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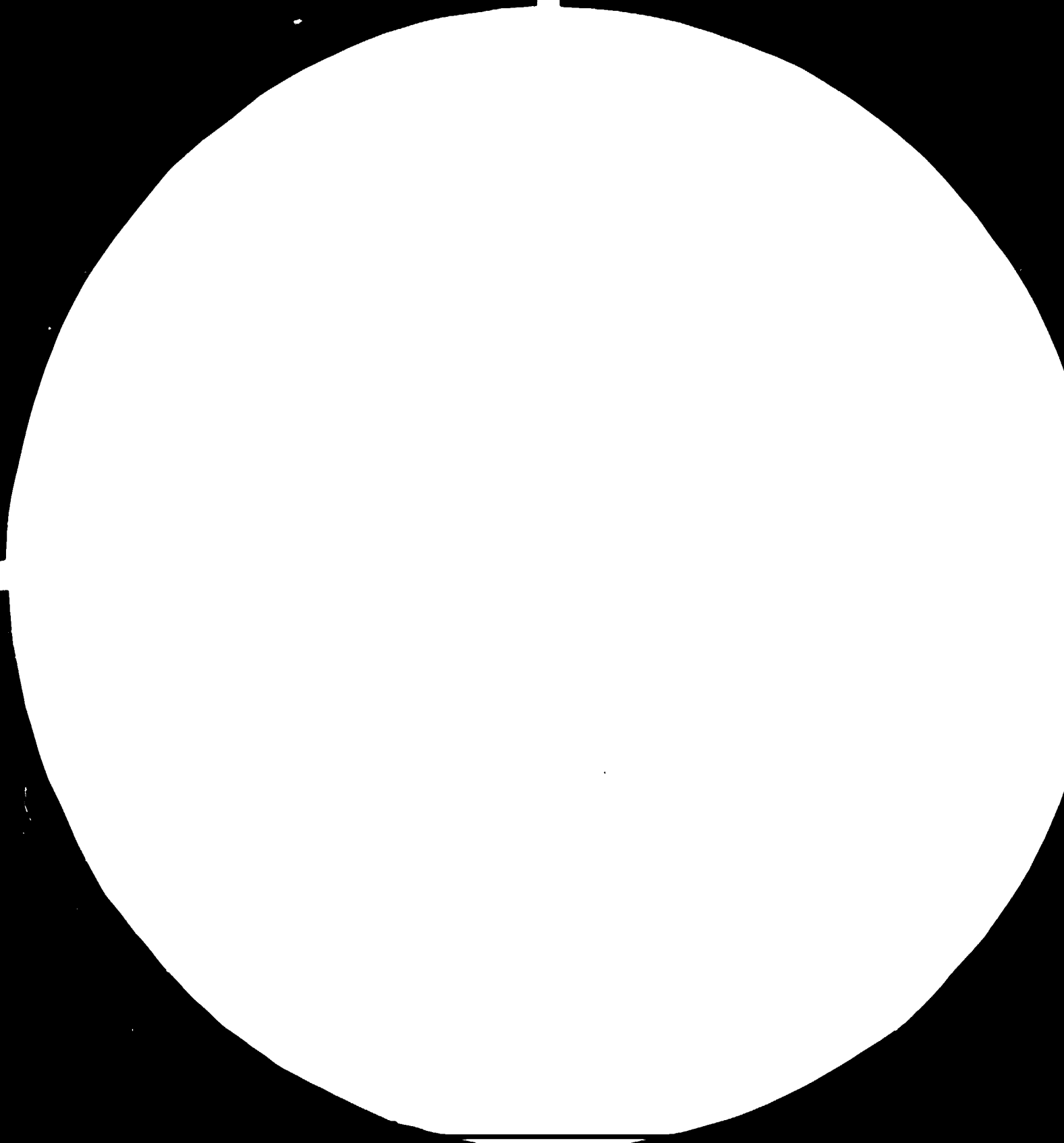
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English

REPORT ON THE TIMBER ENGINEERING WORKSHOP*

Held in Melbourne, Australia

2 to 20 May 1983

by

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Industrial Development Officer

Agro-Industries Branch

Division of Industrial Operations

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1. PURPOSE OF THE MISSION

A staff member of the Agro-Industries Branch of the Division of Industrial Operations, Robert M. Hallett, went to Australia to attend and help conduct the first UNIDO Timber Engineering Workshop which was held in Melbourne from 2 to 20 May 1983.

2. ATTENDANCE

UNIDO had planned for 20 participants but, in consultation with the Australian Government, agreed to accept 22 since two post-graduate engineering students (from Tonga and the Solomon Islands) were then in Australia who could attend at little extra cost. In the event, only 18 participants attended since three notified UNIDO of their inability to attend too late to arrange for standby attendance and the student from the Solomon Islands had unfortunately left Australia just at the time of notification and could not be traced.

Some problems were encountered by participants owing to last-minute notifications and visa problems - one, from St. Lucia, having first been told that no visa was required only to be told in San Francisco by Qantas, that one was after all needed, causing him a weekend layover and late arrival. The participant from Bangladesh was only able to arrive late on 5 May. All participants attended the Workshop to the end.

3. PARTICIPANTS

Although the UNDP offices for 15 participants were notified of acceptance before the end of March, some of these participants were not informed of this until two weeks later. Owing to cost increases in the budget, some delay was caused in notifying the remaining seven of their acceptance, although in most cases this did not cause undue difficulties.

In all 70 nominations were received before 22 April of which 11 were by cable only 30 of those nominated with full documentation would have qualified to attend, and 15 were recommended with reservations. This response was considered excellent considering that this was the first such event to be organized.^{1/}

..... The 18 participants represented 14 countries as shown in (attached) Annex I.

Most participants were of a highly acceptable level but three had real language difficulties (the two from the People's Republic of China and one from Indonesia). A few were architects, who, although benefitting from the course, found some of the engineering design formulae and calculations daunting. Nevertheless, the philosophy; followed in all such training courses in the wood sector, of arranging for group assignment work enabled all to benefit and share experiences by working together.

NOTE: The language proficiency of the Chinese was queried by UNIDO at the end of March when notifying them of acceptance; and it was recommended that an intensive course be taken by them. A telex from UNDP later confirmed the adequacy of their English. They neither took such a course nor could in any way be considered to have sufficient facility with the language to benefit properly from the course despite 3 and 10 years study, respectively, some time before. They were not even informed of the need to prepare a country paper and so had not done so. Nevertheless, they were both very keen to learn and managed to justify their attendance - especially as early contacts with the Harbin Institute which hopefully will grow between both UNIDO and the Australian organizers. The proficiency of one of the Indonesian participants was only somewhat better but was exacerbated by shyness.

4. PROGRAMME

The original programme drafted by UNIDO and agreed with the

^{1/} Four candidates were nominated too late for evaluation before the course.

course director, Mr. Les D. Armstrong, in London, was basically followed although some last-minute changes were made to accommodate lecturers' schedules and to cater for special interests. The final programme as actually followed is attached as Annex II.

Some of the lectures were only completed during the Workshop, but all were delivered on time. Local arrangements for tours and factory visits were very well done and generally appreciated. Most participants felt that the course tried to accomplish too much in too short a time but the need for an intensive course was also appreciated. The author gave a summing-up presentation on the last Thursday which included a description of UNIDO's technical assistance philosophy and activities in this sector as well as comments on the generally acceptable characteristics of wood as a construction material permitting it to be used in many millions of buildings around the world.

The lectures were all of a very high standard - reflecting the experience and knowledge of the authors (both from CSIRO and other well-known institutions). A few presentations did not sufficiently take into account the weakness of some participants in English and used colloquial expressions too much or spoke too fast, but on the whole the standard was very good.

Ample use was made of slides and overhead projector transparencies which contributed significantly to the presentations and to overcoming the effects of the previous statement. Several films were shown of timber structures or special aspects such as jointing, including UNIDO's film on prefabricated wooden bridges 'Short Cut'. These were all well received.

The final day comprised a relaxed visit to CSIRO, Hightett, where participants could see and discuss informally the work of the two divisions involved -- Building Research and Chemicals and Wood Technology. A special talk and discussion session was arranged for seven participants with architectural backgrounds on urban planning and resettlement policies on this final day.

5. DOCUMENTATION

The participants were given bound copies of most of the lectures at registration plus a good assortment of brochures, standards and illustrative literature. These were added to by the remaining lectures and more material as the course proceeded - both from the organizers and from companies visited.

