



**European Cooperation  
in the field of Scientific  
and Technical Research  
- COST -**

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**Secretariat**

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**Brussels, 11 June 2009**

**COST 242/09**

**MEMORANDUM OF UNDERSTANDING**

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Subject : Memorandum of Understanding for the implementation of a European Concerted Research Action designated as COST Action TU0901: Integrating and Harmonizing Sound Insulation Aspects in Sustainable Urban Housing Constructions

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Delegations will find attached the Memorandum of Understanding for COST Action TU0901 as approved by the COST Committee of Senior Officials (CSO) at its 174th meeting on 26-27 May 2009.

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## **MEMORANDUM OF UNDERSTANDING**

**For the implementation of a European Concerted Research Action designated as**

### **COST Action TU0901**

#### **INTEGRATING AND HARMONISING SOUND INSULATION ASPECTS IN SUSTAINABLE URBAN HOUSING CONSTRUCTIONS**

The Parties to this Memorandum of Understanding, declaring their common intention to participate in the concerted Action referred to above and described in the technical Annex to the Memorandum, have reached the following understanding:

1. The Action will be carried out in accordance with the provisions of document COST 270/07 “Rules and Procedures for Implementing COST Actions”, or in any new document amending or replacing it, the contents of which the Parties are fully aware of.
2. The main objective of the Action is to harmonise the descriptors for airborne and impact sound insulation between dwellings and for airborne sound insulation of facades as well as to prepare a European classification scheme with a number of quality classes.
3. The economic dimension of the activities carried out under the Action has been estimated, on the basis of information available during the planning of the Action, at EUR 100 million in 2009 prices.
4. The Memorandum of Understanding will take effect on being accepted by at least five Parties.
5. The Memorandum of Understanding will remain in force for a period of 4 years, calculated from the date of the first meeting of the Management Committee, unless the duration of the Action is modified according to the provisions of Chapter V of the document referred to in Point 1 above.

## **A. ABSTRACT AND KEYWORDS**

Most European countries have legal requirements concerning acoustic performance of buildings; these differ widely in performance descriptors and limit values. Of high relevance for cooperation are acoustic classification schemes. The diversity (indicators, steps between classes, grade of quietness achieved, etc.) found in the nine existing national schemes and proposals in three more countries is an obstacle for exchange of experience, development and trade.

The harmonization of such descriptors and preferably performance levels of sound insulation classes is important to make progress and would be well received by many industry, government and research sectors. The Action will stimulate innovation, support sustainability through simplified research and development objectives and reduce trade barriers between Member States and facilitate marketing. A harmonized classification scheme for dwellings will form a basis to uniform clear information to inhabitants, builders and specialists in acoustic sound insulation quality of dwellings.

Coordination of research activity, knowledge transfer, psychoacoustic evaluation, collection of data of typical and high performance acoustic solutions is necessary to make progress.

This Action will facilitate efficient cooperation in the conduction of research and in the exchange of information within Europe in order to develop common descriptors and promote the harmonization of standards, legislation and classification

**Keywords:** Building acoustics, dwellings, legislation and sound classification, social surveys, design guidelines

## **B. BACKGROUND**

### **B.1 General background**

There is an increasing concern about noise for a large majority of Europeans. The European Union has a population of about 500 million people and there are more than 200 million dwellings. Based on social surveys in some EU Member states- although not consistent - it is estimated that about 50 million people are exposed to neighbour noise causing adverse effects on health or on the quality of

life. Based on the results from the WHO LARES Survey about European housing (Large Analysis and Review of Housing and Health) carried out in 2002-2003, neighbour noise was identified as a health problem, and reduction of indoor noise exposure was included in the proposed objectives for a policy with the following recommendation: "Little attention was paid to neighbour noise till now and therefore pathological effects are considerably under-estimated. The health effect of neighbour noise induced annoyance is approximately in the same range as the health effect of traffic noise induced annoyance. The results point out, that it is necessary to improve the sound insulation in residential buildings. The cardio-respiratory system also reacts to neighbour noise with increased relative risks."

With implementation of the Environmental Noise Directive (END) 2002/49/EU, mapping of noise levels outside the dwellings caused by road traffic, rail traffic, air traffic and industrial plants has been made for major sources and places according to the time schedule in the END, and action plans to reduce the noise levels are in progress. Nevertheless the external noise levels are still increasing in many European countries. In cases with reduction of environmental noise intruding into dwellings, the noise produced by the living activities of the neighbours and transmitted through partitions and floors often become more audible, leading to increased annoyance and stress.

