COST Office

162nd CSO Meeting, 14 - 15 June 2005
Proposal for a new COST Action

COST E53

"QUALITY CONTROL FOR WOOD AND WOOD PRODUCTS"

Proposer: Mr. Keith Maun
Building Research Establishment (BRE)
Garston, Watford, Herts, WD2 5 9xX
United Kingdom
Tel: +44 1923 664 812
Fax: +44 1923 664 785
Email: maunk@bre.co.uk

COST National Coordinator: Mr. Chris Reilly
Office of Science and Technology
Department of Trade and Industry
1 Victoria Street
London
United Kingdom
Tl: +44 20 7215 6425
Fax: +44 20 72156448
Email: chris.reilly@dti.gsi.gov.uk

TC FFP Rapporteur: Prof. Detlef Noack
Bundesforschungsantalt für
Forst und Holzwirtschaft
Leuschnerstraße 91
D-21031 Hamburg
Tel: +49 40 720 70 31
Fax: +49 40 739 70 32
Email: noack@holz.uni-hamburg.de

DRAFT

MEMORANDUM OF UNDERSTANDING

for the implementation of a European Concerted Research Action designated as

COST E53

”QUALITY CONTROL FOR WOOD AND WOOD PRODUCTS”

The Signatories 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 400/01 “Rules and Procedures for Implementing COST Actions”, the contents of which the Signatories are fully aware of.

2. The main objective of the Action is to improve methods of quality control in processing of round wood and timber to ensure that timber products and components meet the requirements of the users.

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 Euro 25 million in 2005 prices.

4. The Memorandum of Understanding will take effect on being signed by at least five Signatories.

5. The Memorandum of Understanding will remain in force for a period of four years, calculated from the date of first meeting of the Management Committee, unless the duration of the Action is modified according to the provisions of Chapter 6 of the document referred to in Point 1 above.

COST Action E53

QUALITY CONTROL FOR WOOD AND WOOD PRODUCTS

Abstract
The Action aims at the improvement of existing and the development of novel methods and techniques for fast and accurate quality assessment along the forestry wood chain. Special attention is given to a) scanning of round wood for inherent wood properties, b) determination of moisture content and distortions, and c) assessment of strength, stiffness and visual appearance of timber and wood products. Improved quality control systems will help to increase the competitiveness of the wood sector, ensure that round wood is optimally processed and that European wood industry provides wood products which are well adapted to end user requirements.

A. Background

In the EU(15) member states over 60 million m^3 sawn of softwood timber (mainly Spruce and Pine) and over 20 million m^3 sawn of hardwood timber (mainly Oak and Beech) are produced per year. This represents a total value of approx. 13.000 million Euro for softwood and circa 6.000 million Euro for hardwood. The major part of the softwood material is currently used in the building sector in structural components, joinery, furniture, cladding (façade, wall cladding and flooring) and in temporary structures (including formwork). A high proportion of the structural members (beams, roof-truss timber, purlins, studs) have to be kiln dried to approximately 18-20% moisture content, then graded for strength and preservative treated. Other products may have to be dried to lower moisture contents corresponding to their likely in-service moisture content (approximately 10% for interior joinery, 12% for glulam and 16% for exterior joinery) and also appearance graded for surface defects and growth rate. Hardwoods, mainly used for decorative purposes such as furniture, internal wall cladding and flooring, also need to be kiln dried and graded for appearance.

Over the last decade nearly in all areas of Europe an increase in the output of timber products can be observed. Furthermore, the overall timber production in the EU has increased by about 20% with the entry of the 10 new members in May 2004. The trend of increasing timber production is expected to continue. For example, in the UK the output from their forests is estimated to increase from the current figure of 7 million m^3 to 17 million m^3 in 2015.

Nowadays, timber end-users often claim that timber does not come-up to their expectations. Some properties are well over the acceptance level but other crucial properties are unacceptable. Various timber qualities are already available, but some of them are not being used correctly at the present time as high-quality timber is used on occasion for inferior products and vice versa. One of the main reasons is that the industry is unable to identify the performance requirements. The structure of the timber industry with its predominance of small companies has stood in the way of joint marketing concepts and market surveys. Neither consumers nor producers are aware of the wood properties which govern performance and, as a result, the current grading rules are more production-oriented than consumer-oriented: As a result, timber products are not manufactured as well as they might be, nor are they specified as they could be. The current standardization work still follows the traditional approach. In that it is production-oriented rather than consumer-oriented. The relevant standardization committees are becoming increasingly aware of this deficiency but are not equipped to take the necessary steps. If the new and existing material is not to the correct standard when

delivered to the market place and if it does not perform to specification then timber will loose its market share. The aim should be to increase market share and make more use of Europe's environmentally friendly and renewable resources.