Each participant was notified of the need to prepare a country paper (except the two from the People's Republic of China) and these were presented orally to the group. They were all of an acceptable to very high standard and 13 will be reproduced as ID/WG. series documents. It is felt that these will add significantly to the background material already available in the Branch on this subject for future technical assistance projects.

A 'mini-library' was made available to participants throughout the course comprising UNIDO documents and selected references from CSIRO staff members. The list of documents available is given in Annex III.

Much use was made of the Australian building code AS1720-1974 in following through design examples, as well as other specialized literature.

The complete set of lectures, together with an introduction, list of participants, opening speeches and recommendations will be reproduced in limited numbers by CSIRO. UNIDO plans to reproduce the complete set of lectures as UNIDO documents for a wider distribution.

6. WORKSHOP ASSIGNMENTS

Consistent with the philosophy of having participants work in small groups on practical problems in such training course, four design problems were handed out to each participant within a few days of the start with the request to indicate their preferences. They were then divided into groups of 4 and 5 to work out the correct solutions and prepare presentations for 19 May. The problems and the groups are attached as Annex IV.

The presentations were all quite good and most participants contributed to the work - sometimes even till late in the evenings. A few, inevitably perhaps, did not make the same good effort but all in all the assignments were well done and served the purpose intended - that of illustrating many of the technical points and of creating a cooperative atmosphere amongst participants.

The solutions and presentations are on file in the Branch, including the various visual aids, drawings, etc. used. Their assessment is as follows:

Problem 1 - Glulam Design

This problem was solved competently with the design loads properly calculated, and the necessary checks made for strength, shear, deflection and slenderness of the columns. It was assumed that such long glulam beams would be available but it was recognized in discussion that this was not likely to be so. An interesting cost comparison showed that the glulam structure was much cheaper than either a reinforced concrete or steel design - but only for Australian conditions. The presenter was Mr. Potrayanont (Thailand) and he felt that this would not apply to conditions in his country due to the much cheaper labour and readily available cement, aggregates and steel reinforcing rods.

The group was hampered by the poor spoken English of the two Chinese participants and, to a lesser extent, by similar problems with the Indonesian but nevertheless did a good job (see also 'NOTE' on page 2).

Problem 2 - Farm Building Design

This was the hardest assignment and the group spent a great deal of time in its solution. The result was a good introduction by Mr. P. Moala (Tonga) and a rather long presentation by Mr. Ferdinando (Sri Lanka) with undue time spent on the minutiae of design stress calculations rather than on explanations of decision-making and alternatives. The design presented was, however, "correct" although somewhat inefficient. The dense nailing pattern chosen could have been improved upon by using simple supports or struts at the critical knee joint but lack of calculating aids limited the analysis that could reasonably have been carried out.

Preservative treatment was specified although during discussion it was pointed out that large sizes of Douglas Fir would contain a lot of heartwood which was very hard to treat with CCA preservatives. Creosote would have been better. The design of footings suitable for exposed conditions was also not acceptable - a problem that emerged in other assignments as well. Also, the need to design the apex joint to allow safe and simple site erection was also discussed.

Problem 3 - Truss Design

This solution was well presented by Mr. Jagadeesh (India) and the verdict from the expert who posed the problem was that it was correct but could have used better plate positioning and smaller sized plates and top rafters for a more efficient design. A few adjustment factors were overlooked that would have permitted a less conservative design such as duration of live load (five days not five months) and a 10% strength increase allowed for using green timber.

All in all a very good illustrative assignment with good group interaction evidenced.

Problem 4 - Wind Resistant Design

Although the problem statement was the longest, this was the simplest assignment since it followed fairly closely the worked example presented in the lecture on this subject. Nevertheless, it was of great interest to many of the participants, especially those from Tonga who had suffered a major cyclone less than a year before.

The solution was poorly introduced by Mr. Nurul Islam (Bangladesh) who simply read out the problem as stated and who apparently had contributed little to its solution. Mr. S. P. Moala (Tonga) made a good presentation of the general aspects, Mr. Ciro Politi (Brazil) described bracing details and certain calculations, and Mr. R. Beckett (Zimbabwe) continued the explanation of structural design details.

Discussion centred on design details of battens (too small, and possibly with inadequate fire resistance), washer size and spacing for the roof sheeting hold-down bolts, and the need to provide for tightening of anchoring rods after drying of the structure had occurred. The top wall plates were judged too small to take the upward lift restrained by the hold-down bolts.

Extra Assignment - Concrete Formwork

One problem was formulated for individual work to illustrate the procedures for assuring good concrete formwork design. Although voluntary, about one-half of the participants worked through the problem and discussion on the 'Assignment Day' showed that it had been useful with no particular troubles encountered.

One surprising conclusion was that there was no real difference in design for regular and the modern 'super-flow' (or super plasticized) concrete. A particularly well done solution and explanation was handed in by Dr. Tuladhar (Nepal).

7. ADMINISTRATIVE MATTERS

Local Arrangements/Financial Aspects

It was decided by the Australian Government that technical arrangements would be the responsibility of CSIRO and the Course Director, Mr. Les D. Armstrong, and that administration would be handled by the Department of Industry and Commerce (Multilateral Branch).

The logistics were very well worked out and the workshop ran smoothly although as it was the first of its kind there were a great many details to look after. There was some overlapping of responsibility since UNIDO had first understood that the Course Director would himself assume both functions with a greater contribution from CSIRO. In the event, the Department of Industry and Commerce assigned a full-time junior officer (Ms. Linda Hall) to the course as well as a more senior officer (Mr. Laurie Ffrench) at the start and finish.

This was much appreciated although it increased the total cost of the Workshop.

Furthermore, the project document stated that CSIRO was to provide the Course Director (as well as administrative assistance and lecturers at no cost), but during the preparatory phases, Mr. Armstrong retired and so was paid a fee for his services. His long association with CSIRO made liaison easy, however, and a considerable amount of 'in-kind' support was given to the Workshop. Nonetheless, in future, a simpler chain of command is recommended, and the counterpart or subcontracting agency should assume full responsibility for the event and report to UNIDO in the first instance. If the Australian Government (or other donor country) wishes to monitor the project it should do so out of its own budget and all necessary administrative support would be better provided by the one responsible agency - in this case CSIRO.

All this being said, the very competent administrative work of Ms. Hall was much appreciated as was the liaison and coordinating role of Mr. Ffrench.

Owing to the non-attendance of four selected participants, about US\$10,000 is expected to be saved. The finally approved budget is attached as Annex V which includes the extra provision due to cost increases then estimated at US\$29,498.

A detailed account of expenditures will only be ready later and will be submitted in the normal way.

Hospitality

A provision was made for US\$1,000 in the budget. A brief ice-breaking gathering was held on Sunday evening, 1 May; a reception, hosted by the Department of Industry and Commerce (Mr. Ray Balduan, Director - Melbourne Regional Office), was held on 2 May, and a final 'beer and chips' celebration was also held after the assignments and evaluation sessions on 19 May.

Since one of the lectures (by Mr. E. E. Dagley on metal connectors) was deemed of special interest to local members of the Institute of Wood Science, about 30 extra people attended. A reception was provided afterwards by the Institute for which thanks are given on behalf of UNIDO and the participants.

Travel Arrangements

Most participants had made their return plans as requested but it seems to be inevitable that this area poses problems and extra work for the organizers of such events. Thanks should be extended to Ms. Linda Hall for her patience in dealing with the special requests and changes.

All participants were given an MCO for 5kg excess baggage for the return trip and requested to return them to UNIDO if unused - partly used.

Press Coverage

This was disappointing but with two exceptions: (a) the Chinese Section of the Australian Broadcasting Commission interviewed the two Chinese participants for broadcast to China (after their return) and at the same time interviewed the author for transmission on their English language service; and (b) local press coverage was arranged for the final day's visit to CSIRO and all participants were photographed for sending to their countries' news services together with a press release announcing the Workshop's successful completion.

A press release (IDO/1000, dated 27 April 1983) describing the event had been prepared by UNIDO's Public Information Section and was made available.

8. EVALUATION AND ASSESSMENT

UNIDO's forms for "Evaluation of In-Plant Group Training Programmes" were handed out early in the event and were collected during the afternoon of 18 May to enable the Course Director, Department of Industry and Commerce officials and the author to study them before the evaluation session.