Noise sources of different kinds are problematic: environmental noise (traffic), neighbour noise (music, conversation, walking, jumping and running, pet noise), equipment noise. New and renovated dwellings are expected to provide sufficient sound insulation to allow privacy and reasonable activities without disturbing neighbours. Indeed, exposure to noise can have negative effects on a person's ability to communicate, relax and sleep, and it can generate health troubles, psychological disorders as well as conflicts. Nevertheless, there is a lack of knowledge in the construction sector of the negative effects of insufficient sound insulation on dwelling occupants. In some EU Member States sound insulation in new homes is classified as a "health and well-being" requirement. Sustainable building and urban development should take into account the acoustic and sound insulation aspects.

Regulatory sound insulation requirements for dwellings have existed since the 1950s in some countries and descriptors for evaluation of sound insulation have existed for nearly as long. However, the descriptors have changed considerably over time, from simple arithmetic averaging of frequency bands in the beginning, to a variety of more complex descriptors developed in different countries and later included in EN ISO 717:1996. As a result, this standard provides a large variety of descriptors causing confusion for the building industry rather than presenting a simple way to express sound insulation with a limited number of harmonized descriptors.

Most European countries have legal requirements concerning acoustic performance of buildings. These differ widely in chosen annoyance or performance descriptors as well as in their limit values. The range and number of sound insulation criteria can cause confusion for manufacturers who wish to provide products and services for the whole EU market. Potential harmonization of such criteria would be received positively by many industry and research sectors. A future harmonized and simplified approach would stimulate innovation, encourage sustainability and facilitate marketing.

This Action will give the opportunity to collect, exchange and disseminate all the information about regulatory requirements and classification schemes for all European countries participating in the network. The Action will offer the appropriate framework because of the great number and experience of the participating countries and experts.

Based on experience, legal requirements and classification criteria could be adjusted and optimized. This Action will play an important role in disseminating the harmonization concepts of the descriptors and legal requirements. It is important to note that any proposal within this Action would not specify the regulatory sound insulation limit values, because they are subject to legislation in individual member countries.

During the latest decades, the external noise levels as well as noise from neighbours have not only increased but contain far stronger low frequency components. The use of the extended frequency range down to 50 Hz or below to cope with these new problems raises also several issues which require further analysis and discussion, not least the predicting performance methods and the reproducibility problems of the laboratory and field measurement methods.

Research on these issues is ongoing and under consideration in several EU countries by a number of different research institutions. However, there is often a lack of cooperation and exchange of information between the groups doing this research in the different EU countries. A more intensive contact would help to improve the outcome from all these projects.

The Action will facilitate cooperation and exchange of information since the Action has the participation of many experts, who normally define and carry out research at a national level and are involved in standardization and legislation related to sound insulation requirements.

## **B.2 Current state of knowledge**

Some European researchers have studied and compiled the legal requirements on sound insulation in dwellings in several countries in Europe and have gathered data on the response by dwelling occupants and the sound transmission characteristics of the buildings. However, the legal requirements are based on different descriptors and previous surveys have used different questionnaires and types of questions. Thus, the data cannot simply be compared and hence not immediately serve as a basis for general results or recommendations. This has resulted in duplication of research across the EU Member states and in the impossibility to use much of the research results across borders. Furthermore, exchange of experience of design and construction details was of limited benefit due to different criteria.

The Action shall create a uniform set of descriptors and a uniform type of questionnaire by common work of experts from the different European countries.

Of high relevance for cooperation are acoustic classification schemes where classes can reflect different levels of sound insulation and acoustic comfort. Such schemes exist in nine EU-countries and a further three countries have made proposals. Unfortunately, all schemes are different (descriptors, steps between classes, comfort levels to be expected etc.), implying no benefit from exchange of experience.

The method of calculating the sound insulation within buildings is clearly described in EN 12354 series, which is widely used in all European countries. However, it may be used to calculate the sound insulation stated with different descriptors used in the different countries. Thus, the

calculation is uniform but the results have to be optimized and stated applying the particular descriptors used in a country. So comparison of sound insulation for a certain type of building from country to country is not possible. Furthermore, the method is not applicable for all types of constructions used in Europe, causing trade barriers for some types of constructions. A future necessary progress of this standard series may only be found in a common work of experts from the different countries.

### **B.3 Reasons for the Action**

Much research has been carried out on measurement techniques, standardisation, building acoustics and psycho-acoustics, and interesting developments can be found in the automotive industry. It is now time to collect the interdisciplinary research data, exchange and align views, and come to a harmonized new approach in Europe, in order to facilitate trade with building systems and building products within EU and make sound insulation figures more understandable also for non-acousticians.