Despite the recent investments of many millions of Euros made by the European sawmill industry to improved strength grading, surface defect appearance grading, kilning technologies and scanning equipment, there are still major problems that require addressing and enhancements that must be made to improve the competitiveness of timber products with other materials for timber to maintain or increase its market share.

For example, for the construction sector timber must have:

- sufficient strength
- sufficient stiffness
- correct target moisture content
- appropriate form i.e. be dry and straight with low twist, spring, bow and stay straight in service despite changes in local environmental conditions
- good sawing accuracy
- sufficient durability
- good appearance.

For joinery use extra requirements would include:

- control of defects and
- growth rate.

Timber can achieve these requirements but it is important that quality control systems are available and are actively applied. To achieve this, quality control must be precisely defined, features for a particular product must be identified, limits must be established, accurate measurement systems must be developed and above all the systems must be widely used. Also, the products should be processed in economical and competitive ways.

In principle, Quality Control (QC) should start with the seed that produces the mature tree, and continue through forest management and harvesting of logs, as well as through log processing, including especially the production of general timber (hardwood or softwood) and timber components. But this Action considers only Quality Control along the whole chain from log processing to the final wood products.

Quality control of all timber and timber products has requirements which rely on scanning to aid:

- correct and accurate measurement for growth, strength, stiffness and distortion parameters
- dimensional accuracy.

Scanning helps to facilitate the competitiveness of timber by ensuring that:

- timber products look good
- production economics are optimised.

Whilst scanning is already important nowadays it will become even more important in the future as competition among materials and the demands of the customers are steadily increasing. It is essential for fast and accurate measurements which are needed for quality control of round wood prior to processing and for quality assessment of timber products.

Processing European-grown round wood into saleable sawn components which meet the market requirements (fit for purpose) requires an efficient manufacturing system operated by a well-trained

staff. An essential and integral part of this system is the optimisation of volume and quality of output of sawn products from each tree. It is essential therefore, to make best use of modern scanning technology to measure material and optimise sorting and conversion of logs as well as of sawn battens and boards. The technology must be able to direct each log and subsequently each batten and board to the most appropriate market by scanning for true log shape, growth characteristics and dimensional accuracy.

To date, scanning technology has generally only been used in sawmills in Europe, to measure log shape so as to maximise volumetric yield and to detect the usable area of a waney-edged board. In the future, scanning technology will be able to take on even more importance as the industry strives to utilise European timber to sell into the highest value markets in a viable fashion maintaining a high product quality and output.

Some sawmills are already undertaking simple defect recognition on sawn boards but more assessments are required. This includes the need for the measurement of strength- and appearance-reducing defects which can be minimised by re-engineering for a higher structural grade or removed to facilitate a high value re-engineered product. Furthermore, advanced scanning of growth characteristics is required at lower cost than the x-ray systems currently being developed to gain knowledge of the internal quality of a log before conversion in terms of extent of knots, grain direction, growth rate and density. The gained information will help to direct the log towards conversion for the most suitable market.

Assessment of the technical end-use demands and expectations that end-users in European countries impose on various timber products (objective and subjective requirements) is very important when quality control systems are to be designed and implemented. It involves the analysis of the crucial properties of timber products and timber components related to function at the production stage. An open discussion about timber as a building material will reveal preconceived attitudes and crucial properties which are important in order to increase the use of timber. The discussion will also include possible new applications for timber and the properties needed for such products.

Assessment of product dimensions immediately after sawing to detect potential sawing inaccuracies and maintain quality control is especially important if the wood is going to be economically re-engineered. Good sawing accuracy is essential for good kiln drying as it ensures even stacking which helps to minimise drying distortion.

Assessment of distortion (spring, twist and bow) and growth rate immediately after kiln drying is the final quality control step on timber before further processing.

These measurements are all required in order to direct the material to the correct market and to facilitate re-engineering for potential enhanced up-grading and the production of value-added product.

To make these techniques and technologies available to all sawmills and secondary processors, including SMEs, low cost scanning systems are required and knowledge needs to be disseminated across Europe.

Moisture related factors in the quality control of timber

In general, the moisture content (MC) of timber supplied, especially to the building industry, is too high and this leads to problems which in turn could reduce timber's market share. There is an urgent need to establish precise MC requirements and limits for specific products so as to improve specifications. Improved, more rapid methods are needed for determining the MC during the production stages and to recommend methods and sorting systems needed to achieve viable low MC timber.

