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WORKSHOP ON DEVELOPMENT OF WOODEN BRIDGE CONSTRUCTION IN LATIN AMERICA AND THE CARIBBEAN, WASHINGTON, D.C., 17-21 NOVEMBER 1986

UC/RLA/86/195

Report*

Prepared for the Government of the countries participating
in the regional project
by the United Nations Industrial Development Organization

Backstopping officer: R. M. Hallett, Agro-based Industries Branch

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I. INTRODUCTION

The "Workshop on Development of Wooden Bridge Construction in Latin America and the Caribbean" was organized by UNIDO in co-operation with the US National Science Foundation (NSF) with the overall objective of bringing together researchers and practitioners in the field of bridge design and construction and so creating a "community of bridge engineers" within the countries of Latin America and the United States of America. Initial contact with the National Science Foundation was made by UNIDO's New York Liaison Office and the detailed programme was worked out by UNIDO Headquarter's staff and Computech Engineering Services so that the UNIDO-sponsored participants could benefit from a three-day American "Workshop to Identify Research Needs for Short- and Medium-Span Bridges" which was held from 17 to 19 November 1986.

Thus the UNIDO workshop began on the evening of 16 November and continued through 21 November 1986 with the secondary objective of creating a greater awareness of the role that timber could play in construction in the countries of the region.

Annex I comprises the Aide-Mémoire and gives more details of the background and purpose of the UNIDO workshop, the general programme of the NSF workshop, the type of participants invited and the activities.

II. PARTICIPANTS

Due to the complexities of financing this project (as described in the following section) there was only a short time between approval of the project and the actual event. Therefore fewer nominations were received than might have been expected and some curricula vitae were not received in time for the candidates to be considered. In all, 30 candidates were nominated either officially or informally through contacts with ongoing UNIDO technical assistance projects in the region. The 19 eventually selected included two from Panama who, although not authorized in advance to attend, did so at their own expense in the hope that they might later be reimbursed. This was, in fact, possible but the meeting room was somewhat crowded as a result of their and other last minute attendants.

Five UNIDO participants arrived 15 November and 14 arrived 16 November and all stayed until the end of the workshop at 17.00 hours, 21 November 1986.

All were civil engineers, and most worked for their Ministries of Public Works. Three were professors of civil engineering in universities and one was an Army Major responsible for road building in an isolated part of his country. Several were counterparts to UNIDO bridge projects (Bolivia, Chile, Ecuador, Honduras) and one was a national expert helping his country (Peru) to introduce the UNIDO bridge system. All were well-qualified with considerable experience in the field of bridge design and construction.

Annex II is the list of participants showing their positions or titles and their organization and address.

III. ADMINISTRATION AND FINANCE

Due to the interest established by the New York Liaison Office, the travel of Messrs. Hallett and Bahlouli was approved to Washington to meet Mr. John Scalzi of the NSF and Mr. Ian Buckle or Computech Engineering Services, in late June 1986. At this meeting agreement was reached in principle for the NSF to provide $US 30,000 (including overheads) provided that a similar sum was forthcoming from UNDP and/or UNIDO.

Following protacted discussions between UNIDO and UNDP, the funding eventually approved was: UNDP $US 30,000 (excluding overheads); NSF - $US 30,000 (including overheads); and UNIDO (UNIDF) $US 17,900. Therefore, two projects were created:

DP/RLA/86/024 - $US 30,000 for participants and experts and

UC/RLA/86/195 - $US 42,451 (net) for participants, staff member travel and miscellaneous expenses.

The distribution among the three sources of funds is shown in Annex III.

The daily subsistence allowance was paid in cash on Monday afternoon to 16 participants since one from Ecuador had received an 80 per cent advance from UNDP/Quito. He was paid the remaining 20 per cent in cash the next day. A request was made later for UNIDO to authorize UNDP/Panama to pay the DSA and travel for the two Panamanian participants who had travelled to the workshop at their own expense at the hope of being reimbursed later.

Considerable difficulty was encountered in cashing the $US 12,700 of travellers cheques in Washington and this practice should not be followed in the USA again. This is especially so since Bank of America travellers cheques are issued from San Francisco and are not readily accepted in the eastern part of the country. A telexed bank transfer would have been better had there been time to make such an arrangement.

A reception was held on Sunday evening attended by 17 of the participants, three staff members, two consultants and several of the American participants. This served to introduce the attendees, and the speech on behalf of the Director-General of UNIDO was made by Mr. Robert Hallett, who also made comments on the arrangements for the week ahead and a brief introduction to UNIDO's activity in the wood industry sector. Mr. Chris Mettem (one of the UNIDO consultants) presented the UNIDO bridge system with a video film.

This sort of hospitality is considered by the organizers to be a most useful means of "breaking the ice" amongst participants and international consultants, and goes a long way towards creating a group atmosphere.

Annex IV comprises the speeches on behalf of the Director-General of UNIDO, the one made by Mr. Hallett to the UNIDO participants and the other by Mr. Bahlouli at the opening of the NSF Workshop on 17 November 1986.

IV. DOCUMENTATION

Because the Wood Unit of the Agro-based Industries Branch has concentrated over the years in producing literature in the form of manuals and reports on appropriate technology within its field of competence, a wide range of documents were sent in advance to the venue. This enabled the following package of documents to be given to each participant:

UNIDO/IO.606-610	Timber Engineering for Developing Countries
ID/330 + Corr. 1	Popular Manual for Wooden House Construction
PI/78 + Press Release	UNIDO for Industrialization: Wood Processing and Wood Products
PI/88	Wooden Bridges: UNIDO Prefabricated Wooden Bridge System
ID/WG.359/7	Report: Expert Group Meeting on Timber Stress Grading and Strength Grouping
ID/WG.447/17	Report: Expert Group Meeting on Timber Construction
ID/WG.447/5/7-11/13/14	Documents for above

Extra copies of ID/WG.447/17, PI/78 and IDO/INF/75/Rev. 2 (English) were made available to the US participants to increase their awareness of UNIDO's activities. Unfortunately IDO/INF/75/Rev. 2 was sent in French rather than Spanish.

Aside from this mission report, reports will be prepared by Computech Engineering Services (CES) and by UNIDO on the respective events which will be circulated to participants. The entire UNIDO report and the executive summary and some extracts of the CES report will be translated into Spanish.

In many cases the speakers at the NSF workshop brought copies of their presentations and extra literature which was eagerly taken up by the UNIDO participants.

V. PROGRAMMES

The NSF programme lasted three days (17 - 19 November 1986) as shown in Annex V which also includes a one-page statement of objectives.

The UNIDO programme was for five days plus Sunday evening (16 to 21 November 1986) and is reproduced as Annex VI.

The UNIDO participants were given the chance to take part in the Workshop Group Meetings Wednesday morning and were encouraged to enlist in those on materials, bridge management systems, evaluation and strengthening, and loads as being most relevant to their work.

Since the programmes extended on Sunday, Monday and Tuesday evenings to 20.00, 19.30 and 18.30 hours respectively, Wednesday evening was kept free from 15.00 on.

A. National Science Foundation Programme

It was generally considered by the UNIDO consultants and participants that the subjects covered were correct but that the level was too high. Nevertheless, it was felt that the presentations inspired ideals amongst participants and showed very well the kind of research that has been done and is proposed to be done in the USA and contributed to their awareness of how their own problems could be tackled. In fact, a draft proposal for the organization of a workshop on bridge design and construction was prepared by the UNIDO participants and signed by seven of them with the hope that sponsorship could be provided by UNIDO and the NSF in due course. An informal translation of this proposal is given as Annex VII.