The development within this Action of a standardised methodology for researching, reporting and assessing sound insulation would assist the Member states to undertake comparison studies, improve the quality of data analysis and provide a more harmonized approach for building system developers, product manufacturers and the construction sector.

There is a strong demand for harmonized sound insulation descriptors and classification schemes in the building industry all over Europe. Besides, a correlation between annoyance, sound insulation descriptors and classification schemes must be performed following a uniform and coherent procedure.

Furthermore, high performance acoustic solutions for multi-storey dwelling units must be achieved in relation with thermal and environmental requirements and at competitive prices. All of this should lead to a new integrated thermal and acoustic approach in building. Far too often, the acoustic aspects in "sustainable building" approaches have been forgotten.

A good workmanship practice manual concerning acoustic performance of buildings will be prepared and made available to all the sectors involved in the building construction industry.

## **B.4 Complementarity with other research programmes**

Since the constructive solutions used all over Europe include many different types of products, this Action concerns all types of buildings, made of heavy-weight as well as light-weight materials. Issues relevant to timber buildings will be taken care of by Action FP0702: Net-Acoustics for Timber based Lightweight Buildings end Elements. Other activities of common relevance - mainly those related to light-weight buildings - will be coordinated to optimize progress and deliveries from the Actions.

Concerning improvement of sound insulation in existing housing, contact will be made with Action TU0701: Improving the Quality of Suburban Building Stocks, aiming at drawing attention to the importance of sound insulation improvements and cooperation about integrating these issues into the refurbishment design processes.

The Action will also well complement the new Action TD0804: Soundscape of European Cities and Landscapes, which focuses on the sound environment in external spaces, considering both "positive" and "negative" sound sources. Some experts from Action TD0804 will also participate in the Action.

## **C. OBJECTIVES AND BENEFITS**

### **C.1 Main/primary objectives**

The main objective of the Action is to harmonize the descriptors for airborne and impact sound insulation between dwellings and for airborne sound insulation of facades as well as to prepare a European classification scheme with a number of quality classes. This will form a basis for uniform clear information on acoustic sound insulation quality of dwellings.

### **C.2 Secondary objectives**

The rationalization of sound insulation descriptors and classification schemes will set the basis for the exchange of data on sound insulation of building systems from country to country. It will improve efficiency and dissemination of sound insulation measurements results and construction details and solutions. Last but not least, it will help the marketing of building elements, systems and constructions based through clear data and as such promote trade.

According to this, the main secondary objectives of the experts group created under this Action are:

- to propose a uniform system of descriptors of acoustic performance of dwellings for all European countries taking care of the adequate frequency range, especially low frequencies and representing correctly the actual comfort of dwelling occupants in relation to neighbour noise;
- to propose a set of classes of sound insulation;
- to prepare a questionnaire for uniform enquiries on the annoyance of people by neighbours activities;
- to deduce a correlation between sound insulation and annoyance caused by neighbours activities in multifamily houses based on surveys in the different countries; such investigations require research projects designed for this purpose, as conclusions cannot be made based on typical social surveys not including information about constructions
- to establish a catalogue on sound insulation data (including low frequencies) for constructions used for partitions and floors in the different countries;
- to produce an on-line compendium of good workmanship practice for typical EU Member country constructions leading to extensive knowledge transfer to non acousticians (e.g. architectural and structural designers, house builders, contractors, product manufacturers).

Besides, the Action will also encourage an integrated thermal and acoustic approach in "sustainable" buildings by examining the possibilities of the use of Building Information Models.

### **C.3 How will the objectives be achieved?**

An initial meeting of experts from the different countries involved will be organised, with the aim of exchanging knowledge and experience regarding the different points and issues concerning this Action, and of organising their cooperation during the different stages of it, taking into account the tasks allocated to the three different Working Groups as explained in E.2. The establishment of an acoustics oriented scientific network is fundamental in order to optimize and make economically profitable research projects. In most cases these projects will require external funding either from local administration and/or from international administration.

This preliminary meeting will need to be followed by regular meetings, particularly of the Working Groups. In addition, this Action will be used to organise and finance a series of initiatives, including themed symposia and special sessions at relevant international conferences, dissemination materials and initiatives, as well as media coverage, in order to reach a wide audience which would include practitioners, policy makers, researchers, architects, but also the general public.