For optimum quality and value, kiln dried timber products should be dried to have:

- correct target moisture content
- low moisture gradient
- low batch variability
- appropriate form i.e. be dried straight with only low twist, spring, bow and remain straight in service despite changes of climate.

Technical drying of sawn timber is a very energy and time consuming process but is essential for high quality applications. In order to achieve reasonable drying quality in terms of final moisture content, precise moisture, temperature and humidity measuring techniques are needed. Depending on the location in the production process one can distinguish between green chain and dry chain moisture measuring systems. These may be in-line (mostly continuous and non-contact), off-line (mostly handheld) moisture measuring systems, and in-kiln systems (for supervision and end point determination). In-kiln systems either estimate average MC of a fraction of the kiln load or determine MC of individual boards.

Moisture content is a key parameter that should be known when other quality related properties of sawn timber, including drying distortion, are determined. Grading systems and scanners normally use measuring techniques where the resulting signals are affected by MC. Precise determination of moisture content is crucial for achieving acceptable accuracy. For precise estimation of moisture content the local density of the wooden material should be known. For this reason, multi-sensor systems are needed to build up highly accurate measuring systems.

Conventional measuring systems for moisture content are resistance type meters which are normally invasive and need to be calibrated for species and temperature, whereas the more advanced capacitance-type MC meters need to be calibrated only for density. Infra-red systems can be used to estimate the MC of green and dry pieces when it can be assumed that surface MC is equal to the average MC of the whole timber batten. The most recent micro-wave systems have a lot of as yet unexplored potential for innovative and improved measurement, both for non-contact in-line processes as well as for in-kiln control.

Drying distortion (spring, twist and bow) also needs to be minimised and it is necessary to determine specifications, requirements and make automatic measurements on dried timber products before assessing whether they are fit for purpose.

In order to improve measuring and assessment systems for moisture content and distortion, there is a need to exchange existing and new information throughout Europe between scientists, manufacturers of measuring systems and potential users. This is of utmost importance because enhanced co-operation will help to secure the leading position of European companies in the field of quality control in primary and secondary wood processing technology.

Quality control of the strength properties of timber

A pre-requisite for the use of timber in load-bearing constructions is that the strength and stiffness properties are known and can be controlled to stay within desirable limits. Being a natural material, this can not be achieved in the same way for wood as for man-made products such as steel, concrete, plastics and even wood-based panels where a certain material quality can be assured by changing the composition of the raw materials or by changing some of the processing conditions (temperature, pressure etc). Although some properties can be selected and controlled, e.g. durability through selection or enhancement, mechanical properties of wood can only be specified and selected within desired limits through grading. There are presently two types of strength grading systems:

- *Visual strength grading* which is based on visual inspection to control that the pieces do not have visual defects in excess of the limits specified in the relevant grading rule
- *Machine strength grading* where the pieces are passed through a machine which measures one or several parameters non-destructively. Based on the measurements the strength and stiffness are predicted.

The most common technique used for machine strength grading is to measure flatwise bending stiffness. However, during the last decade new methods for non-destructive detection of timber characteristics have been applied for grading machines. Gamma radiation and x-ray can be used to detect knots and to predict clear wood strength. So-called CCD Cameras, equipped with opto-electrical sensors, can be used to detect knots and other visible characteristics. The fastest growing technique is to use acoustical methods to measure the frequency of an axially-induced vibration.

Despite the introduction of new techniques, the ability of automatic systems to predict strength has not increased. The lack of reliable predictive ability and the safety factor that has to be built into the machine strength grading systems together have the effects that a considerable amount of timber that actually fulfils the strength requirements for a certain class is incorrectly down graded or rejected. This provides a great challenge and opportunity to develop measurement techniques and quality control schemes that can optimise the utilisation and higher value usage of timber as a modern and competitive building material.

Current Activities

In some European countries, Universities and Research Institutes as well as the Industry themselves are all engaged together in research and development as well as in standardization, and it is in these contexts that specification, requirements, measurements and assessments for Quality Control of timber and round wood are addressed. However, often information is restricted to national level dissemination only. Furthermore, some standards can actually hinder the uptake and application of new technologies. To unlock this potential and overcome limitations due to our current state of knowledge, which also might differ from country to country, collaborative activities on a European level are needed. The necessary information and techniques are still fragmentary, and activity in this field is not spread consistently throughout Europe. Therefore, exchange and research work should be initiated in some areas and continued or extended in others. The Quality Control of timber must be a concern for the whole of Europe because if it is lacking in just one country it is possible that this will have consequences for timber marketing in other countries. Therefore, a European cross-sectoral approach is required in order to co-ordinate activities across the whole field of wood production and processing in different countries by co-operation between the institutes and industries concerned.