Informal sessions were held on the evening of Sunday, Monday and Tuesday to preview the next day's agenda and review the previous day's discussions partly to assist participants to understand better what would be discussed, and partly in an effort to further the group atmosphere begun on Sunday evening. The Tuesday evening session was somewhat shortened since some of the UNIDO participants chose to join the informal working groups of the NSF workshop for preliminary discussions on their chosen specialities. This was recognized as a valuable contribution to creating the "community of design engineers" stated clearly as a general objective by the NSF organizers.

The recommendations of these working groups are being considered by the organizers and will be included in the CES report.

Unfortunately, participation by UNIDO participants was somewhat weak due both to the very high level of discussions and to language problems.

B. UNIDO Programme

1. General discussion

Following an introduction by Mr. Hallett, Mr. Buckle (CES) provided the participants with more information about the role of the NSF and presented an overview of the thinking behind the NSF workshop and of the types of presentations made.

He noted that the Federal Highway Administration (FHA) was the main agency responsible for channelling federal money to the States for bridge construction and research which in turn can be channelled to State universities for specific research projects.

He explained that the Transportation Research Board (TRB) was a unit of the National Research Council in the USA, separate from the FHWA, and that it did contract research for the States. He pointed out that these two agencies had been funding research for some time but that the participants at this workshop would not be able to take advantage of these agencies as the money goes to American institutions.

On the other hand, the National Science Foundation (NSF) gets money from the Federal Government to conduct research into the sciences. Only a fraction of the $US 3 - 4 billion allocated each year goes into engineering research, and the engineering community has felt that they are not being funded sufficiently.

He then reminded the participants that the NSF Workshop was organized to create a list of research needs for the USA and to co-ordinate this overall programme between States since the very size of the country meant that often one State was not aware of research being done be another in the same field.

Mr. Buckle mentioned that the NSF had an International Aid Division and had many co-operative joint US-XXX research agreements, often involving bringing people to the USA to work on research programmes or sending American researchers to other countries. It was important that there be money provided from both sides although the proportions did not have to be equal - only enough to show sufficient serious interest on the part of the other country. Although universities were the preferred organization for such programmes, the NSF could also work with organizations that might be companies or Government departments.

There was some discussion about potential counterpart agencies to the NSF in Latin American countries, and Mr. de Freitas pointed out that most countries had an agreement with the National Science Foundation, usually their national research council or equivalent, but the initiative must start at the project level for any specific programme to succeed.

Dr. Gutkowski underlined the importance of mutual benefit and of targeted concepts to guide the NSF in its decision about funding. There was a general feeling expressed by the NSF organizers that researchers in the United States were somewhat isolated so that workshops helped them communicate with each other.

The report by CES will be possibly 200 pages but will include an executive summary which, together with other key points, UNIDO will translate into Spanish. This report will describe the workshop activities, include the presentations of the experts (see Annex V) and provide the NSF with an assessment of the priorities for research projects as submitted by the participants and discussed during the workshop.

Following this, Mr. Cano mentioned that the Acuerdo de Cartagena (JUNAC) did not conduct fora to discuss research needs, and that the Panamerican Committee for Technical Standards (COPAN) created a Timber Section in 1975 but stated that this did not deal with structural design per se. He also noted that JUNAC produced a draft timber engineering code but did not really follow it up.

Ms. Sollazzo reported that the Latin American Structural Committee met in Buenos Aires the preceding week and that this covered all materials and was trying to unify structural codes in Latin America. The Ministry of Public Works in Argentina initiated this work which was supported by civil and structural engineers.

In this context, Mr. Mettem pointed out that in the United Kingdom there was a continual interchange of ideas on technical matters between the British Standards Institute and the professionals involved in structural design. This permitted a continual revision and improvement of standards and codes in the U.K.

Mr. Uriguen proposed that timber design societies or committees be formed in each country to promote the use of timber in construction and this was supported by Mr. Franco who pointed to the need to identify interested groups.

From these comments the discussion turned to what action could be taken in the region to remedy the situation where differing regulations posed problems and many engineers and architects were unfamiliar with timber construction, and it was decided to form two sub-groups of the workshop to:

(a) develop terms of reference for a Latin American Timber Construction Association and
(b) formulate a long-range programme of activities including support from international organizations such as UNIDO.

The terms of reference for the Latin American Timber Construction Association are given in Annex VIII and it was agreed during the meeting that Mr. Carlos Ilabaca of the Forest Industries Development Centre, University of Biobio, Concepción, Chile, would act as secretary/co-ordinator. It was hoped that UNIDO would be able to support this fledgling association even in a modest financial way until national timber design societies or committees could be formed and the association became more or less self-supporting.

Regarding the longer-range programme of research and development in this field, it was suggested by Mr. Ortiz that this be viewed under two subjects:

(a) Timber construction including bridges and
(b) Bridge design including timber.

The necessity to consider rural needs of developing countries was also emphasized, starting with the conduct of an organized, comprehensive study of the extent of bridge problems and needs on an individual country basis but where there were common problems to join forces on a regional basis. It was also important to develop bridge inventories on a uniform basis and to find ways of reflecting the effectiveness of existing transport systems for rural needs, bearing in mind programmes for rehabilitation or replacement of bridges and deciding upon appropriate technology and materials (including timber) within these programmes. The necessity of maintaining such inventories was emphasized so that the improved movement of goods to market and increased commercial and social activities could be recorded and benefits measured and demonstrated. In this way funding was more likely to be attracted for continued improvement programmes in the road transport networks.

With these above points in mind, a short questionnaire was drafted that could be completed by various counterpart agencies within a country as below.

(i) Name of counterpart or respondant agency;
(ii) Co-operating institution(s) or agencies;
(iii) Background: including national plans for five to ten years summarized for roads, bridges, retaining walls, schools, community buildings, clinics;
(iv) Existence of building code, separate structural code, timber design code, bridge design code:

2. Evaluation of NSF Working Groups

Mr. Gutkowski was responsible for discussion of the results and value of the NSF Working Groups to the participants. It was generally felt that these were not particularly relevant to the needs of most participants who often felt like spectators rather than members of working teams. This was partly due to the level of discussion, the language problem as well as the fact that, in many cases, the other members of the Working Groups had been friends for some time.

Loads

Mr. Ponce and Ms. Sollazzo reported that the results were interesting, although timber was not really considered, especially time dependency problems which are very important for timber.

Bridge evaluation and stengthening

Both Messrs. Yi and Lombardo felt that these sessions were very relevant to Panama because of the great number of bridges and in view of the recent World Bank financed project to survey and rehabilitate the nearly 1200 bridges in the country. They said that more in the future on this subject would be useful since an estimated 50 per cent of their bridges did not have sufficient capacity for their loads.

Mr. Gutkowski suggested that a textbook "Structural wood research" could be obtained from the American Society of Civil Engineers for about $US 20 per copy and it was agreed that UNIDO would look into whether a copy could be sent to each participant with the workshop report.

Mr. Franco suggested that nearly half the bridges in Bolivia were deficient but that it was very expensive to evaluate them. Mr. Cano and others were impressed by the work being done on evaluation and testing of bridges in the field in Ontario, Canada, and it was hoped that some way could be found to sponsor bridge inventories and evaluations in Latin American countries using methods similar to those.