Another important aspect will be the organisation of training schools and workshops for early-stage researchers throughout Europe, and exchange visits among those involved in the various projects in different countries, in order to ensure knowledge transfer and thus avoid duplication of projects and initiatives.

Preparing the results of this Action for a practical implementation in the area of construction will demand for a close co-operation with the Standardization Committees CEN and ISO

#### **C.4 Benefits of the Action**

The Action will utilize the results of available research projects and thus encourages the knowledge transfer between European countries with regard to the development of common sound insulation indicators, which correlate well with the actual comfort/discomfort caused by neighbour noise.

This Action will also help the construction and building product markets insofar as building technology developed in one European state could be more easily transferred into another European state if common indicators were used.

An additional benefit will be rendering the consumer more sensitive to the acoustic performances of existing and future buildings. This would stimulate innovation, as real sustainable buildings should also take into account acoustic comfort.

The Action will benefit from the creation of a network of complementary specialists in the different fields of building acoustics and from different countries and institutions. This is needed to share and spread knowledge concerning building acoustic performance, thus reducing significantly the duplication and multiplication of efforts throughout Europe.

## **C.5 Target groups/end users**

The target groups and end users of this Action are primarily standards institutions (European and national), building authorities, the construction industry, companies, product manufacturers, marketing groups, architects, and researchers, who would benefit from a harmonization of sound insulation requirements for sustainable urban housing constructions. At the same time, dwelling occupants and customers would also benefit from a greater awareness of the importance of sound insulation in buildings.

## **D. SCIENTIFIC PROGRAMME**

### **D.1 Scientific focus**

To achieve the main objectives stated above, the following tasks will be considered in the scientific programme:

#### *a) Standardization, prediction methods and legal requirements concerning acoustic performance of buildings*

One of the objectives of the Action is to provide results to be used for reduction of sound insulation descriptors in EN ISO 717 and EN ISO 140. These standards are the basic sound insulation standards used in connection to health, safety and environment matters for construction products in accordance with the Building Product Directive. Reduction of the sound insulation descriptors is essential for harmonization at the European level. Also, these standards are the basic standards for determination of sound classification of dwellings and other buildings.

It is thus necessary to collect and compare the information available in all European countries to evaluate different typical building constructions with respect to the various acoustic descriptors, classification schemes, legislation, and enforcement. Much research has already been done, but not for all the descriptors usually considered in the legislation: airborne and facade sound insulation, impact sound insulation, noise from installations and equipment, etc. Furthermore an update is needed due to the changed legislation in several European countries.

*b) Listening tests to explore the validity of existing and new annoyance descriptors through the use of auralisation of impact sound, airborne sound insulation and structure-borne sound sources.*

Auralisation models allow for the comparison of many different insulation situations in a virtual environment. The insulation is calculated by using different wall and floor constructions, airborne sound sources, force signals or structure-borne sound sources. The listener is positioned in the virtual receiving room. Rapid calculations of many different situations can be used as input material for listening tests. This kind of listening tests can support research in the field of standard and future single number ratings in building acoustics.

*c) Surveys and psychoacoustic evaluation of neighbour noise annoyance through the uniform type of questionnaires created by common work of EU experts*

The opinion of society, i.e. end users of dwellings in each country will be analyzed.

A network of EU experts will create a uniform questionnaire related to acoustic comfort and noise annoyance in dwellings. Uniform questionnaire based on inputs from experts from different European countries will bring typical question and problems from national levels to the European one and will help to judge the acoustical situation all over the Europe more objectively.

The information obtained performing social surveys combined with the results of sound insulation measurements in the related dwellings could be compared with those obtained using listening tests in a virtual environment and with the experimental field test.

Social surveys could yield important information also in relation to the different habits of people from different countries, making it easier to understand different requirements.

*d) Uniform system of descriptors of acoustic performance of dwellings and establishment of a set of sound insulation classes, harmonization.*

Based on the existing technical standards (international and national), results from laboratory listening tests and in situ measurements as well as uniform socio-acoustic surveys (output from task c or in accordance to ISO/TR 15666 ) under normal living conditions, a uniform system of

descriptors of acoustic performance of dwellings will be proposed. Uniform descriptors are essential for the establishment of the sound insulation classes.

*e) Sound insulation data for building constructions, technological research on improved building details*

Collection of data of extensive field tests and analysis the results with the aim of evaluating the uncertainty, for different types of constructions, correlated with the mounting conditions. This would provide a performance range for constructions from real buildings assisting designers and architects to meet their Member State regulatory performance requirements.