The holistic design of this COST Action will allow to promote future opportunities for enhanced Quality Control of round wood timber and timber to support the establishment of state-of-the-art

standards in this field in accordance with the EU requirements. This COST Action will create a multi-disciplinary forum drawn from the wood industry, electronic and computer control industry, building sector, general timber users as well as researchers from universities and research institutes for the exchange of ideas and to contribute to the harmonisation of the available, appropriate methodologies. It will also contribute to improving the comparability of the collected data.

B. Objectives and Benefits

The main objective of this Action is to improve methods of quality control in processing of round wood and timber to ensure that timber products and components meet the requirements of the users. The Action will also promote the improvement of specifications for timber products and contribute to economic optimisation of production so that the full environmental and sustainability benefits of the forestry wood chain can be realised.

In particular this Action aims to take into account the following specific issues:

- evaluation of the technical requirements needed for effective quality control of timber products across Europe
- improvement of the quality of the European information databases on the requirements for the quality control of timber to support its efficient and economically viable production
- broadening of the knowledge base and improvement of measurement procedures
- advance the common understanding and promote the development of appropriate assessment systems for quality control of round wood and timber on a European level to optimise the use of the European wood resources.

The combined benefits of the Action will be to:

- define quality control parameters for particular products
- improve methods of data collection and exchange
- evaluate the state of the art in the three defined working areas
- give a comprehensive overview on the state of the art (State of the Art-Report)
- produce best practice procedures to facilitate achievement of the required quality control
- contribute to the harmonisation of corresponding legalisation and standardisation
- provide strategic information for possible European Commission frameworks
- initiate possible common proposals to European Commission framework programs and act as a focus for the preparation of European research projects
- bring together a multi-disciplinary ‘team’ under one umbrella.

In the long run, information resulting from this Action can be used by forestry wood chain to increase the use of timber products. An overview and a description of applicable standardization and legislation within all European countries will be provided on a European level. This will in turn offer a basis for decisions on necessary future R&D efforts at the European level so as to enable concentration of existing, often limited resources for research and development in order to gain maximum result based on given financial and economic input.

C. Scientific programme

In order to stay competitive the forestry wood chain needs to increase its efforts towards improved methods of quality control throughout the whole production chain. The scientific programme focuses on supporting developments related to scanning for wood properties as well as assessment of wood moisture and distortions, strength, stiffness and visual appearance.

For a better understanding of the physical processes influencing the behaviour of wood in the various phases of processing the Action will analyse the fundamental interactions between wood properties, processing and final product behaviour to the extend necessary for an improvement of the quality control.

Encouraging cross-sectoral cooperation the Action will bring together expertise from a broad range of different fields, such as measuring techniques, processing of round wood and timber and quality specification. By identifying new measuring and assessment techniques the Action will promote their adaptation to the specific needs of the wood products sector as well as support the development of reliable, cost-efficient quality control systems.

The scientific programme is outlined in more detail in the description of the three Working Groups which will be coordinated by the Management Committee.

Working Group 1: Scanning for Wood Properties in Quality Control and Processing

During recent years various scanning techniques have been developed which are applicable for assessment of inherent properties of round wood and sawn timber. Many of the systems available have their origin in medical science. They had and still have to be adapted to the special requirements of the wood sector. Liaison with the Task Group on Requirements and Specification of end use related Properties (TG RSP) will help to specify the requirements.

WG 1 will concentrate on the technological aspects of novel scanning techniques for round wood and sawn timber products. Early assessment of the inherent properties of logs will open the opportunity to direct logs to the most appropriate processing line and prevent conversion of logs into sawn timber products which most likely will not meet the requirements. Additional information on growth characteristics, grain angle, knot size and position can be used to optimise the output of mechanical wood processing (mainly sawing).