Mr. Montero stated that the Ministry of Public Works in Colombia regularly studied traffic to and from production and consumption centres to determine bridge needs. He reported that rather expensive concrete bridges were now built except in the very rural areas where rustic wooden bridges were being built. These were very cheap and no calculations were made and he felt that a middle design was needed. He estimated that a fifteen-metre UNIDO system bridge would cost about 60 per cent of the equivalent bridge in reinforced concrete.

Mr. del Valle reported that there were bridge surveys done in Guatemala but the evaluations were only subjective. Some 80 per cent were between 10 and 12 metres span and although a prefabricated concrete system had been developed more research was needed on timber species and joints.

Similar comments were made by Mr. Franco about conditions in Bolivia and Ms. Ucles about Honduras where 80 per cent of bridges were in rural areas.

Regarding research needs, Mr. Granados said that although JUNAC had studied species and different joint types, there was a need for studying the long-term loading effects in tropical climates. Mr. Cano felt that since 20 species from each of the JUNAC countries had been studied (including joints) no more research was required and that it was more important to start producing bridges and other structures. He noted that linkage with industry was more important than more research since much of the information available in the region was isolated and efforts should be directed towards sharing and harmonizing this information between countries. Mr. Erichsen supported this view and stated that links were lacking between industry and forestry centres.

3. Timber engineering related to bridges

Mr. Mettem presented a series of slides and other illustrations showing examples of timber construction around the world and referred to the long history of timber usage including hundreds, if not thousands, of timber bridges which have been standing for up to 100 years or more. He showed examples from the United Kingdom, North America and Australia as well as the standard design for 6 to 8 metre-spans, using king posts with poles, from New Zealand.

An important point was that foundations and abutments constituted 70 per cent of problems and he suggested that they should be protected for ever and the superstructure replaced as needed. This is consistent with the notion (and requirement in the U.K.) for some bridges to be specified as having an indefinite life time. He also suggested that local inhabitants should be consulted for flood information and not necessarily officials from Government departments.

Copies of his notes were handed out to participants.

Mr. Hallett then described the UNIDO Bridge System and explained UNIDO's policy of providing full technical details only through technical assistance projects although a licensing scheme was being considered owing to the many requests for information about the system.

Mr. Mettem introduced the strength grouping system, referring to ID/WG.447/7, and highlighted certain details of the design of the bridge.

Mr. de Freitas suggested that the use of one-inch thick pieces for the basic triangular panels might make fabrication easier and this was noted as an interesting proposition. He also presented an interesting example of cost calculations that showed the importance of maintenance and inspection and compared the annual cost of concrete and wood bridges. In summary, this assumed a 25-year service life for a wooden bridge and infinite life time for a concrete bridge and showed that with an interest rate of 12 per cent the annual costs were equal after about 25 or 30 years.

Following this (on Friday, 21 November 1986) Ms. Ucles presented a paper on how Honduras had introduced the UNIDO Bridge System into the country and gave some supporting figures. There were then 40 requests for single-span bridges, 12 for multiple-span and 10 for pedestrian bridges. The capacity of the workshop was estimated at 10 bridges per year owing to the limitation of funds for the steel parts. A total of 17 had been built and 6 were in process.

Costs were estimated for HS 20-44 spans of up to 18 metres as $US 700 per linear metre (four trusses) and for spans over 18 metres at $US 1000-1200 per linear metre (6-8 trusses).

Mr. Ilabaca described the project in Chile and some of the small changes that they had introduced to suit conditions there.

(a) The lower chord was reinforced at each end to make a total thickness of 10 + 10 = 20 mm.
(b) An extra plate was put under the anchor plates with oval holes (at one end) to permit some movement due to possible seismic and vehicle braking loads.
(c) The distribution of trusses was changed so that 3 pairs were used rather than 2 pairs plus extras on each side.
(d) The dimensions of deck and running boards were increased to 2 inches by 6 inches and 3 inches by 8 inches, respectively.

He reported that they intended to work towards using timber abutments instead of concrete to reduce costs and because the appearance was felt to be better. The Ministry of Public Works and University of Biobio also intended to carry out a survey to see how many sites could use the UNIDO system. There was also a plan to try and increase the load carrying capacity.

There followed a discussion about the possible use of laminated, prefabricated decks and engineers in Chile were looking into their use for emergency bridges but it was felt that prefabricated decks were not as well fixed to the top chords. Mr. Mettem suggested that longitudinal decking could be used as another alternative.

4. Identification of research and technical assistance needs

Mr. Erichsen introduced this item and stated his opinion that very little more research was needed except for some detailing, especially on the UNIDO Bridge system, but that it was important to make use of the available research results. As for low cost bridges, he felt that composite materials could be investigated to replace tension chords and suggested that universities could well undertake this kind of research.

Using Ecuador as an example, he stressed the need for more assistance and control of timber extraction and reforestation as well as efforts to redress the very low pay of forest workers which contributed to illegal fellings. As far as he knew there was only one timber drying kiln linked to a sawmill in Ecuador but there were attempts to introduce solar kilns. His view was that training centres or complexes including forest industry development centres should be in private hands or at least strongly under the influence of industry and should have a significant programme aimed at demonstration and public information services.

Mr. Ilabaca remarked that the Development Centres at the University of Biobio were strongly linked to industry and Mr. Hallett suggested that two levels could be identified depending on the level of development of the forest-based industry sector. For example, a more advanced country such as Chile would have development centres capable of providing consultants' services to industry whereas a country with a less advanced wood industry sector would have to provide more basic information on wood technology and thus was more likely to require Government subsidies. In this context it was suggested that the best combination for co-operatives or development centres was for bilateral aid to provide equipment and international organizations such as UNIDO to provide technology and training.

In reviewing the problems encountered in developing countries in this sector, Mr. Erichsen noted the difficulties caused by lack of funds and the reliance on bilateral aid especially; the bureaucratic problems linked with co-ordination between Ministries and other Agencies such as rural or regional development corporations; the importance of selecting the right counterpart agency for technical assistance projects since changes in midstream caused real problems. His view was that privatisation of such industry was the ultimate aim with the Government agencies providing co-ordination and basic support services.

Finally, he drew attention to the difficulties of ordering materials and equipment, especially if it had to be imported, owing to both lack of counterpart funds and bureaucratic difficulties.

VI. SUMMARY OF DISCUSSIONS, COMMENTS AND CONCLUSIONS

A. National Science Foundation Workshop

The evening review/preview sessions of the UNIDO participants and consultants concluded that the subjects covered were correct. i.e. well chosen and suitable for their needs as well as for American conditions. The level was higher than they would have preferred although the presentations were definitely inspiring and professionally stimulating. In fact, several participants met together informally and drafted a request for a repeat workshop, in Spanish, covering the same subjects (see Annex VII for outline and sponsors).

Many recommendations emerged, especially since the CES organizers requested, and obtained, lists of research proposals from individuals before the workshop. These were distributed and discussed during the Working Group sessions on Wednesday. Participation from the UNIDO group was generally passive but with some notable exceptions. Those attending the "Materials" Group (felt by UNIDO to be the most appropriate unless strong specific interests were shown) benefitted from the strong guidance of the UNIDO consultants and timber was well covered. The recommendations were analysed by Messrs. Buckle and Scalzi on Friday, 21 November, and will be thoroughly presented in the CES report (approx. 200 pages). UNIDO will translate and disseminate the executive summary and relevant extracts.