Collection of typical EU construction designs and examples of good and bad workmanship practice to assist designers, contractors and architects in avoiding mistakes and providing more robust construction designs to achieve their required sound insulation performance levels.

## **D.2 Scientific work plan - methods and means**

In order to achieve successful results within this ACTION, permanent collaboration and contact must be kept at least with the following standardisation bodies and their corresponding WGs.

- CEN TC126: Acoustic properties of building products and of buildings
- ISO TC43/SC2: Building Acoustics.

Many of this ACTION members are already involved actively in CEN and ISO WGs.

The scientific plan is as follows:

### **Task a. Work plan and methods related to standardization and legal requirements**

The assessment of current sound insulation measurement descriptors applied in legislation across the EU member states will be analysed in terms of its relationship to current ISO 717 (parts 1 and 2) and the measurement requirements of ISO 140 for field measurements. A parametric study of the different requirements and criteria across the EU will be prepared and provide a benchmark exercise in the development of a simplified or new performance reporting descriptors. A frequency statistical analysis will be undertaken of the impact such new performance reporting descriptors

would have. Furthermore an analysis of the impact such a descriptors may have on different construction formats (various heavy and light-weight constructions) would also be undertaken. The findings of the analysis will be transferred to the current Action FP0702: "Net-Acoustics for Timber based Lightweight Buildings end Elements", who might benefit from those results found for light-weight buildings.

This task would provide an impartial and unbiased review taking into account all EU Member States and a statistical impact study would be undertaken and reported at each meeting of the likely effects of any changes. The tasks will be undertaken with statistical rigour and presented in a standardised format.

#### **Task b. Work plan and methods related to listening tests and auralisation**

The auralisation process has to be based on some kind of physical model. For a building situation made out of homogenous solid walls the EN 12354 standard can be used as a calculation framework. To check the validity of the calculated auralisation, a verification with the real situation has to be done through listening tests.

The insulation of different building situations depends on frequency and can be very different for constructions made out of wood, concrete, gypsum boards, or a combination of those. To allow for a quick comparison between constructions in practice, every insulation spectrum is to be reduced to one single descriptor that represents the annoyance of that particular building situation. At present, single number rating is done according to the ISO standard 717 and is based on research during the 1960s. To establish a single number rating figure with a better correlation to the actual annoyance it is essential to question the standard rating system once more and explore the use of newer psychoacoustic figures like loudness and time-varying loudness.

Three different fields have to be treated separately: airborne sound insulation, impact sound insulation and structure borne sound insulation. A series of different sources has to be selected for the different fields to make sure that the single number rating does not depend on one particular source character.

Subjective listening tests are the obvious choice for the rating of the sound insulation as they reflect about the annoyance in a certain situation. It has however been shown that objective performance tests (e.g. mental arithmetic) do not correlate in the same way as subjective listening tests. To assess the general acoustic disturbance caused by a building situation, this additional information can be used to improve the quality of the single number rating system. Subjective listening tests can easily be run parallel with objective performance tests.

### **Task c. Work plan and methods related to uniformed questionnaires addressed to end users**

Collection of inputs for creation of uniformed questionnaires will be done as follows:

First, different existing questionnaires (about noise annoyance in dwellings) used recently on national levels will be discussed and analyzed. Later, typical complains from society in each country will be shown and if necessary, new questions for surveys will be created. This response from end users can be collected via website in each country, where people can write about acoustical problems they experience in their apartments. In some of the EU countries these kind of websites already exist.

Finally, information about building technology (materials, examples of typical constructional details etc) and typology (distribution of functions) in residential houses from different countries will be collected and compared. Possible acoustical problems will be announced and used for the acoustical survey as well.

The focus of this task is the investigation of existing data and surveys and to determine the most appropriate methodology and "required questions" which a new sound insulation survey methodology would require. Importantly, that any new such survey must be practical, robust and impartial in the questions posed to dwelling occupants. To assist future comparisons using the new survey the task will develop robust statistical parameters and boundaries which would be required by future users in the compilation of new studies using the new survey format. In addition, supporting guidance for users of the new survey format will also be prepared. All survey documentation will be prepared in a uniform and standardised format with no bias to any EU member state or construction sector. Auralisation techniques and studies will be used to assess the

usability of the new survey format and identify specific class or subjective performance level differences by those taking part in the auralisation studies. In addition, the auralisation studies will also look at the effects of before and after remedial treatments using sound insulation test data from existing databases.