WG 1 will focus its efforts on the following topics:

- Improvement of 3D log scanners for log measurement and assessment
- Improvement tree stem scanning to optimise log cross-cutting
- Automatic grading of saw logs by linking 3D scanners (assessment of shape) with X-ray scanners (assessment of internal log quality)
- Modifying board scanners used in sawmills to detect other growth defects as well as wane
- Board scanning for defect cutting and end-jointing applications to increase strength, produce clear joinery or to facilitate engineered structural components
- Detection of growth rate in logs linked with conversion optimisation on 3D scanned logs to cut particular sizes for added value products where growth rate is important
- Detection of growth rate of boards and battens on the “green chain” in order to select material for high value products such as joinery and laminated beams
- Detection of slope of grain on the surface of logs during initial sorting to segregate logs which, if cut for construction, will produce battens which are likely to exhibit excessive distortion after kiln drying

- Detection of slope of grain on the surface or microfibril angle of battens and boards in order to segregate those which are likely to exhibit unacceptable levels of distortion. The segregated lower quality material could then receive special attention for drying or be directed to a more appropriate market; this could be especially important if drying to 15% moisture content or below
- Indicating knottiness, density and other factors of timber and hence predict the internal quality within the log by detecting and measuring log characteristics
- Predicting the internal quality of the log by modelling juvenile wood and compression wood formation
- Providing measurements needed for WG2 as well as WG3.

All the above scanning techniques are needed to facilitate Quality Control and enable efficient processing.

Working Group 2: Moisture Content and Distortion in Quality Control and Processing

This Working Group will cover the issues related to consideration of moisture content and distortion induced by moisture content change in automated quality control systems:

WG 2 will focus its efforts on the following topics:

- Establishing moisture content and distortional requirements for particular timber products (in cooperation with TG RSP
- Defining quality control and assigning limits for assessment (in cooperation with WG1)
- Considering what additional methods are needed to dry timber to lower MCs
- Determination of moisture in individual pieces of timber whilst keeping other factors, such as distortion, within QC limits
- In-line determination of moisture content, provision of moisture content information in quality control and scanning systems for wood properties which are affected by moisture content
- Using existing knowledge to improve quality of sawn timber in terms of straightness of end-products
- Considering implementation where appropriate for enhanced quality control techniques and strategies for minimising deformations during drying
- Considering the moisture content-induced in-service performance of timber products and propose appropriate methods for QC
- Informing the European wood industry about possible ways of moisture content determination in industrial practice.

Furthermore, the Working Group will analyse moisture content measuring systems, and will collect data about the accuracy of such systems. It will identify barriers and obstacles to the wider use of such systems and will provide a forum for initiating cooperative research to overcome such obstacles.

Working Group 3: Strength, Stiffness and Appearance in Quality Control and Processing

WG3 will provide a platform for the interchange of current knowledge and the exchange and development of new ideas across Europe in aspects of strength, stiffness and appearance in relation to quality control of timber. This will lead towards the implementation of the best measurement techniques and facilitate the required quality control methods which will ensure that the available

structural and non-structural timber is used effectively in Europe and is fit for purpose. There will be a need for this WG to:

- Liaise with TG to review requirements for particular timber products
- Liaise with WG2 to define quality control and assign limits for assessment.

The main objective of Working Group 3 is to review the use of existing systems of measurement, encourage their wider application and provide the forum for co-operation in the development of lower cost systems and advanced high speed systems. Success in these objectives will make grading for quality control more readily available to all sizes of industry across Europe.

There are a number of possible developments on the horizon offering the potential for more accurate assessment which need study. These are:

- *More advanced non-destructive methods and combination of methods*: None of the methods applied in machine strength grading today is capable of correctly mapping the variability of the timber. It is a great challenge to better predict the strength reducing effect of knots. More flexible systems combining strength and appearance can result in a more economic process for companies grading timber.
- *More accurate machines at reasonable cost*: The most accurate ones on the market today are expensive and only have an advantage over other less accurate machines if high strength material is to be graded. Combining bending or resonant vibration systems with detection of edge knots appears to be a promising concept with the technique available today.
- *Grading early in the production process*: One way is to grade the logs to obtain an enrichment of logs that after sawing are more likely to give higher yields of structural timber.
- *"Visual strength grading" by means of surface scanning techniques*: There are a number of different systems for surface scanning on the market but exclusively used for appearance grading. It is likely that these systems could be further developed for grading with respect to strength.

Task Group on Requirements and Specification of end use related Properties

The three WGs in this COST Action are assisted by this Task Group which deals with gathering and generating qualitative and quantitative knowledge about demands and expectations that end-users in European countries impose on various timber products (objective and subjective requirements). The TG will examine whether these requirements can be met by existing scanning techniques. The performance levels required to guarantee use of timber according to various standards, codes of practice, safety and to identify appropriate grading parameters as well as the measurable wood properties required to comply with the above-mentioned quality parameters will be reviewed in a state of the art document. The TG will concentrate on user requirements and will hereby support the more technological approach of WG 1 (scanning), WG 2 (moisture content) and WG 3 (strength, stiffness and appearance).

