “The developments of the methods in design of highway bridges and verifying of characteristics usable criteria of reliability of existing bridges with respect to the stochastic properties”

Publications

Drdácký M., Structural and material health monitoring of historical objects. I-SAMCO workshop, Prague, September 2006

S. Pospíšil, Activities of ITAM in structural monitoring, past and present, I-SAMCO workshop, Prague, September 2006

S. Pospíšil, J. Lahodný, V. Janata, S. Urushadze, Life-time prediction of slender structures subjected to turbulent wind, Engineering Mechanics, Svratka, Czech Republic, 2006

3.7 CLSMEE

Activities in the 3 reporting periods

1. Activities in WP3 - International Workshops/Summer Academies:

- Participation in SAMCO – Summer Academy in September 2005 in Zell am See with one presentation “Seismic Monitoring System of Unit 6, Kozloduy NPP”
- Participation in COORDINATED RESEARCH PROJECT on the “Safety Significance of Near Field Earthquakes” 3rd (Final) RESEARCH CO-ORDINATION MEETING (RCM)
- JRC, Ispra, Italy, October 3rd – 7th 2005
- Participation in I-SAMCO workshop "Advances in Monitoring of Historical and Modern Structures", Prague, 18-19 September, 2006
- I-SAMCO workshop has been organized in Sofia, 19-20 October 2006
- Participation in the 2nd World Forum on Collaborative Research in Earthquake Engineering, 26-27 March 2007, JRC, Ispra, Italy

2. Activities in WP5 – Participation in Overseas Projects

Participation in IAEA - COORDINATED RESEARCH PROJECT on the “Safety Significance of Near Field Earthquakes”

3. Activities in WP8 – Information Dissemination

- Participation in SMiRT – 18, August 2005, Beijing, China
- Participation in X National Congress on Theoretical and Applied Mechanics, Varna 2005, Bulgaria

Specific information on items of interest for the project

The problem of damage potential and capacity evaluation of structures under seismic excitations.

Cooperation with national or other international projects which should be mentioned

Seismic Risk Assessment of the Potential Loss of Building and Structure Damage in Urbanized Areas as a Base of the Geographic Information Systems (GIS), an Element of the Unified National Data Base - Bulgarian national project

Publications

Dimitar Stefanov, Marin Kostov, Hristo Abadjiev, Georgi Varbanov, Antoaneta Kaneva, Nikolina Koleva, **ENGINEERING SAFETY OF HYDROTECHNICAL STRUCTURES OF KOZLODUY NPP**, International Nuclear Forum “NUCLEAR POWER AND ENVIRONMENT”, organized by Bulgarian Atomic Forum /2 - 4 June 2006, Riviera Holiday Club/, in Bulgarian

Marin Kostov, Dimitar Stefanov, Hristo Abadjiev, Georgi Varbanov, Antoaneta Kaneva, Nikolina Kolev, **MONITORING OF HYDROTECHNICAL STRUCTURES OF KOZLODUY NPP**, International Nuclear Forum "NUCLEAR POWER AND ENVIRONMENT", organized by Bulgarian Atomic Forum /2 - 4 June 2006, Riviera Holiday Club/, in Bulgarian

Georgi Varbanov, Marin Kostov, Dimitar Stefanov, Antoaneta Kaneva, Nikolina Koleva, **SEISMIC RISK ASSESSMENT FOR BELI ISKAR DAM**, First European Conference on Earthquake Engineering and Seismology, Geneva, Switzerland, 3-8 September 2006

Marin Kostov, Dimitar Stefanov Nikolina Koleva , **NUMERICAL SIMULATIONS AND ENGINEERING METHODS FOR EVALUATION OF SEISMIC BEHAVIOUR OF EXPERIMENTALLY TESTED SHEAR WALL**, First European Conference on Earthquake Engineering and Seismology, Geneva, Switzerland, 3-8 September 2006

M. Kostov, A. Kaneva, E. Vaseva, D. Stefanov, G. Varbanov, N. Koleva, **AN ADVANCED APPROACH TO ASSESS THE SEISMIC RISK FOR LARGE URBANIZED AREAS** , First European Conference on Earthquake Engineering and Seismology, Geneva, Switzerland, 3-8 September 2006

M. Kostov, N. Koleva, **DAMAGE POTENTIAL OF THE SEISMIC STRONG MOTION**, First European Conference on Earthquake Engineering and Seismology, Geneva, Switzerland, 3-8 September 2006

Marin Kostov, Georgi Varbanov, Dimitar Stefanov, **SEISMIC MONITORING SYSTEMS FOR NUCLEAR POWER PLANTS IN BULGARIA**, The Tenth East Asia-Pacific Conference on Structural Engineering&Construction (EASEC-10), August 3-5, 2006, Bangkok, Thailand

Four papers are presented and accepted for publishing in the proceedings of The 8th Pacific Conference on Earthquake Engineering, 5-7 December 2007, Singapore:

Dimitar Stefanov, **SEISMIC QUALIFICATION OF POWER ELECTRIC TRANSFORMER**

M. Kostov, N. Koleva, **DAMAGE POTENTIAL OF THE SEISMIC STRONG MOTION**

M. Kostov, A. Kaneva, E.Vaseva, D. Stefanov, G.Varbanov, N.Koleva, **AN ADVANCED APPROACH TO EARTHQUAKE RISK SCENARIOS OF SOFIA**

G.Varbanov, M. Kostov, D. Stefanov, A. Kaneva, N.Koleva, **SEISMIC RISK ASSESSMENT FOR LARGE DAMS**

Two papers are presented and accepted for publishing in the proceedings of SMiRT-19, 12-17 August 2007, Toronto, Canada:

Marin Kostov, Tsena Todorova, Anton Andonov, **ULTIMATE CAPACITY ASSESSMENT OF VVER 1000 CONTAINMENT STRUCTURE**

Dimitar Stefanov, **ANALYTICAL AND EXPERIMENTAL SEISMIC QUALIFICATION OF THREE TYPES OF ELECTRIC TRANSFORMERS**

4. RECOMMENDATIONS

The project clearly shows the fragmentation of the European Research Environment. Through the performed international collaboration and contacts the necessity for a higher level of coordination and integration is compulsory not to loose ground against other regions of the world. Europe is still characterized by the brains but lacks the means.

Out of this understanding the following 2 recommendations are formulated:

- The coordination activities as performed by I-SAMCO should be continued even on considerable higher funding level to achieve the necessary equal performance compared to the United States and Japan
- The supporting major laboratories and research facilities have to be coordinated and strengthened considerably not to loose ground against the mega activities seen in the United States (refer to NEES) and Japan (refer to E-Defense)