**Task d. Work plan and methods related to uniform descriptors and sound insulation classes**

First, a set of already existing European descriptors will be shown. This information will be taken from valid international technical norms and will be followed by discussion about possible improvements, such as enlargement of the frequency range for evaluation of the sound insulation. Knowledge obtained from laboratory listening test based on auralisation and information obtained from acoustical surveys will be also used to propose new descriptors. Uniformed descriptors, will allow us to quantify different acoustical situations and correlate those with human perception. This knowledge will be later used for an establishment of a set of the sound insulation classes.

**Task e. Work plan and methods related to sound insulation data for building constructions**

This task will focus on the national databases of previous constructions and dwelling statistics in each EU member state. In addition, a review of existing publications and literature (outside of national databases) will be undertaken to assess as fully as possible the housing and construction types. This will provide a map of existing dwelling types and typical sound insulation performance and provide a unique reference document for future research. Where occupant sound insulation surveys have been undertaken (from task c) these will be correlated with construction types and sound insulation levels for existing buildings. This would identify gaps in social surveys for sound insulation, and gaps in sound insulation data for specific constructions across the EU pinpointing areas for further work. This will also identify reasons for the range of performance and provide valuable information and lessons for future construction.

This task will also establish a unique field database of new constructions and sound insulation performance levels across the EU Member States. Linking with task **a**, a detailed and specific analysis will be undertaken of the influence of the new performance reporting criteria for these new and future constructions. A compendium of good and bad workmanship practice will be developed, which relates to the impact this has on sound insulation performance and occupant feedback. The occupant feedback will be developed from existing studies and databases but also from the auralisation studies (task b).

## **E. ORGANISATION**

### **E.1 Coordination and organisation**

This Action will be led by a Management Committee (MC), and will be responsible for decisions regarding activities. It will be formed by all the partners in this Action.

The Working groups will be responsible for the scientific program of the Action, and for establishing links with existing research programs.

The MC will assess the work of the Working Groups at every meeting and update the Work Plan as found necessary while partners can be added or removed, and if necessary revised WGs can be set up during this Action. WG meetings will be organized as and when required within individual activities. Exchange visits of scientists, especially young scientists, will be encouraged by the MC to foster collaboration between institutions, laboratories and industries of COST countries.

### **E.2 Working Groups**

Three Working Groups will be created to cover the different areas included in the Action:

WG1 (task a and d): This WG focuses on common descriptors, classification schemes, legislation, enforcement, harmonization, rating and prediction methods (ISO and EN standards) for all member states and this in the fields of airborne and impact sound insulation of dwellings.

WG2 (task b and c): WG2 collects and interprets research data in the participating countries about the social surveys and psychoacoustic evaluation of neighbour noise: annoyance, impact on health, quality of life, relocation, correlation with acoustic comfort. It will also try to suggest common approaches in the research of the participating members so that research results can be more easily compared and interchanged. This WG provides the psychoacoustic support for the work and decisions in WG1. It will also be in contact with TD0804 "Soundscape of European Cities and Landscapes" and share experiences and results.

WG3 (task e): WG3 shall prepare practical answers for the larger building industry about sound insulation and has to provide construction data for building and innovating dwellings. Therefore it will collect and discuss the information provided by the research teams of the participating

countries in order to create a European database giving several examples of traditional and innovative "robust" solutions for new housing and the acoustical improvement of existing dwellings. WG3 will be composed of Subgroups for the different technical items (details about the façade sound insulation, impact sound,...). Each Subgroup will be composed of experts from the various fields of building acoustics from different European countries and institutions. All proposed "robust" details will be checked on their consistency with other technical requirements (humidity, thermal requirements, and requirements for sustainable buildings...). Close links will be maintained with national scientific and research institutions throughout Europe in order to gather information, organise workshops and conferences, specific training seminars to involve early-stage researchers, exchange documentation and publications, coordinate existing research activities, propose new joint projects and disseminate findings (see also point H).

### **E.3 Liaison and interaction with other research programmes**

All participating members of this proposed Action either have local national research programs about applied building acoustics, psychoacoustics or both. Many participating experts are active in the establishment of local building legislations, standards or are active in CEN and ISO Working Groups and commissions about building acoustics or psycho acoustics.

This Action will establish and extend its network to European Experts by publishing information and invitations via the European Acoustics Association (EAA) and the relevant Technical Committees Room and Building Acoustics and Noise. People from EAA and EAA TC are involved as experts in this Action. By using the internet platform of EAA, links will be created to national acoustical societies and their committees. EAA offers also the platform to organize symposia, sessions and workshops and to inform through its website and publications. This Action also has close links with the CIB organization, more specifically with CIB TC 051 "Acoustics" organization. The CIB organization (based in Rotterdam) regroups more than 150 research institutions worldwide active in the construction sector.