These were generally supportive, as one would expect, but also pointed to recommendations for more practical work on a longer course. Some of these have been singled out and elaborated upon in the section on recommendations (q. v.). The individual forms have been summarized as shown in Annex VI.

An evaluation meeting was held late afternoon 19 May between Messrs. Armstrong and Leicester (CSIRO), Mr. French and Ms. Hall (Department of Industry and Commerce) and the author. The Australian representatives stated that the Workshop had been a success. The recommendations adopted in draft by the participants at the closing

session were reviewed and agreed to be worthwhile. They are reproduced as Annex VII. It was also agreed that the country papers were good enough to be reproduced by UNIDO.

The final contents of the course document which will be reproduced in limited numbers by CSIRO was also agreed.

9. OTHER MATTERS

The UNIDO staff member took the opportunity of announcing that UNIDO is organizing a Consultation on Wood and Wood Products, hosted by the Government of Finland, to be held in Helsinki on 19-23 September 1983, and of explaining its objectives and procedures to both the participants and to most of the lecturers - especially those from the Australian and New Zealand wood industries.

Advantage was also taken of the author's presence in Australia to discuss a current project proposal (cleared for negotiation with potential donors) on Low-Cost Automation (LCA) in the woodworking industries. Australia had shown interest in funding this regional project which would strengthen the UP-ISSI in Quezon City, Metropolitan Manila, Philippines in this field and try to introduce LCA systems into factories in the region, but was anxious to have a greater involvement with Australian industry.

Meetings were therefore held at the request of the Australian Government with Mr. John Meyer, Manager, Industrial Training and Manpower Development of the Victorian Chamber of Manufacturers (VCM) and Mr. Michael Taplin of his staff to try to agree on details of their involvement. The first was for only 1-1/2 hours on Friday, 6 May when it became clear that there had been misunderstandings on both sides (UNIDO and VCM) on expected roles and capacities to fulfil them. Agreement was reached in principle, supported by the Department of Industry and Commerce, that the VCM should play a coordinating role and that the budget could be raised accordingly to cover VCM expenses - at least to the point of making formal submissions to UNIDO and the Australian Government.

The next meeting (Messrs. Meyer and the author) was for 7 hours, Friday, 13 May when details were worked out and the project document (including budget) was revised. Terms of Reference for a subcontract to VCM were agreed in draft along with most details of their submissions and costing.

A final meeting (1-1/2 hours) was held in the evening of 19 May with Messrs. Meyer and Taplin, Mr. Ffrench and Ms. Hall and the author. The revised project document was reviewed and explained to the Department of Industry and Commerce officials who agreed with its contents. Although no assurance could be given of funding, Mr. Ffrench felt that it would stand a good chance of approval in August 1983, spreading the total US\$336,269 over three financial years.

This revised project document will thus be submitted to the Secretariat of the UNIDO Project Review Committee as soon as possible.

10. ACKNOWLEDGEMENTS

The author hereby wishes to thank the Course Director, Mr. Les D. Armstrong, the Deputy Course Director, Dr. Bob Leicester, and all the lecturers from CSIRO who contributed their time and experience to the Workshop. Special thanks are also due to the 'outside lecturers' from industry and other organizations both in Australia and New Zealand, as well as to the representatives of the Australian Timber and building industries for permitting visits to their factories and sites and for explaining their operations.

Thanks must also go to Ms. Linda Hall, Department of Industry and Commerce for organizational support and to CSIRO administrative staff for their assistance. In any such event there are others who contribute to varying degrees to a successful outcome but who are too numerous to mention individually. Gratitude may only be expressed to them in a general way as above.

DISTRIBUTION:

Mr. D. G. A. Butaev	Mr. R. Seccombe - Australian Mission, 3x
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Ms. I. Lorenzo/Mr. K. Hanselmann	Mr. R. H. Leicester
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Division of Industrial Operations

PROGRAMME OF WORKSHOP

Monday, 2 May 1983

- 09:00 - Registration and Administrative Arrangements
- 09:30 - Welcome - Dr. F. A. Blakey, Chief - CSIRO;
Division of Building Research
- Official Opening - Mr. A. Caddy, Assistant Secretary -
International Branch; Department of Industry
and Commerce - Canberra
- 10:15 - Introductory Message - Mr. R. M. Hallett; UNIDO
- 10:30 - Morning Tea
- 10:45 - Introduction of Delegates) Mr. L. D. Armstrong,
Rationale and Objectives of Workshop); Course Director
- 11:00 - Forest Products Resources - Dr. W. E. Hillis
- 11:30 - Timber Engineering and its Application in
Developing Countries - Mr. J. Stokes
- 12:30 - L U N C H
- 13:30 - Excursion to view housing construction and
other timber structures.
- 17:30 - Return to Hotel.
- 18:30 - Reception hosted by the Australian Government.

Tuesday, 3 May 1983

- 09:00 - Wood, the Material - Dr. W. E. Hillis
- 11:00 - Morning Tea
- 11:15 - Mechanical Properties of Clear Wood -
Mr. L. D. Armstrong
- 12:30 - L U N C H
- 13:30 - Mechanical Properties of Clear Wood . . . (contd)

- 14:30 - Panel Discussion
- 15:00 - Afternoon Tea
- 15:15 - Country Papers*

Wednesday, 4 May 1983

- 08:45 - Characteristics of Structural Timber - Dr. R. H. Leicester
- 09:45 - Morning Tea
- 10:00 - Structural Grading (including film on computer-matic grader) - Mr. W. G. Keating
- 11:00 - Visual Grading of Timber (including demonstration) - Mr. John Hay
- 12:00 - Panel Discussion
- 12:30 - L U N C H
- 13:30 - Coach excursion to inspect manufacture of trusses, wall sections, glulam and plywood.
- 17:00 - Return to Hotel.

Thursday, 5 May 1983

- 08:45 - Wood-based Sheet Materials - Mr. K. J. Lyngcoln
- 09:45 - Wood Adhesives and Glueing - Mr. R. E. Palmer
- 10:45 - Morning Tea
- 11:00 - Structural Plywood - Dr. L. Pham
- 12:00 - Plywood in Concrete Formwork - Mr. K. J. Lyngcoln

* One representative from each country presented a 15/30-minute monograph on building construction and its requirements in his country.

- 13:00 - Panel Discussion
- 13:15 - L U N C H
- 14:15 - The Fracture Strength of Wood - Dr. R. H. Leicester
- 15:00 - Timber Connectors - Mr. E. P. Lhuede
- 16:00 - Afternoon Tea
- 16:15 - Buckling Strength of Timber Columns and Beams -
Dr. R. H. Leicester
- 17:15 - Glued Laminated Timber - Dr. R. H. Leicester
- 17:45 - Panel Discussion
- 18:00 - Close

Friday, 6 May 1983

- 08:45 - Conversion of Timber - Mr. M. W. Page
(including the film "To Touch the Sky")
- 10:45 - Morning Tea
- 11:00 - Seasoning of Structural Timber - Mr. F. J. Christensen
- 13:00 - Issuance of assignments and formation of groups.
- 13:15 - L U N C H
- 14:15 - Durability of Timber - Mr. J. Beesley;
(agencies of deterioration)
(natural durability)
(preservation treatment)
- 15:30 - Afternoon Tea
- 15:45 - Durability of Timber . . . (contd)
- 17:15 - Panel Discussion
- 18:00 - Close

Saturday, 7 May 1983

FREE TIME - A S S I G N M E N T S

Sunday, 8 May 1983

- 08:30 - Leave Hotel in tour coach for Mount Gambier
- 13:00 - Lunch (Service Station Restaurant)
- 20:00 - Arrive at Motel at Mount Gambier

Monday, 9 May 1983

- 08:30 - Depart in tour coach to inspect Mount Burr forest, plantation, timber mill, seasoning plant and preservation plant
- 11:00 - Visit to Beddisons Industry - veneer peeling, drying manufacture of food utensils from veneer
- 12:30 - Lunch at Softwood Holdings, Ltd.
- 13:30 - Visit Softwood Holdings, Ltd. operations:
 - nursery
 - timber production
 - engineering-stress grading, frames, trusses, glulam including finger jointing
 - preservation and quality control
 - discussions with staff
- 18:00 - Return to Motel