B. UNIDO Workshop

Since the level of English of probably one half of the participants was inadequate to carry on with full discussions, it was decided to accept comment discussions and presentations in Spanish as well. This worked reasonably well and a mixture was used for 20 and 21 November which greatly increased the level of active participation.

It was apparent that even after such a short time together, the UNIDO participants interacted well together and became very much involved in the subject matter. Discussions and participation in the UNIDO sub-groups were lively and it was clear that all participants benefitted from this contact.

Aside from being exposed to many technical presentations and discussions on bridge design and construction, those who were not already familiar with timber construction must have gone away impressed with its potential. There was also, no doubt, a greater awareness of the possible roles of the National Science Foundation and of UNIDO in assisting in overall development of Latin American countries and, in particular, in sponsoring research/exchange programmes and in implementing technical assistance projects.

The more notable and tangible results were the clear recommendation to hold a repeat Bridge Design and Construction Workshop in Spanish and the drafting of terms of reference for a Latin American Timber Construction Association together with the nomination of a secretary.

As a direct result of the impression made by this Workshop, the National Science Foundation has contacted UNIDO about co-operating in organizing a Workshop on Building Materials including cement, masonry and timber. This was proposed to be held in Puerto Rico in October 1987.

Finally, the broad objectives of a long-term technical assistance project to the region which would be implemented by UNIDO were agreed. These were to improve national infrastructure, especially in rural areas, and in particular to:

(i) Co-ordinate the identification and breakdown of barriers within regulatory and standards bodies;

(ii) Generate appropriate literature, manuals, standards and codes in all aspects relevant to timber in construction;

(iii) Create a clearing house for technical information applicable to the regional characteristics to work to prevent wasteful overlap of research and development activities;

(iv) Assist countries in the region to strengthen their road networks in rural areas, replacing bridges in poor condition and building new ones as appropriate to provide access to and from isolated and depressed areas;

(v) Extend basic timber engineering technology to social, industrial and agricultural buildings;

(vi) Assist in the formation and development of the Latin American Timber Construction Association.

A short questionnaire was drafted that was to be sent by the participants through their Ministries to Mr. Hallett, copied to the appropriate Senior Industrial Development Field Adviser, that would provide UNIDO with more background information in this sector.

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August 1986

WORKSHOP ON DEVELOPMENT OF WOODEN BRIDGE CONSTRUCTION IN LATIN AMERICA AND THE CARIBBEAN

Organized by the United Nations Industrial Development Organization
in cooperation with the US National Science Foundation
and Computech Engineering Services to be held in Washington D.C.
17 - 21 November 1986

A I D E M E M O I R E

Background and Purpose of the Workshop

Timber is a valuable renewable natural resource whose use in construction has not been developed as much as it could be in most developing countries. One main reason for this is that engineers, architects and specifiers are not familiar with how to use it to best advantage and avoid problems. Few university degree programmes include more than a superficial treatment of the technical subjects necessary.

Furthermore, outmoded standards and building codes where they exist at all, restrict the use of wood due largely to lack of information on and confidence in the material.

Civil and structural engineers are usually trained to use concrete and steel with much less emphasis being placed on timber and, despite long traditions of timber used in many developing countries, inappropriate and sometimes overly expensive structures are often the result. This is often due to the lack of trained personnel involved in planning, specification and fabrication in timber, and has meant that scarce foreign currency has been used to import other building materials when a renewable natural resource could have been used instead and jobs created as well in local conversion.

The need for bridges in developing countries is great, especially in rural areas, to provide essential links to remote parts and to those producing agricultural products. Timber bridge engineering is well developed but little known in most developing countries. It is important that civil engineers and Government officials become aware of this potential and with the bases for decisions as to main structural material for bridges -be it timber, steel or concrete, or combinations.

Road construction and improvement programmes involve very large sums of money and an important component is for bridges. Appropriate bridge design offers the possibility of either reducing the amounts spent or increasing the kilometers or number of bridges built.

The US National Science Foundation (NSF) is funding a 'Workshop to identify long-term research needs for short and medium span bridges', 17 - 19 November 1986 in Washington D. C. that will bring together over 30 leading experts in the field of bridge design and construction. It is organized by Computech Engineering Services, Inc., Berkeley, California and the programme will involve keynote addresses during the first morning on general themes and on the 8 main issues which are:

1. Materials
2. Strengthening, maintenance and repair
3. Structural analysis
4. Structural form
5. Construction methods
6. Management or expert systems
7. Foundations and scour
8. Loads

Working groups will address these issues during the next 1½ - 2 days and a final plenary session will discuss and agree on recommendations for research priorities with brief descriptions of their scope and proposed programmes.

UNIDO has proposed to take advantage of this US Workshop by organizing a one-week programme that includes a short introductory briefing (16/11 eve.) participation in the 3-day workshop and in a separate 2-day Workshop immediately following, on 20 - 21 November 1986. The 15 - 17 participants at the UNIDO meeting would discuss relevance to developing Latin American and Caribbean countries, scope for timber as a bridging material in comparison or conjunction with other materials and identify research and technical assistance needs on regional and national basis.

UNIDO will engage two international consultants to prepare background documentation and to conduct the 2-day Workshop together with a substantive officer from UNIDO Headquarters.

At least two and possibly more of the participants sponsored by the NSF will stay on to assist in this activity. Establishment of bilateral programmes of research is envisaged as well as holding of specialized follow-up activities in the Latin American region involving American universities and institutions.

It is also expected that participants of the UNIDO Workshop will be able to make an impact on the US Workshop with a view to ensuring that discussions, recommendations and conclusions bear the particular needs and constraints of developing countries in mind.

Date and Place

The UNIDO Workshop will be held from 17 - 21 November 1986 in Washington D. C. in English.

Participants are expected to arrive by the afternoon of 16 November 1986 for a brief introductory session that evening.

The Workshop is of the residential type and all participants are expected to stay in the same hotel where a group booking has been made for the nights of 16 - 21 November inclusive.

Participants

Up to 17 fellowships [1/] will be awarded to candidates from selected developing countries in Latin America and the Caribbean Region. Governments are invited to nominate up to three candidates who should be fully qualified engineers involved in design and specification work for the construction of bridges. They should be closely involved in engineering design work in their countries and, if possible, also be in a position to influence the drafting or interpretation of relevant regulations and codes of practice. Candidates will be requested to describe the role that timber is permitted to play in bridge construction within the regulations presently in force or traditional practices followed.

Candidates are requested to indicate under item 14 of the Nomination Form their specific interests and particular design and/or development projects currently being worked upon. Participants should refer to the NSF programme and indicate what topics would be of specific interest to them, their work and country development. They should also indicate specific points or questions that could be raised either during the US Workshop or the following UNIDO Workshop.

1/ Both male and female candidates can be nominated. In this connection, attention is drawn to General Assembly Resolutions 3010 (XVII) designating 1975 International Woden's Year, and 3342 (XXIX) calling for the full integration of women in the development process.

UNIDO will select participants from among the nominations received, taking into account professional qualifications and other relevant considerations. They will be notified of their acceptance as much before the Workshop as possible.

Participants will attend the Workshop in their individual capacity even if officially nominated by their respective Government. They must attend the entire course, according to the schedule prepared by UNIDO and the host authorities and comply with the rules and regulations laid down. It is essential that they contribute to the programme whenever possible, e.g. in technical discussions related to the industries and research programmes in their countries and in any individual or group assignment work.