In particular, this Action will actively collaborate with Action FP0702 "Net-Acoustics for Timber based Lightweight Buildings end Elements" that focuses on the improvement the acoustic behaviour of timber based lightweight buildings.

Both Actions are concerned with improving the acoustical quality of building situations. Both Actions can benefit of exchanging information by discussing particular issues by email or on meetings. Some experts will be present in both Actions and will serve as links between them. Action FP0702 can especially support this Action about light weight constructions using the experience with prediction models and measurement schemes.

There will equally be an exchange of information with Action TU0701 "Improving the Quality of Suburban Building Stocks" whose main objective of the Action is the development and dissemination of knowledge and tools to assess and promote the refurbishment of existing suburban building stocks. Our aim is to stimulate this Action TU0701 to take in account acoustic considerations and to insert results of our Action in their work and dissemination of results. The Action will also collaborate and give feedback to the new Action TD0804: Soundscape of European Cities and Landscapes.

#### **E.4 Gender balance and involvement of early-stage researchers**

This Action will respect an appropriate gender balance in all its activities and the Management Committee will place this as a standard item on all its MC agendas. The Action will also be committed to considerably involve early-stage researchers. This item will also be placed as a standard item on all MC agendas.

This Action will promote young researchers being involved in all aspects of the research and the related information interchange between the different Groups.

For permanent communication among the young researchers and graduate students, an internal discussion forum will be established on the website of the EAA TC Room and Building Acoustics.

#### **F. TIMETABLE**

The Action is scheduled for a four year period. During this time there will be systematic MCs and WGs meetings/workshops/work load update approximately every six months.

Management/Coordination		Monthly time schedule							
		06	12	18	24	30	36	42	48
	MC meetings	x	x	x	x	x	x	x	x
	WGs meeting/workshop	x	x	x	x	x	x	x	
	Final reports								x
WG/Task	Description	Monthly time schedule							
		06	12	18	24	30	36	42	48
1/a	Collection of EU member states sound insulation descriptors, requirements, special rules and classification schemes	x							
1/a	Analysis of data – proposals of new performance descriptors		x	x					
1/a	Feed back from EU members				x				
1/a	Preliminary results of task 1					x			
1/d	State of the art/knowledge from members	x							
1/d	Frequency range enlargement debate		x	x					
1/d	Listening tests/Acoustical surveys				x	x			
1/d	Preliminary set of sound insulation classes/feedback						x	x	
2/b	State of the art/knowledge from members	x							
2/b	Validation of auralisation		x	x					
2/b	New single number rating discussion (psychoacoustics)			x	x				
2/b	Subjective listening/objective tests				x	x	x		
2/b	Preliminary results of task b							x	

2/c	Collection and discussion of existing questionnaires	x							
2/c	Uniform questionnaire proposal		x	x					
2/c	Website	x	x	x	x	x			
2/c	Technical/types of construction data base		x	x					
2/c	Auralisation/New uniform survey				x	x	x		
2/c	Preliminary results of task c						x	x	
3/e	Constructive solutions performance database	x	x	x					
3/e	Reference Document			x	x				
3/e	Correlation to surveys when possible				x	x			
3/e	Field database of new buildings performance				x	x	x		
3/e	Compendium of good and bad workmanship practice output						x	x	

## G. ECONOMIC DIMENSION

The following 25 countries have actively participated in the preparation of the Action or otherwise indicated their interest: AT, BE, HR, CZ, DK, EE, FI, FR, DE, HU, IS, IT, LT, NL, NO, PL, PT, RS, SK, SI, ES, SE, CH, TR, UK. On the basis of national estimates, the economic dimension of the activities to be carried out under the Action has been estimated at 100 Million € for the total duration of the Action. This estimate is valid under the assumption that all the countries mentioned above but no other countries will participate in the Action. Any departure from this will change the total cost accordingly.

## H. DISSEMINATION PLAN

### H.1 Who?

"Integrating and Harmonizing Sound Insulation Aspects in Sustainable Urban Housing Constructions" benefits in the first place the large public. But in order to be able to realize this goal, a very large target audience needs to be convinced, informed and stimulated to adapt the results of this project and to start to innovate:

- Architectural and engineering offices;
- Contractors;
- Building material and system manufacturers;
- scientific and educational institutions and networks that concern the building and even part of the health sector;
- The building press;
- Policy makers (from the European level to the very local authorities);
- Standards Bodies. (CEN TC126 and ISO TC43 )
- Guidelines for forensic engineering (when estimating the global quality and value of apartments)
- In particular the EAA TC-RBA WG 4 "Sound Requirements and Sound Classification - Harmonisation of concepts" (see <http://www.eaa-fenestr.org/TCs/RBA/Workgroups/WG4>)

Such a large target group is a risk and needs a strategic, in priority layered approach taking full use of secondary networks that can further divulgate the information.