Tuesday, 10 May 1983

- 08:30 - Depart in tour coach
- 09:00 - Visit Mount Gambier Pine Industries
- 10:30 - Visit Woods and Forest Department complex:
 - sawmills (green and dry)
 - machine stress grading
 - glulam manufacturing
 - discussions
- 12:30 - Barbecue lunch at Umpherston Cave
- 13:30 - Continue visit
- 14:30 - Visit to cheese factory
- 15:00 - Visit housing estate - timber frame/brick veneer houses in various stages of construction
- 18:00 - Return to Motel

Wednesday, 11 May 1983

- 09:00 - Depart in tour coach for Melbourne (items of interest in Workshop and scenic attractions to be inspected en route)
- 17:00 - Arrive at Melbourne Hotel

Thursday, 12 May 1983

- 08:45 - Timber Structures; Detailing for Durability - Mr. L. D. Armstrong
- 09:30 - Use of Treen Timber in Structures - Mr. L. D. Armstrong
- 10:00 - Morning Tea
- 10:15 - Derivation of Design Properties - Dr. R. H. Leicester
- 11:00 - Film "A Timber-Engineered Building"
- 11:30 - Fire Resistance of Timber - Dr. R. H. Leicester
- 12:30 - L U N C H
- 14:00 - Review of Timber Strength Grouping Systems - Mr. W. G. Keating
- 15:15 - Light Timber Framing for Housing (including Workmanship) - Mr. B. T. Hawkins
- 16:00 - Afternoon Tea
- 16:15 - Light Timber Framing . . . (contd)
- 17:00 - Specification of Timber for Structural Use - Mr. W. G. Keating
- 17:45 - Panel Discussion
- 18:00 - Close

Friday, 13 May 1983

- 08:45 - Presentation of remaining 'Country Papers'
- 09:15 - Engineering Design Codes (including worked samples of the use of AS1720-1975) - Dr. R. H. Leicester, Mr. L. D. Armstrong, Mr. E. P. Lhuede and Dr. L. Pham

- 10:30 - Morning Tea
- 10:45 - Engineering Design . . . (contd)
- 12:45 - L U N C H
- 13:45 - Visit to Gang-Nail Australia, Ltd. - inspect
Computer design facilities and Gang-Nail
plant (Mr. J. Tadich)
- 16:15 - Close

Saturday, 14 May 1983

FREE TIME - A S S I G N M E N T S

Sunday, 15 May 1983

F R E E D A Y

Monday, 16 May 1983

- 09:00 - Engineering Design . . . (contd)
- 10:15 - Engineering Design . . . (contd)
- 10:30 - Engineering Design . . . (contd)
- 12:30 - L U N C H
- 13:30 - Engineering Design . . . (contd)
- 14:30 - Break
- 15:30 - Efficient Timber Structures Using Metal Connectors -
Mr. E. E. Dagley (attended by invited guests)
- 17:30 - Close

Tuesday, 17 May 1983

- 09:00 - Wind Resistance of Timber Buildings - Mr. G. F. Reardon
(film: Building to Resist Cyclones)
- 10:30 - Morning Tea

- 10:45 - Earthquake Resistance of Timber Buildings -
Dr. G. B. Walford
- 11:45 - Discussion and Questions
- 12:00 - Construction Experiences in Developing
Countries - Mr. C. R. Francis
- 13:00 - L U N C H
- 14:00 - Load Testing of Structures - Dr. R. H. Leicester
- 15:00 - Quality Assurance - Mr. R. M. Hallett
- 15:15 - Case Study of Timber Construction - Dr. G. B. Walford
- 16:00 - Afternoon Tea
- 16:15 - Economics of Timber Construction - Mr. C. R. Francis;
including film - 'Short Cut' on UNIDO's
wooden bridge system
- 17:30 - Panel Discussion
- 18:00 - Close

Wednesday, 18 May 1983

- 08:45 - Pole Structures - Dr. G. B. Walford
- 10:00 - Morning Tea
- 10:15 - Case Study of Timber Construction 1 - Mr. P. Campbell
- 11:35 - Case Study of Timber Construction 2 - Mr. J. Tadich
- 13:00 - L U N C H
- 14:00 - Panel Discussion
- 14:30 - Group Assignment Work
- 15:30 - Afternoon Tea
- 15:45 - Group Assignment Work
- 18:00 - Close

Thursday, 19 May 1983

- 09:00 - Presentation of Assignments - Problem No. 3
- 10:30 - Morning Tea
- 10:45 - Presentation of Assignments - Problem No. 4
- 12:15 - Presentation of Assignments - Problem No. 1
- 13:00 - L U N C H
- 14:00 - Presentation of Assignments - Problem No. 2
- 15:30 - Afternoon Tea
- 15:45 - Presentation of Assignments . . . (contd)
- 16:30 - Evaluation of Workshop and Consideration of
Recommendations - Mr. R. M. Hallett
- 17:00 - Close

Friday, 20 May 1983

- 08:45 - Train to Highett to visit Division of Building Research
- 09:45 - Structures Laboratory - Welcome by Chief; Dr. F. A. Blakey,
View working exhibits in testing machines:
 - proof grading,
 - racking of wall frames,
 - missile test on plywood wall plate,
 - selected gour of DBR
- 13:00 - L U N C H
- 14:00 - Personal discussions between staff and Participants*
- 15:30 - Return to Hotel via train

* A special session was organized for seven architects and participants interested in urban planning - (Dr. J. Brotchie).

LIST OF DOCUMENTS

- 1) ID/10 - Production Techniques for the Use of Wood in Housing Under Conditions Prevailing in Developing Countries; Report of Study Group, Vienna, 17-21 November 1969
- 2) ID/61 - Production of Prefabricated Wooden Houses
- 3) ID/108/Rev.1 - Furniture and Joinery Industries for Developing Countries
- 4) ID/133 - Selection of Woodworking Machinery; Report of a Technical Meeting, Vienna, 19-23 November 1973
- 5) ID/154/Rev.1 - Low-Cost Automation for the Furniture and Joinery Industry
- 6) ID/180 - Wood Processing for Developing Countries; Report of a Workshop, Vienna, 3-7 November 1975
- 7) ID/247 - Technical Criteria for the Selection of Woodworking Machines
- 8) UNIDO/IO.514 - Annotated Bibliography on the Research Done on the Use of Naturally Occurring Adhesives for Wood Processing Industries
- 9) UNIDO/IO.533 - Promotional Actions and Technical Services to End-Users for the Development of Wood-Based Panel Industries
- 10) ID/WG.359/2-7 - Set of Papers Prepared for the Expert Group Meeting on Stress Grading and Strength Grouping, Vienna, 14-17 December 1981
- 11) ID/WG.335/16 - Guidelines for the Selection of Options in Establishing Wood-Based Panel Industries in Developing Countries
- 12) UNIDO: Specifications and PR for Wooden Bridges
- 13) UNESCO: BKB/77/RHD/1098-200 - An Introduction to a Method of Estimating the Cost of a Building - A Worked Example
- 14) Uniform Building Regulations, Victoria, 1974

- 15) Journal of the Institute of Wood Science, Vol. 9, Nos. 3 and 4: The Evolution of Wooden Bridge Trusses to 1850 by J. G. James
- 16) CSIRO - Paper 25: The Mechanical Properties of 174 Australian Timbers, 1963
- 17) CSIRO - Paper 12: Properties of Timbers Imported into Australia, 1961
- 18) CSIRO - Technical Paper 31: Australian Methods for Mechanically Testing Small Clear Specimens of Timber, 1979
- 19) CSIRO - Division of Building Research Newsletter, Vol. 8, No. 1, February 1983
- 20) TRADA - Timber Research and Development Association, United Kingdom; Timber in Excavations, September 1981.

ASSIGNMENT TOPICS AND GROUPS

GROUP ASSIGNMENTS

In all these assignments only the essential facts are presented. Consider these to be the basic instructions for a building project which requires a solution and a proposal that must be presented to a committee or panel of assessors. Each group must present the proposed design and justify each aspect to the other participants and lecturers.

In solving these problems, you must look into the need for protection of the structures against decay and/or insect attack including termites; you must draw up complete specifications for materials used and justify your decision. Design calculations must be shown and, where appropriate referenced to standards or lecture notes.

Finally, a comparison of costs should be made between using timber and either steel or concrete as the structural material including comments on necessary site equipment or other aspects related to the choice of material. Since costs vary from country to country, decide amongst yourselves on a set of hypothetical costs and prices that will serve as a basis for discussion and highlight the effects of labour-intensive versus capital-intensive technology.