Participants will be expected to be informed on conditions of the construction industry and related technical and engineering development work in their own countries. Prior to the Workshop each accepted participant is requested to prepare a paper of about 1,000 words, (time permitting) typewritten (double-spaced), in English, describing a particular aspect of their sector in his/her country and, if possible, elaborate on a particular project or programme that could be the basis of an analysis, case study or discussion or of a research programme that might be arranged in collaboration with an American University or institute. Emphasis should naturally be given to the problems faced in designing and using timber and timber products in bridge construction and which may require technical assistance by UNIDO. Two copies of this paper should be brought by the participant to the course. These may, at UNIDO's discretion, be reproduced an distributed as background material.

Consideration should also be given to the regional needs in this field and how technical assistance might be coordinated.

Workshop Activities

The Workshop comprises two parts:

(1) Attendance at/participation in the US/NSF Workshop from 17 - 19 November and,

(2) Participation in the UNIDO Workshop on the evening of 16 November and from 20 - 21 November 1986.

Nominated candidates will be sent programmes of both Workshops as soon as prepared.

The UNIDO Workshop programme will comprise lectures/presentations on UNIDO's activities in the use of timber construction; a synopsis of the report of the Expert Group Meeting on Timber Construction, 2 - 6 December 1985 and of the special meeting on the UNIDO Prefabricated Modular Wooden Bridge System, 9 - 10 December 1985; discussions of the role of timber construction in the region -emphasizing civil works and bridges; and, discussions on research and promotion needs in this field.

Due cognizance will be taken of the current attitudes within the US Government to promote and foster linkages between specialized agencies in the region and in the USA.

Provision is made for both the US and the UNIDO Workshop reports to be translated into Spanish and for selected background documents to be reproduced for wider circulation.

If participants wish special arrangements to be made during their stay in Washington, they should request these as soon in advance as possible.

Language Requirements

Since the Workshop will be conducted in English a proficiency of the English language is required. Candidates must submit such a certificate together with their nomination forms with their official nomination through the UNDP office if English is not their mother tongue or language of professional training.

Financial and Administrative Arrangements

The costs of the project will be met as follows:

(A) UNIDO will provide [1/]

-Round trip economy class air transportation for 15 to 17 participants between the airport of departure in the home country and the airport in Washington D. C., USA

-Daily subsistence allowance to cover board, lodging and incidentals at the prevailing United Nations rate for Washington D.C. at the time of the Workshop,

-A staff member to manage UNIDO finances, monitor the training, and assist in the conduct of the Workshop

-Staff of the UNIDO New York Liaison Office (1 professional and 1 secretary) to assist in the conduct of the Workshop and in administrative matters,

-Consultants to present lectures and background information.

1/ From the UNIDF General Pool plus a contribution from the US National Science Foundation and a matching amount from UNDP Regional funds.

(B) The US Government/NSF will provide [1]

-Organization of the 3-day Workshop, 17 -19 November 1986;

-Local arrangements for hotel, meeting rooms, secretarial and administrative facilities for the entire week;

(There is no registration fee).

(C) The Participant's Government or his/her Employer will be required to bear the following costs:

-All expenses in the home country incidental to travel abroad, including expenditures for passport, medical examinations, inoculations and other such miscellaneous items as well as internal travel to and from the airport of departure in the home country;

-Salary and other benefits for the participant during the period of the course, and

-All costs involved in any pre- or post-workshop scenic or technical tours, or deviations from the authorized itinerary.

UNIDO, the NSF, CES will not assume responsibility for the following expenditures in connection with the participants' attendance at the Workshop:

(1) Costs incurred by participants with respect to any insurance, medical bills and hospitalization costs;

(2) Compensation in the event of death, disability or illness;

(3) Loss of, or damage to personal property;

(4) Purchase of personal belongings and compensation for damage caused to them by climatic or other conditions;

(5) Any costs for accommodation, food, transport or entertainment other than those organized by UNIDO and CES.

1/ Through a contract with Computech Engineering Services, Inc.

ANNEX II

WORKSHOP ON DEVELOPMENT OF WOODEN BRIDGE CONSTRUCTION IN LATIN AMERICA AND THE CARIBBEAN, WASHINGTON, D.C.
17 - 21 NOVEMBER 1986

LIST OF PARTICIPANTS

COUNTRY	POSITION/TITLE	ORGANIZATION/ADDRESS
Bolivia		
Carlos Franco V.	Supervisor P.S.R.T.	CORDECRUZ P.O. Box 218 Florida 470 St. Santa Cruz Tel: 32770 INT 158 Tlx: 4271 BV
Brazil		
Amantino R. de Freitas	Director	IPT - Cidade Universitária Wood Division 05508 Sao Paulo SP Tel: (011) 2682211 r. 418/515 Tlx: (011) 22831 INPT BR
Jose Jesus Soreira	Commandant 1st Constr. Div.	Army 1ª/1º BEC Sao Gabriel da Cachoeira Amazonas, Brazil Tel: CEP 69750
Chile		
Daniel Ortiz Ibañez	Civil Engineer	Ministry of Public Works Department of Bridges Morande 59 Santiago
Carlos Ilabaca Ugarte	Director	Universidad del Biobio Centro de Desarrollo en Industrias Forestales Av. Collao 1202 Concepción Tel: 238984

COUNTRY	POSITION TITLE	ORGANIZATION/ADDRESS
Colombia		
Gustavo Granados V.	Professor	Bogota National University Calle 56A No. 46-72, 502 Bloque 75, Pablo VI Bogotá Tel: 2442779
Rafael Arturo Montero		Fondo Nacional de Caminos Vecinales Calle 13 No. 7-66 Valledupar Tel: 24027
Costa Rica		
José A. Rivera M.	Civil Engineer	Ministerio de Obras Públicas y Transportes Departamento Diseño de Puentes San Jose
Ecuador		
Daniel Uriguen	Consultant Civil Engineer	Ave. El Inca 28-22 Quito
Guatemala		
Marco A. Arango M.	Sub-Director Administrativo de Caminos	Highway Bridges - General Roads Directorate Apdo. Postal No. 1, Mixco Guatemala City Tel: 721002
David Del Valle	Deputy Director	Road Maintenance Division General Roads Directorate 12, Avenida "A" 4-20, Zona 4 Mixco Guatemala City
Honduras		
Simón R. Castro Waimín	Dirección	Puentes Modulares Ministry of Public Works (SECOPT) Bo. La Bolsa Comayagüela

COUNTRY	TITLE/POSITION	ORGANIZATION/ADDRESS
Honduras		
Karla A. Uclés	Dirección General de Caminos	Departamento de Construcción Sección Puentes de Madera Ministry of Public Works (SECOPT) Barrio La Bolsa Comayagüela
Panama		
Walter H. Yi	Ingeniero Estructural y de Carreteras	Ministerio de Obras Publicas (MOP) P.O. Box 6-1658 Est. El Dorado Panama Tel: 32-5058
Marco A. Lombardo	Maintenance Engineer	Ministerio de Obras Publicas (MOP) Chitre, Herrera Tel: 96-5882
Peru		
José Carlos Cano D.	Consultant Civil Engineer	Jr. Arica 115 Miraflores Lima 18 Tel: 443809
Carlos Tapia Martinez	Principal Professor	Universidad Nacional de Ingeniería Facultad de Ingeniería Civil Casimiro Ulloa 254 San Antonio, Miraflores Lima 18
Uruguay		
Alberto Ponce Delgado	Professor of Bridges	Facultad de Ingeniería de Montevideo - Uruguay Pablo de María 1265 Montevideo Tel: 498246 - 496324
Martha Sollazzo de Dupuy	Jefe	Departamento Estructuras Dirección Nacional de Vialidad Avda. Uruguay 1120 Piso 6 Montevideo Tel: 911941/43

Workshop on Development of Wooden Bridge Construction in Latin America and the Caribbean.