The Task Group will aim at the elaboration of a description of the most promising measuring and assessment systems and their capability in determining the end use related properties. It will contain:

- Summary of the requirements for finished components/elements/structures (independent of materials) imposed by society for safety and by commissioners for functional and aesthetic reasons
- Inter-relationship between performance requirements and grading parameters
- Review of quality control techniques for logs, boards, semi-finished wood products and their suitability for measuring parameters to facilitate quality control.

D. Organisation

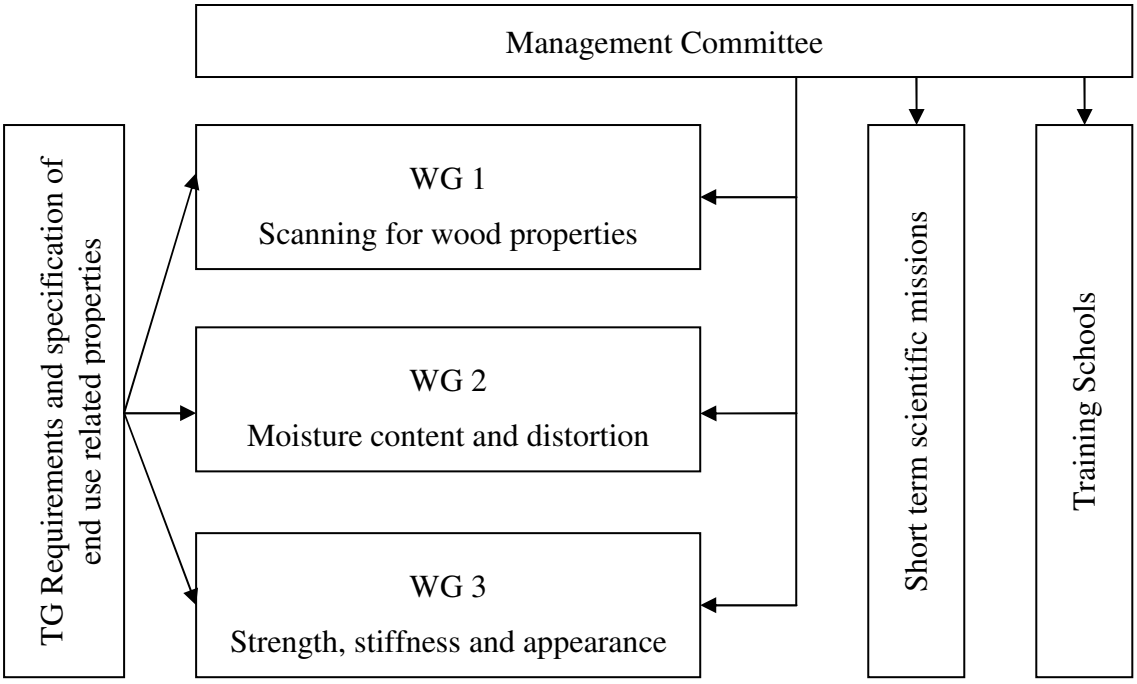
The COST Action will be led by a Management Committee (MC). Responsibility for detailed planning, execution and documentation of the individual activities will be delegated by the MC to a Steering Group (SG), consisting of the Chair of the COST Action, the Working Group Coordinators, and when necessary others through appointment by the MC. Where possible, the MC or SG meetings will be organised in connection with Working Group meetings, workshops and conferences to minimise the costs involved in the coordination of the COST Action.

The main activities of the COST Action are to be carried out at the WG level. The WGs will act as links between the COST Action and existing research programs, and will be the fora for intensive interactions between the industry and the research community. WG meetings for sub-groups or for the entire WG will be organised as and when required within individual activities. Exchange visits of scientists, especially young scientists, within the short-term scientific mission scheme will be encouraged by the MC to foster collaboration between institutions, laboratories and industries of COST countries.

The three WGs and the Task Group (TG) are closely linked to each other (see graph below). To provide the key information from within the WGs to the plenum of the COST Action, and to stimulate the interactions between the WGs, two plenum workshops will be organised. These workshops may include a one day session for each of the WGs, which will run in parallel, followed by a one day session in the plenum.