## **H.2 What?**

In order to spread results of the ACTION, different dissemination procedures will be used depending on the target group:

- Dissemination of the information within the Action (and eventually some approved external parties) on a password protected website where all working documents can be posted;
- Dissemination to the EAA TC-RBA WG 4 “Sound Requirements and Sound Classification – Harmonisation of concepts”;
- Dissemination of results to the National and European Standards Bodies and to Working Groups preparing National or Regional laws: Each member of this Action has links with the national standards bodies and most members belong to CEN or ISO Working Groups. Some members are part of Working Groups that prepare laws with national or regional requirements to buildings. As such Action members can influence new standardization or legal work so as to adapt the results of this Action. These new standards will of course have a direct impact on the larger Building Sector who needs to

comply with the standards and laws. This approach is particularly useful for the dissemination of the results about the common indicators describing the acoustic qualities of dwellings and for the results of the study about the (very) low frequency approach;

- Dissemination by the creation of a web based database with the performance of building elements: this will be a great tool to make acoustic information more easily available to the vast building sector. This would also push more companies to declare acoustic results and as such stimulate them to improve their acoustic performances. All this information is absolutely necessary to correctly design an acoustic comfortable building at a reasonably low cost. The lack of this information now very often leads to a nonchalant approach towards acoustics in the design phase. These databases are of vital importance in the development of prediction tools such as can be added to Building Information Models. This approach can greatly improve the technical design of buildings without increasing the costs;
- Dissemination of information by the creation of a website that will contain 1) access to the above mentioned database; 2) an “Atlas” of acoustically robust building details composed of commented and detailed technical drawings introduced by the different Action members (some details will be of only local use as building methods differ between the different countries, but they could inspire innovation for other countries); 3) different publications and presentations of the Action members concerning the topic.
- Dissemination of information in two articles in peer-reviewed scientific and technical Journals (e.g. in Applied Acoustics or Building Acoustics).
- The organisation of a dedicated congress about the results of this project with workshops, seminars and conferences to be organized in association with CIB TC 051 “Acoustics”. The latter organisation regroups building research institutes, universities and building industry worldwide.
- The organisation of a Workshop & meeting in 2009, e.g. linked to EuroNoise 2009 or as a separate event.
- The organisation of a Structured session at EuroNoise 2009 (London).
- The organisation of a Workshop & meeting in 2010, e.g. linked to a conference or as a separate event.

- The organisation of a Structured session at FA2011 (Aalborg/DK) or workshop or symposium as a separate event.
- All of this will lead to information that can easily be reshaped, translated or adapted to publications in the different countries for local use in the specialized building press. This press is always looking for ready available information that can be processed in an article specific for their target audience (architects, general contractors, carpenters, etc.). It is the task of the network members to help this top down approach work for their country. Most Action members have good contacts with this special technical press or do themselves have special “technical advisers” that can do this.
- Dissemination of the acoustical quality classes in guidelines used by forensic engineers when estimating the global price of an apartment. (at the moment, acoustical quality is not included in their calculations at all).

### **H.3 How?**

All of these dissemination tools will be developed in a gradual way during the course of the Action. During each Action meeting, network members will communicate scientific advances/ own knowledge,... to the Action. Right from the start of the Project, it is intended to start up the password protected information exchange platform so that all members can have at any time access to all the most recent information. Half way the project, the intention is to have the internet database working so that manufacturers can start uploading their product information during the second part of the project. The public website should then be available in a first, not public way. Once approved and when enough information (publications, robust details,...) is added to the website, it will be opened for the larger public and a press release will be communicated to the specialized technical press. This will be the case sometime in the second half of the project. Each of the network members will disseminate the obtained information locally to its own country and target groups and will report at each meeting (in the second half of the project period) of what has been done. Towards the end of the Action, the international congress will be organized in collaboration with the CIB TC051 "Acoustics".

Besides, and as already mentioned, a close cooperation with standardizing bodies like CEN TC126 and ISO TC43 will be kept at all stages of the Action, which will guarantee the spread of this ACTION even beyond a European context.