ANNEX III

Distribution among the three sources of funds

	US NSF	UNDP	UNIDF	TOTAL
BUI.I				
11-50		11,606	1,994	13,600
13-00			790	790
16-00	———	———	7,090	7,090
19-00		11,606	9,874	21,480
35-00	26,548	18,394		44,942
51-00	———	———	6,029	6,029
99	26,548	30,000	15,903	72,451
13% overheads	3,452	3,900	2,067	9,419
	30,000	33,900	17,970	81,870

ANNEX IV

Opening Speech on behalf of the Director-General of UNIDO

presented by Mr. R. Hallett, 16 November 1986, 18:00 hours

On behalf of Mr. Domingo L. Diazon, Jr., Director-General of the United Nations Industrial Development Organization, I am pleased to welcome you to Washington. While some of you are familiar with UNIDO's activities in this sector, either through technical assistance activities in the field or by involvement in special projects or publications, I feel it will be useful to explain our role and overall activities and to review our current programme in this field.

In particular, I feel it is important to explain what is expected from this workshop, and how such meetings as this can influence our work.

In the field of wood processing, UNIDO has convened several expert group meetings since 1969 on wooden housing, panels from agricultural residues, selection of woodworking machinery and wood processing for developing countries, and adhesives used in woodworking industries. In general, expert group meetings are intended to provide specialized advice and expertise to UNIDO's secretariat on subjects felt to be important and relevant to the longer term needs of developing countries. On the structural side, expert group meetings have been held on timber stress grading and strength grouping (Dec. 1981) and on timber construction (Dec. 1985). More will be said about those later.

UNIDO has also organized a good number of specialized training courses aimed at making professionals and managers more aware of available technology in this field. This workshop is neither an expert group meeting nor training course but combines aspects of both since we are anxious to learn from your experiences in bridge design and construction in your countries and to draw out your views on the relevance of the National Science Foundation's Workshop beginning Monday. We also hope you will learn from the overall programme and return home with a greater appreciation of bridge design factors as well as specific plans for linkages with American institutions and universities active in related research and development work.

We feel that this workshop is particularly timely in view of the increasing importance being placed on rural development and the need for buildings and structures of many kinds, but especially bridges, which must somehow be produced in very large numbers. Just as this need is being recognized, so is the role that timber could play in meeting it being increasingly recognized.

ANNEX IV (2)

Ladies and gentlemen, I will now take this opportunity briefly to review our programme in the wood products and wood processing industries sector, and at the same time will explain UNIDO's policy behind our attempts to meet the varying and particular needs of developing countries.

Most UNIDO's technical assistance is provided to individual countries following specific requests from their governments through the local UNDP office. UNIDO, as with other United Nations Agencies, assists the governments to identify priorities and formulate projects in support of their national development programmes. These projects may vary from large (US$ 1 to 2 million) to small (US$ 10 to 20,000) with the former providing longer term expertise, consultancy or subcontracted services, specialized training opportunities and equipment or materials over several years, while the smaller projects usually involve the services of a high level consultant for a short period of time to solve a specific and usually urgent problem. Regional or interregional projects are also possible where the objectives and activities cover a wider range and address themselves to problems common to several or many countries. This applies to the wood industries sector which additionally has found that specialized group training is an effective way of providing technical assistance directly to owners and manager of production units owing to the common types of problems facing the furniture and joinery industries.

UNIDO has organized many such specialized courses since 1971, and four in recent years in the field of timber construction for civil engineers and architects with generally satisfying results.

Since its invention some 15 years ago, but especially in the last 5 or so years, there has been a lot of interest in UNIDO's prefabricated modular wooden bridge system and several countries now have at least one prototype bridge and the capability of making many more. Honduras is now the focal point for the specialized bridge technology and I am especially pleased to welcome three of our 'bridge experts' who have contributed so much to this success. There are still government requests outstanding and we are confident that this activity will continue to grow. Other projects related to timber engineering which have been completed recently were in Sri Lanka where finger jointing and glue laminating technology applicable to rubberwood was passed on to a local firm, and in the Philippines, where UNIDO, in cooperation with FAO, developed strength data and grading rules for coconut wood as well as low cost housing designs. This has resulted in prototype houses being built in Davao and Lucena City, with full cost analyses being made.

Due to the interest in timber construction in the Asian and Pacific region UNIDO has proposed a large-scale project to help countries of the region use coconut wood in construction and promote timber engineering and design including development of appropriate codes and standards.

We are also seeking funds for two special courses for engineers, architects and builders from Africa (one in English in Zimbabwe and one in French in France).

In many of the countries represented here, UNIDO has an on-going project to introduce the prefabricated wooden bridge system and the associated technology so some of you already realize that, behind the formulation and implementation of such projects lies the belief that timber has an important role to play in construction but that many 'artificial barriers' exist to its greater use. These include many misconceptions among the general public regarding the physical and mechanical properties of timber and how it can perform in use, as well as a great lack of familiarity amongst professionals involved in the building industry. Wood is nature's gift to mankind; it is renewable if properly managed, is extremely versatile, and besides, wood construction materials are 'energy efficient' in production and use. We hope to be able to make careful studies of the situation in each country, identify these barriers, whether emotional, legal or technical, and assist interested representatives of industry, institutes and universities and governments to evaluate alternatives through comparative cost studies and so to make more rational and proper use of timber as a building material.

The 1981 Expert Group Meeting on Timber Stress Grading and Strength Grouping made several recommendations aimed at creating a sound framework for providing this technical assistance and resulted in a set of model stress grading rules being commissioned. The 1985 Expert Group Meeting on Timber Construction carried this initial work further and recommended UNIDO draft model timber engineering design and light framing codes as well as study the areas of hazard classification (of timber in use) and of preservation standards. Documentation from these meetings is available in limited numbers.

The programme of this workshop has been planned to focus discussions on those aspects which our experience has led us to believe suffer most either from unfamiliarity or lack of proper legislation. We hope that you will take the most advantage possible of participating in the National Science Foundation Workshop and in the UNIDO programme build around it, and that your discussions are fruitful - both by deriving mutual benefit from sharing experiences and by giving UNIDO advice on how best to undertake our mandate of assisting in the industrialization of developing countries. At the same time I hope that this meeting is both personally and professionally rewarding for you and that your stay in Washington is a pleasant one.

ANNEX IV (4)

Opening Speech on behalf of the Director-General of UNIDO

presented by Mr. H. Bahlouli, 17 November 1986, 9.30 hours

On behalf of Mr. Domingo Siazon, Jr., Director-General of the United Nations Industrial Development Organization, I would like to thank, once again, the National Science Foundation of the United States, particularly Dr. John Scalzi, and Computech Engineering Services, especially Dr. Ian Buckle, for associating UNIDO in the organization of this workshop on the important subject of bridge construction research, thereby making this meeting an international event.