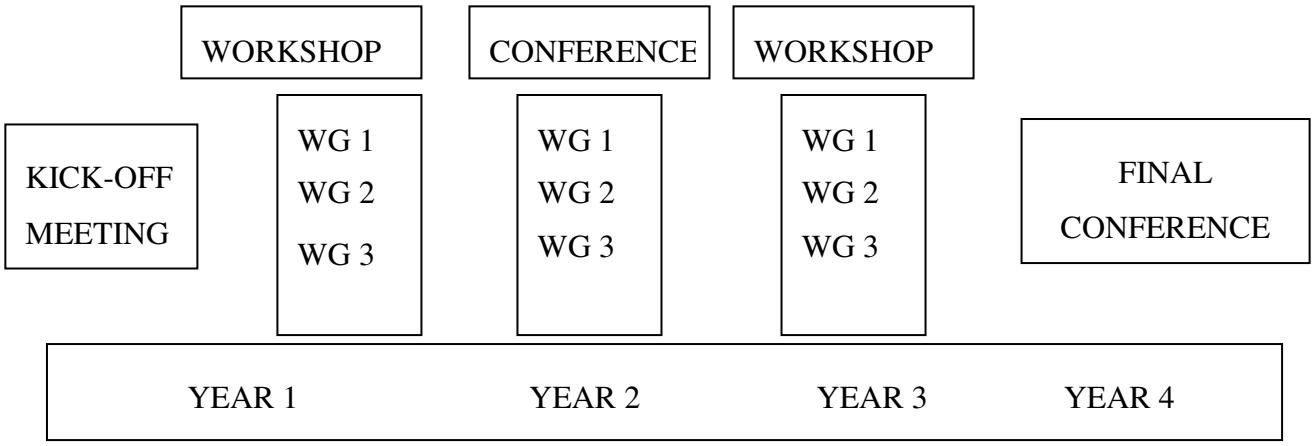
In addition, this Action will make use of the "Training School" for the training of both industrialists and academics that are interested in various aspects of the newly emerging methods for Quality Control and processing. This sector is a technological one and so it changes rapidly in terms of the equipment used to control processes and products, and legislation. At the same time, this instrument can help disseminate information coming from this Action.

A midterm conference and a final conference will present the results of the COST Action to a broader audience. These conferences may be organised in connection with established international conferences.



E. TIMETABLE

The duration of the Action is four years and the time schedule for various activities is shown in the following chart:



F. Economic dimension

The following COST countries have actively participated in the preparation of the Action or otherwise indicated their interest:

- Austria
- Belgium
- Denmark
- Finland
- France
- Germany
- Greece
- Hungary
- Ireland
- Italy
- Latvia
- Netherlands
- Norway
- Poland
- Portugal
- Spain
- Sweden
- Switzerland
- United Kingdom

On the basis of national estimates provided by representatives of these countries the economic dimension of the activities to be carried out under the Action has been estimated, in 2005 prices, at roughly Euro 25 million.

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.

G. Dissemination plan

The Management Committee will organise at least three workshops during the Action with the main aim of presenting results. Joint meetings among the Working Groups can be organised in such a way as to best promote interdisciplinary communication.

A state-of-the-art-report on specific available quality control methods (techniques, systems, products), including their suitability and experience of application to timber in varied situations, as well as recommendations on how to use the novel methods of quality control on site will help to inform the public domain and potential future users.

All publications arising from research carried out under this COST Action will acknowledge the support of COST. The Management Committee will encourage and promote co-authored papers. Results of research carried out by the Working Groups will be submitted to international scientific journals and reviews.

The target audiences for the dissemination of the results of the Action (in particular, findings and recommendations) are mainly other researchers working in this field, research institutes, industry (represented by manufacturers and service providers) and European level R&D policy makers.

The dissemination will be done by using the following various existing possibilities, e.g.

- posting of general information on a public Web-site
- posting of working documents on a password protected Web-site
- establishment of an e-mail network
- publications: state of the art reports, interim reports, case study reports, proceedings, guidelines, manuals, final reports
- events: workshops, seminars and conferences organised by the MC and/or the Working Groups, contributions to other national and international conferences and symposia
- articles in scientific and technical journals, non-technical publications.

COST E53

” QUALITY CONTROL FOR WOOD AND WOOD PRODUCTS”

ADDITIONAL INFORMATION

NOT PART OF THE MOU

The following scientists have participated in the drafting of the Technical Annex of the MoU or expressed their interest in participating in this COST Action:

Austria
Alfred Teischinger
Universität für Bodenkultur
Department für Materialwissenschaften und Prozesstechnik
Gregor Mendelstr.33, A-1180 Wien
Tel: (+43)1/47654-4251
Email: alfred.teischinger(at)boku.ac.at

Belgium
Jozef De Corte
CTIB-TCHN
(The Belgian Institute for Wood Technology)
Allée Hof ter Vleest, 3
B 1070 Bruxelles
Phone+32 (0)2 558 15 50, Fax+32 (0)2 558 15 89
Email: jozef.decorte@ctib-tchn.be