Although the assignments will be presented orally and with visual aids, each group is expected to complete a fully written out solution. Please do not hesitate to ask for help and advice from the organizers and lecturers. Also, full discussion amongst yourselves is expected.

NOTE: The formwork assignment is to be done individually.

Assignment Groups:

<u>Problem</u> <u>1</u>	<u>Problem</u> <u>2</u>	<u>Problem</u> <u>3</u>	<u>Problem</u> <u>4</u>
Mr. Carayo	Mr. Idris	Mr. Jagadeesh	Mr. S. Moala
Mr. Potrayanent	Mr. P. Moala	Mr. Tuladhar	Mr. Islam
Mr. Gai	Mr. Mua	Mr. Felix	Mr. Politi
Mr. Qiu	Mr. Ferdinando	Mr. Balanon	Mr. Beckett
Ms. Wong		Mr. Silva Peña	

SEMINAR ASSIGNMENT : GLULAM DESIGN

Design glue laminated post and beam construction to support a roof system with the following loadings:

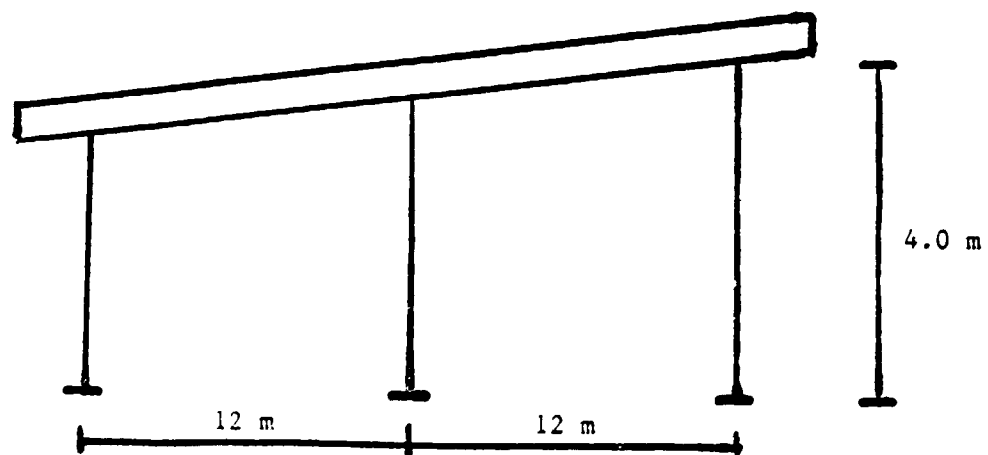
Dead Load - sheet roof, insulation and T & G ceiling with a roof mass of 40 kg/m^2

Live Load - 0.25 KPa

Wind Load - 0.60 KPa (upward)

Fire Rating - one hour

The beams will be exposed and continuous over two 12 m spans at 2.4 m spacing.



SEMINAR ASSIGNMENT : FARM BUILDING DESIGN

Design a pitched roof portal frame as shown in Figure 1 for the following loadings:

Dead Load - sheet roof of mass 10 kg/m^2

Live Load - 0.25 KPa

Wind Load - as shown in Figure 1

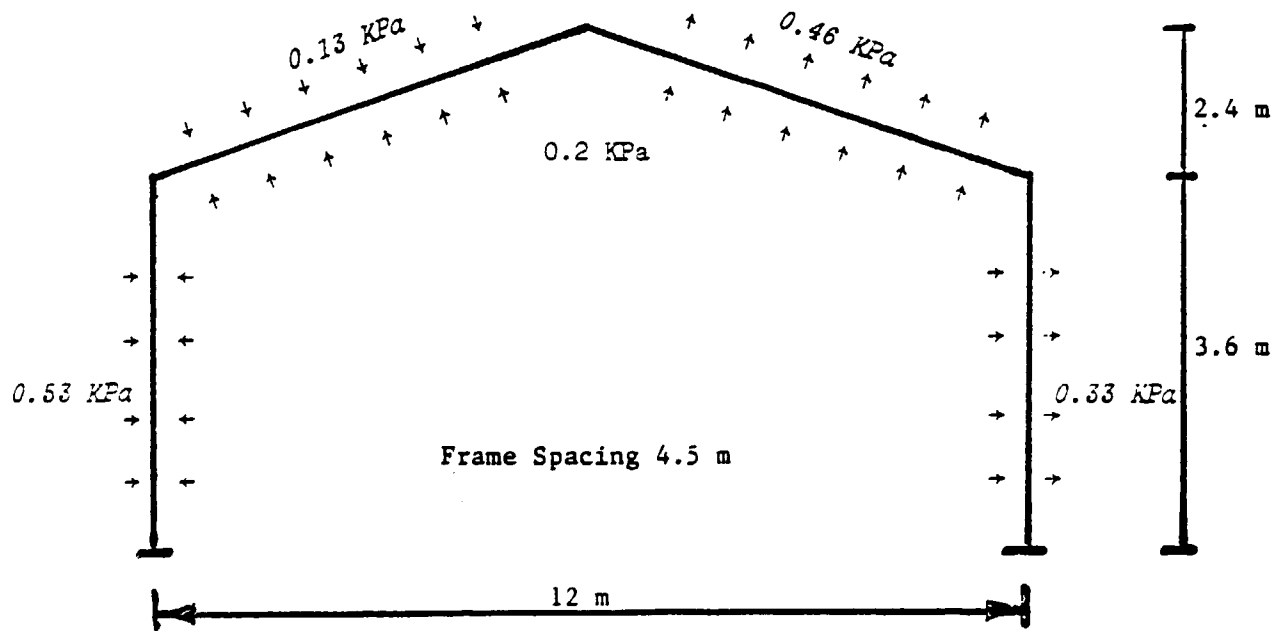


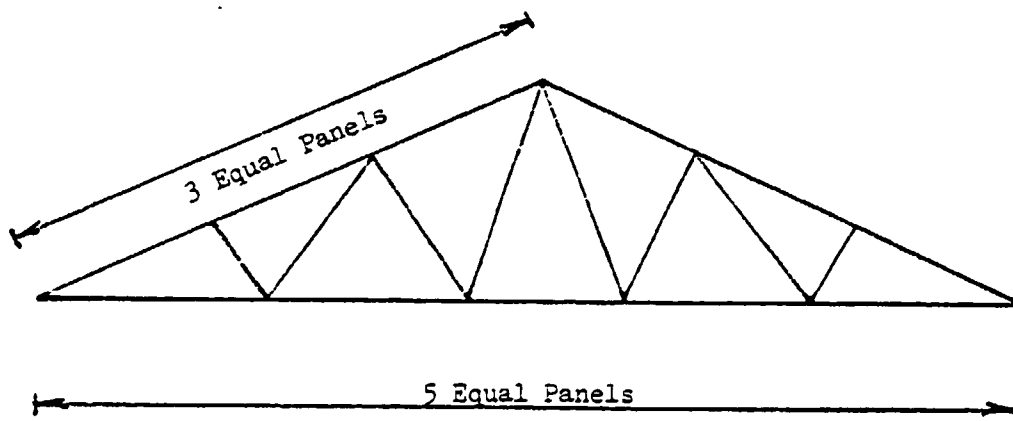
FIGURE 1

SEMINAR ASSIGNMENT : TRUSS DESIGN

Design the following timber truss using multi-tooth connectors.

SPECIFICATION

Span	15,000
Pitch	15°
Spacing	2,250
Roof Dead Load (including purlins and self weight)	0.20 KPa
Roof Live Load	0.25 KPa
No uplift due to wind	
Purlin spacing	900
Timber F14 unseasoned hardwood	
Joint group classification J2	
Timber thickness available	38 mm, 50 mm



JOINT DESIGN DATA

Tooth shear (i.e. shear between plate and timber) parallel to grain	2.07 MPa
Angle reduction factor $F = 1 - \theta/360$ where θ = angle to grain to axis of plate	
Longitudinal tension of Plate	200 N/mm width/pair
Lateral tension of plate	115 " "
Longitudinal shear of plate	100 " "
Lateral shear of plate	90 " "

SEMINAR ASSIGNMENT : WIND RESISTANT DESIGN

REFERENCES

- A. Paper No. 26 - Wind Resistance of Timber Buildings.
- B. Structural Plywood Wall Bracing Design Manual.
- C. Timber Engineering Code, AS 1720.