Yes, in addition to the 36 participants from the United States, we have among us, 19 high level experts from 10 Latin American countries, namely, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, Guatemala, Honduras, Panama, Peru and Uruguay, they are here to share their own national experiences and co-operate with their counterparts of the North.

As you know, the NSF Workshop on Bridge Research needs will be immediately followed by a two-day Workshop, organized by UNIDO, on the Development of Wooden Bridges in Latin America and the Caribbean. The participation of 19 experts from that region in both meetings is jointly financed by the National Science Foundation, the United Nations Development Programme (UNDP) and the United Nations Industrial Development Organization (UNIDO). Indeed, we are very pleased that a number of the U.S. participants will also attend the UNIDO workshop.

The purpose of the UNIDO meeting is to discuss the scope for the use of timber in the construction of bridges in rural areas, in comparison, or in conjunction with, other materials. It will also identify research and technical assistance needs on a regional and national basis.

For the Workshop on Wooden Bridges, UNIDO has engaged the services of two international consultants to prepare background documentation and to assist in conducting the workshop with a substantive officer from UNIDO Headquarters, Mr. Robert Hallett of Canada. Two U.S. participants in the NSF workshop will also assist in guiding discussions and determining research priorities and follow-up activities in developing countries.

Mr. Chairman,

UNIDO, which has a broad mandate to assist developing countries in the expansion and modernization of their industries, provides technical assistance in the form of projects which include the services of experts, the organization of training and research and the purchase of equipment. One of the sectors covered by its activities is building materials manufacture and low-cost housing techniques, with emphasis on utilization of national material resources and skills.

UNIDO has, in fact, developed a low-cost modular prefabricated wooden bridge system for spans of 24 metres and loads of up to 40 tons. Questions related to design and production of wooden bridges were discussed at an Expert Group Meeting on Timber Construction which UNIDO convened in Vienna in December 1985. This system has been utilized successfully by UNIDO in Bolivia, Chile, Costa Rica, Dominica, Ecuador, Honduras, Nicaragua, Peru, Kenya, Central African Republic, Madagascar and Laos.

Mr. Chairman,

As there is nothing more symbolic than a bridge, we express the hope that both workshops will serve as a bridge to closer relations among all countries concerned, through a better north/south and south/south co-operation. This could lead to the establishment of projects at the national level, the regional level or the global level. We hope that the United States will continue to give its support to his kind of international economic co-operation for development, and we look forward to a closer collaboration with the U.S. Government and the American Business Community.

Thank you, Mr. Chairman.

Computech Engineering Services, Inc.
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NATIONAL SCIENCE FOUNDATION

Workshop to Identify Research Needs for Short- and Medium-span Bridges

Washington, D.C.
November 17, 18, 19, 1986

MONDAY, NOVEMBER 17

8:00	REGISTRATION	
9:00 - 10:45	OPENING SESSION - Chair: Ian Buckle	
	Welcome and Introductory Remarks	.... John B. Scalzi .... James S. Crooke
	9:15 STATE-OF-THE-ART : World Scene	.... Roger A. Dorton
	10:45 STATE-OF-THE-ART : US Scene	.... Gerard F. Fox
10:45 - 11:15	Break (30 mins)	
11:15 - 12:45	CURRENT RESEARCH PROGRAMS - Chair: Bruce M. Douglas	
	11:15 FHWA	.... Charles Galambos
	11:45 TRB	.... Robert Reilly
	12:15 AASHTO	.... Fred Sutherland
	12:30 ASCE	.... Richard Gutkowski
12:45 - 2:15	Lunch	
2:15 - 3:15	LOADS - Chair: Andrzej Nowak	
	2:15 Live Loads	.... Fred Moses
	2:45 Other Loads	.... Roy Imbsen
3:15 - 3:30	Break (15 mins)	
3:30 - 5:15	BRIDGE EVALUATION/STRENGTHENING - Chair: James Baldwin	
	3:30 Rating	.... David Beal
	4:00 Field Testing	.... Baidar Bakht
	4:30 Break (15 mins)	
	4:45 Strengthening	.... Wayne Klaiber

ANNEX V (2)

TUESDAY, NOVEMBER 18

9:00 - 10:30	**MATERIALS - Chair: John Kulicki**	
	9:00 Concrete	.... David Whiting
	9:30 Steel	.... Pedro Albrecht
	10:00 Composites	.... Joseph Plecnik
	10:15 Timber	.... Richard Gutkowski
10:30 - 11:00	Break (30 mins)	
11:00 - 12:00	**ANALYSIS - Chair: Frieder Sieble**	
	11:00 Statics	.... Alex Scordelis
	11:30 Dynamics	.... Ian Buckle
12:00 - 1:30	Lunch	
1:30 - 2:30	**BRIDGE MANAGEMENT SYSTEMS/EXPERT SYSTEMS - Chair: Celal Kostem**	
	1:30 Bridge Management	.... Richard McClure
	2:00 Expert Systems	.... Graham Powell
2:30 - 2:45	Break (15 min)	
2:45 - 3:45	**CONSTRUCTION METHODS - Chair: Charles Roeder**	
	2:45 Contractor's View	.... H.W. Reece
	3:15	
3:45 - 4:00	Break (15 mins)	
4:00 - 5:00	**STRUCTURAL FORM FORUM - Chair: Charles Seim**	
5:00 - 5:15	**INTRODUCTION TO WORKSHOP GROUPS**	

WEDNESDAY, NOVEMBER 19

9:00 - 10:30	**WORKSHOP GROUP MEETINGS**
10:30 - 11:00	Break
11:00 - 12:30	**WORKSHOP GROUP MEETINGS**
12:30 - 2:00	Lunch
2:00 - 3:20	**GROUP REPORTS, GENERAL DISCUSSION**
3:20 - 3:30	**CLOSING SESSION**

ANNEX V (3)

TUESDAY, NOVEMBER 18

9:00 - 10:30	**MATERIALS - Chair: John Kulicki**	
	9:00 Concrete	.... David Whiting
	9:30 Steel	.... Pedro Albrecht
	10:00 Composites	.... Joseph Plecnik
	10:15 Timber	.... Richard Gutkowski
10:30 - 11:00	Break (30 mins)	
11:00 - 12:00	**ANALYSIS - Chair: Frieder Sieble**	
	11:00 Statics	.... Alex Scordelis
	11:30 Dynamics	.... Ian Buckle
12:00 - 1:30	Lunch	
1:30 - 2:30	**BRIDGE MANAGEMENT SYSTEMS/EXPERT SYSTEMS - Chair: Celal Kostem**	
	1:30 Bridge Management	.... Richard McClure
	2:00 Expert Systems	.... Graham Powell
2:30 - 2:45	Break (15 min)	
2:45 - 3:45	**CONSTRUCTION METHODS - Chair: Charles Roeder**	
	2:45 Contractor's View	.... H.W. Reece
	3:15 UNIDO's Wooden Bridge System	.... R.M. Hallett
3:45 - 4:00	Break (15 mins)	
4:00 - 4:15	**INTRODUCTION TO WORKSHOP GROUPS**	
4:15 - 5:15	**WORKSHOP GROUP MEETINGS**	

WEDNESDAY, NOVEMBER 19

9:00 - 10:30	**WORKSHOP GROUP MEETINGS**
10:30 - 11:00	Break
11:00 - 12:30	**WORKSHOP GROUP MEETINGS**
12:30 - 2:00	Lunch
2:00 - 3:20	**GROUP REPORTS, GENERAL DISCUSSION**
3:20 - 3:30	**CLOSING SESSION**

ANNEX V (4)

Workshop to Identify Research Needs for Short- and Medium-span Bridges

OBJECTIVES

The objective of this meeting is to determine a research agenda for the National Science Foundation on Short and Medium Span Bridges. In view of the activity currently sponsored by the Federal Highway Administration and the Transportation Research Board, it seems appropriate that NSF's role should be that of encouraging fundamental research into long range problems. Accordingly, this workshop provides the opportunity to take a broad view of bridge engineering, the problems facing the profession and the setting of research objectives to address these issues. We should attempt to visualize the bridge of the future and determine what needs to be done now to ensure its efficiency, economy, reliability and aesthetic appeal. The long-range needs of existing bridges also require identification.