Denmark
Jørgen Baadsgaard-Jensen
Danish Technological Institute
Gregersensvej
2630 Taastrup
Phone: +45 72 20 23 20Telefon 72 20 20 00
E-mail: j.baadsgaard-jensen@teknologisk.dk

Finland
Usenius Arto, Research Professor
VTT Building and Transport
Materials and Products
Betonimiehenkuja 5
P.O.Box 1806
FIN-02044 VTT, Finland
Phone: +358 9 456 5540
Fax: +358 9 456 7027
Email: Arto.Usenius@vtt.fi

France
Aleon Daniel
Centre technique du bois et de l'ameublement CTBA
Wood, Sawing, Packaging Department
10, avenue de Saint-Mandé
75012 Paris
Tel.: 33 140 194 947
Fax : 33 144 746 521
Email: daniel.aleon@ctba.fr

Germany
Johannes Welling
Bundesforschungsanstalt für Forst- und Holzwirtschaft
Institut für Holzphysik und mechanische Technologie des Holzes
Leuschnerstr. 91
D-21031 Hamburg

Tel: +49 40 73962 619
Fax: +49 40 42891 2925
Email: welling@holz.uni-hamburg.de

Gard Wolfgang
Technologie-Zentrum Holzwirtschaft GmbH
Kreuzstraße 108 - 110
44137 Dortmund
Phone: +49 5261 92 14-0
Fax: +49 5261 92 14-10
Email: gard.tzh@tischler.de

Greece
Michalis Skarvellis
Forest research Inistute of Athens
Terma Alkmanos,
115 28, Ilisia,
Athens, Greece
Tel.: +30 210 7784 850
FAX: +30 210 7784 602
Email: skmi@fria.gr

Hungary
Dr. Róbert Németh
University of West Hungary
Bajcsy Zsilinszky u. 4.
9400 Sopron
Hungary
Tel:+36 99 518 187
Email: nemethr@fmk.nyme.hu

Ireland
Gordon Knaggs
Gordon Knaggs & Associates
The Cables Balboyle Rs
Dublin
Ireland
Tel: +353 1 839 6783
Fax: +353 1 839 6783
Email: gordonknaggs@eircom.net

Latvia
Ivars Akerfields
Latvian University of Agriculture
Faculty of Forest- Akademijas iela 11
Jelgava
LV-3001
Phone: +371 300 7582
Fax: +371 308 1932
Email: ivars.akerfelds@ktc.lv

Norway
Knut Magnar Sandland
NTI
Norwegian Institute of Wood Technology
P.O. Box 113, Blindern
314 Oslo
NORWAY
+47 22 965500
+47 22 604291
Email: knut.sandland@treteknisk.no

Spain
Carlos Baso
Universidad de Vigo
Campus 'A Xunqueira', s/n
36002 Pontevedra
SPAIN
+34 986801900
+34 986801907
Email: cbaso@uvigo.es

Sweden
Robert Kliger
Chalmers University of Technology
Structural Engineering and Mechanics,
Steel and Timber Structure
SE-412 96 Göteborg
Phone: + 46 31 772 2016
Fax + 46 31 772 2260
Email: Robert.kliger@sem.chalmers.se

Esping Bjorn
SP / TRATEK
Swedish Institute for Wood Technology Research
BOX 5609
11486
Stockholm
Sweden
+46 87621800
+46 87621801
Email: bjorn.esping@tratek.se

Carl-Johan Johansson
Charlotte Bengtsson
SP Swedish National Testing and Research Institute
Building Technology and Mechanics
Wood Materials and Structures
Box 857
SE-501 15 Borås
Sweden
Phone: +46 33 165491 or +46 705 106603

Switzerland
Christophe Sigrist
Swiss Institute for Wood Engineering
Solothurnstr.102
2504
Biel
Switzerland
+41 032 344 03 76
+41 032 344 91 61
christophe.sigrist@swood.bfh.ch

United Kingdom
Mr. Keith Maun
Associate Principal Consultant
Building Research Establishment (BRE)
Garston, Watford, Herts, WD2 5 9xX
United Kingdom

Tel: +44 1923 664 812
Fax: +44 1923 664 785
Email: maunk@bre.co.uk

Furthermore, in the frame of the 24th meeting of the TC FFP the representatives of Italy, The Netherlands, Poland and Portugal expressed their specific interest in this Action as well as informed about the financial dimension of their relevant research projects.