Consider a two-storey set of apartments, each storey having the plan shown in Figure 9 of Reference B (without the verandah).

Timber framed brick veneer construction is used with unseasoned F11 timber throughout. Assume prefabricated roof trusses at 900 mm spacing, having 900 mm overhang, supporting a sheet metal roof at 10° pitch.

Using the design wind pressures calculated in Section 3.2 of Reference A, and assuming external pressures and internal pressures to act simultaneously:

1. For the top storey:
 - (a) design a suitable connection for securing trusses to walls
 - (b) design a hold-down wall using M12 anchor rods (i.e. anchor rod spacing and top plate size)
 - (c) design a plywood wall to resist the uplift
 - (d) compare the approximate costs of materials in (b) and (c) above.
2. For the lower storey:
 - (a) determine the bracing requirements in each direction (i.e. the length and position of bracing walls).

ADDITIONAL DATA

The length of some internal walls is given in Figures 10 and 11; estimate other lengths. Assume the strength of an anchor rod is 15 kN.

Costs:

- anchor rods - \$3.50 each
- 75 x 50 timber - \$1.00 per metre
- 7 mm structural plywood - \$5.50 per square metre.

INDIVIDUAL SEMINAR ASSIGNMENT: PLYWOOD FORMWORK DESIGN PROBLEM

Using the information contained in the manual 'Plywood in Concrete Formwork', develop a specification for plywood formwork used in a column under the following conditions:

1. Where
 - (a) the concrete temperature is 15°C @ 2400 kg/m^3 ;
 - (b) rate of pour 5 m/hr ;
 - (c) height 3 m ;
 - (d) column dimension $500 \text{ mm} \times 500 \text{ mm}$; and
 - (e) concrete slump 75 mm .
2. Where more modern 'Super Flow' (super plasticised) concrete is used @ 2400 kg/m^3 .

Thus calculate concrete pressures for above. Remember impact. Assume the design is for a Class 2 architectural off form finish, maximum deflection $\text{span}/270$.

The specification should include:

1. Description of plywood
 - (a) code, e.g. (17-10-7);
 - (b) stress grade, e.g. (F_H); and
 - (c) bond type and adhesive (maximum pores 10).
2. Type of surface of plywood to give desired finish
 - (a) description of overlay paper if any;
 - (b) maximum recommended face veneer thickness and quality;
 - (c) additional surface treatments; and
 - (d) grain texture of face veneer.
3. Method of support
 - (a) continuous or simple;
 - (b) face grain parallel or right angles to span;
 - (c) maximum spacing of supports; and
 - (d) detail of supports including corner details.

TIMBER ENGINEERING WORKSHOP

Breakdown of Revised Budget, 8 April 1983

BL 16	UNIDO Staff Travel		6,715
	-- Travel	3,404	
	-- DSA/Terminals	2,778	
	-- Excess Baggage	533	
BL 34	Group Training (Non-UNDP)		131,033
	(a) <u>Participants</u>	101,033	
	- Travel, 21 participants	53,000	
	- Excess Baggage (5kg	2,000	
	- DSA Ret)	46,033	(35,856)
	(b) <u>Administration (local costs)</u>	30,000	
	- Course Director's		
	Fees	6,000	
	- Guest Lecturers	5,000	
	Fees:	1,000	
	DSA	500	
	Travel	3,500	
	- CSIRO Miscellaneous	7,500	
	Preprogramme		
	Travel	2,000	
	Workshop		
	Travel/DSA	2,500	
	Lecture		
	reproduction	3,000	
	- Others	6,000	
	Conference		
	facilities		
	hire	2,500	
	Bus hire		
	for tours	2,500	
	Hospitality	1,000	
	- Dept of Industry		
	and Commerce	5,500	
	Preprogramme		
	Travel	1,000	
	Adminis-		
	tration	2,000	
	Workshop		
	Travel/DSA	2,500	
BL 99	GRAND TOTAL		<u>137,748</u>

COMPILATION OF REPLIES TO EVALUATION FORM

The following evaluation form has been filled in from the 18 replies received from the participants. Where particular comments were made that were felt to provide useful extra information, these are either quoted or summarized as appropriate:

Programme: Timber Engineering Workshop
Melbourne, 2-20 May

Host Country: Australia

Year: 1983

I Pre-Programme Information

1. What is your opinion about the advance information on the programme received in your country? (Please indicate with an "X" in the appropriate column.)

	<u>Sufficient</u>	<u>Too Little</u>	<u>None</u>
Aim of programme	18	--	--
Contents of programme	14	4	--
Level of programme	18		

Do you think that additional information should have been provided? If so, please state your suggestions:

II Concept and Organization of Programme

2. What is your opinion about the contents of the programme?

appropriate	17
not appropriate	1

If not appropriate, please state why:

3. What is your opinion about the level of the programme?

too high	--
sufficient	18
too low	--

4. Is, in your opinion, the programme:

too specialized	--
too broad (covering too many subjects)	6
correct in its concept	12

5. What is your opinion about the total duration of the programme?

much too short	--
too short	10
correct	8
too long	--
much too long	--

If too short or too long what should have been the duration?

Average often replying "too short". -6.2 Weeks-

6. Do you consider the size of the total group of participants:

too large	--
adequate	18
too small	--

7. Give your opinion about the composition of the group of participants (homogeneity as to cultural background, profession, age, etc.). Were there too many under-qualified or over-qualified participants? Did you personally feel integrated in the group or, if not, why?

Yes; Homogeneous/Yes; -; -; Yes. OK; OK; Homogeneity not necessary/Yes. Some had language problems; composition well selected but some had language problems/well organized; composition good/integrated well; fairly good cross section of developing countries. About the correct mix of qualified professionals. Excellent interaction.

8. What is your opinion about the general character of the programme? Should it, in your opinion, be:

more practical	9
more theoretical	1
as it is	8

- Definite wish for more practical emphasis.

9. How was, in your opinion - (a) the amount of practical training?

too much	1
adequate	8
too little	9

- Definite wish for more practical emphasis

(b) the amount of theoretical studies (lectures)?

too many	3
adequate	15
too few	--

(c) the number of study visits?

too many	--
adequate	15
too few	3

Please state your suggestions for changes, if any:

10. What is your opinion about the time allotted to language studies?

absolutely indispensable	--
useful	--
unnecessary	--

- Not Applicable -

Please indicate to what extent you could communicate with the personnel of the factories where you had your in-plant training;

Not adequate; Not too much; Sufficient and well presented; Interesting and easy to communicate; OK; No problems; Ready access.

11. What is your opinion about the training material used?

Very good; Good; More practical; Voluminous; Useful and relevant to my job; Well prepared and sufficient; Quite satisfactory; Very broad/covered to great extent appropriate technology and knowledge; Sufficient; Superb, staff were extremely approachable and sympathetic.

12. Did you have sufficient time for a professional exchange of views with instructors:

yes 12
no 6

with fellow participants:

yes 14
no 4

with staff of the factories:

yes 7
no 10
not applicable 1

13. Did you benefit from that exchange with instructors:

yes 17
no 1

with fellow participants

yes 16
no 2

with staff of the factories:

yes 13
no 3
not applicable 1

14. Did you feel that you could influence the programme content?

much --
somewhat 11
little 4
none 1

III Relevance and Applicability of the Programme

15. Did you find the programme as conducted relevant to the conditions in your home country?

to some extent only 8
to a sufficient extent 7
to a great extent 2

16. Do you think this programme should be repeated?

yes 18
no --

17. If yes, do you think it should be held

in the same country and place	5
in the same country and place (but at CSIRO)	1
in the same country -but another place	3
in another developed country	3
in a developing country	7

Please state the reasons for your answer:

- Canada or USA;
- Finland or New Zealand;
- N. E. Australia where industry is less developed and with more hardwoods.
- In a developing country with a tropical climate; with regional outlook; to see actual not solved problems; get people to help themselves from examples in other related countries. Technical content can be provided by consultants from Australia, e. g.