Six topics have been identified in an attempt to focus the discussion: Materials; Bridge Evaluation/Strengthening; Loads; Analysis; Construction Methods; Bridge Management Systems/Expert Systems. Seismic considerations and Foundations have been deliberately excluded from this list, since both topics have been adequately covered elsewhere.

Six group sessions will follow presentations in each of these areas in order to identify and prioritize the research needs. If time permits, all participants will be able to express their opinions in each topic area, but if not, a postal survey will be conducted. A final report will then be prepared and submitted to the National Science Foundation. It will contain the prioritized list of research needs and abstracts of all presentations made to the Workshop.

About 35 participants from the United States and Canada are expected to attend this Workshop. In addition, there will be 17 bridge engineers and researchers from Latin American countries. Representatives from Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, Guatemala, Honduras, Peru and Uruguay will attend under the joint sponsorship of the United Nations Industrial Development Organization and the National Science Foundation. The free exchange of information and ideas will be encouraged to the mutual benefit of all parties.

ANNEX VI

Workshop on Development of Wooden Bridge Construction in Latin America and the Caribbean, Washington, D.C.

Programme

Sunday, 16 November 1986

18:00 - 19:30:	Registration/welcome reception	UNIDO
	Introduction to workshop	UNIDO
	UNIDO's prefabricated timber bridge system (video, 16 minutes)	Mettem
	Preview of NSF programme (17 - 19 November)	Buckle

Monday, 17 November 1986

All day:	NSF workshop (see separate programme)	
	Post mortem of 17 November, preview of 18 November	Hallett

Tuesday, 18 November 1986

All day:	NSF workshop (see separate programme)	
	Post mortem of 18 November, preview of 19 November	Hallett

Wednesday, 19 November 1986

All day:	NSF workshop (see separate programme)	
	Post mortem of 19 November	Hallett

Thursday, 20 November 1986

09:00 - 12:00:	Review and discussion of relevant aspects of NSF workshop	Hallett Gutkowski Buckle
14:00 - 17:00:	Timber engineering related to bridges and reference sources	Mettem
	Discussion	

Friday, 21 November 1986

09:00 - 12:00	Examination of problems and identification of research in the region	Erichsen Gutkowski
14:00 - 17:00	Recommendations and conclusions (Emphasizing linkages with universities, institutes and action programmes)	Hallett Mettem Erichsen

ANNEX VII

Draft Proposal for the Organization of a Workshop on Bridge Design and Construction in Latin America

It is proposed that in the near future a Workshop on Bridge Engineering in Latin America be organized under the auspices of UNIDO in order to determine the state of the art in the region and the needs of each country in this field. A secondary objective would be to allow the establishment of permanent contact between technical organizations and professionals in these countries both amongst themselves and with internationally oriented agencies such as the US National Science Foundation.

This proposal is sponsored by

Mr. D. Ortiz, University of Biobio, Concepción, Chile
Mr. R. Montero, Fondo Nacional de Caminos Vecinales, Bogotá, Colombia
Mr. W. Yi, Ministry of Public Works, Panamá
Mr. C. Franco, Cordecruz, Bolivia
Mr. A. Ponce, Facultad de Ingenieria de Montevideo, Uruguay
Ms. M. Sollazzo, National Highway Administration, Montevideo, Uruguay

Background Information

1) A regional bridge engineering organization does not exist.

2) Different design criteria are used in the various countries and it is considered necessary to work toward uniformity.

3) Exchange of experiences in this field is difficult at present and a real increase would be profitable.

4) There is no regional co-operation between research programmes on bridge engineering.

Objectives

1) The creation of a Latin American Bridge Engineering Association.

2) The identification of research needs in the bridge design for countries of the region such as:

- Bridge earthquake engineering
- Materials
- Bridge evaluation and strengthening
- Loads
- Analysis
- Construction methods

3) Study of the design codes used in participating countries of the region with a view to making uniform some of the important criteria such as loads and other specifications.

It is recommended that a minimum of two persons participate from each country and that at least three international advisers or consultants be involved such as representatives of the National Science Foundation, the AASHTO leading American Universities and UNIDO.

ANNEX VIII

PROPOSALS FOR THE FORMATION OF A LATIN AMERICAN ASSOCIATION FOR THE DEVELOPMENT OF TIMBER ENGINEERING

Objectives of the association

To encourage links and coordination between existing bodies with a view to increasing the knowledge and efficiency of the use of timber in construction throughout Latin America; by this means, to contribute towards the improvement of standards of living. Specific goals so far identified are:

- Dissemination of knowledge and techniques of design and construction with timber
- Formulation of ideas and proposals for research, design and new technology
- Mutual assistance and interchange of knowledge through personal development
- Transfer of technology, with adaptation to regional needs.

Immediate activities

It was agreed that in order effectively to set up the association, certain immediate organizational activities would be necessary, viz:

- Establish a secretariat to regularize communications between the participants
- Prepare a draft statute for the association, circulate it and obtain agreement
- Invite membership from Latin American countries/organizations not present at the RILEM Workshop
- Carry out further investigations to determine bodies with which the association should communicate
- Prepare a directory of relevant bodies, specialized institutions and individuals
- Communicate with relevant international agencies and organizations with the objective of seeking their support and participation in specific activities.

Technical activities

Many technical activities would be possible, dependent upon the scope and opportunities given to the association.

The following were mentioned as examples which are seen as urgent:

- Prepare a follow-up programme for the UNIDO wood bridge project in each country, taking into consideration
  - improvements to the system
  - exchanges of experience in its use
  - controls and periodic adjustments to its implementation.
- Prepare guidelines for a maintenance manual for timber bridges and recommendations on bridge evaluation.
- Arrange for information dissemination and exchange of details of completed bridges, design and construction studies, case histories etc.

Comparable activities are also required in the field of timber building design for housing, agriculture, storage and industrial buildings, as well as other structural used of timber (see ID/WG.447/17).

Participants

The following participants of the UNIDO RLAC Workshop attended the session at which the association was discussed, and agreed to continue correspondence over the matter:

Ing. Carlos Franco	Bolivia
Ing. Carlos Ilabeca*	Chile
Prof. Gustavo Granados	Columbia
Ing. Daniel Uriguen	Ecuador
Ing. Simon Rene Castro	Honduras
Ing. Jose Carlos Cano	Peru
Prof. Carlos Tapia M.	Peru
Ing. Martha Sollazo	Uraguay
Ing. Walter H. Yi	Panama
Ing. Marco A. Lombardo	Panama
Christopher Hattem	UNIDO Consultant, U.K.
Prof. Richard Gutkowski	U.S.A.

* indicated willingness to act as coordinator/secretary.