18. Do you feel that your participaiton in this programme has benefitted you professionally?

to a very small extent	--
to some extent	3
to a sufficient extent	6
to a high extent	4
to a very great extent	5

19. Do you think that the qualifications you have acquired will be recognized in your home country?

yes	16
no	1
not applicable	1

20. Will you have the opportunity to pass on the acquired knowledge in your home country?

to a very great extent	2
to a great extent	9
to a certain extent	6
to a limited extent	1
to a very limited extent	--

21. How will the transfer of knowledge be made?

- | | |
|--|----|
| (a) during daily work with
colleagues and personnel | 12 |
| (b) during meetings organized
for this purpose in your
company | 6 |
| (c) during meetings organized
on a bigger scope | 3 |

Are you of the opinion that you might encounter difficulties in passing on the knowledge obtained? If so, what are the problems you are anticipating?

22. Other suggestions:

SUMMARY OF REMARKS MADE FOLLOWING EACH QUESTION

- BGD 1. More details sent earlier.
11. Should contain material from own country.
17. Misinterpreted as 'developing' not 'developed' (probably).
21. Knowledge acquired is on standardized products unavailable in own country.
- BRA 1. Too many factory visits examining same process and product and two site visits after hours. More time should be allotted to visit site constructions.
21a In project work.
22. Much more time should be allocated to presentation and discussion of country papers, including various solutions and interchange of experience (40 minutes each country).
- COL 1. Given on day of departure.
9. Housing is biggest problem in my country so more time and visits to house construction programmes and design.
- FIJ 22. An attempt will be made to organize conferences. It would help if UNIDO could pass on copies of workshop literature to Government as reference.
- IND 1. Minimum qualifications of participants should have been more clearly spelled out.
7. Too much heterogeneity due to mix of engineers and architects/town planners.
9. Practical demonstrations in field should have had more weight than theoretical and academic lectures.
11. Generally excellent but some too highly technical and could have been avoided.
17. In a developing country with more appropriate level of technology.
21. Although infrastructure exists, main bottleneck is traditional prejudice against timber in structures.

22. More emphasis should have been on appropriate technology based on experience of experts from developing countries. More time should have been given to design problems. More notice needed for travel preparation before event.

INS 9. Practical laboratory work suggested.

22. Programme should be repeated in a developing country such as Indonesia, Philippines or India. The lectures should not fill the whole day, i. e., they were too long.

NEP 1. Tentative day to day programme could have been provided in advance.

9. Theoretical studies could be reduced in favour of some more practical training.
12. Very short time for exchange of views because of too many lectures. Length of time for discussion should be increased. As I feel this is a training rather than workshop, so it should be more practical than theoretical;
22. Lecturers should discuss also the applications and experiences of developing countries and participants should have enough time to present and discuss their country papers and problems, especially in panel discussion sessions. Practical problems from developing countries should be discussed and solved. All lecturers from CSIRO and New Zealand were very good and the UNIDO staff member was excellent and quite cooperative. Topics covered should be restricted somewhat (list given on form). Administration was excellent.

PBI 2. The pacing was off, needed synchronization and lectures should have been followed by demonstration and practical work on the same subject. Everything seemed to be done in a hurry.

9. Should have more emphasis on practical training since most participants had actually done construction work.
11. Voluminous and could have been condensed.
17. Venue should have been where participants could design and fabricate scaled-down models and "rolling their sleeves".
21. Timber engineering facilities are inadequate in our country and technology transfer will require external assistance and, when available, it will have to be channelled through an institution involved in the building and construction industry. (Many good practical suggestions on how to promote timber engineering in this participant's country were given.)

- PHI 4. Terms of reference for complete design of typical structural timber units in Australia could have been appreciated.
22. UNIDO should launch a massive programme in the Philippines on the better use of timber in the Philippines.
- THA 9. Some study visits should be conducted at practical design and consultant enterprises.
21. The low standard of construction and severe price competition will restrict application, and good workmanship and some materials do not exist or are entirely different from Australia.
22. More time needed to prepare country papers and arrange travel.
- SRL 1. Exact nature of assignments should have been available in advance.
5. Two or three more whole days should have been set aside for the assignments
21. Basic timber conversion must be practised before Timber Engineering can be introduced. (Requirements for introduction listed in detail.) Utilization of coconut wood and rubber wood for structures was urged.
- STL 22. (From an architect/planner) - My engineer should have attended. More experienced engineer would have been better. A few site visits to timber mills seemed redundant. The general workshop conduct and warm hospitality of CSIRO team was appreciated.
- TON 22. UNIDO should distribute catalogues and manuals (e. g.) on timber engineering to developing countries.
5. Should be 50:50 lectures: practical and discussions.
21. Lack of support from local builders who haven't tried certain techniques: Nature of building industry structure and 'politics'. UNIDO should hold local training programmes where local builders could be involved.
- ZIM 1. Late notice of selection.
9. Arrangements were excellent and well controlled.
21. Big effort needed to counteract apathy and suspicion against timber-engineered products.
22. Participants should keep in touch and exchange experiences.

R E C O M M E N D A T I O N S

1. Preservation of wood-based panels for structural use in developing countries with harsh climatic conditions and those situations where bio-degradation conditions are adverse is most important. International and national support should be given to research and development projects with the objective of increasing the use of panels in domestic and national construction. (Note was taken of work that CSIRO is doing on treating plywood.) In this respect, the need to choose suitable fasteners to suite the environment was also noted.

2. Considering that there are currently international efforts to evolve and agree on an international system of grouping timber species to facilitate trade and the transfer of technology, especially related to timber engineering and design, the participants strongly supported the creation of ISO/TC 165 Working Group 1 to introduce an acceptable system. Furthermore, it was considered essential that any such strength grouping system should cover the widest possible range of species and properties such as are found in developing tropical timber-producing countries and should also take into account a range of technology including less sophisticated method more directly usable by developing countries. The recent formation of the Pacific Area Standards Congress to work in this field was noted.

3. Design and construction manuals suitable for local and sub-regional use should be drafted with straightforward instructions on how to build standard buildings under a range of environmental hazard and loading conditions. More information on availability and characteristics of local timbers should also be provided. Provision should also be made for including local languages.

4. UNIDO should assist developing countries in drafting Timber Engineering Codes and Guidelines - considering the peculiarities of conditions, resources and availability of materials and level of technology in the various countries. Use of a simple model code to serve as a basis should be considered.

5. The Workshop should be repeated. It should start with the introduction of a simple design code for use in working out simple design examples. This would then be followed by more complex examples as the course proceeded. There was some feeling that a developing country would be more suitable for the location of the next Workshop, although there are many advantages to be obtained in holding the next Workshop in Australia. There should be greater emphasis on practical work and design exercises undertaken by participants in close contact with lecturers/experts. More time should be available for exchange of information amongst participants on construction practices and solutions to building problems in their own countries. The assignment work should be repeated but with smaller problems set earlier on in the programme, leading up to more complex ones at the end. The venue should permit some 'hands-on' work, possibly involving building scaled-down working models and site inspections and discussions.

6. The possibility of UNIDO holding timber construction appreciation courses in developing countries, either individual or on a sub-regional basis, should be investigated to help introduce timber to builders, contractors and local government officials.

7. Participants should keep in contact and develop a liaison system to exchange experiences in introducing timber construction into their countries.

OPENING ADDRESS BY Mr. Adrian Caddy, Government of Australia

Mr. Chairman:

May I first, on behalf of the Australian Government, welcome you all to Australia. I hope that you have a fruitful and enjoyable stay in Melbourne and have the opportunity to learn a little about our country.

I would like to extend a special word of welcome to our colleague from UNIDO, Mr. Robert M. Hallett. It has largely been through the efforts of Mr. Hallett that this Workshop programme has been developed and I am sure we all thank him for his efforts.

At this stage I would also like to pay tribute to our friends from the Commonwealth Scientific and Industrial Research Organization.

I should emphasize that from the Australian end, it has been the involvement of CSIRO staff that has been the critical factor behind our presence here today. The programme has been largely devised by CSIRO and stems from its excellent research and development work in the field of timber for use as an effective construction material.

The Australian Government has a clear and long-standing commitment to assist developing countries in a tangible way. The primary aim of the Australian aid programme is to contribute to the social and economic development of the peoples of developing countries. Our aid is intended to promote self-reliant development in the third world.

Our aid programme is primarily the responsibility of the Australian Development Assistance Bureau, but the Department of Industry and Commerce, which I represent, has a modest role to play in development assistance activities related to industrialization.

The primary role of the Department is to advise the Government

on policies relating to Australian manufacturing and tertiary industries.

In carrying out that role, the Department is naturally in close and frequent contact with Australian industry and with research organizations such as CSIRO.

We are also involved in the activities of a range of international organizations concerned with industry policy, one of which is UNIDO.

We are able, therefore, to match up UNIDO's requirements and Australian industry strengths and to join with these other parties in planning activities such as today's Workshop.

As you all know, UNIDO is the body responsible for the co-ordination of UN efforts to promote industrial development in developing countries.

In recent years the Australian Government and UNIDO have developed a close liaison. We in Australia see this as a good development and one which we hope will flourish in the future.

One way in which this closer involvement has manifested itself in recent years has been through the development of a programme of Workshops held in Australia. We believe that they provide an important practical element in the promotion of industrial development.

The major objectives of these Workshops is to provide participants with the opportunity to discuss and examine Australian developments in selected industry sectors which may be of relevance to their own particular industrial environment. They also provide a unique opportunity for participants to share their own particular experiences and needs with a view to establishing if particular methods and approaches can be applied in their own situation.

Considerable effort is spent in selecting areas which are of immediate relevance to developing country programmes and where the lead time for benefits to participating countries will not be too long.

It is worth noting in this regard that the most recent Workshops have been held on:

- Cement and concrete products;
- Selected building materials;
- Waste heat recovery in industrial processes.

The selection of a Workshop topic on timber engineering sits quite soundly in this programme.

While construction industries, both domestic and commercial are important sectors of the economy of all countries, they assume a special significance in respect of developing countries:

- They provide important employment opportunities;
- And if properly integrated into the economy, provide the opportunity for development in other sectors.

In some cases however, it has been suggested that construction industries in developing countries rely too heavily on the use of imported building materials, components and equipment. This may represent a considerable financial strain on foreign exchange.

Thus, significant benefits may be gained through the development of construction practices that make optimum use of available domestic resources.

Many developing countries have good forest resources. The purpose of this Workshop is to promote the optimum use of timber as an alternative construction material.

The comprehensive programme of the Workshop allows for:

- A series of key papers delivered by leading Australian experts in various aspects of timber engineering;
- A series of visits to organizations where you will be able to observe various engineering techniques;
- A number of panel discussion sessions;
- A session where participants will be able to describe the role that timber is permitted to play in construction activities in their own countries; and
- A series of assignment work sessions.

The organizers have arranged the programme to give you opportunities not only to see and hear, but also to question and discuss.

I am sure that you will all become very actively involved and thus ensure that this Workshop is a success. It is important for you to see the Workshop not as an opportunity for Australia to show off its skills, but one for you to assess these skills, pick out those which are appropriate or adaptable to your circumstances at home and then implement them.

I am sure too, that you will not see the Workshop as an isolated event. We see the follow-up phase as being particularly important, and I suggest that towards the end of the Workshop you will need to give thought to the conclusions and recommendations which should flow from your work here and the way in which you can best put into practice any points of value you have picked up here.

My thanks once again to Dr. Blakey and his staff, Mr. Armstrong, Mr. Hallett and the many others who have worked hard to make the occasion a success.

And my best wishes for an enjoyable stay in this country and for a useful and successful Workshop.

I now have great pleasure in declaring this Workshop open.

Thank you

OPENING STATEMENT of Dr. Abd-El Rahman Kahne,
Executive Director - U N I D O

On behalf of the Executive Director of UNIDO, Dr. Abdel Rahman Khane, I take pleasure in welcoming you to this first "Timber Engineering Workshop" which has been jointly organized by UNIDO and CSIRO through the generosity of the Government of Australia. We are also appreciative of the enthusiasm shown by the Australian Timber and Construction Industries in making their factories and building sites available for visits, and by the staff of CSIRO for preparing the technical programme, the lectures, etc. and of the Department of Industry and Commerce in looking after other arrangements. However, since this is the first such specialized training course, I feel it is opportune to review briefly the philosophy behind UNIDO's technical assistance programme in the secondary wood products and processing field, and to indicate how our activities in the use of wood in construction fit into this overall programme.

Technical assistance is generally provided to individual countries, usually directly to the factories involved to enable them to operate more efficiently - often moving from the craftsman to the industrial level. Certain supporting activities, such as expert group meetings and training seminars/workshops complement this mainstream work in specialized fields, and we have held many such seminars in furniture and joinery production and in the selection of appropriate woodworking machinery.

Consistent with our aim of helping developing countries upgrade the living conditions of their populations, through inter alia providing them with better housing at lower cost, while at the same time using a locally available and renewable resource - wood - UNIDO held a meeting in 1969 on production techniques for the use of wood in housing under conditions prevailing in developing countries. This led to the meeting in 1971 in

Vancouver, co-sponsored by FAO, the UN Centre for Building and Housing and UNIDO. In 1978, UNIDO organized with ACCT a course in Bordeaux, France and a study tour in the UK to show French speaking specifiers how their own timber species were being used in construction in the UK. More recently, we had a meeting on timber stress grading and strength grouping, late in 1981.

I shall not go into the assistance we provide in the field of the use of wood as a non-load-bearing material, though this represents the majority of our work, but give you some examples of assistance given in the field of the use of wood as a structural material:

- In Laos, we designed roof trusses and a low cost prefabrication system for use in schools using local species and built a prototype as well as building a 40-meter bridge.
- In Kenya, we developed a system for low cost modular prefabricated wooden bridges using a ten-foot (3 m) modules that can be assembled into bridges of spans up to 100 feet (30 m) and carrying live loads of up to 40 tons. This system has been successfully introduced since in Honduras, Peru, Costa Rica, Madagascar and the Central African Republic. We have requests to provide assistance for its introduction in Mali, Equatorial Guinea and Guinea.
- In Paraguay, the Institute for Industrial Standards and Technology was assisted in developing a wide wood research programme including timber strength testing.
- In Indonesia, UNIDO has provided assistance for many years to a building materials research institute in Bogor. Among the fields in which assistance was provided was the design of trusses and the use of particle boards in prefabricated housing.

- In Sri Lanka we have an ongoing project to develop the use of coconut stem wood and rubberwood in trussed rafters and glulam beams (including the technology of finger jointing).

- In the Philippines, we are collaborating with FAO in a project to train persons from the region in the production and utilization of coconut wood in construction.

Unfortunately, there exists in most developing countries an aversion to the use of wood in construction, associating wood with slums and shanty towns and considering it an unreliable short-term use material.

It is with this background that this current workshop is being organized and we hope that, by bringing specifiers and persons responsible for construction in developing countries to Australia, you will return convinced of the role that this renewable and locally available building material could play in the development of your countries. We know that many countries have long traditions of woodworking and carpentry - whether blessed with forest resources or not - but modern technologies have allowed materials such as steel and concrete to predominate for many structural purposes, even if steel has to be imported and wood is available locally. Yet wood may also compete if structures are efficiently designed, processing is carried out properly and certain industrial practices are followed. It is our confidence in wood as a structural material that prompted UNIDO to organize this workshop; and it is our hope that the considerable experience gained by Australia in using wood in construction will prove valuable. I should point out here that we are particularly pleased that Australia is hosting this workshop due to its long experience in the use of mixed species (Eucalypts), the development of species grouping by strength, the development of the Plessey strength grading machine, the development of new approaches to timber drying and preservation, and to the well derived building codes.

In all of this CSIRO has been at the forefront of research and development and UNIDO has collaborated with CSIRO's staff on several occasions in this field; we have had their specialists seconded to our projects in Paraguay, Laos and to attend several of our technical expert group meetings. Others have served as consultants at UNIDO free advisory booths at LIGNA Fair. These contacts have confirmed to us that we have, in CSIRO, an excellent host to organize this workshop.

The programme has been planned to include lectures, visits to both wood conversion factories and to building sites, discussions with experts, and amongst participants as well as assignment work that will be done in groups. In this way we hope that your eyes will be opened to the potential of wood in satisfying your country's building needs - for housing, for industrial, commercial, agricultural and institutional buildings, and for special structures such as bridges, warves and temporary works. We hope that you will share and exchange your own experiences with each other and with lecturers and organizers since in this way you will all benefit from broader outlooks. You can be sure that the many examples you will see of timber structures here in Australia are matched by similar ones in North America and Europe in countries both with and without great forest resources. This is because of the many advantageous properties of wood, which outweigh the disadvantages and which, when coupled with modern timber engineering practices permit this fine material to be economically and safely used around the world. I wish you every success in your deliberations and endeavours.

